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Problems in

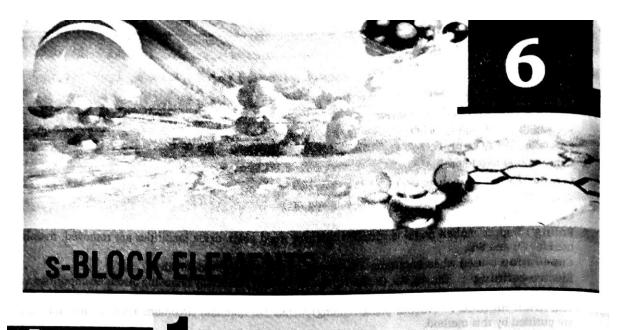
Inorganic Chemistry



9_{th}

Contents

1. Periodic Properties	1-50
2. Chemical Bonding (Basic)	51-103
3. Chemical Bonding (Advanced)	104-178
4. Co-ordination Compounds	179-246
5. Metallurgy	247-277
6. s-Block Elements	278-304
7. p-Block Elements	305-379
8. d-Block Elements	380-407
7 Types of Reactions	408-461
10. Qualitative Inorganic Analysis	462-525
11. Environmental Chemistry	526-536



Level

Alkali Metals (gp.1 or IA)

	(3)				
1.	Sodium bicarbonate l	nas :			
	(a) Ionic bond	(b) Covalent bond	(c)	Hydrogen bond	(d) All of these
2.	Which of the following	ng metal on burning in	mois	t air does not give	smell of ammonia?
	(a) Mg	(b) Ca	(c)		(d) Li
3.	For the alkali metals,	which of the following			ng atomic number?
	(a) First ionization e			Electronegativity	
		of the univalent ion			
4.	Among the carbonate	s of alkali metals which			al stability?
	(a) Cs ₂ CO ₃			K ₂ CO ₃	(d) Na ₂ CO ₃
5.		ig is most soluble in wa			
	` '	(b) NaClO ₄		KClO ₄	(d) LiClO ₄
6.		in liquid ammonia is b			
	(a) the presence of ic		(b)	the presence of ar	nmoniated electron
		NaNH ₂	(d)	the formation of s	odium hydride
7.	The basicity of the hy	droxides of the followi	ng a	lkali metals is of th	e order :
	(a) Li > Na > Rb >			Na > Li > Rb > 0	
	(c) Cs > Rb > Na >			Rb > Cs > Na >	Li
8.		hibited by sodium is ex	77.0		
	(a) diffusion of Na ⁺		(p)	oscillation of loose	e electrons
	(c) excitation of free		(d)	existence of body-	centered cubic lattice
9.	Soda lime is made fro	om:			
	(a) Na + CaO + H ₂ O		(b)	CaO + NaOH(aq)	
	(c) NaOH + CaCO ₃		(a)	NaHCO 3 + CaO	

10.	The compound called microcosmic salt is:
	(a) $Na_2 HPO_4 \cdot 2H_2O$ (b) $Na(NH_1)HPO_4 \cdot 4H_2O$
	(c) $Na_2NH_4PO_4 \cdot 2H_2O$ (d) $(NH_4)_2HPO_4 \cdot 2H_2O$
11.	Potassium when heated strongly in oxygen, it forms:
	(a) K_2O (b) KO_2 (c) K_2O_2 (d) KO_3
12.	When a concentrated solution of ammonia is saturated with sodium chloride in the presence of pieces of dry ice, a water cloud forms. This is due to the:
	(a) precipitation of sodium carbonate from the reaction mixture
	(b) precipitation of sodium hydrogen carbonate from the reaction mixture
	(c) precipitation of ammonium hydrogen carbonate from the mixture
	(d) precipitation of ammonium carbonate
13.	The compound formed on heating sodium metal in a current of dry ammonia gas, is:
	(a) sodium imide (b) sodium nitrite (c) sodium amide (d) sodium azide
14.	Which of the following compounds is not obtained when the products obtained from the
tomor	electrolysis of brine are mixed?
	(a) NaCl (b) H ₂ (c) NaOCl (d) Cl ₂
15.	When dry ammonia gas is passed over heated sodium (in absence of air) the product formed
	is: " " " " " " " " " " " " " " " " " " "
	(a) sodium nydride (b) sodium nitride
	(c) sodamide (d) sodium cyanamide
16.	Which of the following compounds liberate(s) oxygen on heating?
	(a) Li ₂ CO ₃ . Magazina Origina (b) LiOH
	(c) LiNO ₃ (d) NaOH
17.	Sodium peroxide is used to purify the air in submarines and confined spaces because :
	(a) it removes CO ₂ and produces O ₂
	(b) it decomposes to form Na ₂ O
	(c) it reacts with oxygen to form sodium superoxide
	(d) none of these
18.	Which of the following salt is known as washing soda?
	(a) Na ₂ CO ₃ and the control of th
	(c) Na ₂ CO ₃ ·10H ₂ O (d) Na ₂ CO ₃ ·5H ₂ O (Ald properties of the
19.	Which of the following compounds is formed when sodium burns in excess supply of air?
	(a) Sodium suboxide (b) Sodium oxide
	(c) Sodium peroxide (d) Sodium superoxide
20.	Glauber's salt is:
	(a) Na SO . (b) Na SO 4 H O
	(c) $Na_2SO_4 \cdot 5H_2O$ (d) $Na_2SO_4 \cdot 10H_2O$
21.	Sodium hydroxide is produced on a large scale :
	 (a) by the hydrolysis of Na₂CO₃ (b) by the electrolysis of an aqueous solution of NaCl (c) by adding water to sodium oxide (d) by reacting sodium with water

22.	Which of the following metal is used in flash	bulbs?
	(a) Be	(b) Mg
	(c) Ca	(d) Ba
23.	The pairs of compounds which cannot exist t	ogether in aqueous solution are :
	(I) NaH ₂ PO ₄ and Na ₂ HCO ₃	(II) Na ₂ CO ₃ and Narroo ₃
	(III) NaOH and NaH ₂ PO ₄	(IV) NaHCO ₃ and NaOH
	(a) I, II, III	(b) III, IV
	(c) I, IV	(d) II, III
24.	Which one on reaction with NaOH solution g	
	(a) S	(b) Zn
	(c) NH ₄ Cl	(d) I ₂
25.	In the reaction LiH + AlH ₃ \rightarrow LiAlH ₄ , AlH ₃ a	
	(a) Lewis acid and Lewis base	(b) Lewis base and Lewis acid
	(c) Bronsted base and Bronsted acid	(d) None of these
26.		factor in making lithium metal, the strongest
	reducing agent?	
	(a) Ionisation energy (b) Hydration energy	(c) Heat of sublimation (d) None of these
27.		air of ionic compounds has the higher lattice
	energy?	3.7
	(i) KCl and MgO (ii) LiF and Li	Br (iii) Mg ₃ N ₂ and NaCl
	(a) KCl, LiBr, Mg ₂ N ₂	(b) MgO,LiBr,Mg ₃ N ₂
	(c) MgO,LiF,NaCl	(d) MgO, LiF, Mg ₃ N ₂
28.	Sodium bicarbonate has:	
	(a) ionic bond	(b) covalent bond
	(c) hydrogen bond	(d) all of these
29.	Compound having lowest melting point:	
	(a) LiCl	(b) CsCl
	(c) RbCl	(d) KCl
30.	Incorrect statement is:	
	(a) NaHCO ₃ and KHCO ₃ have same crystal s	
	(b) On heating LiNO 3 decomposes into Li 2O	and NO 2
	(c) Among alkali metals, Li metal impart red	colour to flame
	(d) Li ₂ SO ₄ does not form alum	
31.	The solubility of metal halides depends on	their nature, lattice enthalpy and hydration
	enthalpy of the individual ions. Amongst fluor	their nature, lattice enthalpy and hydration rides of alkali metals, the lowest solubility of LiF
	(a) Ionic nature of lithium fluoride	(b) High lattice enthalpy
20	(c) High hydration enthalpy of lithium ion	
32.	ine reducing power of a metal depends on va	rious factors. Suggest the factor which makes Liss solution:
	(c) Hydration enthalpy	(b) Ionisation enthalpy
	(c) Hydration enthalpy	(d) Electron-gain enthalpy

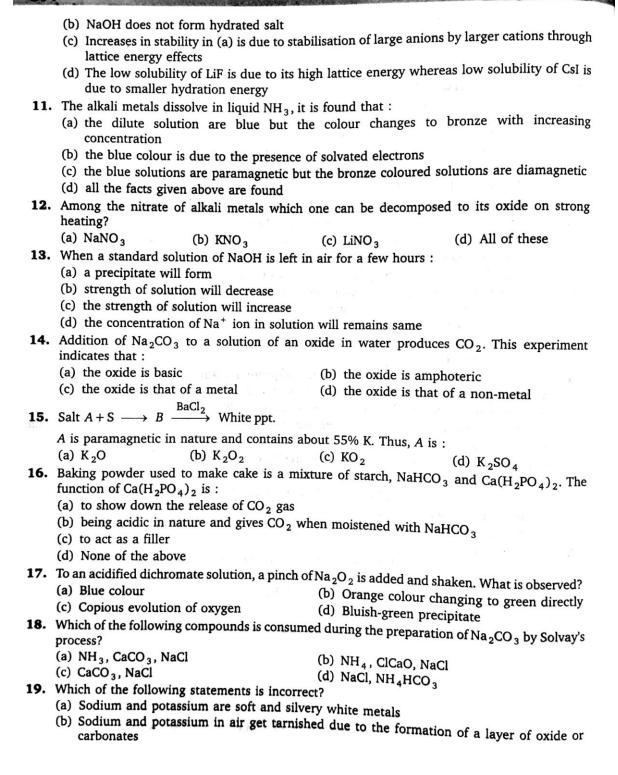
Alkaline Earth Metals (gp.2 or IIA)

33.	Mg ₂ C ₃ reacts with water forming propyne gas. C ₃ ⁴⁻ ions has:
	(a) two sigma and two ni honds
	(a) two sigma and two pi bonds (b) three sigma and one pi bond (c) two sigma and one pi bond (d) two sigma and three pi bonds
24.	mb flood do 1 1 1 1
34.	
25	(C) 5112
33.	The highest occupied energy level of the group 2 elements radius is $7s^2$, which of these statements is likely to be incorrect?
	statements is likely to be incorrect?
	(a) The element will decome an oxidation state of +II in all its compounds
	(b) The element will decompose water, liberating hydrogen
	(c) Hydroxide of the element will be amphoteric
96	(d) Metal carbonate is relative stable at higher temperature than calcium carbonate
30.	Amongst the following hydroxides, the one which has the highest value of K_{sp} at ordinary temperature is:
	SOME THE PROPERTY OF THE PROPE
27	(a) Mg(OH) ₂ (b) Ca(OH) ₂ (c) Sr(OH) ₂ (d) Ba(OH) ₂
3/.	Which of the following alkaline earth metal hydroxides is the least soluble in water?
-10 ftv	(a) Be(OH) ₂ (b) Mg(OH) ₂ (c) Ca(OH) ₂ (d) Ba(OH) ₂
20	-
38.	The thermal stability of BaCO ₃ , CaCO ₃ , SrCO ₃ and MgCO ₃ decreases in the order:
	(a) $BaCO_3 > SrCO_3 > MgCO_3 > CaCO_3$ (b) $CaCO_3 > SrCO_3 > MgCO_3 > BaCO_3$
-	(c) MgCO ₃ > CaCO ₃ > SrCO ₃ > BaCO ₃ (d) BaCO ₃ > SrCO ₃ > CaCO ₃ > MgCO ₃
39	Magnesium cation has polarising power close to that of: (a) Li ⁺ (b) Na ⁺ (c) K ⁺ (d) Cs ⁺ (d) Cs ⁺ (e)
40	Which of the following salt does not impart colour to the flame?
2.2	(a) MgCl ₂ to many 1 (b) SrCl ₂ and (c) BaCl ₂ and manage 1 (d) LiCl _{11 a.8 (b)}
41	Mortar is mixture of the real patients (b) of the standard montar to probable.
3.	(a) Ca(OH) ₂ , silica and water white who (b) CaCO ₃ and SiO ₂ (v) brunging A .43
	(c) CaO and silica (A) to return a most of the life forms (d) CaCO ₃ , SiO ₂ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₂ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₂ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₂ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₃ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₃ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₃ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₃ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₃ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₃ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₃ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₃ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₃ and water (W) seed on the life forms (d) CaCO ₃ , SiO ₃ and water (d) CaCO ₃ , SiO
42	When MgCl ₂ ·6H ₂ O is strongly heated, then it forms: (a) MgO (b) Mg(OH) ₂
	(a) MgO
	ICI MULTICI
43	A piece of magnesium ribbon is heated to redness in an atmosphere of nitrogen and on cooling with water, the evolved gas is:
	(a) ammonia control and the state of the sta
50.77	
44	Plaster of Paris when mixed with the correct amount of water sets into a solid mass due to the
	formation of: (b) $(CaSO_4)_2 \cdot H_2O$
	(a) CaSO ₄
	(c) CaSO ₄ 2H ₂ O
4	6. Plaster of Paris is: (b) CaSO ₄ ·7H ₂ O
	(a) CasO 3H O
	(c) 2CaSO ₄ H ₂ O (d) CaSO ₄ 2H ₂ O

46.	Magnesium liberates H ₂ on reaction with :	
	(a) dil. HCl	(b) dil. H ₂ SO ₄
	(c) very dil. HNO 3	(d) all of these
47.	At high temperature, nitrogen combines with	1 CaC 2 to give :
	(a) calcium cyanide	(b) calcium cyanamide
	(c) calcium carbonate	(d) calcium nitride
48.	Calcium hydride on hydrolysis forms?	
	(a) CaO + H ₂	(b) Ca(OH) ₂ only
	(c) $Ca(OH)_2 + H_2$	(d) only CaO
49.	Magnesium wire is heated in the atmosphere	
	(a) magnesium acts as an oxidising agent	3 3 7 3 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	(b) magnesium has two electrons in the out	ermost shell
	(c) magnesium acts as a reducing agent and	removes oxygen from CO ₂
	(d) none of the above	
50 .	MgO is used for lining furnaces because:	
	(a) of high melting point of MgO	(b) MgO is a very good conductor of heat
	 MgO is an electrical insulator 	(d) None of these
51.	Amongst LiCl, RbCl, BeCl2, MgCl2, the comp	pounds with greatest and least ionic character
	respectively are :	
	(a) LiCl and RbCl	(b) RbCl and BeCl ₂
	(c) RbCl and MgCl ₂	(d) MgCl ₂ and BeCl ₂
52 .	Which of the following compounds does not	have similarity in their structural aspect?
	(a) FeSO ₄ ·7H ₂ O	(b) Na ₂ CO ₃ ·7H ₂ O
	(c) MgSO·7H ₂ O	(d) ZnSO ₄ ·7H ₂ O
53.	By adding gypsum to cement:	
	(a) Setting time of cement becomes less	(b) Setting time of cement increases
100 10	(c) Colour of cement becomes light	(d) Shining surface is obtained
54.	A compound (A) is used in preparation of	washing soda to recover ammonia in Solvay's
	DIOCESS. WHEN COA IS DUDDIED UNDURING AN AUD	POUS SOUITION OF (A) AL - 1
	is used in write washing due to distinctiant	nature. What is the chemical formula of A?
	(a) Ca(HCO ₃) ₂ (c) Ca(OH) ₂	(b) CaO
55	Which is not similar characteristic(s) shout the	(d) CaCO ₃
33.	Which is not similar characteristic(s) about the	ne electronic configuration of Be, Mg, Ca?
	(a) All the atoms have a pair of 3-electrons in	LUCIT OUTERMOSE on and 1
	(b) All the atoms contain a pair of p-electron (c) All are alkaline earth metals	s in their outermost energy level
	(d) All are of second group of the periodic ta	hle
	(a) 1m are of second group of the periodic to	DIE .

Δlk	cali Metals (gp.1 or IA)		
1.	$KO_2 + CO_2 + H_2O \xrightarrow{\text{more } CO_2} [X] + [Y]$	the Satistical at a de-	
	Products [X] and [Y] are respectively:	the slue side	
	(a) K_2CO_3 , O_2 (b) KHCO ₃ , O_3	(c) KOH, K ₂ CO ₃	(d) KHCO ₃ , H ₂ O
2.	The correct order of increasing solubility in	n water is:	
	(a) KF < NaF < LiF	(b) NaHCO ₃ < KHC	O ₃ < RbHCO ₃
	(c) $K_2CO_3 < Na_2CO_3 < Li_2CO_3$	(d) LiNO ₃ < NaNO ₃	< KNO ₃
3.	Which of the following carbonate salt is so	oluble due to high entro	py change ?
		(c) $(NH_4)_2CO_3$	(d) Na ₂ CO ₃
4.	Which of the following compounds decom	pose on heating?	Y 41.25 1
	(a) NaHCO $_3$ (b) Na $_2$ CO $_3$	(c) CaCO ₃	(d) K ₂ SO ₄
5.	Li does not resemble with other alkali met		
		0	

- (a) Li₂CO₃ decomposes into oxides while other alkali metal carbonates are thermally stable
- (b) LiCl is predominantly covalent
- (c) Li₃N is formed, when Li metal is heated with N₂ gas
- (d) all are correct
- 6. Which of the following statement about the sulphate of alkali metal is correct?
 - (a) Except Li₂SO₄ all sulphate of other alkali metals are soluble in water
 - (b) All sulphate salts of alkali metals except lithium sulphate forms alum.
 - (c) All sulphate salts of alkali metals except lithium sulphate do not decompose at high temperature
 - (d) All of the above
- 7. Alkali metals possess metallic lustre when freshly cut because :
 - (a) they have a hard surface and light is reflected back
 - (b) their crystal structure contains ordered arrangement of constituent atoms
 - (c) they contain loosely bound electrons which absorb the photons and then re-emit
 - (d) they are obtained from the minerals on which light has been falling for years
- 8. Select incorrect statement:
 - (a) Li₂CO₃ is only sparingly soluble in water and no LiHCO₃ has been isolated
 - (b) K₂CO₃ can not be made by a method similar to the solvey process
 - (c) Li₂CO₃ and MgCO₃ both are thermally stable
 - (d) Na₂CO₃ NaHCO₃ 2H₂O is a mineral called trona
- 9. Melting point of a mixture of Na₂CO₃ + K₂CO₃, mixture is:
 - (a) higher than that of Na₂CO₃
 - (b) higher than that of K₂CO₃
 - (c) lower than that of both Na_2CO_3 and K_2CO_3
 - (d) lower than that of K₂CO₃ only
- 10. Select incorrect statement:
 - (a) Stability of peroxides and superoxides of alkali metals increases with increases in size of the metal ion



(c) $Al_{(aq.)}^{3+} > Mg_{(aq.)}^{2+} > Na_{(aq.)}^{+}$: Hydrated size (d) $I_{(aq.)}^- < Br_{(aq.)}^- < Cl_{(aq.)}^- < F_{(aq.)}^-$: Ionic mobility

(a) Li, Mg

(c) Na, K or Mg

(a) Ca and Mg

(c) Li and Na

The metals X and Y may be :

28. Metal M + air $\xrightarrow{\Delta} A \xrightarrow{H_2O} B \xrightarrow{HCl}$ White fumes; Metal M can be :

(b) Li, Al or K

(d) Li, Na or K

(b) Na and Mg

(d) Na and K

29. X and Y are two metals. When burnt in air, X forms only oxide while Y forms oxide and nitride.

260		INURGANIC CHEMISTRY
30.	Wh	ich is incorrect statement?
	(a)	The heats of hydration of the dipositive alkaline earth metal ions decrease with an
		increase in their ionic size
	(b)	NaNO ₃ forms Na ₂ O ₂ on heating
	(c)	Hydration of alkali metal ion is less than that of IIA group
	(d)	Alkaline earth metal ions, because of their much larger charge to size ratio, exert a much stronger electrostatic attraction on the oxygen of water molecule surrounding them

31. Which of the following statement is incorrect?

- (a) The atomic radius of Na is greater than that of Mg
- (b) Metallic bond of Mg is stronger than the metallic bond in Na
- (c) Melting and boiling points of Mg are greater than those of Ca
- (d) Mg and Ca are the most abundant elements amongst the alkaline earth metals
- **32.** Thermal stability of MCO₃ is in order:
 - (a) $BeCO_3 < MgCO_3 < CaCO_3 < SrCO_3 < BaCO_3$
 - (b) $MgCO_3 < BeCO_3 < CaCO_3 < SrCO_3 < BaCO_3$
 - (c) $CaCO_3 < SrCO_3 < BaCO_3 < BeCO_3 < MgCO_3$
 - (d) $BaCO_3 < SrCO_3 < CaCO_3 < MgCO_3 < BeCO_3$
- 33. Select incorrect statement about alkaline earth metals :
 - (a) Solubility of sulphates decreases down the group
 - (b) Solubility of hydroxides decreases down the group
 - (c) Thermal stability of carbonates increases down the group
 - (d) Basic nature increases down the group
- **34.** In polymeric (BeCl₂)_n, there are :
 - (a) three centre four-electron bonds
- (b) three centre three-electron bonds
- (c) two centre three-electron bonds
- (d) two centre two-electron bonds
- 35. A metal is burnt in air and the ash on moistening smells of NH3. The metal is:
 - (a) Na
- (b) Fe
- (c) Mg

36. Which is not obtained when metal carbides react with H2O?

- (a) $Al_4C_3 + H_2O \longrightarrow CH \equiv CH$
- (b) $CaC_2 + H_2O \longrightarrow CH \equiv CH$
- (c) $Mg_4C_3 + H_2O \longrightarrow CH_3C \equiv CH$
- (d) $Be_2C + H_2O \longrightarrow CH_4$
- 37. Choose incorrect statement:
 - (a) BeCO₃ is kept in the atmosphere of CO₂ since, it is least thermally stable
 - (b) Be dissolves in alkali forming [Be(OH)₄]²
 - (c) BeF2 forms complex ion with NaF in which Be goes with cation
 - (d) BeF2 forms complex ion with NaF in which Be goes with anion
- 38. II A (alkaline earth metals) and II B (zinc family) resemble :
 - (a) MgSO₄ · 7H₂O is isomorphous with ZnSO₄ · 7H₂O
 - (b) II A and II B cations are not precipitated by H2S in acidic medium
 - (c) both (a) and (b)
 - (d) none of the above

39. Select the correct statement:

- (a) Be and Al show diagonal relationship
- (b) Be forms tetrahedral complexes [Be(C₂O₄)₂]²-

S-BLOCK ELEMENTS

- (c) Al forms AlF₆³⁻, an octahedral complex
- (d) All are correct statements
- **40.** Calcium imide on hydrolysis gives gas (B) which on oxidation by bleaching powder gives gas (C). Gas (C) on reaction with magnesium give compound (D) which on hydrolysis gives again gas (B). Identify (B), (C) and (D).

(a) NH_3 , N_2 , Mg_3N_2

(b) N₂, NH₃, MgNH

(c) $N_2, N_2O_5, Mg(NO_3)_2$

- (d) NH_3 , NO_2 , $Mg(NO_2)_2$
- 41. A compound X on heating gives a colourless gas. The residue is dissolved in water to obtain Y. Excess CO₂ is bubbled through aqueous solution of Y and Z is formed. Z on gentle heating gives back X. The X is:

(a) CaCO₃

(b) Ca(HCO₃)₂

(c) Na₂CO₃

(d) NaHCO₃

- 42. Which of the following statement is false?
 - (a) The milk of magnesia used as antacid is chemically MgO + MgCl₂
 - (b) Stability of alkali metal peroxides increases with increase in atomic number
 - (c) Hydration energy of AgF is higher than its lattice energy
 - (d) Anhydrous MgCl2 cannot be prepared by direct heating of MgCl2 6H2O
- 43. The more commonly used baking powder contains about 30% NaHCO₃, 20% NaAl(SO₄)₂, 10% Ca(H₂PO₄)₂ and 40% starch. Which of the following statements is/are correct?
 - (a) Ca(H₂PO₄)₂ is acidic and when moistened it reacts with NaHCO₃ evolving CO₂ gas
 - (b) NaAl(SO₄)₂ slows down the decomposition reaction of NaHCO₃ so that CO₂ is evolved more slowly
 - (c) NaAl(SO₄)₂ is acidic and when moistened it reacts with NaHCO₃ evolving CO₂
 - (d) Both (a) and (b)

Level 3

PASSAGE 1

All alkali metals dissolve in anhydrous liquid ammonia to give blue colour solution. It is the ammoniated electron which is responsible for the blue colour of the solution, and the electrical conductivity is due to the ammoniated cation, $[M(NH_3)_x]^+$ as well as the ammoniated electron, $[e(NH_3)_y]^-$, values of x and y depend on the extent of solvation by NH_3 . Dilute solutions are paramagnetic due to free ammoniated electrons.

- 1. What happens if more alkali metals is allowed to react with concentrated liquid ammonia?
 - (a) Paramagnetic character of solvated electrons is retained
 - (b) Solvated electrons associate to form electron-pairs and paramagnetic character decreases
 - (c) Reducing character is increased
 - (d) Reducing character is not affected
- 2. Which of the following statement about solution of alkali metals in liquid ammonia is correct?
 - (a) The solution have strong oxidizing properties
 - (b) Both the dil. solutions as well as conc. solution are equally paramagnetic in nature
 - (c) Charge transfer is responsible for the colour of the solution
 - (d) None of these
- **3.** Ammoniated solutions of alkali metals are reducing agents due to the presence of free ammoniated or solvated electrons that can reduce :
 - (I) O_2 to O_2^{2-}

(II) $K_2[Ni(CN)_4]$ to $K_4[Ni(CN)_4]$

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(III) Aromatic ring

(IV) Non-terminal alkyne

Choose the correct code:

- (a) III and IV
- (b) II and III
- (c) I, II, III and IV
- (d) I, III and IV

PASSAGE 2

Na
$$\xrightarrow{\text{H}_2\text{O}} A \xrightarrow{\text{CO}_2} B \xrightarrow{\text{SO}_2} C \xrightarrow{\text{Na}_2\text{S}/\text{I}_2} D \xrightarrow{\text{Ag}^+/\text{salt}} E \text{ (complex)}$$

- **1.** The compound B and C are:
 - (a) Na₂CO₃, Na₂SO₄

(b) NaHCO3, Na2SO4

(c) Na₂CO₃, Na₂SO₃

(d) None of these

- **2.** The compound *D* is :
 - (a) Na₂SO₄
- (b) $Na_2S_4O_6$
- (c) Na₂S₂O₅
- (d) $Na_2S_2O_3$
- 3. Oxidation number of each 'S' atom in compound D:
 - (a) +2, +2
- (b) +4, 0
- (c) +6, -2
- (d) +5, -1

Metal + dil. HCl
$$\longrightarrow$$
 A $\xrightarrow{\text{Na}_2\text{HPO}_4}$ B (white ppt.)

HCl(g) Heated

C $\xrightarrow{\text{Electrolysis in}}$ Metal (M)

- 1. The compound A is:
 - (a) CaCl₂·2H₂O
 - (c) Na₂SO₄·10H₂O
- 2. The compound B is:
 - (a) $Mg(NH_4)PO_4$
 - (c) Na(NH₄)HPO₄
- (b) MgCl₂·6H₂O
- (d) CaSO₄·2H₂O
- (b) $Ca_3(PO_4)_2 + NH_3$
- (d) both (a) and (b)
- 3. The compound C and metal M are:
 - (a) NaCl, Na
- (b) CaCl2, Ca
- (c) MgCl₂, Mg
- (d) BeCl₂, Be

PASSAGE

Calcium sulphate is found in nature in two forms, anhydrous calcium sulphate and hydrated calcium sulphate. When anhydrous calcium sulphate is heated with coke, sulphur dioxide gas is obtained. When hydrated calcium sulphate is heated to 200°C, it forms anhydrous salt.

- 1. The anhydrous calcium sulphate is called:
 - (a) gypsum
- (b) anhydrite
- (c) plaster of Paris
- (d) lime
- 2. When calcium sulphate is mixed with conc. HCl and the paste is formed. What colour is obtained when a pinch of this paste is brought near the flame?
 - (a) golden yellow
- (b) brick red
- (c) crimson red
- (d) apple green
- 3. What is the product formed when hydrated CaSO₄ is heated to 125°C instead of 200°C?
 - (a) $(CaSO_4)_2H_2O$
- (b) CaSO₄ $\frac{3}{4}$ H₂O
- (c) CaSO₄
- (d) $CaO + SO_3$

Sodium sulphite (Na₂SO₃) is added to meat as a preservative. The presence of Na₂SO₃ can be detected by adding dil. H₂SO₄ when the pungent smelling gas evolved turns the lime water milky. The gas evolved was detected as sulphur dioxide. The SO₂ evolved was dissolved in water and it requires I_2 solution in order to oxidize SO₂ to SO₄²⁻ in titration.

$$SO_2 + 2H_2O + I_2 \longrightarrow 4H^+ + SO_4^{2-} + 2I^-$$

In order to check the results of titration, excess barium chloride is added to the final solution. The resulting precipitate is collected and weighed.

1.	SO_2 and CO_2 both turns lime water milky	. Which	of the	following	reagent	can	be	used	to
	distinguish these two gases?								

(I) $K_2Cr_2O_7/H_2SO_4$ (II) $KMnO_4/H^+$

(III) I2 solution

(a) I, II, III correct

(b) I, III only correct

(c) II, III only correct

(d) III only correct

- 2. SO_2 gas is used as a bleaching agent. Its bleaching action is :
 - (a) temporary and due to its oxidizing nature
 - (b) temporary and due to its reducing action
 - (c) permanent and due to its oxidizing action
 - (d) permanent and due to its reducing action
- 3. Which of the following compounds is formed, when Na₂SO₃ is boiled with sulphur.

(a) Na₂SO₄

(b) $Na_2S_2O_5$

(c) $Na_2S_2O_6$

(d) Na₂S₂O₃

PASSAGE



On treatment with cold water, an element (A) reacts readily liberating a colourless, odourless gas (B) and a solution (C). Lithium is reacted with (B) yielding a solid product (D) which effervesce with water to give a strongly basic solution (E). When CO_2 gas is bubbled through solution (C), a white ppt. (F) is formed but this redissolved forming solution (G) when more CO_2 is passed. Precipitate (F) effervesced when moistened with conc. HCl and give deep red colouration to a Bunsen burner flame. (F) on heating with excess of carbon at 2000°C give (H).

Answer the following questions on the basis of above passage.

1. Metal (A) may be:

(a) Be

(b) Ca

(c) Mg

(d) Ba

2. Solution (G) contains a salt which:

- (i) causes permanent hardness of water
- (ii) can not be obtained in solid state
- (iii) causes temporary hardness of water
- (iv) can be obtained in solid state

Select the correct statements:

(a) (i) and (ii)

(b) (i) and (iv)

(c) (ii) and (iii)

(d) (ii) and (iv)

3. Solid (H) on hydrolysis gives a gas, which on passing through ammoniacal AgNO₃ solution, yields:

(a) white ppt.

(b) red ppt.

(c) no ppt.

(d) brown ppt.

Lithium only forms monoxide when heated in oxygen. Sodium forms monoxide and peroxide in excess of oxygen. Other alkali metals form superoxide with oxygen, i.e., MO_2 . The abnormal behaviour of lithium is due to small size. The larger size of higher alkali metals also decides the role in formation of superoxides. All the three anions abstract proton from water. The three anions are related to each other as follows:

$$O^{2-} \xrightarrow{\frac{1}{2}O_2} O_2^{2-} \xrightarrow{O_2} 2O_2^{2-}$$

Oxide ion Peroxide ion Superoxide ion

1. Consider the following reaction:

$$M + O_2 \longrightarrow MO_2$$

(M = alkali metal) (stable superoxide)

- (a) M can not be Li and Na
- (b) M can not be Cs and Rb
- (c) M can not be Li and Rb
- (d) None of these
- 2. Which anion is stable towards water:
 - (a) 0^{2}
- (b) O_2^{2-}
- (c) O_2^-
- (d) None of these
- 3. Which compound will liberate oxygen when reacts with ice cold water?
 - (a) Na_2O_2
- (b) KO₂
- (c) Na₂O
- (d) Cs_2O_2
- 4. In hydrolysis, the alkali metal oxides, peroxides and superoxides act as :

Hell of to fairly or

(a) Bronsted acid

(b) Bronsted base

(c) Lewis acid

(d) Lewis base

Most metal oxides are thermally stable at temperatures upto 1000°C but the oxide of metals below hydrogen in the electrochemical series decompose fairly easily. Thus HgO and Ag 2O decompose on heating.

- 1. Which of the following salt does not give NO₂ gas on heating?
 - (a) $Pb(NO_3)_2$
- (b) $Zn(NO_3)_2$
- (c) AgNO₃
- (d) KNO₃
- 2. Which of the following compound cannot be thermally decomposed even at high temperature?
 - (a) CsHCO₃
- (b) Rb₂CO₃
- (c) Li₂CO₃
- (d) (NH₄)₂CO₃
- 3. Correct code for following thermal decomposition reaction(s) evolving gas having equal number of σ - and π - bonds is :
 - (i) BeCO₃ $\xrightarrow{\Delta}$

(ii) ZnSO₄ $\xrightarrow{\Delta}_{T<800^{\circ}C}$

(iii) FeSO₄ 300°C

(iv) $(NH_4)_2 Cr_2 O_7 - \frac{\Delta}{2}$

- (a) I, II
- (b) I, III, IV
- (c) I, II, III
- (d) All of these



ONE OR MORE ANSWERS IS/ARE CORRECT

1. The correct statement(s) is/are:

(a) Thermal stability of alkaline earth metal chloride decreases with increasing molecular mass but reverse order is true for their melting point

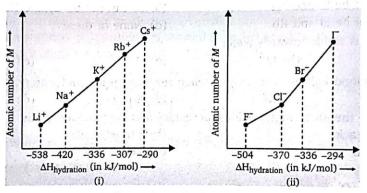
(b) Thermal stability of boron halides increases with decreasing molecular mass but reverse order is true for their melting point

(c) Thermal stability of beryllium halides increases with decreasing molecular mass and same order is also true for their melting point

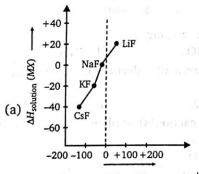
(d) Thermal stability of hydra acids of halogens increases with decreasing molecular mass but reverse order is true for their melting point.

2. Consider the following two graphs between atomic number of element and hydration enthalpies (at 25°C) of corresponding ion.

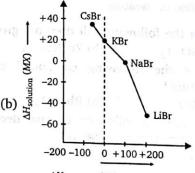
(M = Alkali metal and X = halogens)



Then according to the given information which of the following is/are correct relationship between enthalpy of solution ($\Delta H_{\text{solution}}$) of a salt MX in water and difference of the enthalpies of hydration ($\Delta H_{\text{hydration}}$) of the constituent ion (M^+ and X^-).



 $\Delta H_{\text{Hydration}}(X^{-}) - \Delta H_{\text{Hydration}}(M^{+})$



 $\Delta H_{\text{Hydration}}(X^{-}) - \Delta H_{\text{Hydration}}(M^{+})$

BLOCK ELEMENTS (d) none of these -200 -100 0 +100+200 $\Delta H_{\text{Hydration}}(X^{-}) - \Delta H_{\text{Hydration}}(M^{+})$ 3. Which of the following metal(s) in liquid NH₃ with low conc. is not paramagnetic? (a) Cs (b) Be (c) K 4. Which of the following substances can be used directly as fertilizer? (a) $(NH_4)_2SO_4$ (b) Ca₃(PO₄)₂ (d) $CaCN_2 + C$ (c) $Ca(H_2PO_4)_2$ 5. Which of the following will release CO₂ when heated to 1000°C? (a) KHCO₃ (b) Li₂CO₃ (c) K₂CO₃ (d) PbCO₃ 6. Which of the following properties show a similar trend on moving from Li to Cs within the (a) Ionic mobility in aqueous solution (b) Reactivity towards water (d) Thermal stability of carbonate salt (c) Solubility of bromide salt 7. The alkali metals: (a) form salt like ionic hydrides (b) possess low ionisation potential (d) have low density (c) have high affinity for non-metals 8. On heating NaNO₃ gives: (b) NO₂ (a) O_2 (d) NaNO₂ (c) $O_2 + NO_2$ 9. Which of the following statements is/are true? (a) All alkali metals are soft and can be cut with knife (b) Alkali metals do not occur in free state in nature (c) Alkali metals are highly electropositive elements (d) Alkali metal hydrides are covalent in character 10. Nitrogen dioxide cannot be obtained by heating: (c) $Pb(NO_3)_2$ (b) LiNO₃ (d) NaNO₃ (a) KNO₃ 11. Select the incorrect statement(s): (a) Cs+ is more hydrated than the other alkali metal ions (b) Among the alkali metals Li, Na, K and Rb, lithium has the highest melting point (c) Ionic mobility of Li⁺ is maximum among alkali metal cations

(d) Ionisation potential of Li is lower than that of Na

(b) Sodium can be prepared by electrolysing fused NaCl

(a) Sodium can be prepared by electrolysing aqueous solution of NaCl

12. Select the correct statement(s):

	(c) Sodium is a strong oxidising agent (d) Sodium is soluble in liquid ammonia
12	Identify the correct statement(s):
10.	(a) Sodium carbonate on heating evolves carbon dioxide
	(b) Sodium nitrate on heating evolves carbon dioxide
	(c) Sodium hydroxide does not decompose on heating
	(d) Sodium bicarbonate on heating evolve carbon dioxide
14.	Which statements are false?
	(a) Manufacture of NaOH is done by Solvay process
	(b) Manufacture of K ₂ CO ₃ is done by Solvay process
	(c) Manufacture of NaOH is done by Castner Kellner process
	(d) Manufacture of NaHCO ₃ is done by Solvay process
15.	Sulphates salt gives metal oxide and SO_3 (or $SO_2 + \frac{1}{2}O_2$) on heating:
	(a) K_2SO_4 (b) $CaSO_4$
	(c) $MgSO_4$ (d) $(NH_4)_2SO_4$
16.	The correct statements about sodium and its compounds would include that:
	(a) Sodium forms an ionic hydride NaH
	(b) Sodium nitrate decomposes to the nitrite on heating(c) Sodium is a hard metal
	(d) Sodium carbonate decomposes readily on heating
17.	NaH reacts with water to give :
_,,	(a) alkaline solution (b) acidic solution
	(c) neutral solution (d) hydrogen gas
18.	Which of the following statement(s) is/are incorrect?
	(a) Magnesium may be extracted by self reduction method
	(b) Down's cell process is used to extract magnesium from sea water
	(c) Magnalium is an alloy of magnesium
	(d) Formula of Epsom salt is MgSO ₄ 6H ₂ O
19.	Identify the incorrect statement(s):
-/-	(a) Density of Mg is less than Ca
	(b) The atomic radius of Mg is greater than that of Ca
	(c) Mg alloys are used in the construction of air crafts
	(d) Mg is used as a reducing agent
20.	Which of the following properties of the elements of group II (alkaline earth metals)
	increase(s) with increasing atomic number:
	(a) Stability of carbonate (b) Solubility of hydroxide
	(c) Reactivity with water (d) First ionization energy
21.	Select the wrong statement(s):
	(a) CaF ₂ is soluble in water (b) BaSO ₄ is soluble in water (c) Re(OH) is soluble in water
	(C) Ba(On) ₂ is soluble in water (d) Mgs(), is coluble in
22.	which of the following statements about the elements, Mg. Ca. Sr and Bo and their
	(a) Solubility of the hydroxides in water increases with increasing atomic number

	(b) Thermal stability of the carbonates increases	with increasing at	omic number
	(c) 1m Siven cicilicity leact with water or steem to sive budge on		
	(d) Metal chlorides are all liquids at room tempe	rature	
23.	Which of the following does/do not impart characters (a) MgSO	cteristic colour to t	he flame?
	(a) 141850 4 (b)	CaCl ₂	
	(a) Sr(N())	BeCl ₂	
24.	 Which statement is correct regarding the diagona (a) BeO and Al₂O₃ are amphoteric in nature (b) Both carbide on hydrolysis produce same gas (c) Both can form complex (d) Both have nearly close m.p. 	l relationship betw	een the Al and Be?
25.	. Which of the following metals on treatment with	alkali will liberate	Hagas?
A-10000388	(a) Be (b) Sn (c)		(d) In
26.	. Choose the correct statement(s):	Ja Hari	(4)
	(a) BeCO ₃ is kept in the atmosphere of CO ₂ since	e it is least therms	ally stable
	(b) Be dissolves in an alkali solution forming [Bet	(OU) 12-	my stable
			ne a v
	(c) BeF ₂ forms complex ion with NaF in which B		
0.7	(d) BeF ₂ forms complex ion with NaF in which B	e goes with amon	
27.	Select the incorrect statement(s):		
	(a) Magnesium can be burnt in the atmosphere of		
	(b) Magnesium reacts with alkyl halides to form(c) Out of Mg and Ca, only Mg reacts with N₂ to		nitrida
		Torin magnesium	illulue
	(d) Calcium is less reactive than magnesium	+2	
28.	 Which of the following statement(s) is/are correct (a) Sodium bicarbonate is more soluble than sod 	ium carbonate	
	(b) Sodium hydroxide is known as caustic soda	ram carbonate	
	(c) Sodium bicarbonate is used as antacid		
	(d) Sodium nitrate is used in the manufacture of	soaps	
20	• Select the incorrect statement(s):		x (V)
47.	(a) KOH is a weaker base than NaOH		
	(b) Milk of magnesia is an aqueous solution of M	Ig(OH) ₂	
	(c) Mg ²⁺ ions are precipitated with the addition	of NH4OH in the r	presence of NH ₄ Cl
		1	
	(d) CaO ₂ is less stable than MgO ₂	des of alkali and all	caline metals is correct?
30.	Which of the following statement regarding the oxi	than that of Na O	diffe metals is correct!
	(a) The reactivity of K ₂ O towards water is more (b) The oxides of alkaline earth metals are more	basic than those o	f alkali metals
	(c) MgO is used as a refractory material for linin	of electric furnac	es
	(c) MgO is used as a refractory material for mind (d) The milk of lime and lime water are two diff	erent solutions	
_	(d) The milk of lime and lime water are two data	her in aqueous solu	ution is :
31.	The pair of compounds which can not exist toget.	NaHCO ₃ and NaO	H
	(a) Na ₂ CO ₃ and Narico ₃	NaOH + Na ₂ HPO ₃	
	(c) Nath and Namer of 4	114011 1142111 0 3	
32.	Which of the following are soluble in water?	MgCO ₃	(d) Ca(NO ₃) ₂
	(a) Na_2CO_3 (b) BaC_2O_4 (c)		(4) 54(1.03)2

- 33. Which of the following salts exist(s) as decahydrated crystals?
 - (a) Washing soda
- (b) Glauber's salt
- (c) Epsom salt
- (d) Gypsum salt

- 34. Which of the statements are true?
 - (a) NaHCO₃ and KHCO₃ have same crystal structure
 - (b) On heating Li₂CO₃ gives Li₂O and CO₂
 - (c) Among alkali metals, Li metal has high I.E. and impart no colour to flame
 - (d) Li₂SO₄ does not form alum
- 35. Saturated hydrocarbon gas is evolved by carbide(s) is/are:
 - (a) CaC₂
- (b) Al_4C_3
- (c) Mg_2C_3
- (d) Be₂C



MATCH THE COLUMN

Entries of Column-I are to be matched with entries of Column-II. Each entry of Column-I may have the matching with one or more than one entries of Column-II.

Column-I (Prop. of metals)

- (A) Yellow flame colour
- (B) Most reactive with water
- (C) Gives carbide with 'C'
- (D) Metal nitrate $\stackrel{\Delta}{\longrightarrow}$ metal oxide + NO₂

- (Q) Mg
- (R) Na
- (S) Li

- (A) Product in Solvay process
- (B) Evolve CO₂ ↑ on heating
- (C) aq. soln. is neutral towards litmus
- (D) Oxone (Na₂O₂)

Column-II

- (P) NaCl
- (Q) Na₂O₂
- (R) NaHCO 3
- (S) Na₂CO₃

Column-I (Chemical Prop.

- (A) Metal sulphate $\xrightarrow{\Delta}$ metal oxide $+SO_2+O_2$
- (B) Metal cation + $K_2CrO_4 \longrightarrow yellow ppt$.
- (C) Metal + NH₃ $\xrightarrow{\text{(liquid)}}$ blue solution
- (D) $MCl_2 + conc. H_2SO_4 \longrightarrow white ppt.$

- (P) Ba
- (Q) Sr
- (R) Na
- (S) Mg

) 020	The second secon	
4.	Column-I	Column-II
	(Chemical eq. related to compounds)	(Compound in excess amount)
	(A) $S \longrightarrow S_2O_3^{2+} + S^{2-}$	(P) Na ₂ S ₂ O ₃
	(B) Ag^+ salt \longrightarrow soluble complex	(Q) NaOH
	(C) $Fe^{3+} \longrightarrow Fe(OH)_3$	(R) KOH
	(D) $FeCl_3 \longrightarrow FeCl_2$	(S) Na ₂ SO ₃ and so it as nonlinear as
5.	Column-I	Column-II
	(A) Most negative standard electrode potential an element in the periodic table	(P) Solvated electrons
	(B) Alkali metal carbonate which decomposes on heating	(Q) Mg ₂ C ₃
	(C) Na/liq. NH ₃ is blue colour solution which conducts electricity	(R) Al ₄ C ₃
	(D) Metal carbide which gives methane on hydrolysis	(S) Magnesium
	(E) Metal carbide which on hydrolysis gives propyne	(T) Li ₂ CO ₃
	(F) Metal used in flash bulbs	(U) Lithium
6.	Column-I (Compounds)	(Use of compounds)
	(A) Magnesium hydroxide	(P) As a purgative
	(B) Barium sulphate	(Q) As a fertilizer
	(C) Magnesium sulphate	(R) As a constituent of sorrel cement
	(D) Calcium cyanamide 28 to 120 ann relie	(S) As a constituent of lithopone
7.	Column-I	10 Assertion: Alkill carif metals have
′•	(Compound)	enflutis to liber a Colúmn-II comen
	(A) B ₄ C	(P) Propyne preparation
	(B) Al ₄ C ₃	(Q) Abrasive
	William is the second of the algebra	(R) Methane preparation
	(C) Mg ₂ C ₃ (D) WC	(S) Interstitial carbides
8.	Column-I h nedt salval	Heaven II-nmuloo energy of BaSO.
	(A) $BeF_2 < BaF_2 < SrF_2 < CaF_2 < MgF_2$.	(P) Lattice energy
	(B) LiBr < NaBr < KBr < RbBr < CsBr	(Q) Solubility in water
	(C) Be(OH) ₂ < Mg(OH) ₂ < Ca(OH) ₂ < Sr(OH) ₂ < Ba(OH) ₂	(R) Thermal stability
	(D) BeCO ₃ < MgCO ₃ < CaCO ₃	(S) % ionic character
	< SrCO ₃ < BaCO ₃	



ASSERTION-REASON TYPE QUESTIONS

These questions consist of two statements each, printed as assertion and reason, while answering these questions you are required to choose any one of the following responses.

- (A) If both assertion and reason are true and the reason is the correct explanation of assertion
- (B) If both assertion and reason are true but reason is not the correct explanation of assertion
- (C) If assertion is true but the reason is false
- (D) If assertion is false but the reason is true
- 1. Assertion: Li₂SO₄ does not form double salt like alum.
 - : Li reacts with NH₃ gas to form LiNH₂.
- Assertion: BeCl₂ cannot be easily hydrolysed.
 - **Reason**: BeCl₂ is electron deficient compound.
- Assertion: K⁺ and NH₄⁺ ions have many similarities in their test.
 - : Radius of K⁺ is almost equal to radius of NH₄.
- Assertion: Alums are crystalline double salts, which are soluble in water.
 - eason: The aq. solutions of alums have acidic character due to hydrolysis.
- 5. Assertion: Mg gets oxidised, when heated in CO₂ atmosphere.
 - : Mg has a strongly affinity for oxygen.
- 6. Assertion: $Mg^{2+} + ZnSO_4 \longrightarrow MgSO_4 + Zn^{2+}$
 - : More active metal can displace less active metal from its salt solution. Reason
- 7. Assertion: Li resembles with Mg in properties.
 - **Reason**: Li⁺ has almost same polarising power as Mg²⁺.
- 8. Assertion: Be(OH), dissolves in excess NaOH solution.
 - **Reason**: Be(OH)₂ is an acidic compound.
- 9. Assertion: SO₄²⁻ is estimated as BaSO₄ but not as MgSO₄.
 - : Ionic radius of Mg²⁺ is smaller than that of Ba²⁺
- 10. Assertion: Alkali earth metals have lower densities than alkali metals.
 - Reason : Atomic radii of alkaline earth metals are smaller than that of corresponding
 - alkali metals.
- 11. Assertion: Magnesium does not impart characteristic colour to the bunsen-burner flame.
 - **Reason**: Ionisation energy of Mg is very high.
- 12. Assertion: Among hydroxides of alkali metals, LiOH is the weakest base. Reason : Among alkali metals, lithium has the highest ionisation energy.
- 13. Assertion: BaSO₄ is insoluble in water.
 - Reason: Lattice energy of BaSO₄ is higher than its hydration energy.
- 14. Assertion: CsI is sparingly soluble in water.
 - **Reason**: Hydration energy of Cs⁺ and I⁻ ions are higher than lattice energy.
- 15. Assertion: Potassium is not obtained by the electrolysis of fused KCl.
 - Reason: Potassium vapourises at the melting point of KCl.

S-BLOCK ELEMENTS 299

16. Assertion: M.P. of BeCl₂ is less than that of MgCl₂, but reverse is true for their thermal

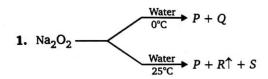
stability.

Reason: M.P. and thermal stability of both compounds depend upon their lattice energy.

17. Assertion: Li is most strong reducing agent among alkali metals.

Reason: Hydration energy of Li⁺ is maximum among the alkali metals.

SUBJECTIVE PROBLEMS



Calculate sum of bond order between same bonded atoms in Q and R compounds.

ANSWERS

Level

1.	(d)	2.	(c)	3.	(d)	4.	(a)	5.	(d)	6.	(b)	7.	(c)	8.	(b)	9.	(b)	10.	(b)
11.	(b)	12.	(b)	13.	(c)	14.	(d)	15.	(c)	16.	(c)	17.	(a)	18.	(c)	19.	(c)	20.	(d)
21.	(b)	22.	(b)	23.	(b)	24.	(b)	25.	(a)	26.	(b)	27.	(d)	28.	(d)	29.	(a)	30.	(a)
31.	(b)	32.	(c)	33.	(a)	34.	(d)	35.	(c)	36.	(d)	37.	(a)	38.	(d)	39.	(a)	40.	(a)
41.	(a)	42.	(a)	43.	(a)	44.	(c)	45.	(c)	46.	(d)	47.	(b)	48.	(c)	49.	(c)	50.	(a)
51.	(b)	52.	(b)	53.	(b)	54.	(c)	55.	(b)										

Level 2

1.	(b)	2.	(b)	3.	(c)	4.	(a,c)	5.	(d)	6,	(d)	7.	(c)	8.	(c)	9.	(c)	10.	(b)
11.	(d)	12.	(d)	13.	(b)	14.	(d)	15.	(c)	16.	(b)	17.	(a,c)	18,	(c)	19.	(c)	20.	(c)
21.	(b)	22.	(c)	23.	(b)	24.	(d)	25.	(d)	26.	(a)	27.	(c)	28,	(a)	29.	(b)	30.	(b)
31.	(c)	32.	(a)	33.	(b)	34.	(a)	35.	(c)	36.	(a)	37.	(c)	38.	(a)	39.	(d)	40.	(a)
41.	(a)	42.	(a)	43.	(d)	70							arta			STAGE.			

Level 3

Passage-1	1,	(b)	2.	(d)	3.	(c)	
Passage-2	1.	(c)	2.	(d)	3.	(c)	
Passage-3	1.	(b)	2.	(a)	3.	(c)	
Passage-4	1.	(b)	2.	(b)	3.	(a)	
Passage-5	1,	(a)	2.	(b)	3.	(d)	

BLOCK ELEMENTS

301

passage-6	1.	(b)	. 2.	(c)	3.	(a)	
passage-7	1	(a)	2.	(d)	3.	(b)	(b)
passage-8	1.	(d)	2.	(b)	3.	(c)	675909L59E8

One or More Answers is/are Correct

- 1. (b,c) **2.** (a) **3.** (b,d) 4. (a,c,d) 5. (a,b,d) 6. (a,b,d) 7. (a,b,c,d) 8. (a,d)
- 10. (a,d) 11. (a,c,d) 12. (b,d) 13. (c,d) 14. (a,b) 15. (b,c) 16. (a,b) **9.** (a,b,c)
- **18.** (a,b,d) **19.** (a,b) 17. (a,d) 20. (a,b,c) 21. (a,b) 22. (a,b,c) 23. (a,d) 24. (a,b,c)
- 25. (a,b,c) 26. (a,b,d) 27. (c,d) 29. (a,c,d) 30. (a,c,d) 31. (b,c) 32. (a,d) 28. (b,c)
- 33. (a,b) **34**. (b,d) **35**. (b,d)

Match the Column

1. $A \rightarrow R$; 2. $A \rightarrow R, S$; 2. $A \rightarrow R, S;$ $B \rightarrow R;$ 3. $A \rightarrow P, Q, S;$ $B \rightarrow P, Q;$ 4. $A \rightarrow Q, R$; **5.** $A \rightarrow U$; 6. $A \rightarrow R$; 7. A→ Q; $C \rightarrow Q$, R, S; $D \rightarrow R$, S $B \rightarrow S$; 8. $A \rightarrow P$;

Assertion-Reason Type Questions

1. (C) 2. (D) 3. (A) 4. (B) 5. (A) 6. (D) 7. (A) 8. (C) 9. (B) 10. (D)

and the state of t

11. (A) 12. (B) 13. (A) 14. (C) 15. (A) 16. (C) 17. (A)

Subjective Problems

1. 3

Hints and Solutions

Level 1

2. (c) In I group only Li form nitride and all II group metals form nitride.

$$\begin{split} \text{Mg} + \text{N}_2 &\rightarrow \text{Mg}_3 \text{N}_2 \xrightarrow{\text{H}_2\text{O(moist)}} \text{Mg(OH)}_2 + \text{NH}_3 \\ \text{Ca} + \text{N}_2 &\rightarrow \text{Ca}_3 \text{N}_2 \xrightarrow{\text{H}_2\text{O(moist)}} \text{Ca(OH)}_2 + \text{NH}_3 \\ \text{Li} + \text{N}_2 &\rightarrow \text{Li}_3 \text{N} \xrightarrow{\text{H}_2\text{O(moist)}} \text{LiOH} + \text{NH}_3 \end{split}$$

$$K + N_2 \rightarrow$$
 no reaction

- 4. (a) It is due to more ionic character of Cs₂CO₃.
- 29. (a) In general order of melting point.

$$\underbrace{\text{LiX}}_{\text{Predominantly}} < \underbrace{\text{CsX} < \text{RbX} < \text{KX} < \text{NaX}}_{\text{Predominantly ionic}}$$

$$\underbrace{\text{Cox}}_{\text{Covalent}} < \underbrace{\text{CmX} < \text{RbX}}_{\text{Covalent}} < \underbrace{\text{Classifice energy}}_{\text{Covalent}}$$

$$\underbrace{\text{CmX}}_{\text{Predominantly ionic}} < \underbrace{\text{CmX}}_{\text{Covalent}} < \underbrace{\text{CmX}}_{\text{Cova$$

LiX being predominantly covalent have low m.pt.

- 30. (a) Li metal imparts carmine red colour to flame due to emission spectrum.
- 31. (b) Due to strong packing of Li⁺ and F⁻ ion, lattice energy of LiF is higher than its hydration energy.
- 32. (c) Due to high hydration energy of Li+ cation, the standard reduction potential of Li+ is more negative among all alkali metal cations hence Li acts as strong reducing agent in water.
- 53. (b) By adding gypsum the setting time and strength of cement increases.

54. (c)
$$NH_3 \uparrow \leftarrow NH_4CI \atop Solvay's \atop process} Ca(OH)_2 \xrightarrow{CO_2} CaCO_3$$

Level 2

2. (b) Order of solubility in water

$$\begin{aligned} & \text{LiF} < \text{NaF} < \text{KF} \\ & \text{LiNO}_3 > \text{NaNO}_3 > \text{KNO}_3 \\ & \text{Li}_2\text{CO}_3 < \text{Na}_2\text{CO}_3 < \text{K}_2\text{CO}_3 \end{aligned}$$

- 3. (c) ΔH_{sol} of ammonium salts are found to be positive but they are highly soluble due to high positive entropy change it makes ΔG_{sol} more negative according to equation $\Delta G_{\text{sol}} = \Delta H_{\text{sol}} - T\Delta S_{\text{sol}}$
- 13. (b) NaOH being deliquescent absorb water from atmosphere therefore strength of solution will decrease.

20. (c) NaNO₃
$$\xrightarrow{\text{below}}$$
 NaNO₂ + $\frac{1}{2}$ O₂ Cu(NO₃)₂ $\xrightarrow{\Delta}$ CuO + 2NO₂↑ + $\frac{1}{2}$ O₂↑ Hg(NO₃)₂ $\xrightarrow{\Delta}$ Hg \downarrow + 2NO₂↑ + O₂↑ AgNO₃ $\xrightarrow{\Delta}$ Ag + NO₂↑ + $\frac{1}{2}$ O₂↑

- 22. (c) Due to much lower freezing point of eutectic mixture of CaCl₂/H₂O.
- 26. (a) Only bicarbonate salt of alkali metals are found in solid state.
- 27. (c)

(a)
$$Ca^{2+} < K^+ < S^{2-} < P^{3-}$$
: Ionic size

(b)
$$Na_{(aq.)}^+ > K_{(aq.)}^+ > Rb_{(aq.)}^+ > Cs_{(aq.)}^+$$
: Electrical conductance

(d)
$$I_{(aa)}^- < Br_{(aa)}^- < Cl_{(aa)}^- < F_{(aa)}^-$$
: Ionic mobility

130

$$\begin{array}{c} \text{Ca(NH)} + 2\text{H}_2\text{O} & \longrightarrow & \text{Ca(OH)}_2 + \text{NH}_3(g) \\ \text{(B)} & \text{(B)} \end{array}$$

$$\begin{array}{c} 2\text{NH}_3 + 3\text{CaOCl}_3 & \longrightarrow & \text{N}_2(g) + 3\text{CaCl}_2 + 3\text{H}_2\text{O} \\ \text{(B)} & \text{(C)} \end{array}$$

$$\begin{array}{c} \text{N}_2(g) + 3\text{Mg} & \longrightarrow & \text{Mg}_3\text{N}_2 \\ \text{(C)} & \text{(D)} \end{array}$$

$$\begin{array}{c} \text{Mg}_3\text{N}_2 + 6\text{H}_2\text{O} & \longrightarrow & 3\text{Mg}(\text{OH)}_2 + 2\text{NH}_3 \\ \text{(D)} & \text{(B)} \end{array}$$

42. (a) Milk of magnesia is a suspension of MgO + H₂O.

Level 3

Passage-1

- 2. (d) All are wrong. The solution has strong reducing nature and coloured due to ammoniated electron.
- 3. (c) $M(s) + NH_3(l) \longrightarrow M^+(NH_3)_x + \bar{\epsilon}(NH_3)_y$ excess

Ammoniated \bar{e} responsible for blue colour and reducing character.

If conc. of solution is increased, then association of solvated electrons get started hence, paramagnetism decreases and solution changes to bronze colour.

Passage-6

1. (b,c)

- 2. (c) It is CaHCO₃, which can not be obtained in solid state and causes temporary hardness.
- 3. (a) It is acetylene gas and gives white ppt. of silver acetylide.

Passage-7

- 1. (a) Li and Na do not form stable superoxide.
- 2. (d) All the three O^{2-} , O_2^{2-} and O_2^{-} are unstable in presence of water and abstract proton from water.
- 3. (b) All superoxides liberate oxygen with water :

All superoxides inectate
$$O_2$$

 $O_2 + 2H_2O(l) \longrightarrow 2OH^-(aq) + H_2O_2(l) + O_2(g)$

4. (b) All abstract proton from water so they are Bronsted base.

One or More Answers is/are Correct

- 1. (b, c)
 - (d) \Rightarrow Thermal stability of Hydra acids HF > HCl > HBr > HI \Rightarrow Melting point : HI > HF > HBr > HCl
- 3. (b, d)

Due to high ionization energy and metallic lattice energy Be and Mg do not dissolve into liquid NH_3 ; hence their solution in liquid NH_3 is not paramagnetic.

4. (a, c, d)

 $Ca_3(PO_4)_2$: It is a tertiary phosphate and not soluble in water hence it is of no use for plants.

19. (a,b) Magnesium is more dense than calcium.

Magnalium is an alloy of magnesium which is used in the construction of air crafts.

- 25. (a,b,c) Be, Sn and Ga are amphoteric metals.
- **26.** (a,b,d) $BeF_2 + 2NaF \longrightarrow Na_2[BeF_4]$

Assertion and Reason Type Questions

1. (C) Among sulphate salt of alkali metals only Li₂SO₄ does not forms alum, as Li⁺ has very small size.

$$2\text{LiI} + \text{NH}_3(g) \xrightarrow{\Delta} \text{Li}_2\text{NH} + \text{H}_2\uparrow$$

2. (D)BeCl₂ can be easily hydrolysed due to its e^- deficient nature

$$BeCl_2 + 2H_2O \longrightarrow Be(OH)_2 + 2HCl \uparrow$$

- 3. (A) Ionic radius of NH₄⁺ is almost equal to ionic radius of K⁺.
- **4.** (B) Alums are $M'_2(SO_4) M'''_2(SO_4)_3 \cdot 24H_2O$

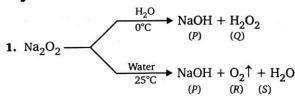
These are soluble in water. Their aqueous solution are acidic in nature both the statements are true but it is not the correct explanation.

5. (A) 2Mg + CO₂ $\xrightarrow{\Delta}$ 2MgO + C

Mg is a strong reducing agent and have great affinity for O2 at high temperature.

- **6.** (D)Mg²⁺ + Zn²⁺ + SO₄²⁻ \longrightarrow Mg²⁺ + SO₄²⁻ + Zn²⁺ (no reaction)
- 8. (C)Be(OH)₂ is amphoteric in nature.

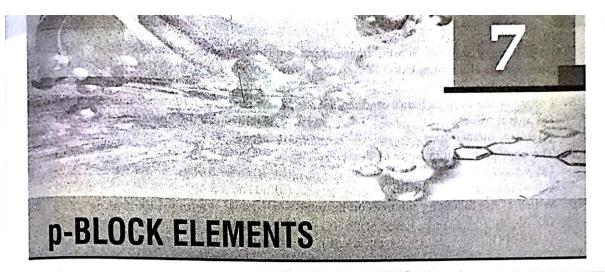
Subjective Problems



Bond order of [O-O] in $H_2O_2 = 1.0$

Bond order of [O-O] in $O_2 = 2.0$

Sum of bond order between same bonded atoms in Q and R compounds = 1 + 2.0 = 3.0



(c) LiBH₄

	GVG L VOIM SERVED)		
40 ct	The state of the s	the state of the second	
3or	on Family and their Compounds (1	3 gp.) initiavament a universit au	
1.	Anhydrous aluminium chloride (Al ₂ Cl ₆) is cov	valent compound and soluble in wate	er giving:
	(a) Al ³⁺ and Cl ⁻ ions a made of Grade (b)	State of the state	
	(b) $[Al(H_2O)_6]^{3+}$ and Cl^- ions	tores and the area much	
	(c) $[AlCl_2(H_2O)_4]^+$ and $[AlCl_4(H_2O)_2]^-$ ions		
	(d) none of the above	a grooms at the metal is strong a	
2.	u a ' ''bida namad as:	Tel . Les cable than Philip	
	(a) Approlida	(b) Methanide (d) Alloy	
	(c) Allylide	(d) Alloy	
3.	Which of the following compounds is former		
	solution of borax? (a) Boron oxide 21 202 11 202 bas no near	(b) Orthoboric acid	
	(c) Metaboric acid	(d) Pyroboric acid	
1	AICI on hydrolysis gives:	, T-1, 12	
4.		(b) Al(OH) ₃	
	(c) Al ₂ O ₃ (d) require coordinated (e) Al ₂ O ₃	(d) AlCl ₃ 6H ₂ O	
5.		misi-contract factors	
	(a) It is a correlant compound	f hadration at the minimum or a set of	
	(L) It has bigh lattice energy and low near of	i flydration	
	(c) It has low lattice energy and high heat of	drated	
	(d) Al ³⁺ and O ²⁻ ions are not excessively hyd	et moleculo?	
6.	Which of the following is an electron deficien	(b) B ₂ H ₆	
	(a) LiH	(d) $B_3N_3H_6$	
	(c) LiBH		

306 INORGANIC CHEMISTRY

7.	Anhydrous aluminium chloride fumes in mo	ist air owing to the formation of:
	(a) gaseous aluminium chloride	(b) chlorine
	(c) chlorine dioxide	(d) hydrogen chloride
8.	Colour of the bead in borax bead test is mai	nly due to the formation of:
	(a) metal oxides	(b) boron oxide
	(c) metal metaborates	(d) elemental boron
9.	The possible oxidation state of Tl are:	
	(a) +1 and +2	(b) $+2$ and $+3$
	(c) $+1$ and -1	(d) $+1$ and $+3$
10.	Which of the following sublimes on heating?	7 (A)
	(a) Al ₂ O ₃	(b) Al(OH) ₃
	(c) $(AlH_3)_n$	(d) $(AlCl_3)_n$
11.		perature by reaction of sodium borohydride and
	boron trifluoride under anhydrous conditions	
	(a) H ₂	(b) B ₂ H ₆ and H ₂
	(c) B ₂ H ₆	(d) BH ₂ F and H ₂
Co		
	rbon Family and their Compounds	
12.	Silicate having one monovalent corner oxyge	
	(a) sheet silicate	(b) cyclic silicate
	(c) single chain silicate	(d) double chain silicate
13.	PbI ₄ does not exist because:	
	(a) iodine is not a reactive	Tend predia too by a
	(b) Pb(IV) is oxidizing and I is strong redu-	cing agent
	(c) Pb(IV) is less stable than Pb(II)	10 121 141 0 16
	(d) Pb 4+ is not easily formed	sa beer a solution of the same
14.	The silicate anion in the mineral kinoite is a cl	nain of three SiO ₄ tetrahedra, that share corners
	with adjacent tetrahedra. The change of the	silicate anion is:
	(a) -4 (b) -8	(c) -6 (d) -2
15.	The gaseous product of the reaction between	Sn and conc. H-SO is:
	(a) H ₂	(b) SO ₂
	(c) SnH ₄	(d) SO ₃
16.	The dehydration of malonic acid $\mathrm{CH}_2(\mathrm{COOH})$) with P.O. gives:
	(a) carbon monoxide	(b) carbon suboxide
	(c) carbon dioxide	(d) all three
17.	Which of the following structural features of or	raphite best accounts for its use as a lubricant?
	(a) Delocalized electrons	rapinte best accounts for its use as a lubricant?
	(b) Strong covalent bonds between carbon a	tome
	(c) van der Waals' forces between layers	tons
	(d) limited three covalency of carbon	
18	Which of the following is sparingly soluble :-	a cald
13.	(a) Pb(NO ₃) ₂	cold water and fairly soluble in hot water?
	(c) PbSO ₄	(b) FBCl ₂
	(5) 15504	(d) PbCrO ₄

			Same and the same of the same	, Miles or
19.	The structural of silicon(IV) oxide belongs to t (a) ionic lattice	the type:	THE BUT FROM	
	(b) macromolecular, with a layer structure	1.1		
	(c) molecular lattice with a layer structure	2 2 2 2 1		
	(c) molecular lattice, with van der Waals' force	ces among the molecu	les	
20.	(d) macromolecular, with a non-layer structur	re		
20.	(a) CiE		40 77 67	
	(b) OHIA	(c) H ₂ SiF ₆	(d) H ₂ SiF ₄	
21.	Which of the following halides does not hydro (a) PbCl ₄ (b) SiCl ₄	olyse at room tempera	iture?	
	(a) PbCl ₄ (b) SiCl ₄ SiCl ₄ on hydrolysis gives:	(c) CCl ₄	(d) SnCl ₄	
22.	(a) silies	is infantable and about the Par	programme and the second	
	(a) allianna	(b) silicic acid		- 3
00	MARK TO THE PROPERTY OF THE PR	(d) silicate		
23.	Which substance is having molecular solid:	a section and the section		
0.4	(a) graphite (b) C ₆₀		(d) $Ca_3(PO_4)_2$	
24.	A cyclic skeleton of silicon and oxygen can co	onstructed by the silica	ate ion composition:	
	(a) $Si_2O_7^{4-}$ (b) $Si_2O_5^{2-}$	(c) SiO_3^{2-}	(d) SiO ₄ ⁴	
25.	Which of the following is an organo silicon p	oolymer?		
	(a) Silica	(b) Silicone		
	(c) Silicon carbide	(d) Silicic acid		
26.	SnCl ₂ acts as a reducing agent because:	1 1 22 11 11 11 11 11	TOTAL TOTAL STATE OF THE STATE	
	(a) SnCl ₂ can accept electrons readily		San Francis A	
	(b) Sn ²⁺ is more stable than Sn ⁴⁺	And officers are the first project	on the ray	
	(c) Sn ⁴⁺ is more stable than Sn ²⁺			1
	(d) Sn ²⁺ can be easily converted to metallic	tin		
27.	The correct order of decreasing ionic nature	of lead dihalides is:	the first text of a	
	(a) $PbF_2 > PbCl_2 > PbBr_2 > PbI_2$			
	(c) $PbF_2 < PbCl_2 > PbBr_2 < PbI_2$	$(d) PbI_2 < PbBr_2 < P$	bCl ₂ < PbF ₂	
28.	Carborundum is a:		3-5-00	
	(a) molecular solid	(b) covalent solid		
	(c) ionic solid	(d) amorphous solid		
29.	The plague of tin is the:	ada example esta	The control of the control	
	(a) conversion of stannous to stannic		3.0	
	(b) conversion to white tin to grey tin	- 4 BC 18, 55, 55, 55	17 4 27 1	
	(c) emission of sound while bending a tin re	od -		
	(d) atmospheric oxidation of tin			
30	 The butter of tin is represent by: 			
	(a) SnCl ₂ ·5H ₂ O	(b) SnCl ₂		
	(c) SnCl ₄	(d) SnCl ₄ ·5H ₂ O	As Grant	
21	• $H_2C_2O_4(B) \xrightarrow{\Delta} gas(A) + gas(B) + liquid($		g, la e g V	
91				
	Gas (A) burns with a blue flame and is oxid	lised to gas (B)		
	$Gas(A) + Cl_2 \longrightarrow (D) \xrightarrow{NH_3, \Delta} (E)$			
	Gas (A) + Cla (D)			

	A, B, C and E are:	100	
	(a) CO ₂ ,CO,H ₂ O,HCONH ₂ (c) CO,CO ₂ ,H ₂ O,NH ₂ CONH ₂	(b) CO, CO ₂ , COCl ₂ , I (d) CO, CO ₂ , H ₂ O, CO	HCONH ₂ DCl ₂
32.	Si ₂ O ₇ ⁶⁻ anion is obtained when:		1 . 1
	(a) no oxygen of a SiO ₄ tetrahedron is share (b) one oxygen of a SiO ₄ tetrahedron is share (c) two oxygen of a SiO ₄ tetrahedron are all	red with another SiO ₄	tetranedron
	(c) two oxygen of a SiO₄ tetrahedron are sh(d) three or all four oxygen of a tetrahedron	are shared with other	SiO ₄ tetrahedron
N			-
	rogen Family and their Compound	s (15 gp.)	
33.	Trisilyamine (SiH ₃) ₃ N is:	100	No. of the last of
	(a) trigonal pyramidal and acidic	(b) trigonal pyramida	al and basic
	(c) trigonal pyramidal and neutral	(d) trigonal planar ar	nd weakly basic
34.	The mixed anhydride of nitrogen is:		
	(a) N ₂ O ₂ (2NO)	(b) N_2O_4 (2NO ₂)	agent a street
	(c) N_2O_5	(d) N_2O_3	
35.	Among NH ₃ , PH ₃ , AsH ₃ and SbH ₃ which on	e is a stronger reducing	g agent?
	(a) NH ₃	(b) PH ₃	
	(c) AsH ₃	(d) SbH ₃	
36.	When zinc reacts with very dilute HNO3, the	oxidation state of nitr	ogen changes from:
	(a) $+5$ to $+1$	(b) $+5$ to -3	
	(c) +5 to +4	(d) $+5$ to $+3$	
37.	Which of the following orders regarding the correct?	ermal stability of hydri	des MH ₃ of group 15 is
	(a) $NH_3 > PH_3 > AsH_3$	(b) $NH_3 < PH_3 < AsH$	
		(d) $NH_3 < PH_3 > AsH$	\mathbf{I}_3
38.	The products formed by complete hydrolysis	of PCl ₃ are:	
	(a) H ₃ PO ₃ and HCl	(b) POCl ₃ and HCl	
		(d) H ₄ P ₂ O ₇ and HCl	
39.	When a sample of NO2 is placed in a contain	ner, this equilibrium is	rapidly established.
	$2NO_2(g)$	$\rightleftharpoons N_2O_4(g)$	
	If this equilibrium mixture is a darker colour a	it high temperatures an	d at low pressure which
	of these statements about the reaction is tru-	e?	a action pressure, mine
	(a) The reaction is exothermic and NO 2 is d		204
	(b) The reaction is exothermic and N ₂ O ₄ is	darker in colour than	NO ₂
	(c) The reaction is endothermic and NO ₂ is	darker in colour than	N_2O_4
	(d) The reaction is endothermic and N ₂ O ₄ is		
40.	Heating of ammonium dichromate produces		•
	(a) NH ₃ , Cr ₂ O ₃ and H ₂ O	(b) N ₂ , Cr ₂ O ₃ and H	₂ O
	(c) NO, CrO ₃ and H ₂ O	(d) N ₂ O, CrO ₃ and H	
41.	Which of the following halide undergoes in		
	(a) BCl ₃ (b) NF ₃	(c) NCl ₃	(d) AsCl ₃

42.	Which of the following compound does not	give oxyacid of centra	al atom on hydrolysis?
	(a) SiCl ₄ (b) NCl ₃	(c) PCl ₃	(d) PCl ₅
43.	In which process does the nitrogen undergo	oxidation?	
	(a) $N_2 \rightarrow 2NH_3$	(b) $N_2O_4 \rightarrow 2NO_2$	
	(c) $NO_3^- \rightarrow N_2O_5$	(d) $NO_2^- \rightarrow NO_3^-$.8.
44.	For which element would XH ₃ be a stable sp	pecies :	
•	(a) C (b) Si	(c) P	(d) S
Ox	ygen Family and their Compounds	(16 ap.)	
		(10 9)11/	
45.	S—O bond length is maximum in :	(L) (OC)	
	(a) SOBr ₂	(b) SOCl ₂	
	(c) SOF ₂	(d) SO(CH ₃) ₂	
46.	In case of hydride of oxygen family, which of	the following physical	property change regularly
	on moving down the group.	a ml aphilie	y a many tanan in this file.
	(a) Melting point	(b) Thermal stability	
	(c) Boiling point	(d) Critical tempera	
47.	When KHSO ₄ is added into a concentrated	solution of H ₂ SO ₄ , th	e acidity of the solution.
	(a) increases	(b) decreases(d) can't be predicted	ed
	(c) remains constant		
48.	Hydrolysis of one mole of peroxodi-sulphuri	c acid produces:	
	(a) two moles of sulphuric acid(b) two moles of peroxomono-sulphuric aci	d CP and a	i je vittle i fir r
	(c) one mole of sulphuric acid, one mole of	peroxomono-sulphuri	ic acid
	(d) one mole of sulphuric acid, onle mole	of peroxomono-sulphi	uric acid and one mole of
	hydrogen peroxide	•	THE WILL BY LOVE
40	In trimer form of sulphur trioxide, each sulp	ohur atom is bonded v	with:
47.	(a) four oxygen atoms	(b) three oxygen at	oms
	(c) two oxygen atoms	(d) two sulphur ato	oms
EO	Sodium thiosulphate is formed when:	And a Kerket	1.02 15 40 14.04
50.	(a) SO ₂ is boiled into Na ₂ S	and themselve	rive in the second of the
	(b) Na ₂ SO ₃ is boiled with elemental sulphu	ur	271 %
	(c) H ₂ S ₂ O ₃ is neutralised by NaOH		
	(d) Na ₂ SO ₄ is reduced by zinc dust	nolasional la larsistant a	de trada de la casa des
	$K_4[Fe(CN)_6]$ reacts with ozone to give:	H+.030%	
51.		(b) Fe(OH) ₂	
	(a) Fe ₂ O ₃	(d) KNO ₃	
	(c) K ₃ [Fe(CN) ₆] The dipole moment of H ₂ O ₂ is more than that	ot of HaO but HaOa is r	not a good solvent because:
52 .	(a) It has a very high dielectric constant so	that ionic compound	s cannot be dissolved in it
	(a) It has a very night dielectric constant	era de Carta d	4
	(b) It does not act as an oxidising agent		
	(c) It acts as a reducing agent(d) It dissociates easily and acts as an oxid	ising agent in chemic	al reactions
	(d) It dissociates easily and acts as an order	11	
53	The correct increasing order of acidity is:	(b) H ₂ O < H ₂ O ₂ <	CO ₂
	(a) $CO_2 > H_2O_2 > H_2O$	(d) $H_2O_2 > CO_2 >$	
	(c) $H_{2}O < H_{2}O_{2} > CO_{2}$, 2	•

Halogen Family and their Compounds (17 gp.)

54.	In which case, the order of acidic strength is	not correct ?	
	(a) HI > HBr > HCl	(b) $HIO_4 > HBrO_4 > H$	IClO ₄
	(c) HClO ₄ > HClO ₃ > HClO ₂	(d) $HF > H_2O > NH_3$	
55.	Concentrated nitric acid reacts with iodine to		
	(a) HOI	(b) HI	
	(c) HOIO ₂	(d) HOIO ₃	
56.	Thermally most stable compound is:	(4) 110103	
	(a) HOClO ₃	(b) HOClO ₂	Mary State of the
	(c) HOCl	(d) HOCIO ₂	
57.	A STATE OF THE STA		monovide in automobile
٠,,	Which of the following halogen oxide is used f exhaust gases?	or estimation of carbon	monoxide in automobile
1.1		(c) ClO ₂	(d) BrO ₃
58.	The interhalogen which does not exist is:	(c) CiO ₂	(4) 2103
	(a) IF ₅ (b) CIF ₃	(c) BrCl	(d) ICl ₄
50			(d) 1C1 ₄
07.	Which of the following halogen disproportion (a) F ₂ (b) Cl ₂		CON ATTAL
60		(c) I ₂	(d) All three
00.	Which of the following is correct statement?	•	
	(a) F ₂ has higher dissociation energy than C	1 ₂	
	(b) F has higher electron affinity than Cl		E 21
	(c) HF is stronger acid than HCl		
	(d) Boiling point increases down the group		
01.	Only iodine forms hepta-fluoride IF ₇ , but of reason for this is:	niorine and bromine g	ive penta-fluorides. The
	(a) low electron affinity of iodine		
	(b) unusual pentagonal bipyramidal structur	re of IF_	
	(c) that the larger iodine atom can accommodate	e more number of smalle	r fluorino et
	(d) low chemical reactivity of IF ₇	and the state of straine	i muorine atom around it
62.	Acid used for making permanent marking or	the place curface ice	
02.	(a) HNO ₃	(b) HF	
	(c) HIO ₃	(d) H ₂ SO ₄	ter
63	The unfavourable electrochemical reaction a		
03.			
	(a) $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$	(b) $KI + Cl_2 \longrightarrow KC$	$I + I_2$
	(c) $KCl + I_2 \longrightarrow KI + ICl$	(d) Al+3HCl \longrightarrow A	$AlCl_3 + \frac{3}{2}H_2$
64	Which anion can undergo both oxidation an		2 -
04.	(a) $\text{Cr}_2\text{O}_2^{\text{7-}}$ (b) NO_3^{3}	(c) OCl	411 - 2
			(d) S ²⁻
65.	In the series HCl, HBr and HI, the boiling point	nt increases in the orde	r HCl < HBr < HI. This is
	due to :		
	(a) HI is the strongest acid among the series		
	(b) HI is the strongest reducing agent among		
	(c) higher van der waals' forces of attraction	in HI	
	(d) intermolecular H-bonding in HI		

Noble Gases and Xenon Compounds (18 gp.)

- **66.** Which factor is most responsible for the increase in boiling points of noble gases from He to Xe?
 - (a) Decrease in I.E.

- (b) Monoatomic nature
- (c) Decrease in polarisability
- (d) Increase in polarisability
- 67. The compound that cannot be formed by xenon is:
 - (a) XeO₃

(b) XeF₄

(c) XeCl₄

- (d) XeO₂F₂
- 68. The noble gases can be separated by:
 - (a) passing them through suitable solution
 - (b) electrolysis of their fluorides
 - (c) adsorption and desorption on charcoal
 - (d) adsorption and desorption on activated hydrogen
- **69.** Which of the following xenon compound has the same number of lone pairs as in I_3^- ?
 - (a) XeO₄

(b) XeF₄

(c) XeF₂

(d) XeO₃

Chemical Bonding

- 70. Incorrectly matched characteristic is:
 - (a) S₈: Covalent lattice

(b) P4: Tetrahedron

(c) S₄²-: Zig-Zag

- (d) SiO2: Covalent lattice
- 71. Which is wrong statement?
 - (a) The decreasing order of thermal stability is CsOH > RbOH > KOH > NaOH
 - (b) The decreasing order of bond angle is BF₃ > PF₃ > ClF₃
 - (c) The decreasing order of bond dissociation energy is $Cl_2 > Br_2 > F_2 > I_2$
 - (d) The decreasing order of melting point is $NH_3 > (CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$
- 72. Which of the following has been arranged in order of decreasing bond dissociation energy:
 - (a) P O > Cl O > S O
- (b) P O > S O > Cl O
- (c) S O > Cl O > P O
- (d) Cl O > S O > P O

Level 2

Boron Family and their Compounds (13 gp.)

1.	$BX_3 + NH_3 \longrightarrow BX_3 \cdot NH_3 + Heat of adduct formation (\Delta H)$	
	The numerical value of ΔH is found to be maximum for :	

(a) BF₃

(b) BCl₃

(c) BBr₃

(d) BL₂

- 2. Which of the following properties describes the diagonal relationship between boron and silicon?
 - (a) BCl₃ is not hydrolysed while SiCl₄ can be hydrolysed
 - (b) Both form oxides B₂O₃ is amphoteric and SiO₂ is acidic
 - (c) Both metals dissolve in cold and dilute nitric acid
 - (d) Silicide and boride salts are hydrolysed by water
- 3. Anhydrous AlCl₃ is covalent however, when it is dissolved in water hydrated ionic species are formed. This transformation is owing to:

(a) the trivalent state of Al

(b) the large hydration energy of Al3+

(c) the low hydration energy of Al3+

(d) the polar nature of water

- 4. Borax in its crystal possess:
 - (a) 3 tetrahedral unit
 - (b) 2 tetrahedral and 2 planar triangular units
 - (c) 3 tetrahedral and 2 planar triangular units
 - (d) all tetrahedral units
- 5. Consider the following statements for diborane:
 - 1. Boron is approximately sp³ hybridized
 - 2. B-H-B angle is 180°
 - 3. There are two terminal B-H bonds for each boron atom
 - 4. There are only 12 bonding electrons available

Of these statements:

(a) 1, 3 and 4 are correct

(b) 1, 2 and 3 are correct

(c) 2, 3 and 4 are correct

(d) 1, 2 and 4 are correct

- 6. Aluminium vessels should not be washed with materials containing washing soda because:
 - (a) washing soda reacts with aluminium to form soluble aluminate
 - (b) washing soda is expensive
 - (c) washing soda is easily decomposed
 - (d) washing soda reacts with aluminium to form insoluble aluminium oxide
- 7. Which of the following statements about anhydrous aluminium chloride is correct?
 - (a) It can exist as AlCl3 molecule in vapour
 - (b) It is a strong Lewis base
 - (c) It sublimes at 180°C under vacuum
 - (d) It is not easily hydrolysed

(a) Twelve electrons are involved in bonding(b) Four, two centre-two electron bonds

17	(c) Two, three centre-two electron bonds (d) X does not react with NH ₃	as of 12th group elements (boron family) is
17.	The incorrect stability order of $+3$ and $+1$ state (a) $Ga^{3+} < In^{3+} < Tl^{3+}$	es of 13th group Helicius (boton tamay) is: $(b) Tl^{+} > Tl^{3+}$
	(a) $Ga^+ < In^+ < II^+$	(d) $Ga^{3+} > Ga^{+}$
Cou	The second contract c	
	rbon Family and their Compounds	(14 gp.)
18.	Consider the following route of reactions:	
	$R_2 \text{SiCl}_2 + \text{Water} \longrightarrow (A) \xrightarrow{\text{Polymerisation}} (B)$	
	Compound(B) in above reaction is:	
	(a) Dimer silicone	(b) Linear silicone
	(c) Cross linked silicone	(d) Polymerisation of (A) does not occur
19.	The most basic oxide of elements in group 14	
20	(a) SiO_2 (b) GrO $(Si_2O_5)_n^{2n-}$ anion is obtained when:	(c) SnO_2 (d) PbO
20.		device constant SiO 4 totrohodron
	a) no oxygen of a SiO ₄ tetrahedron is shar	
	(b) one oxygen of a SiO ₄ ⁴ tetrahedron is sha	
	(c) two oxygen of a SiO ₄ ⁴ tetrahedron are sl	
	(d) three oxygen of a SiO_4^{4-} tetrahedron are	
21.	•	corner shared per tetrahedron. The value of 'x'
	18:	
	(a) 2 (b) $2\frac{1}{2}$	(c) 3 (d) 4
22.	The silicate anion in the mineral kinoite is a ch	nain of three SiO ₄ tetrahedra that share corners
	with adjacent tetrahedra. The mineral also con in a 1:1:1 ratio mineral is represented as:	tains Ca ²⁺ ions, Cu ²⁺ ions, and water molecules
	(a) CaCuSi ₃ O ₁₀ ·H ₂ O	(b) CaCuSi ₃ O ₁₀ ·2H ₂ O
	(c) $Ca_2Cu_2Si_3O_{10} \cdot 2H_2O$	(d) none of these
23.		
	(a) Acetylene < ethylene < graphite < benze(b) Acetylene < ethylene < benzene < graph	
	(c) Acetylene < graphite < ethylene < benzelic < graphite	
	(d) Acetylene < benzene < graphite < ethylene	
24.	Silicate having one monovalent corner oxyge	
	(a) sheet silicate	(b) cyclic silicate
	(c) single chain silicate	(d) double chain silicate
25 .	In which of the following silicates, only two	corners per tetrahedron are shared?
	(i) Pyro silicate	(ii) Cyclic silicate
	(iii) Double chain silicate (v) 3D silicate	(iv) Single chain silicate (vi) Sheet silicate
	(a) (i), (ii) and (v)	(b) (iv) and (vi) only
	CA CAN AND AND AND AND AND AND AND AND AND A	Visit Viny

	(c) (i) and (vi) only	(d) (ii) and (iv) only	
26.	The correct code for stability, of oxidation sta	ites for given cations is	: 4+
	(i) $Pb^{2+} > Pb^{4+}$, $Tl^{+} < Tl^{3+}$	(ii) $Bi^{3+} < Sb^{3+}$, Sn^{2+}	< Sn 4
	(iii) $Pb^{2+} > Pb^{4+}$, $Bi^{3+} > Bi^{5+}$	(iv) $Tl^{3+} < In^{3+}$, Sn^{2+}	> Sn 44
	(v) $\operatorname{Sn}^{2+} < \operatorname{Pb}^{2+}$, $\operatorname{Sn}^{4+} > \operatorname{Pb}^{4+}$	(vi) $\mathrm{Sn}^{2+} < \mathrm{Pb}^{2+}$, Sn^4	+ < Pb ++
	(a) (v) and (vi)	(b) (i), (iii) and (vi)	
	(c) (iii) and (v)	(d) (ii) and (iv)	
Nitr	ogen Family and their Compound	s (15 gp.)	2 · · · · · · · · · · · · · · · · · · ·
27.	Nitrogen gas is liberated by thermal decompo	osition of:	
.yi	(a) NH ₄ NO ₂	(b) NaN ₃	
	(c) $(NH_4)_2Cr_2O_7$	(d) All	
28.	Two oxides of nitrogen, NO and NO 2 are all	lowed to react togethe	r at 243° K and form a
	coloured compound of nitrogen (X). When co	mpound (X) reacts with	il water to yield discuss
	compound of nitrogen (Y). The shape of the	(b) triangular pyramic	lal
	(a) triangular planar	(d) square planar	
	(c) tetrahedron Consider the following sequence of reaction.		
	$Na + NH_3(g) \longrightarrow [X] \xrightarrow{N_2O} [Y] \xrightarrow{Heat}$	Gas Pure	
	Identify [Z] gas:	19 000 915	(4) 11
	(a) N_2 (b) NH_3	(c) O ₂	(d) H ₂
30.	Which of the following oxyacid contains both	1 P—H and P—P bond	(d) None
	(a) $H_4P_2O_5$ (b) $H_4P_2O_7$	(-)4-2-0	(u) None
31.	Among the following statement which one is	truer	
	(a) NH ₃ is less soluble than PH ₃ in water	ing agent than DH	
	 (a) NH₃ is less soluble than 2 H₃ (b) NH₃ is stronger base and stronger reduce (c) NH₃ has higher boiling point than PH₃ at the NH₃ 	and has lower melting i	point than PH a
	(c) NH ₃ has higher boiling point than FH ₃ c (d) PH ₃ is stronger reducing agent than NH ₃ c	and it has lower critical	temperature than NH ₂
	(d) PH ₃ is stronger reducing agent than Yang. Which of the following statements regarding	N ₀ O ₄ is not correct?	
32 .	Which of the following statements regarding		
	(a) It is a planar molecule		6. 6
	 (a) It is a planta (b) It is used as non-aqueous solvent (c) It involves N—N bond which is larger th 	an the N—N bond in h	ydrazine
	nitrate in NaU4 acts as a be	100	
20	Which of the following on heating produces	NO ₂ ?	
33.	Which of the following		
	(a) NaNO ₃ (c) NH ₄ NO ₃	(d) NH ₄ NO ₂	
24	a state of the action is incorrect	ly written?	
J4.	Which of the following AH PO + 20NO 2 +		
	(a) D + 20HNO ₂ \longrightarrow 41131 04		
	Which of the following equation is incorded: (a) $P_4 + 20HNO_3 \longrightarrow 4H_3PO_4 + 20NO_2 + 4$ (b) $I_2 + 10HNO_3 \longrightarrow 2HIO_4 + 10NO_2 + 4$		
	(a) $P_4 + 20HNO_3 \longrightarrow 4H_3IO_4 + 10NO_2 + 4IIO_4 + 10HNO_3 \longrightarrow 2HIO_4 + 10NO_2 + 4IIO_4 + 10HO_2 + 4IIO_4 + 4IIO_$		

2.64	A CONTRACT TO SERVICE AND A CONTRACT OF THE PROPERTY OF THE PR	N. P. Commission		
35.	35. The cyclotrimetaphosphoric acid is:	7		
	(a) (HPO ₃) ₃ and contains 9 σ-bonds			
	(b) H ₃ P ₃ O ₆ and contains 12 σ-bonds	,		
	(c) $(HPO_3)_3$ and contains 15σ -bonds			
	(d) H ₃ P ₃ O ₉ and contains 18 σ-bonds			
36.	36. $A + H_2O \longrightarrow B + HCl$			
	$B + H_2O \longrightarrow C + HCl$			
	Compound (A), (B) and (C) will be respectively:	and the second		
	(a) PCl_5 , $POCl_3$, H_3PO_3 (b) PCl_5 , $POCl_5$	Cl_3, H_3PO_4		
	(c) SOCl ₂ , POCl ₃ , H ₃ PO ₃ (d) PCl ₃ , PO			
37.	- , , , , , , , , , , , , , , , , , , ,	opened after	cooling it in ice	for
	sometime. This is because liquor ammonia:			
	(a) brings tears in the eyes (b) is a corre	sive liquid		
	(c) is a mild explosive (d) generates	s high vapou	r pressure	
38.	38. Which of the following statements are correct about the re-	action betwe	en the copper m	etal
	and dilute HNO ₃ ?			
	(I) The principal reducing product is NO gas			
	(II) Cu metal is oxidised to Cu ²⁺ (aq.) ion which is blue in	colour.		
	(III) NO is paramagnetic and has one unpaired electron in	antibonding	molecular orbita	al
	(IV) NO reacts with O2 to produce NO2 which is linear in			
	Choose the correct statements:			
	(a) I, II, III (b) I, III			
	(c) II, IV (d) All the all	oove		
39.				
	(a) Tetra poly phosphoric acid (H ₆ P ₄ O ₁₃)		A 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	(b) Pyrophosphoric acid (H ₄ P ₂ O ₇)			
	(c) Hypophosphoric acid (H ₄ P ₂ O ₆)			
	(d) Polymetaphosphoric acid (HPO ₃) _n			
			grant term	
10.	$10. \text{ NH}_3 + O_2 \xrightarrow{\text{Pt}} A + H_2O;$			
	$A + O_2 \longrightarrow B$;	20x		
	$B + O_2 + H_2O \longrightarrow C$			
	A, B and C are:			
	(a) N_2O , NO_2 and HNO_3 (b) NO , NO_2	and HNO		
	(c) NO_2 , NO and HNO ₃ (d) N_2O , NO		C.	
1 1.	1. The formation of PH ₄ is difficult compared to NH ₄ becaus			
	(a) lone pair of phosphorus is optically inert			
	(b) lone pair of phosphorus resides in almost pure p-orbita	1		
	(c) lone pair of phosphorus resides at sp^3 orbital	•		
	(c) totte hatt of hijoshijorgs resides at sh. otottat			

(d) lone pair of phosphorus resides in almost pure s-orbital

49.	In which of the following compounds hydroly respectively?	sis takes place through $S_{N^1}^{}$ and $S_{N^2}^{}$ mechanism
	(a) NF ₃ , NCl ₃	(L) P.O. SiCl.
	(c) SF ₄ , TeF ₆	(b) P ₄ O ₁₀ , SiCl ₄
50		(d) SiCl ₄ , SiF ₄
30.	Incorrect statement about PH ₃ is:	
	(a) It is produced by hydrolysis of Ca ₃ P ₂	And the second of the second o
	(b) It gives black ppt. (Cu ₃ P ₂) with CuSO ₄ s	olution
	(c) Spontaneously burns in presence of P ₂ H ₄	4
E 1	(d) It does not react with B ₂ H ₆	
51.	which of the following compound does not j	produce oxyacid of central atom on hydrolysis?
	(a) BF ₃	(b) NCl ₃
	(c) SF ₄	(d) PCl ₅
52.	The incorrect statement regarding 15th group	hydrides (EH_3) . $[E = N, P, As, Sb, Bi]$
	(a) $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$: Then	mal stability
	(b) $N-H > P-H > As-H > Sb-H > Bi-$	-H : E—H bond dissociation enthalpy
	(c) $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$: Redu	cing character
	(d) $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$: Basic	rity
53.	Calculate $x + y + z$ for H ₃ PO ₃ acid, where x	is number of lone pairs, y is number of σ -bonds
	and z is number of π -bonds:	
	(a) 5	(b) 14
	(c) 13	(d) 12
54.	A non-metal M forms MCl_3 , M_2O_5 and M_8	3M ₂ but does not form MI ₅ . Then incorrect
	statement regarding non-metal w is:	
	(a) M can form multiple bond	
	(b) M is of second period element	7 4
	(c) Atomicity of non-metal is 4	_ 10tr 10tr
	(d) The range of oxidation number for M is	+5 to -3
55.		The state of the s
	(a) Thermal stability: HF > HCl > HBr	(b) Lewis basic character: PF ₃ < PCl ₃ < PBr ₃
	(c) % <i>p</i> -character : $NO_2^+ > NO_3^- > NH_4^+$	(d) Bond angle : $NH_3 > PH_3 > AsH_3$
Ох	ygen Family and their Compounds	(16 ap.)
50.	The correct order of S—S bond length in fol (I) $S_2O_4^{2-}$ (II) $S_2O_5^{2-}$	lowing oxyanions is :
	- '	(III) S ₂ O ₆ ²⁻
	(a) I > II > III	(p) $I > III > II$
	(c) III > II > I	(q) $III > I > II$
57.	In which of the following reaction product of	oes not contain 'Peroxy' linkage?
	(a) 2OF Dimerisation	(b) $H_4P_2O_8 \xrightarrow{+H_2O}$
	excess O ₂	
	(c) $2Na \xrightarrow{\text{excess O}_2} \Delta$	(d) None of these
58.	Consider the following statements in respect	of oxides of out-
	(1) In gas phase SO ₂ molecule is V-shape.	or oxides of sulphur.

_	-	and the last	MORNEY
		31	19
	the		NO
	110		
	(3)		

(2) In gas phase SO₃ molecule is planar. (3) y - SO₃ is cyclic trimer. Which of the above statements are correct? (a) 1 and 2 only (b) 2 and 3 only (c) 1 and 3 only (d) 1, 2 and 3 59. Gas that can not be collected over water is: (d) PHa (a) N₂ (b) O, (c) SO₂ 60. In thiosulphuric acid: (a) each sulphur atom is in identical oxidation state (b) there is a S=S linkage present (c) one S atom is in +2 and other sulphur atom is in +4 oxidation state (d) there is only one replaceable hydrogen atom 61. One gas bleaches the colour of flowers by reduction, while the other by oxidation gases respectively are: (b) H2S and Br2 (a) CO and Cl₂ (d) SO2 and Cl2 (c) NH₃ and SO₃ 62. Which of the following halides cannot be hydrolysed at room temperature? (IV) NF₃ (III) NCl₃ (II) SF₆ Choose the correct code: (a) III and IV (b) I, II and III (d) II and IV (c) I, II and IV 63. By which of the following methods, H2O2 can't be synthesised? (a) Lewis addition of ice cold H₂SO₄ on BaO₂ (b) Addition of ice cold H₂SO₄ on PbO₂ (c) Aerial oxidation of 2-ethyl anthraquinol (d) Electrolysis of (NH₄)₂SO₄ at a high current density 64. Give the correct order of initials T or F for following statements. Use T if statement is true and F if it is false. (I) Number of S—S bonds in $H_2S_nO_6$ are (n+1)(II) When F₂ reacts with water gives HF, O₂ and O₃ (III) LiNO₃ and BaCl₂ compounds are used in fire works (IV) Be and Mg hydrides are ionic and polymeric (b) FTTT (c) TFTT (d) TTFF (a) FTTF 65. Which of the following parent oxy acid does not have its hypo acid? (b) HNO₂ (c) H_3PO_3 (d) HClO₃ (a) H_2SO_2 66. Which pair of elements can from multiple bond with itself and oxygen? (b) N, Cl (a) F. N (d) N, C (c) N, P 67. Consider the following reactions: (i) $PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl$ (ii) $SF_4 + 3H_2O \longrightarrow H_3SO_3 + 4HF$ (iii) $BCl_3 + 3H_2O \longrightarrow H_3BO_3 + 3HCl$ (iv) $XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$ Then according to given information the incorrect statement is:

- (a) During the (i) reaction the hybridisation of 15th group element does not change
- (b) During the (ii) reaction the hybridisation of 16th group element has been changed
- (c) During the (iii) reaction the hybridisation of 13th group element does not change
- (d) During the (iv) reaction the hybridisation of 18th group element does not change

Halogen Family and their Compounds (17 gp.)

- **68.** Consider the oxy acids $HClO_n$ series, here value of n is 1 to 4. Then incorrect statement regarding these oxy acids is:
 - (a) Acidic character of oxy acids increases with increasing value of n.
 - (b) oxidising power of oxy acids increases with decreasing value of n.
 - (c) Thermal stability of oxy acids decreases with increasing value of n.
 - (d) 'Cl—O' bond order decreases with decreasing value of n
- 69. The correct statement regarding ClO_n molecular ion is:
 - (a) On decreasing value of 'n', 'Cl—O' bond order increases
 - (b) On increasing value of 'n', 'Cl—O' bond length increases
 - (c) On increasing value of n, oxidation number of central atom increases
 - (d) On increasing value of n, hybrid orbitals on central atom increase
- **70.** In, $Cl_2O_6(l) + HF \longrightarrow P + Q$

If H⁺ of acid HF attaches with Q, then correct option for hybridization of Cl-atom and \angle OClO in the P and Q ions:

(a) $P: sp^2 > 120^\circ$

(b) Q:sp3; 109°28'

(c) P: sp³; < 109°28'

(d) $Q: sp^3 > 109^{\circ}28'$

71. Bromine is commercially prepared from sea water by displacement reaction

$$Cl_2 + 2Br^-(aq) \longrightarrow 2Cl^-(aq) + Br_2$$

Br2 gas thus formed is dissolved into solution of Na2CO3 and then pure Br2 is obtained by treatment of the solution with:

(a) Ca(OH)₂

(b) NaOH

(c) H₂SO₄

(d) HI

72. Which of the following properties of halogens increase with increasing atomic number?

(I) Ionization energy

(II) Ionic radius

(III) Bond energy of the X_2 molecule

(IV) Enthalpy of vaporisation

(a) I, II, III

(b) I, III (d) IV

(c) II, IV

73. Predict the correct product when Cl₂ passed through H—O—O—

- (a) $H^+ + Cl^- + O_2$ (both oxygen having 18)
- (b) HOCl and HClO₂ (all oxygen having 18)
- (c) HClO₄ and HCl (all oxygen having 18)
- (d) Cl₂O and H₂O (all oxygen having 18)

74.
$$Cl_2(g) + Ba(OH)_2 \longrightarrow X(aq.) + BaCl_2 + H_2O$$

$$X + H_2SO_4 \longrightarrow Y + BaSO_4$$

$$Y \xrightarrow{\Lambda} Z + H_2O + O_2$$

Y and Z are respectively:

- (a) HClO₄, ClO₂
- (c) HClO₃, ClO₆

- (b) HClO₃, ClO₂
- (d) HClO₄,Cl₂O₇
- 75. Auto-oxidation of bleaching powder gives:
 - (a) only calcium chlorate
 - (c) only calcium hypochlorite
- 76. Which is incorrectly matched? (a) $I_4O_9 \iff I^{3+} + 3IO_3^{-}$
 - (c) $CsBr_3 \rightleftharpoons Cs^+ + Br_3^-$

- (b) only calcium chloride
- (d) both (a) and (b)
- (b) $I_2O_4 \implies IO^+ + IO_3^-$
- (d) None of these
- 77. The three elements X, Y and Z with electronic configurations shown below all form hydrides:

Element		Electronic configuration			
2 X 30 200			$1s^22s^22p^2$		
Y	Course of	1100	$1s^2 2s^2 2p^6 3s^1$		
\boldsymbol{z}			$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^5$		

Which set of properties match correctly with properties of the hydrides of these elements:

Hydride of X

Hydride of Y

Hydride of Z Colourless gas forms a

Ionic solid with formula

- Colourless gas insoluble in H₂O
- Colourless liquid, (b) reaction with H2O
- compound Non-polar (c) reacts with Cl2 in light
- Silver/grey solid reacts with H2O to form an alkali Silver/grey solid forms H₂
- and H₂O Silver/grey ionic
- solid with formula YH2

Silver/grey solid which

reacts violently with acids

Forms when water is added to phosphorus and elemental Z.

strong acid in H2O

Colourless, corrosive liquid at STP

burns with air 78. The incorrect order is:

(d)

Colourless

- (a) HF < HCl < HBr < HI : Acidic strength
- (b) HF > HCl > HBr > HI : Thermal stability

gas

- (c) HF > HCl > HBr > HI: Boiling point
- (d) HF > HCl > HBr > HI : Bond dissociation enthalpy

which

Noble Gases and Xenon Compounds (18 gp.)

- **79.** The correct statement regarding perxenate ion (XeO_6^{4-}) is :
 - (a) It is polar species
 - (b) It is a planar species
 - (c) 'Xe-O' bond order is 1.33
 - (d) Molecular ion has only one type of bond angle
- 80. XeF2 and XeF6 are separately hydrolysed then;
 - (a) both give out O2

(b) XeF₆ gives O₂ and XeF₂ does not

(c) XeF₂ alone gives O₂

(d) Neither of them gives HF

81.	$MF + XeF_4 \longrightarrow A$ $(M = Alkali metal cal$	1011)
	The state of hybridisation of the central atom (a) sp^3d , TBP	(b) sp ³ d ³ , distorted octanieural
	(c) sp^3d^3 , pentagonal planar	(d) No compound formed at all
82.	Xenon tetrafluoride, XeF ₄ is: (a) tetrahedral and acts as a fluoride donor (b) square planar and acts as a fluoride donor (c) square planar and acts as fluoride donor	with SbF ₅ or with PF ₅ with NaF
	(d) see-saw shape and acts as a fluoride don	or with AsF ₅
83.	XeF ₆ dissolves in anhydrous HF to give a goo	od conducting solution which contains:
	(a) H ⁺ and XeF ₇ ion and although the	(b) HF ₂ and XeF ₅ ions
	(c) HXeF ₆ and F ⁻ ions	(d) none of these
84.	Which of the following is not true about heli (a) It has the lowest boiling point	
	(b) It has the highest first ionization energy	Which set of properties match estatedow
	(c) It can diffuse through rubber and plastic (d) It can form clathrate compounds	Material X to abridge
85.		e shapes of cation and anion in the adduct are
00.	respectively:	ronte galutorat englacimento di un
	(a) square planar, trigonal bipyramidal	(b) T-shaped, octahedral
	(c) square pyramidal, octahedral	(d) square planar, octahedral
86.	Consider the following transformations:	national appropriate and property on
		(II) $2PCl_5(s) \longrightarrow [PCl_4]^+[PCl_6]^-$
	(III) $[Al(H_2O)_6]^{3+} + H_2O \longrightarrow [Al(H_2O)_5O]$	$[H]^{2+} + H_3O^+$
. OV	Possible transformations are:	artic lawly may terretor (b)
	(-, -, -,	(c) I, II (d) II, III
87.	Which of the following is an uncommon hyd	rolysis product of XeF ₂ and XeF ₄ ?
	(a) Xe	(b) XeO ₃
00	(c) HF	(d) O ₂
88.	Incorrect statement regarding following reach +Excess F	120 V + UP
	XeF ₆ +2H ₂ O	La line of the party of the par
	(A) 1881 (A) 1	→ 'Y' + HF,
	(a) 'X' is explosive(b) 'Y' is an oxyacid of xenon	
	(c) Both are example of non-redox reaction	
	(d) XeF ₆ can undergo partial hydrolysis	
89	Which of the following noble gas does not for	orm clathrate compound?
	(a) Kr	(b) Ne
	(c) Xe	(d) Ar

Chemical Bonding

90. Correct order of bond angle in given species is :

(a)
$$SiO_4^{4-} > PCl_3 > NCl_3 > SbH_3 > H_2Te$$

(b)
$$SiO_4^{4-} > NCl_3 > PCl_3 > SbH_3 > H_2Te$$

(c)
$$SiO_4^{4-} > H_2Te > SbH_3 > PCl_3 > NCl_3$$

(d)
$$NCl_3 > PCl_3 > SiO_4^{4-} > SbH_3 > H_2Te$$

91. The incorrect order is:

(a) N > P > As : Strength of π -bond with oxygen atom

(b)
$$SiF_4 > SiCl_4 > SiBr_4 > SiI_4$$
: Thermal stability

(d) CaBr₂ > MgBr₂ > BeBr₂: Melting point

92. Among the following, cyclic species are:

(I) H₅P₃O₁₀

(II) $[B_3O_3(OH)_5]^{2-}$

(III) $H_5P_5O_{15}$

(a) I, III

(b) I, III, IV

(c) II, III, IV

(d) I, II, III, IV

93. The substance that has the lowest boiling point is:

(b) H_2S

(c) PH₃

(d) SiH₄

(IV) P₃N₃Cl₆

94. Which of the following molecule can show Lewis acidity?

(IV) HF

(III) SnCl₂ (II) Br₂

(I) CO₂ (V) NMe₃

(a) III, IV

(b) I, II, III

(c) I, III, IV

(d) II, III, V

95. Molecule having non-polar as well as polar bonds but the molecule as a whole is polar:

(a) (SCN)₂

(b) Cl₂O₈

(c) B_2Cl_4

(d) I2Cl6

96. Which of the following order is incorrect?

(a) Lewis basic character: NH₃ > PH₃ > AsH₃ > SbH₃

(b) Bond dissociation energy: HF > HCl > HBr > HI

(c) Thermal stability: $H_2O > H_2S > H_2Se > H_2Te$

(d) Bond angle : $CH_4 > SiH_4 > GeH_4 > SnH_4$

97. Which of the following does not undergo Lewis acid-base reaction?

(a) $CO_2 + H_2O$

(b) $AlCl_3 + Cl^-$

(c) $SF_6 + BF_3$

(d) $B(OH)_3 + H_2O$

Level 3

PASSAGE 1

Each oxy-acid contains at least one X—OH unit (X is non-metal). The H-atom of X—OH unit is ionisable and the number of —OH groups directly attach to non-metal decides the basicity of oxy-acid.

1.	Which of the	following	ovv-acid	does not	have its	nerovy	form	having	two	central	atoms	?
	AAIIICII OI IIIE	TOHOWING	oxv-acid (does nor	nave us	Deloxy	ши	Having	LVVO	cciitiui	atoms	

(a) H₂SO₄

(b) HNO₃

(c) H₃PO₄

(d) None

2. Which of the following hypoform of oxy-acid can exhibit tautomerism?

(a) $H_2N_2O_2$

(b) $H_4P_2O_6$

(c) $H_2S_2O_6$

(d) H₃PO₃

3. Which of the following oxyanion of Pyro acid has different oxidation state of central atom?

(a) $S_3O_6^{2-}$

(b) $Si_2O_7^{6-}$

and the first of the particular property of the first to

(c) $S_2O_5^{2-}$

(d) None

PASSAGE 2

Formation of a bridge bond is best explained by molecular orbital theory. According to which a bridge bond is formed by filling electrons into molecular orbital which spread over three nuclei hence such bonds are specified as three centered bond.

 In which of the following dimer empty atomic orbital of central atom of monomer does not involve in hybridization:

(a) Ga₂H₆

(b) Al₂Br₆

(c) Be_2H_4

(d) Cl_2O_6

2. In which of the following compound hybridization of bridging atom is different from hybridisation of central atom:

(a) $Al_2(NH_2)_6$

(b) I₂Cl₆

(c) Solid BeCl₂

(d) $Al_2(OH)_6$

3. Which of the following compound is having maximum number of atoms in same plane?

(a) Al₂Me₆

(b) B_2H_6

(c) Be 2H4

(d) C_3H_4

M. In M. Carl - All

Question No. 1 to 3 (3 questions)

- (i) $P + C(carbon) + Cl_2 \longrightarrow Q + CO \uparrow$
- (iii) $BN + H_2O \longrightarrow R + NH_3 \uparrow$
- (v) $S + H_2 \longrightarrow R + H_2 \uparrow$
- (ii) $Q + H_2O \longrightarrow R + HCI$

(II) a planar trigonal structure

(iv) $Q + \text{LiAlH}_4 \longrightarrow S + \text{LiCl} + \text{AlCl}_3$

M. Allow pp. of compensed to Mandalland

(vi) $S + \text{NaH} \longrightarrow T$

(P, Q, R, S and T do not represent their chemical symbols)

- 1. Compound Q has:
 - (I) zero dipole moment
 - (III) an electron deficient compound Choose the correct code:
 - (a) I, IV
- (b) I, II, IV
- (IV) a Lewis base
- (c) I, II, III
- (d) I, II, III, IV

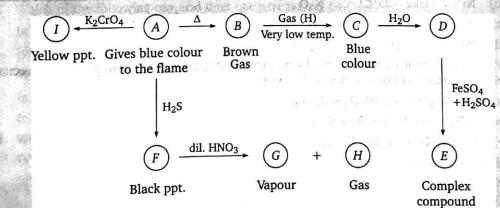
- 2. Compound T is used as a/an:

 - (a) oxidising agent (b) complexing agent (c) bleaching agent
- (d) reducing agent

- **3.** Compound S is:
 - (I) an odd-e compound
 - (III) a electron deficient compound
 - Choose the correct code:
 - (a) III
 - (c) II, III, IV

- (II) $(2c-3e^{-})$ compound
- (IV) a sp2 hybridized compound
- (b) I, III
- (d) I, II, IV





- 1. Compound (D) + $I^- + H^- \longrightarrow Gas$
 - Evolved gas is similar to:
 - (a) Gas-B
- (b) Gas-G
- (c) Gas-H
- (d) None

- 2. Yellow ppt. of compound (I) is insoluble in:
 - (a) NaOH

(b) CH₃COOH

(c) dil. HNO₃

- (d) none
- **3.** Type of hybridization of complex (E) is:
 - (a) sp^3d^2

(b) d^2sp^3

(c) sp^3

- (d) dsp^2
- 4. Type of hybridization of central atom of gas (B) is:
 - (a) sp

(b) sp^2

(c) sp^3

(d) no hybridization

PASSAGE 5

The following flow diagram represent the industrial preparation of nitric acid from ammonia:

$$NH_3 + O_2 \xrightarrow{(excess air)} \xrightarrow{900^{\circ}C} NO \xrightarrow{(Y)} (Z) \xrightarrow{water} HNO_3 + NO$$

Answer the questions given below:

1. Which line of entry describes the undefined reagents, products and reaction conditions?

X

- Y
- Z

- (a) Pt
- cool (-25°C)
- NO₂

- (b) Ni
- cool (-25°C)
- N_2O

- (c) Fe
- cool (-11°C)
- NO₂

- (d) Pd
- high pressure
- N_2O_3
- 2. When (Z) is dissolved in H₂O then formation of HNO₃ takes place through various reactions. Select the reaction not observed in this step:
 - (a) $NO_2 + H_2O \longrightarrow HNO_3 + HNO_2$
 - (b) $HNO_2 \longrightarrow H_2O + NO + NO_2$
 - (c) $NO_2 + H_2O \longrightarrow HNO_3 + NO$
 - (d) none of these

PASSAGE 6

Species having X - O - H linkage (X = non-metal with positive oxidation state) are called oxy acids and parent acid of a non-metal may exist in two form (a) -ic form of parent oxy acid (b) -us form of parent oxy acid.

- 1. Number of P—O bond(s) having bond order = 2, in $P_2O_6^{4-}$ ion is :
 - (a) 0

(b) 2

(c) 3

- (d) 6
- 2. Which of the following parent oxy acid does not have its pyro-oxy acid?
 - (a) H₂SO₃

(b) HNO₃

(c) H₃PO₃

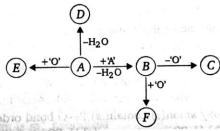
- (d) H₄SiO₄
- 3. X O X bond (where X = central atom) is not present in species.
 - (a) Cl_2O_7

(b) H₂N₂O₂

(c) N_2O_5

(d) H₂S₂O₇

Consider the following sequence of reactions, if A is sulphuric acid, then give the answer of following questions.



- 1. Which of the following oxy acid does not have peroxy (-O-O-) linkage?
 - (a) F

(c) E

- (d) None of these
- **2.** In which of the following compound S-atom is sp^2 -hybridised:
 - (a) C

(b) E

(c) D

- (d) B
- 3. Which of the following oxy acid is having S—O—S linkage?
 - (a) B

(b) C

(c) F

(d) None of these



ONE OR MORE ANSWERS IS/ARE CORRECT

1. Consider the following reactions:

$$A_x + yB_2 \xrightarrow{\text{limited}} \text{compound 'P'} \xrightarrow{+zB_2} \text{Compound 'Q'}$$

If atomic number of elements A and B are 15 and 8 respectively, then according to the given information the correct statement(s) is/are:

- (a) (B-A-B) bond angle in compound Q' > (B-A-B) bond angle in compound P'
- (b) (A-B) bond length in compound Q' < (A-B) bond length in compound P'
- (c) Value of x + y + z is 9
- (d) Compound 'P' is P2O5 and compound 'Q' is P4O10.
- 2. Which of the following is V-shaped:

(a)
$$S_3^{2-}$$

(b)
$$I_3^-$$

(c)
$$N_3^-$$

(d) I_3^+

3.
$$'X'+6H_2O \longrightarrow 'Y'+6HF$$

$$X + H_2O \longrightarrow 'Z' + 2HF$$

If 'X' is xenon hexafluoride than correct statement is:

- (a) Compound 'Y' is XeO3 which is explosive solid
- (b) Both compound 'Y' and 'Z' have same number of lone pair(s) at central atom
- (c) 'Z' is a partially hydrolysed product of compound 'X'
- (d) 'X' act as fluoride donor when it reacts with alkali metal fluoride.
- 4. Which of the following oxy anion(s) contain(s) P—O bond order equal to 1.5?

(a)
$$H_2P_2O_6^{2-}$$

(b)
$$H_2PO_3^-$$

(c)
$$H_2PO_4^-$$

(d) $H_2PO_2^-$

- 5. Which of the following order is correct?
 - (a) $N_2 > F_2 > O_2$: Ionisation energy
 - (b) $H_2Te > H_2Se > H_2S > H_2O$: Reducing nature
 - (c) $H_2O > H_2Te > H_2Se > H_2S$: Boiling point
 - (d) HClO₄ > HClO₃ > HClO₂ > HClO: Oxidising nature
- 6. Consider the following sequence of reaction

$$\begin{array}{c} \text{SOCl}_2 \xrightarrow{+\text{H}_2\text{O}} \text{'A'} \\ & +\text{PCl}_5 \end{array}$$

Then according to given information the **correct** statement(s) is/are:

- (a) Compound 'A' has $p\pi$ - $p\pi$ bond
- (b) Central atom of compound B is sp^3 -hybridized
- (c) Compound 'B' has plane of symmetry
- (d) Compound 'A' is polar and B is non-polar
- 7. Correct statement(s) about hydrolysis of H₅P₃O₁₀ is/are:
 - (a) H₄P₂O₆ can be formed by its partial hydrolysis
 - (b) Hydrolysis is proceeded by SN AE mechanism

	(c) Complete hydrolysis produces H ₃ PO ₄
	(d) $H_5P_3O_{10}$ is obtained by hydrolysis of $H_3P_3O_{10}$
8.	The species which react with silica/glass in presence of moisture:
	(a) HF (b) XeF_2 (c) XeF_4 (d) XeF_6
9.	In which of the following compound(s) terminal $(2C - 2e^{-})$ bond and bridge bonds are lying in
	same plane :
	(a) I_2Cl_6 (b) Fe_2Cl_4
	(c) Solid BeCl ₂ (d) Ga ₂ H ₆ from the formula of the first of the f
10.	The correct statement(s) regarding diborane (B ₂ H ₆) is/are:
	(a) Maximum six hydrogen atoms can lie in a plane
	(b) Maximum six atoms can lie in a plane.
	(c) Bridging $H_b - B - H_b$ bond is stronger than terminal $B - H_t$ bond
	(d) Terminal $H_t - B - H_t$ bond angle is greater than bridging $H_b - B - H_b$ bond angle
11.	In which of the compounds oxygen does not exhibit oxidation state (-2)?
	(a) CsO_2 (b) K_2O_2 (c) OF_2 (d) Cl_2O
12.	Aqueous solution of boric acid is treated with salicylic acid. Which of the following statements
	is/are incorrect for the product formed in the above reaction?
	(a) no product will be formed because both are acid
	(b) product is 4-coordinated complex and optically resolvable
	(c) product is 4-coordinated complex and optically non-resolvable
	(d) there are two ring only which are five membered
13.	Borazine is called 'inorganic benzene' min view of its ring structure with alternate BH and NH
	groups. Which of the following statements is correct about borazine?
	(a) Each B and N atom is sp ² hybridised
	(b) Borazine satisfies the $(4n + 2)$ Huckel's rule
	(c) Like organic benzene, borazine does not give addition product with HCl
	(d) Borazine contains dative $p\pi - p\pi$ bond
14	Identify the correct statement about orthoboric acid:
	(a) It has a layer structure in which planar BO ₃ units are joined by hydrogen bonds
	(b) Orthoboric acid (H ₃ BO ₃) is a weak monobasic Lewis acid
	(c) On heating ortho-boric acid form meta-boric acid and on further heating to red hot, forms
	boric oxide anhydride
	(d) It is obtained by reacting borax with dilute HCl using phenolphthalein as an indicator
15	• Which of the following methods can be used for the preparation of anhydrous aluminium chloride?
	(a) Heating AlCl ₃ -6H ₂ O
	(b) Heating a mixture of alumina and coke in a current of dry chlorine
	(c) Decemb dry Ht.1 243 Over medica aranmam portaci
16	Identify the correct statements regarding structure of diborane:
	(a) There are two bridging hydrogen atoms
	(b) Each boron arom Ioillis Ioui bolius
	(a) The hydrogen atoms are not in the same plane
	(d) each boron atom is in sp^3 hybridized state

17.	Heating of oxalic acid with conc. H ₂ SO ₄ evolves:				
	(a) CO (b) SO_2 (c) CO_2 (d) SO_3				
18.	Which of the following is/are correct for group 14 elements?				
	(a) The stability of dihalides are in the order $CX_2 + SiX_2 < GeX_2 < SnX_2 < PbX_2$				
	(b) The ability to form $p\pi$ - $p\pi$ multiple bonds among themselves increases down the group				
	(c) The tendency for catenation decreases down the group				
	(d) They all form oxides with the formula MO ₂				
19.	Select the correct statement about silicates:				
	(a) Cyclic silicate having three Si atoms contains six Si—O—Si linkages.				
	(b) $2\frac{1}{2}$ over oxygen atoms of per tetrahedron unit are shared in double chain silicate				
	(c) $(Si_2O_5)_n^{2n-}$ is formula of double chain silicate				
	(d) SiO 4- units polymerize to form silicate because Si atom has less tendency to form				
	π-bond with oxygen				
20.	SiO ₂ reacts with:				
	(a) Na_2CO_3 (b) CO_2 (c) HF (d) HCl				
21.	/hich of the following statement(s) is/are true?				
	(a) The lattice structure of diamond and graphite are different				
	(b) Graphite is an impure form of carbon while diamond is a pure form				
	(c) Graphite is harder than diamond				
	(d) Graphite is thermally more stable than diamond				
22.	On strong heating Pb(NO ₃) ₂ gives:				
	(a) PbO (b) NO ₂				
	(c) O_2 (d) NO				
23.	PbO ₂ is:				
	(a) acidic (b) basic				
	(c) reducing agent (d) oxidising agent				
24.	Which of the following is true for allotropes of phosphorus?				
	(a) Yellow phosphorus is soluble in CS ₂ while red phosphorus is not				
	(b) P—P—P bond angle is 60° in red phosphorus				
	(c) On heating in air, white phosphorus changes to red				
95	(d) White phosphorus slowly changes to red phosphorus at ordinary temperatures Which of the following statements are true shows P. O.				
25.	The state to the state ments are true about p. (), and p. ()				
	(a) Both these oxides have a closed cage like structure				
	 (b) Each oxide requires 6 water molecules for complete hydrolysis to form their respective oxoacide (c) Both these oxides contain 12 equivalent P—O bonds 				
26.	(d) P_4O_6 and P_4O_{10} both contains $p\pi - d\pi$ bonds				
_0.	Which of the following, when dissolved in water, will liberated ammonia? (a) NaNO ₃ (b) NaNO ₃				
	(b) NaNO ₂				
27.	(c) NaNH ₂ (d) Na ₃ N PH ₃ can be obtained by:				
	(a) heating hypophosphorus acid				
	(b) heating orthophosphorus acid				

.Block Element (c) reacting white phosphorus with hot conc. NaOH (d) hydrolysis of calcium phosphide 28. Which of the following are used as fertilizers? (a) $Ca_3(PO_4)_2$ (b) Ca(H₂PO₄)₂ (c) CaNCN (d) CaC₂ 29. Which of the following statement(s) regarding nitrogen sesquioxide (N2O3) is/are correct? (a) Nitrogen sesquioxide is stable only in the liquid state. It dissociates in the vapour state (b) Nitrogen sesquioxide is a neutral oxide (c) Nitrogen sesquioxide contains a weak N-N bond (d) Nitrogen sesquioxide exists in two different forms 30. Photochemical decomposition of HNO 3 produces: (a) N₂ (b) N₂O (c) NO₂ (d) O₂ 31. Identify the correct statement(s): (a) P₄O₁₀ is used as a drying agent (b) P_4O_{10} contains $p\pi$ - $d\pi$ back bonding (c) in P₄O₁₀ each P atom is bonded to three oxygen atoms (d) P₄O₁₀ hydrolyse in water forming phosphorus acid 32. Which of the following will be formed when HNO₂ disproportionates in aqueous medium? (c) NO (d) HNO₃ (a) NH₃ (b) N₂ 33. Which of the following species is/are formed when conc. HNO₃ is added to conc. sulphuric acid? (b) NO₂⁺ (a) NO_3 (d) HSO₄ (c) NO+ 34. The correct order of reducing power of MH₃ is: (a) $NH_3 < PH_3 < SbH_3 < BiH_3$ (b) $PH_3 < AsH_3 < BiH_3 < SbH_3$ (c) $BiH_3 < SbH_3 < PH_3 < NH_3$ (d) $PH_3 < AsH_3 < SbH_3 < BiH_3$ 35. Which of the following do not have tendency to act as ligands during complex formation? (c) AsH₃ (d) SbH₃ (b) PH₃ (a) BiH₃ **36.** Metal(s) M in the following equation is/are $M + N_2 \xrightarrow{\Delta} Metal nitride$

(b) Li

(d) Mg

(b) NCl₃

(d) P₄O₁₀

(b) pyrophosphoric acid

(d) NI₃

(a) Na

(c) Cs

(a) NF₃

(c) NBr₃

(c) P₄O₆

(a) metaphosphoric acid

37. Which of the following compound(s) is/are explosive(s)?

38. The compounds obtained by heating of orthophosphoric acid are:

39.	At high temperatures, nitrogen directly com (a) Zn			100
	(c) Al	(b) Mg		40
40		(d) Fe		
10.	Phosphine is obtained by the reaction when (a) White phosphorus is heated with NaOH	i; '		
	(b) Ca ₃ P ₂ reacts with water			
	(c) red phosphorus is heated with NaOH			
	(d) phosphorus is heated in current of hydr	rogen		
41.	Predict product(s) in the following reaction	ogen		
		\rightarrow Product(s)	(1) 205	
	(a) PH_3 (b) PO_4^{2-}	(c) $H_2PO_2^-$	(d) PO_2^-	
42.	Which of the following statements is/are co	rrect?		
	(a) NO ₂ is a paramagnetic substance	(b) Solid is brow	n in colour	
2000	(c) NO ₂ dimerizes to N ₂ O ₄	(d) NO ₂ is a mix	ed anhydride	
43.	Which is true about N ₂ O ₅ ?			
	(a) It is anhydride of HNO ₃	1		
	(b) In solid state it exists as NO ₂ ⁺ NO ₃ ⁻			
	(c) It is structurally similar to P ₂ O ₅			
	(d) It can be prepared by heating HNO ₃ ov			
44.	White phosphorus can be separated from re	d phosphorus by:		
	(a) sublimation	(b) dissolving in	CS ₂	
	(c) distillation	(d) heating with	alkali solution	
45.	Orthophosphoric acid $\xrightarrow{\text{gentle heat}} X$			
	What is/are correct about X?			
	(a) It is a tetrabasic acid			
	(b) It contains one P—O—P bond		A 1	
	(c) It is a dibasic acid			
	(d) On hydrolysis it produces metaphospho			
46.	Which of the following act as an oxidising a	as well as a reducing	g agent?	
	(a) HNO_2 (b) H_2O_2	(c) H ₂ S	(d) SO ₂	
47.	Which of the following statements are corre		-	
	(a) It is prepared by reacting sulphur direct			
	(b) Sulphur tetrafluoride hydrolysed by wa	ter to give SO ₂ and	HF	
	(c) SF ₄ has a square planar shape with S ha	iving two lone pair	of electrons	
40	(d) S-atom has a expanded octet			
48.	Nitrating mixture is obtained by mixing conitration is:	nc. HNO ₃ and cond	c. H ₂ SO ₄ . Role o	of H ₂ SO ₄ in
	(a) to force HNO ₃ to behave as a base			
	(b) to supress the dissociation of HNO ₃			
	(c) to produce NO ₂ ions			
	(d) to remove the colour NO ₂ produced du	ring nitration		
	. •	5		

19.	Drops of nitric acid reacts with P ₂ O ₁₀ to gives:
	(a) NO (b) NO_2 (c) N_2O_5 (d) HPO_3
50.	Which of the following statement(s) is/are correct?
	(a) Rhombic sulphur is stable at room temperature
	(b) Monoclinic sulphur is stable at room temperature
	(c) Both rhombic and monoclinic sulphur has the molecular formula S ₈
	(d) Both rhombic and monoclinic sulphur are soluble in CS ₂
51.	Which of the following statements are true about sodium thiosulphate, Na ₂ S ₂ O ₃ ?
	(a) It is used in the estimation of iodine
	(b) It can give a black precipitate with AgNO ₃
	(c) It is used to remove the unexposed AgBr from photographic films
	(d) It contains ionic, covalent and coordinate covalent bonds
52.	Peroxy acids of sulphur are:
	(a) $H_2S_2O_8$ (b) H_2SO_5 (c) $H_2S_2O_7$ (d) $H_2S_2O_3$
53.	Sulphur dioxide can be used as:
	(a) bleaching agent (b) antichlor (c) disinfectant (d) none of these
54.	Which statements are correct for ozone?
	(a) It is obtained by silent electric discharge on oxygen
	(b) It can be obtained by the action of ultraviolet rays on oxygen (modified)
	(c) It is regarded as an allotrope of oxygen
	(d) Ozone molecules is paramagnetic like oxygen molecule
55.	Concentrated sulphuric acid is:
	(a) efforescent (b) hygroscopic
	(c) oxidising agent (d) sulphonating agent
56.	The reaction of sodium thiosulphate with I2 gives:
	(a) sodium sulphite (b) sodium sulphate
	(c) sodium iodide (d) sodium tetrathionate
57.	Identify the correct statement(s):
	(a) Ozone is a powerful oxidising agent as compared to O ₂
	(b) Ozone reacts with KOH and gives an orange coloured solid KO ₃
	(c) There is a decrease in volume when ozone decomposed to form O ₂
	(d) The decomposition of O ₃ to O ₂ is exothermic
58.	Overgen is not evolved when:
	(a) potassium chlorate is heated with MnO ₂ catalyst
	(b) sodium peroxide reacts with water
	(c) ammonium nitrate is heated
	(d) zinc oxide is treated with NaOH
59.	Identify the correct statements:
	(a) Fluorine is a super halogen (b) Iodine shows Lewis basic nature
	(c) AgF is insoluble in water (d) SCN is a pseudohalide
60.	Which of the following properties of the elements chlorine, bromine and iodine increase with
	increasing atomic number?

	(a) Ionization energy(c) Bond energy of the	e molecule X	(b) Ionic radius(d) Enthalpy of vapo	orization
61	Which of the following	_		e alom a c
01.	(a) Chlorine dioxide (C	O) is nowerful oxidis	ing agent but bleachin	g action is lower than Cl ₂
	(b) ClO ₂ in alkaline so	olution undergoes disp	roportionation	Markey and American
			toportionation	
	(c) ClO ₂ is diamagnet			
60	(d) ClO ₂ is a yellow g			A CONTRACT OF THE PARTY OF THE
02.	Which of the following		ut NO ₂ and ClO ₂ :	
	(a) Both are paramagn			
	(b) Both have a bent :			
	(c) On cooling, both u			
60	(d) In both oxides, the		oxidation state ++	
03.	$Cl_2O_6 + NaOH \longrightarrow ?$		(a) NaClO	(d) NaClO.
	(a) NaClO ₄		(c) Nacio ₂	(d) Nacio ₃
04.	Predict product(s) in t		hot legal and	
		$Cl_2 + OI$	1- <u> </u>	
	(a) Cl		(c) OCl	
65.	In the isolation of fluo	rine a number of diffic	culties were encounter	ed. Which statements are
	correct:	r -	p. 0.00 120 - 120	
	(a) Fluorine reacts wi	th moist glass vessels	all respective and pro-	
	(b) Fluorine has great	t affinity for hydrogen		er and protestera. The
	(c) Electrolysis of aqu	eous HF gives ozonize	d oxygen	
		uired for the discharge		west
66.	Iodine is formed when			
	(a) ZnSO ₄			(d) Br ₂
67.	Available chlorine is li	The second secon	Statement Control of the Control of	(-) 212
• , ,	(a) is heated		(b) reacts with acid	A contract to the second
		1. 1. 1. 2. 1. 1. 1.		
68.	Which reactions are u			
-	(a) $2KBr + H_2SO_4$ —	$\rightarrow K_2SO_4 + 2HBr$	(b) CaF ₀ + H ₀ SO	- Coco Loure
	(conc.)	· • • • • • • • • • • • • • • • • • • •	(conc.)	7 Ca3O ₄ + 2FIF
	(c) NaCl+H ₂ SO ₄ —	→ NaHSO₄ + HCl	(d) $2KI + H_2SO_4$ —	V V CO LOUI
	(conc.)	100 Total 1	(conc.)	-7 K ₂ 50 ₄ + 2HI
69.	Which of the followin	g statement(s) is/are o	correct for Halogens.	
		liquid at room temper		
	(b) The most electron	negative element is fluo	orine	
	(c) The most reactive	halogen is fruorine		
	(d) The strongest oxid	dising agent is iodine		
70.	What are products in	the following equation	i,	
	•		! → ?	
	(a) H ₂ S	(b) S ²⁻	(c) S ₂ O ₃ ²⁻	(1) == 2
	(4) 1120	(5) 6	(5) 5203	(d) SO_3^{2-}

71.	Correct statements about the hydrogen halides include that: (a) they are all coloured	
	(b) the thermal stability decreases with increasing atomic number of halogen(c) they all form soluble silver salts	
	(4) there all d	
72	Which of the following statement(s) is (see a see a se	
/ 4.	Which of the following statement(s) is/are not correct? (a) The covalency of N in HNO ₃ is +5	
	(b) HNO ₃ in the gaseous state has a trigonal planar structure	
	(c) The ovidation state of M. Trace	
	(d) Gold dissolves in HNO ₂ to form gold nitrate	
73.	Which of the substances react with water?	
	(a) Chlorine (b) Phosphorus trichloride	
	(c) Silicon tetrachloride (d) Tetrachloro methane	
74.	Which of the following substances are soluble in NaOH solution?	
	(a) Sn(OH) ₂ (b) Al(OH) ₃	
	(c) Bi(OH) ₃ (d) Pb(OH) ₂	
75.	Which of the following molecules have a dative bonding $(p\pi - d\pi)$?	
	(a) P_4O_{10} (b) $(SiH_3)_3N$ (c) P_4O_6 (d) N_2O_5	
76.	Which of the following will give N ₂ when heated?	
	(a) NaN ₃ (b) NH ₄ NO ₂	
	(c) NH_4NO_3 (d) $(NH_4)_2Cr_2O_7$	
77.	Which of the following will give NO ₂ when heated?	
1	(a) LiNO ₃ (b) NaNO ₃ (c) Al(NO ₃) ₂ (d) AgNO ₃	
78.	Identify the correct statements: (a) Calcium cyanamide on treatment with steam under pressure gives NH ₃ and CaCO ₃	
	(a) Calcium cyanamide on treatment with steam and pressure gives viving and edges gives viving edg	
	(c) Ammonium nitrite on heating gives ammonia and nitrous acid	
	(d) Cane sugar reacts with conc. HNO ₃ to form oxalic acid	
70	a love the correct statement(s):	
/7.	At the added to notassium hydroxide solution, hydrogen gas is evolved	
	as as as as formed when silica reacts with hydrogen fluoride followed by hydrolysis	
	(a) Phosphine gas is formed when red phosphorus is heated with NaOH	
	(1) CALL) CO. FOSO 6H O IS CALLED ALUMS	
80.	Which of the following gases on dissolution in water make the solution acture:	
	(b) CO_2 (c) SO_3 (d) PI_3	
81.	Which of the following oxides is/are neutral?	
82.	(a) N ₂ O Which of the following statement(s) is/are incorrect about borazine (inorganic benzene)?	
	hack bond	
	d > 1, does not give addition product with Fig. like organic benzene	
	(a) Each boron and nitrogen atom is sp ² -hybridised	
	(d) Its disubstituted derivatives gives equal no. of ortho, meta and para derivatives like	2
	disubstituted organic benzene	

 $IF_5 + H_2O \longrightarrow ?$

(c) HIO

(c) NCl₅

(d) HF

(d) ICl₃

(b) HF has a highest boiling point among CH₄,NH₃ and HF
(c) Cl₂ has a lowest boiling point among Cl₂,Br₂ and I₂
(d) HClO₃ is weakest acid among HIO₃,HBrO₃ and HClO₃
91. The possible product (s) formed in the following reaction is/are:

(b) HIO

(b) NH₂

92. Which of the following species does/do not exist?

(a) HIO₃

(a) OF₄

93. Consider the following table:

Compound	Enthalpy of for (kJ mol ⁻¹)	_	Boiling point (°C)
H ₂ O	. x ₁	y_1	\boldsymbol{z}_1
H ₂ S	x_2	y_2	z ₂
H ₂ Se	x_3	У3	z_3
H ₂ Te	x_4	У4	z 4

According to given information the correct order is/are:

(a)
$$x_1 > x_2 > x_3 > x_4$$

(b)
$$y_1 > y_2 > y_3 > y_4$$

(d) $x_1 > x_4 > x_3 > x_2$

(c)
$$z_1 > z_4 > z_3 > z_2$$

(d)
$$x_1 > x_4 > x_3 > x_3$$

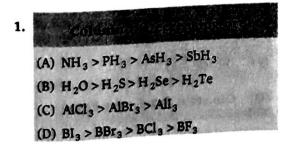
94.
$$2P \xrightarrow{-H_2O} Q \xrightarrow{-[O]} R$$

If P is parent phosphoric acid then according to given information the correct statement is/are:

- (a) Q is pyro form and R is hypo form of given present oxy acid P
- (b) Number of H-atoms present in each given oxy acid is equal to its basicity
- (c) In P, Q, R oxy acids, oxidation state of central atom remains same.
- (d) All given oxy acids have $p\pi d\pi$ bond(s) in their structure
- 95. The correct statement(s) regarding PCl₅ is/are:
 - (a) In solid phase, hybridisation of P-atom in cation is sp³
 - (b) In vapour phase, all P Cl bond lengths are equal
 - (c) In vapour and solid phase, central atom has no lone pair
 - (d) In solid phase, anion has only one type of bond angle
- 96. Correct order(s) is/are:
 - (a) Thermal stability : $H_2O > H_2S > H_2Se > H_2Te$
 - (b) Bond dissociation energy : $Cl_2 > Br_2 > F_2 > I_2$
 - (c) Melting point : $NH_3 > SbH_3 > AsH_3 > PH_3$
 - (d) X C X bond angle : $COCl_2 > COF_2$
- 97. Which of the following reaction(s) do/does not give an oxo-acid?
 - (a) Two moles of Nitric acid $\xrightarrow{-H_2O}$
- (b) One mole of Sulphurus acid $\xrightarrow{-H_2O}$
- (c) Two moles of Chloric acid $\xrightarrow{-H_2O}$
- (d) Two moles of Sulphuric acid $\xrightarrow{-H_2O}$

MATCH THE COLUMN

Entries of Column-I are to be matched with entries of Column-II. Each entry of Column-I may have the matching with one or more than one entries of Column-II.



	Column-II (Property)
(P)	Melting point
(Q)	Lewis acid character
(R)	Thermal stability
(S)	Lewis basic character .

2.

Column-I

- (A) Does not neutralise dil. HNO₃
- (B) Reaction with HF acid
- (C) Solid at room temperature
- (D) May acts as reducing agent

3.

Column-I (Hydrolysed Products)

- (A) H₂ gas is evolved
- (B) Proton donor oxyacid is formed
- (C) Halogen acid is formed
- (D) Back bonding is present in formed oxyacid

4.

Column-I

- (A) POCl₃
- (B) SOF₂
- (C) XeOF₄
- (D) H₂S₂O₈

5.

Column-I (Complete hydrolysis)

t then one charge of Column B.

- (A) $HNCl_3 \xrightarrow{H_2O}$
- (B) NO₂ $\xrightarrow{\text{H}_2\text{O}}$

west lo vetada Column-II

- (P) SiO₂
- (Q) PbO₂
- (R) CO
- (S) SnO
- (T) NO

Column-II(Compounds that undergo hydrolysis)

- (P) CaH₂
- (Q) POCl₃
- (R) NCl₃
- (S) B_2H_6
- (T) R₂SiCl₂

Column-II

- (P) Oxyacid formed during hydrolysis undergoes Tautomeric change
- (Q) Oxidation state of central atom does not change during hydrolysis
- (R) Complete as well as partial hydrolysis is possible
- (S) Hydrolysed product reacts with glass
- (T) Hybridization of central atom in the final product remains same as in the substrate on hydrolysis

Column-II (Characteristics of any hydrolysed product/hydrolysis)

- (P) Dibasic acid
- (Q) Can act as flexidentate ligand

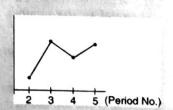
- (C) $H_2S_2O_8 \xrightarrow{H_2O}$
- (D) SF₄ -H₂O

- (R) Can act as both oxidising and reducing agent
- (S) Can act as monodentate ligand
- (T) Non-redox hydrolysis
- 6. Column-I
 - (A) Disproportionation in alkaline medium/heating
 - (B) Oxidizing agent
 - (C) Reacts with water/hydrolysis
 - (D) Basic gas evolves on heating

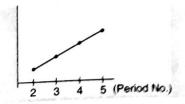
- Column-II
- (P) Cl₂
- (Q) NO₂
- (R) XeF₆
- (S) NaH₂PO₃
- (T) $(NH_4)_2S$
- 7. Match the Column-I with the graph of Column-II which is most close to the answer.
 - Column-I

Column-II

- (A) Bond energies of the hydra acids of the halogens fluorine, chlorine, bromine, iodine
- (P) 2 3 4 5 (Period No.)
- (B) Boiling points of the hydrides of the 16 group elements oxygen, sulphur, selenium, tellurium
- (Q) 2 3 4 5 (Period No.)
- (C) The stability of monochlorides of group 13 elements boron, aluminium, gallium, indium
- (R)



(D) Melting points of the dioxides of the group 14 elements carbon, silicon, germanium, tin



8. Column-I contains four statements following reason and Column-II consists of four options P. Q, R, S.

Answer the following:

- $P \rightarrow If$ both statement and reason are true and reason is correct explanation of statement.
- $Q \rightarrow$ If both statement and reason are true and reason is not correct explanation of statement.
- $R \rightarrow If$ statement is correct and reason is incorrect.
- $S \rightarrow If$ both statement and reason are incorrect.

	Column-I	75		Column-II
(A)	Statements	:	PbI ₄ is a stable compound	P
	Reason	:	Iodide stabilizes higher oxidation state.	
(B)	Statements	:	White phosphorus is more reactive than red phosphorus.	Q
	Reason	:	Red phosphorus consists of P ₄ tetrahedral units linked to one another to form linear chains.	
(C)	Statement	:	Caro's acid has sulphur atom in sp^3 hybridized state.	R
	Reason	:	Caro's acid contains one peroxy O_2^{2-} linkage.	
(D)	Statement	:	Bleaching action of chlorine is permanent while that of SO ₂ is temporary.	s
	Reason	:	Chlorine bleaches by reduction and SO ₂ by oxidation.	\$0 2

9.		Column-I		Column-II
	(A)	Negative charge on the anion is equal to the number of terminal oxygen atoms	(P)	Si ₄ O ₁₃ ¹⁰⁻
	(B)	Three shared corners and ten unshared corners	(Q)	SiO 4
	(C)	Silicon atom(s) is/are present at the center of geometry and every oxygen atom is present at each corner of the geometry	(R)	Si ₄ O ₁₂ ⁸⁻
	(D)	Non-planar geometry	(S)	Si ₂ O ₇ ⁶⁻

(P) F₂

(Q) Cl₂

(A) Moissan method
(B) Ostwald process
(C) Deacon process

(D) Baeyer process

Column-I
(Oxy acid)

(A) HOCl
(B) HNO₃
(C) H₃PO₄
(D) HClO₄

14. Column-I

(A) Maximum solubility in water

Corrosive liquid

(B)

(S) NH₄NO₃ Column-II Purification of bauxite (P) (Q) Manufacture of Cl₂ Manufacture of HNO₃ (R) (S) Isolation of F2 Column-II (Acid anhydride) (P) N₂O₅ (Q) Cl₂O₇ (R) Cl₂O NO_2 (S) (T) P₄O₁₀ Column-II

- (C) Maximum interatomic distance
- (D) Maximum enthalpy of dissociation
- (R) Br₂
- (S) I_2
- 15. Column-I
 - (A) Borax $\xrightarrow{\Delta}$
 - (B) $B_2H_6 + H_2O \longrightarrow$
 - (C) $B_2H_6 + NH_3(excess) \xrightarrow{\Delta}$
 - (D) $BCl_3 + LiAlH_4 \longrightarrow$

- Column-II
- (P) BN
- (Q) B_2H_6
- (R) H_3BO_3
- (S) $NaBO_2 + B_2O_3$
- 16. Column-I (Catalyst involved in process)
 - (A) Platinum
 - (B) V_2O_5
 - (C) Iron
 - (D) Cobalt chloride

- Column-II (Process)
- (P) Decomposition of bleaching powder
- (Q) Manufacturing of HNO₃
- (R) Manufacturing of H₂SO₄
- (S) Manufacturing of NH₃
- (T) Hydrogenation
- 17. Column-I
 - (A) Hypo phosphoric acid
 - (B) Pyro phosphoric acid
 - (C) Boric acid
 - (D) Hypo phosphorus acid

Column-II

Column-II

- (P) All hydrogen are ionizable in water
- (Q) Lewis acid
- (R) Monobasic in water
- (S) sp³ hybridized central atom
- 18. Column-i
 - (A) CO₂
 - (B) SO_2
 - (C) NO₂
 - (D) N₂O

- (P) Acidic oxide
- (Q) Colourless
- (R) Paramagnetic
- (S) Coloured

p-Block Element

19.		Column-I		Column-II AL
	(A)	Na ₂ B ₄ O ₇ ·10H ₂ O	(P)	Basic solution
	(B)	Na ₂ CO ₃	(Q)	Acidic solution
	(C)	$K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$	(R)	can react with NaOH
	(D)	NH ₄ Cl	(S)	Swells up on heating
20.		Column-I		Column-II
	(A)	SiO ₂	(P)	React with HF
	(B)	CN-	(Q)	Pseudo halide
	(C)	L.	(R)	Gives compound with Cu2+ via redox Rxn
	(D)	SnO ₂	(S)	Can dissolves in alkali
21.	1000 B	Column-I		Column-II
	(A)	Sheet silicate	(P)	$(SiO_3)_n^{2n-}$
	(B)	Pyroxene chain	(Q)	$(Si_4O_{11})_n^{6n-}$
	(C)	Pyro silicate	(R)	3-corner oxygen atom are shared
	(D)	Amphibole chain	(S)	Non-planar
22 .		Column-I		Column-II
	(A)	Br ₂	(P)	Liquid at room temperature
	(B)	02	(Q)	Used in estimation of CO
	(C)	ClO ₂	(R)	Paramagnetic
	(D)	I_2O_5	(S)	Powerful bleaching agent
23.	6	Column-I	ous d	Column-II
	(A)	$NH_3 > PH_3 > AsH_3 > SbH_3$	(P)	Reducing property
	(A)	KF > KCl > KBr > KI	(Q)	Heat of fusion (M.P.)
		$H_2O > H_2S > H_2Se > H_2Te$	(R)	Thermal stability
	(D)	$CH_4 < SiH_4 < GeH_4 < SnH_4$	(S)	Lewis basic character

344 INORGANIC CHEMISTRY

24. Column-I (Catalyst involved in process)

- (A) SF₄
- (B) AsH₃
- (C) ClO₄
- (D) SbCl₄

Column-II (Process)

- (P) Can act as Lewis acid as well as Lewis base
- (Q) Central atom belongs to 16th or 17th group
- (R) Non-axial set of *d*-orbitals do not use in bonding
- (S) Only one type bond angle
- (T) Oxidation state of central atom is +4 or greater than +4



ASSERTION-REASON TYPE QUESTIONS

Questions given below consists of two statements each printed as Assertion (A) and Reason (R); while answering these questions you are required to choose any one of the following four responses:

- (A) If both (A) and (R) are true and (R) is the correct explanation of (A)
- (B) If both (A) and (R) are true but (R) is not correct explanation of (A)
- (C) If (A) is true but (R) is false
- (D) If (A) is false but (R) is true
- 1. Assertion: Al(OH)₃ is amphoteric in nature.
 - **Reason**: Al(OH)₃ is H⁺ donar acid as well as OH⁻ donar base.
- 2. Assertion: BF3 is weaker lewis acid than BCl3.
 - **Reason**: BF₃ is less electron deficient than BCl₃.
- 3. Assertion: Compound having X—O—H linkage (X=non-metal) always acts as Arrhenius
 - acid.
 - **Reason**: Bond polarity of O—H bond is higher than that of X—O bond.
- 4. Assertion: When two gaseous OF molecules are allowed to cool, then they undergo
 - dimerisation through O-atom.
 - Reason: Dimer form of OF molecule (i.e., O2F2) is having one peroxy linkage in its
 - structure.
- 5. Assertion: Bond dissociation energy of N—F bond in NF₃ molecule is lower than that of
 - in NCl₃ molecule.
- Reason : Inter electronic repulsion exists between small size N and F atoms in N-F
 - bond of NF₃ molecule.
- 6. Assertion: KAIF4 salt can not be formed by combining AIF3 with KF.
 - **Reason**: AlF₃being predominantly ionic compound never acts as Lewis acid.
- 7. Assertion: NaBO₃/OH⁻ can be used for oxidation of Cr³⁺ to Cr⁶⁺
 - Reason: In alkaline medium NaBO₃ produces H₂O₂

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p-Blo	p-Block Element 345						
8.	Assertion Reason	: :	Aluminium and zinc metal evolve $\rm H_2$ gas from NaOH solution. Several non-metals such as P, S, Cl, etc. yield a hydride instead of $\rm H_2$ gas from NaOH.				
9.	Assertion :		There is a very little difference in acidic strengths of H_3PO_4 , H_3PO_3 and H_3PO_2 .				
	Reason	:	Number of unprotonated oxygen (= O) responsible for increase of acidic strength due to inductive effect remains the same.				
10.	Assertion	:	PCl ₅ and PbCl ₄ are thermally unstable.				
	Reason	:	They produce same gas on thermal decomposition.				
11.	Assertion	:	Conc. H ₂ SO ₄ cannot be used to prepare pure HBr from NaBr.				
	Reason	:	It reacts slowly with NaBr.				
12.	Assertion	:	Oxygen is more electronegative than sulphur, yet H ₂ S is acidic, while H ₂ O is neutral.				
	Reason	:	H—S bond is weaker than O—H bond.				
13.	Assertion	:	Liquid IF ₅ conducts electricity.				
	Reason	:	Liquid IF ₅ conducts as, $2IF_5 \rightleftharpoons IF_4^+ + IF_6^-$.				
14.	Assertion	:	Red phosphorus is less volatile then white phosphorus.				
	Reason	:	Red phosphorus has a discrete tetrahedral structure.				
15.	Assertion	:	Al(OH) ₃ is amphoteric in nature.				
	Reason	:	It cannot be used as an antacid.				
16.	Assertion	:	Chlorine gas disproportionates in hot and conc. NaOH solution.				
	Reason	•	NaCl and NaOCl are formed in the above reaction.				
17.	Assertion	:	Silicones are very inert polymers.				
-,.	Reason	:	Both Si-O and Si-C bond energies are very high.				
18	Assertion	:	AgI does not dissolve in NH ₃ .				
10.	Reason	:	Due to ionic character of AgI.				
10	Assertion		Anhydrous AlCl ₃ is covalent while hydrated AlCl ₃ is ionic.				
17.	Reason	:	In water AlCl ₃ is present as Al $_{(aq.)}^{3+}$ and Cl $_{(aq.)}^{-}$ ion.				
20.	Assertion		Boron reacts with HNO ₃ .				
	Reason	:	Boron reacts with all acids.				
21.	Assertion	:	H ₂ SO ₄ is a weaker acid than HClO ₄ .				
	Reason	:	SO_4^{2-} is more stable than ClO_4^- in solution.				
22.	Assertion	:	HF forms two series of salts but HCl does not.				
	Reason	:	F atom is more electronegative than Cl atom.				
			N. T. Marketter and the second				

23. Assertion: PCl₃ on hydrolysis gives OH—P—OH and not OH—P—OH as major
| H OH

product.

346 INORGANIC CHEMISTRY

Reason:
$$H_3PO_3$$
 exists in two tautomeric forms: $OH - P - OH \Rightarrow HO - P - OH$
OH

24. Assertion: BiI₃ with triiodide (I_3^-) ion never exists.

Reason : Intramolecular redox reaction takes place between bismuth cation and tri-

iodide ion.

25. Assertion: SnO is more reactive towards acid than SnO₂.

Reason: Both SnO and SnO₂ are amphoteric oxides.

Reason : Both SnO and SnO₂ are amphoteric oxides.
 26. Assertion : Bond dissociation energy of F₂ molecule is less than that of Cl₂ molecule.

Reason: Due to inter-electronic repulsion between F atom, F — F bond length in F₂

molecule is higher than Cl—Cl bond length in Cl₂ molecule.

27. Assertion: In H₃PO₃, basicity of the oxy acid is two.

Reason: One H-atom is non-ionizable in more stable tautomeric form of H₃PO₃.

SUBJECTIVE PROBLEMS

1. In phosphorus acid, if *X* is number of non-bonding electron pairs. *Y* is number of σ -bonds and *Z* is number of π -bonds. Then calculate value of " $Y \times Z - X$ ".

2. Consider the following oxyanions:

$$PO_4^{3-}$$
, $P_2O_6^{4-}$, SO_4^{2-} , MnO_4^- , CrO_4^{2-} , $S_2O_5^{2-}$, $S_2O_7^{2-}$

and find the value of R + Q - P

Where P = Number of oxy anions having three equivalent X—O bonds per central atom

Q = Number of oxy anions having two equivalent X—O bonds per central atom

R = Number of oxy anions having four equivalent X—O bonds per central atom

3. For oxyacid HClO_x, if x = y = z (x, y and z are natural numbers), then calculate the value of |x+y+z|. Where x = Number of 'O' atoms

y = Total number of lone pairs at central atom

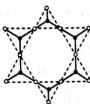
 $z = \text{Total number of pi}(\pi)$ electrons in the oxyacid.

4. Consider the following representation of oxy-acid, $H_{n_1}S_2O_{n_2}$, (where S is central sulphur atom and n_1 and n_2 are natural numbers). If there are two possible oxy-acid of sulphur A and B contains ratio of n_2 : n_1 are 2 and 4 respectively, then sum of oxidation state of 'S' atom in both oxy-acid will be:

5. Total number of molecules which hydrolysed at room temperature and hybridization of central atom is sp^3d in transition state:

 CCl_4 , $SiCl_4$, NCl_3 , PCl_3 , $AsCl_3$, SF_6 , P_4O_6 , P_4O_{10} , SeF_6

- 6. The difference between total number of lone pairs and total number of σ-bonds in $[B_3O_3(OH)_6]^{3-}$ molecular ion is :
- 7. Calculate value of |x + y z| for the following silicate $[Si_xO_{y+z}]^{z-}$ anion.



- **8.** The general formula of polythionate ion is $S_{n+2}O_6^{2-}$. if average oxidation state of 'S' atom in any polythionate ion is equal to bond order of 'S—O' bond. Then calculate the value of 'n' for the corresponding polythionate ion.
- 9. Total number of Boron atoms in anionic part of borax which participate in back bonding.
- 10. Choose total number of correct reactions.
 - (i) When CuSO₄ solution reacts with NH₃, complex is formed.
 - (ii) When CuSO₄ solution react with PH₃, complex is formed.

(iii)
$$C_{12}H_{22}O_{11} \xrightarrow{conc.H_2SO_4} 2C + 11H_2O$$

(iv)
$$NH_3 + Cl_2 \xrightarrow{\Delta} NH_4Cl + N_2$$

(excess)

(v)
$$NH_3 + Cl_2 \xrightarrow{\Delta} NCl_3 + HCl$$

(vi) HNO₃ +
$$P_4O_{10} \xrightarrow{\Delta} HPO_3 + N_2O_5$$

(vii)
$$S + H_2SO_4 \xrightarrow{\Delta} SO_2 + H_2O$$

(viii)
$$SbF_5 + XeF_4 \rightarrow [SbF_4][XeF_5]$$

(ix)
$$XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2$$

- 11. Consider the following orders:
 - (1) $H_2SO_4 > H_2SO_3$: Boiling point
 - (2) H₂O > HF: Extent of H-bond
 - (3) $H_2O < H_2O_2$: Strength of H-bond
 - (4) HF > HCl > HBr : Melting point
 - (5) para-dichlorobenzene > ortho-dichlorobenzene : Boiling point
 - (6) Ethylene glycol > Phenol : Viscosity
 - (7) 1, 3-Dichlorobenzene > 1, 3, 5-Trichlorobenzene : Strength of molecular force
 - (8) ortho-Hydroxy benzoic acid > para-Hydroxy benzoic acid : Solubility in water.

Then calculate value of $|x^2|$ (where 'x' is total number of correct orders.)

12. How many monovalent oxygen atoms are present in the mineral kinoite $(Ca_2 Cu_2 Si_3O_{10} \cdot 2H_2O)$?

13. How many moles of given compound are decomposed in the following decomposition in the following decomposition reaction?

- 14. How many moles of NaOH are required to react with one mole of solid N2O5?
- 15. How many moles of hypophosphorous acid are involved in its thermal decomposition reaction when one mole of each product is formed.
- **16.** Consider the structure of Al₂Me₆ compound and find the value of $\frac{x-y}{x}$.
 - Where x = Maximum number of atoms that can lie in plane having terminal (Al Me) bonds.
 - $y = \text{Total number of } 3c 2e^- \text{ bonds.}$
 - $z = \text{Total number of atoms that are } sp^3 \text{ hybridized.}$
- 17. Sum of oxidation state of nitrogen atom in hyponitrous acid, nitric acid and nitrous acid.
- **18.** Find the value of x in the tremolite asbestos :

$$Ca_{2}Mg_{x}(Si_{4}O_{11})_{2}(OH)_{2}$$

- 19. Consider the following silicates
 - (a) BaTi(Si₃O₉)

(b) ZnCa₂Si₂O₇

Then calculate $X \div Y$, where X and Y are total number of monovalent and divalent oxygen atoms in both silicates respectively.

20. Atomicity of white or yellow phosphorus is 4 and it is represented as P4 molecule

Calculate the value of expression $\frac{x \cdot y}{z}$ regarding this molecule.

Where x: Total number of vertex angles in P_4 molecule y: Total number of lone pairs in P_4 molecule

z: Total number of P – P bonds in P₄ molecule

21. Marshall's acid $\xrightarrow{\text{H}_2\text{O}} A + B$

$$A \xrightarrow{H_2O} B + C$$

If P and Q represent maximum number of atoms that can lie in a plane of compound A and Crespectively. Then, find out value of (P - Q).

- 22. Consider following four compounds
- (ii) $C_x O_{y+1}$
- (iii) $C_{x+2}O_{y+1}$ and
- (iv) $C_{x+11}O_{y+8}$,

If "x = y = 1", then calculate the value of |p - q|, where p and q are total number of sp^2 and hybridized carbon atoms respectively in given four compounds.

- **23.** If following molecules undergo dimerization then find the value of $\frac{YZ}{Y}$:
 - (i) ClO₃
- (ii) OF
- (iii) GaH 3
- (iv) AlCl₃

- (v) ICl₃
- (vi) BeH,
- (vii) NO₂

Where : X = Number of molecules which are hypervalent in dimeric form.

Y = Number of molecules which complete octet in dimer form

- Z = Number of molecules which are hypovalent in dimeric form
- **24.** Consider $Al_2(OH)_6$ compound and calculate the value of (X + Y) + ZWhere X = Total number of $(2c - 2e^{-})$ bond.

 $Y = \text{Total number of } (3c - 2e^{-}) \text{ bond}$

 $Z = \text{Total number of } (3c - 4e^{-}) \text{ bond}$

25. Consider the following covalent compounds in their solid state and find the value of expression (X + Y + Z).

 N_2O_5 , Cl_2O_6 , PCl_5 , I_2Cl_6 , XeF_6 , PBr_5

Where $X = \text{Total number of compounds in which central atom of cationic or anionic part is } sp^3$ hybridized

 $Y = \text{Total number of compounds having } 90^{\circ} \text{ bond angle either in cationic or anionic part.}$

Z = Total number of compounds having 109°28' bond angle either in cationic or anionic part.

26. Consider following compounds A to E.

(A) XeF_n

(B) $XeF_{(n+1)}^+$

(C) $XeF_{(n+1)}^{-}$

(D) $XeF_{(n+2)}$

(E) $XeF_{(n+4)}^{2-}$,

If value of n is 4, then calculate value of "p + q" here, 'p' is total number of bond pair and 'q' is total number of lone pair on central atoms of compounds A to E.

27. When B₂H₆ is allowed to react with following lewis bases, then how many given lewis bases form adduct through symmetrical cleavage of B2H6?

 $\mathrm{NH}_{3},\,\mathrm{MeNH}_{2},\,\mathrm{Pyridine},\,\mathrm{CO},\,\mathrm{T.H.E},\,\mathrm{PH}_{3},\,\mathrm{PF}_{3},\mathrm{Me}_{3}\mathrm{N},\,\mathrm{Me}_{2}\mathrm{NH}$

28. What is covalency of chlorine atom in second excited state?

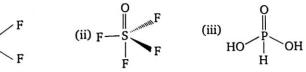
29. Consider the following molecule: 0

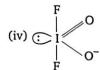
Calculate value of $p \div q$, here p and q are total number of $d\pi - p\pi$ bonds and total number of sp^3 -hybridised atoms respectively in given molecule.

30. Consider the following structures and calculate value of $(P^2 - Q^2)$

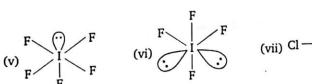
Where P = Total number of correct structure representation.

Q =Total number of incorrect structure representation.





$$(v) \bigvee_{F}^{F} \bigvee_{F}^{F}$$



- **31.** Calculate the value of "x + y z" here, x, y and z are total number of non-bonded electron pair(s), pie(π) bond(s) and sigma bonds in hydrogen phosphite ion respectively.
- 32. Consider the following species:

(i) CH₃⁺

(ii) $(C_3H_5)_3Al$

(iii) HCHO

(iv) CH₄

 $(v) (C_2H_5)_3N$

(vi) TiCl4

(vii) CO₂

(viii) SiCl₄

(ix) BF₃

The find out total number of species which can act as Lewis acid.

33. Consider the following species CF_4 , GeH_4 , BCl_3 , $AlBr_3$, H_2O , PH_3 , PCl_5 , CO_2 , CH_4 and calculate value of $(x-y)^2$:

Where, x: Total number of species which can act as only Lewis acid.

y: Total number of species which can act as Lewis acid as well as Lewis base.

- **34.** If X, Y and Z are total number of π -bond(s) in $H_2S_2O_6$, H_2SO_3 and $H_2S_2O_7$ respectively then calculate value of expression |X + Y Z|.
- **35.** Calculate value of " $x \div y$ " for "hypophosphoric acid", where x is total number of lone pair(s) and y is total number π -bond(s) in given oxo-acids.
- 36. Atomicity of white or yellow phosphorus is 4 and it is represented as P_4 molecule.

Calculate the value of expression $\frac{X \cdot Y}{Z}$ regarding this molecule.

Where

- X: Total number of vertex angles in P_4 molecule
- Y: Total number of lone pairs in P_4 molecule
- Z: Total number of P—P bonds in P₄ molecule

ANSWERS

THE REPORT OF THE PARTY OF

Level

1.	(c)	2.	(b)	3.	(b)	4.	(b)	5.	(b)	6.	(b)	7.	(d)	8.	(c)	9.	(d)	10.	(d)
11.	(c)	12.	(a)	13.	(b)	14.	(b)	15.	(b)	16.	(b)	17.	(c)	18.	(b)	19.	(d)	20.	(c)
21.	(c)	22.	(b)	23.	(b)	24,	(c)	25.	(b)	26.	(c)	27.	(a)	28.	(b)	29.	(b)	30.	(d)
31.	(c)	32.	(b)	33,	(d)	34.	(b)	35.	(d)	36.	(b)	37.	(a)	38.	(a)	39.	(a)	40.	(b)
41.	(b)	42,	(b)	43.	(d)	44.	(c)	45.	(d)	46.	(b)	47.	(b)	48.	(c)	49.	(a)	50.	(b,c)
51.	(c)	52.	(d)	53,	(b)	54.	(b)	55.	(c)	56.	(a)	57.	(b)	58.	(d)	59.	(b)	60.	(d)
61.	(c)	62.	(b)	83.	(c)	.64.	(c)	65.	(c)	66.	(d)	67.	(c)	68.	(c)	69.	(c)	70.	(a)
71.	(d)	72.	(d)	11.0		184		MAL.	10	1000	d.1.3		o.d.		A. (0,02	5 1	20 4	.F

Level 2

t.	(d)	2.	(d)	3.	(b)	4.	(b)	5.	(a)	6.	(a)	7.	(a,c)	8,	(c)	9.	(d)	10.	(c)
11.	(d)	12.	(b)	13.	(a)	14.	(c)	15.	(b)	16.	(d)	17.	(a)	18.	(b)	19.	(d)	20.	(d)
21.	(b)	22.	(c)	23.	(b)	24.	(a)	25.	(d)	26.	(c)	27.	(d)	28.	(a)	29.	(a)	30.	(d)
31.	(d)	32.	(c)	33.	(b)	34.	(b)	35.	(c)	36.	(b)	37.	(d)	38.	(a)	39.	(c)	40.	(b)
124.	(d)	42	(d)	43.	(c)	44.	(b)	45.	(a)	46.	(a)	47.	(a)	48.	(c)	49.	(a)	50.	(d)
191,	(b)	52.	(c)	53.	(c)	54.	(c)	55.	(c)	56.	(a)	57.	(a)	58.	(d)	59.	(c)	60.	(b)
61.	(d)	82.	(d)	63.	(b)	64.	(a)	65.	(d)	66.	(d)	67.	(d)	68.	(c)	69.	(c)	70.	(b)
71.	(c)	72.	(c)	73.	(a)	74.	(b)	75.	(d)	76.	(d)	77.	(a)	78.	(c)	79.	(c)	80.	(c)
81.	(c)	82.	(b)	83,	(b)	84.	(d)	85.	(b)	86,	(a)	87.	(b)	88.	(b)	89.	(b)	90.	(b)
21.	(c)	92.	(c)	93.	(d)	24	(b)	95.	(a,b)	96.	(d)	97.	(c)						

Level 3

Passage-1		(b)	2.	(a)	3.	(c)	90.5	NEWS
Passage-2	1.	(d)	2.	(b)	3.	(a)		
Passage-3	1.	(c)	2.	(d)	3.	(a)		
Passage-4	1.	(c)	2.	(b)	3.	(a)	4.	(b)
Passage-5	1.	(a)	2.	(d)			3	
Passage-6	1.	(a)	2.	(b)	3.	(b)		4
Passage-7	1.	(b)	2.	(c)	3.	(a)		- 智力

One Or More Answers is/are correct

1.	(a,b,c)	2.	(a,d)	3.	(a,b,c)	4.	(a,b,c,d)	5.	(b,c)	6.	(b,c)	7.	(b,c,d)	8.	(a,b,c,d)
9.	(a,b)	10.	(b,c,d)	11.	(a,b,c)	12.	(a,c,d)	13.	(a,b,d)	14.	(a,b,c)	15.	(b,c,d)	16.	(a,b,c,d)
17.	(a,c)	18.	(a,c,d)	19.	(b,d)	20.	(a,c)	21.	(a,d)	22.	(a,b,c)	23.	(a,b,d)	24.	(a,d)
25.	(a,b,c)	26.	(c, d)	27.	(a,b,c,d)	28.	(b,c)	29.	(c,d)	30.	(c,d)	31.	(a,b)	32.	(c,d)
33.	(b,d)	34.	(a,d)	35.	(a,c,d)	36.	(b,d)	37.	(b,c,d)	38.	(a,b,d)	39.	(b,c)	40.	(a,b)
41.	(a,c)	42.	(a,c,d)	43.	(a,b,d)	44.	(b)	45.	(a,b)	46.	(a,b,d)	47.	(a,d)	48.	(a,c)
49 .	(c,d)	50.	(a,c,d)	51.	(a,b,c)	52.	(a,b)	53.	(a,b,c)	54.	(a,b,c)	55.	(b,c,d)	56.	(c,d)
57.	(a,b,d)	58.	(c,d)	59.	(a,d)	60.	(b,d)	61.	(b,d)	62.	(a,b,d)	63.	(a,d)	64.	(a,d)
					(b,c,d)						(b,c)	71.	(b,d)	72.	(a,c,d)
											(a,b,d)			80.	
81.	(a,b,d)	82.	(a,b,d)	83.	(a,c,d)	84.	(a,b,c,d)	85.	(b,c)	86.	(a,b,c,d)	87.	(a,d)	88.	(a,c,d)
89.	(a,b)	90.	(a,d)	91.	(a,d)	92.	(a,c,d)	93.	(a,b,c)	94.	(a,b,d)	95.			(a,b,c,d)
97.	(a,b,c)												,	-0.	(4,5,6,4)

Match the Column

1. A→ R, S; 2. A→ P, Q, R, T; 3. A→ P, S; 4. A→ Q, T; 5. A→ R, S, T; 6. A→ P, Q, S;	$B \rightarrow R, S;$ $B \rightarrow P, S;$ $B \rightarrow Q, R;$ $B \rightarrow P, Q, S, T;$ $B \rightarrow Q, R, S;$ $B \rightarrow P, Q, R;$	$C \rightarrow P, Q, R;$ $C \rightarrow P, Q, S;$ $C \rightarrow Q, T;$ $C \rightarrow Q, R, S;$ $C \rightarrow P, Q, R, S, T;$ $C \rightarrow P, Q, R, S, T;$	$\begin{array}{c} D \rightarrow P, \ Q \\ D \rightarrow R, \ S, \ T \\ D \rightarrow R, \ S \\ D \rightarrow Q, \ R, \ T \\ D \rightarrow P, Q, R, S, T \\ D \rightarrow S, T \end{array}$
7. A→ Q; 8. A→ S;	$B \rightarrow P$;	C→ S;	$D \rightarrow R$
9. $A \rightarrow P$, Q, R, S;	$B \rightarrow P$; $B \rightarrow P$;	$C \rightarrow Q$; $C \rightarrow P$, Q, R, S;	$D \rightarrow R$ $D \rightarrow P$, Q, R, S
10. $A \rightarrow R$;	$B \rightarrow S$;	C → Q;	$D \rightarrow P$
11. A→ Q;	$B \rightarrow R$;	C→ S;	$D \rightarrow P$
12. $A \rightarrow S$;	$B \rightarrow R$;	$C \rightarrow Q$;	$D \rightarrow P$
13. $A \rightarrow R$;	$B \rightarrow P$;	C→ T;	$D \rightarrow Q$
14. $A \rightarrow P$;	$B \rightarrow R$;	C→ P;	$D \rightarrow Q$
15. $A \rightarrow S$;	$B \rightarrow R$;	$C \rightarrow P$;	$D \rightarrow Q$
16. $A \rightarrow Q$, T;	$B \rightarrow R$;	C→ S;	$D \rightarrow P$
17. $A \rightarrow P$, Q, S;	$B \rightarrow P, Q, S;$	$C \rightarrow Q, R;$	$D \rightarrow Q, R, S$
18. $A \rightarrow P$, Q;	$B \rightarrow P, Q;$	$C \rightarrow P, R, S;$	$D \rightarrow Q$
19. $A \rightarrow P$, S;	$B \rightarrow P$;	$C \rightarrow Q, R, S;$	$D \rightarrow Q, R$
20. $A \rightarrow P$, S;	$B \rightarrow P, Q, R;$	$C \rightarrow R$;	$D \rightarrow S$
21. $A \rightarrow R$, S;	$B \rightarrow P, S;$	C→ S;	$D \rightarrow Q, R, S$
22. $A \rightarrow P$;	$B \rightarrow R;$	$C \rightarrow R, S;$	$D \rightarrow Q$
23. $A \rightarrow R$, S;	$B \rightarrow Q, R, S;$ $B \rightarrow P, R, S;$	$C \rightarrow R, S;$ $C \rightarrow Q, S, T;$	$D \rightarrow P, Q$ $D \rightarrow P, R$
24. $A \rightarrow P$, Q, R, T;	D-7 1, 10, 0,	o , 2, 0, 1,	2 , 1, 10

Assertion-Reason Type Questions

- 1. (C) 2. (A) 3. (D) 4. (C) 5. (D) 6. (D) 7. (A) 8. (B) 9. (A) 10. (B)
- 11. (C) 12. (A) 13. (A) 14. (C) 15. (C) 16. (C) 17. (A) 18. (C) 19. (B) 20. (C)
- 21. (C) 22. (A) 23. (A) 24. (C) 25. (B) 26. (C) 27. (A)

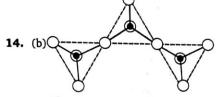
Subjective Problems

1.	0	2.	3	3.	6	4.	9	5.	5	6.	0	7.	0
-									08				
		9.							3				
		16.							4				
22. 29.		23. 30.							16				
36.	8												

Hints and Solutions

Level 1

1. (c) AlCl₃·6H₂O $[AlCl_2(H_2O)_4]^+ + [AlCl_4(H_2O)_2]^-$



Formula: Si₃O₁₀

- **43.** (d) $\stackrel{+3}{N} O_2^- \xrightarrow{\text{Oxidation}} \stackrel{+5}{N} O_3^-$
- 44. (c) PH₃ stable species.

46. (b) Order of M.P. or B.P. or critical temperature : $H_2O > H_2Te > H_2Se > H_2Se$

(Sulphuric acid) (Peroxomono-sulphuric acid)

52. (d) H₂O₂ is thermally unstable and it decomposes easily.

$$H_2O_2(l) \longrightarrow H_2O(l) + \frac{1}{2}O_2(g)$$

Its decomposition is catalysed by alkali metals present in traces in the glass of the vessel.

- 54. (b) $HClO_4 > HBrO_4 > HIO_4 \Rightarrow$ acidic strength has been decided on the basis of electronegativity or charge density on central atom.
- **55.** (c) $I_2 + 10HNO_3 \longrightarrow 2HIO_3 + 10NO_2 + 4H_2O$
- 56. (a) Decreasing order of thermal stability of oxy acids of chlorine. HOClO3; HOClO2; HOClO; HOCl In HOClO₃, chlorine is in +7 oxidation state.
- 57. (b) $5CO + I_2O_5 \longrightarrow 5CO_2 + I_2$ $I_2 + 2Na_2S_2O_3 \longrightarrow 2NaI + Na_2S_4O_6$
- **60.** (d)
 - (a) Bond dissociation energy of F₂ is less than that of Cl₂
 - (b) Cl has higher E.A. than fluorine.
 - (c) HF is weaker acid than HCl, due to higher bond energy
- 61. (c) Due to larger size of iodine atom it can accommodate upto seven small fluorine atoms around, it while due to smaller sizes of chlorine and bromine atoms do not accommodate seven fluorine atoms, i. e., steric factor dominate in case of chlorine and bromine.
- **70.** (a) S_8 : Molecular solid, in solid sulphur various S_8 molecules are bonded to one another by weak molecular

$$\mathbf{S}_{5}^{2-}: \overset{\cdot}{\mathbb{S}} \overset{\cdot}{\mathbb{S}} \overset{\cdot}{\mathbb{S}} \overset{\cdot}{\mathbb{S}} \overset{\cdot}{\mathbb{S}} \overset{\cdot}{\mathbb{S}} \overset{\cdot}{\mathbb{S}} \longrightarrow Zig-Zag$$

SiO₂: represents to 3D silicate, that has covalent lattice as one silicon atom is bonded to four oxygen atoms, and each oxygen in turn is bonded to two silicon.

72. (d) Bond dissociation energy $\propto \frac{1}{\text{Bond length}}$

Order of bond length: P - O > S - O > Cl - O Order of BDE: Cl - O > S - O > P - O

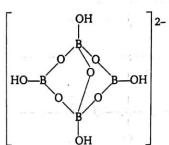
Level 2 and assume of it is seening above origins. Ob a nital 1

- (d) Lewis acidic strength: BF₃ < BCl₃ < BBr₃ < BI₃
 As BI₃ is strongest lewis acid among all boron halides therefore, heat of adduct formation will be maximum numerically, for BI₃.
- 9. (d) $B_2O_3 \xrightarrow{Al} B(crystalline)$ $B_2O_3 \xrightarrow{Mg} B (Amorphous)$
- 10. (c) Al(OH)₃ dissolves in NaOH solution to give Al(OH)₄ ion which is supposed to have the octahedral complex species [Al(OH)₄(H₂O)₂]⁻ in aqueous solution.
 Al(OH)₃ + NaOH(aq) → [Al(OH)₄(H₂O)₂]⁻(aq) + Na + (aq)
- 11. (d) Borazone : A crystalline form of boron nitride which has diamond like structure.

(Non-planar) Borazole : Inorganic benzene : $B_3N_3H_6$ (planar)

non planar

12. (b) In borax (Na₂B₄O₇·10H₂O), among 10 water molecules 2 molecules are part of structure, i.e., exists Na₂[B₄O₅(OH)₄]-8H₂O



 $Na_{2}[B_{4}O_{5}(OH)_{4}]\cdot 8H_{2}O + 2HC1 \longrightarrow 2NaCl + 4H_{3}BO_{3} + 5H_{2}O$

Methyl orange (pH = 3.7) is used to detect end point. Aq. solution of borax acts as buffer, as borax is salt of strong base NaOH and weak acid H₃BO₃.

- 13. (a) H_3BO_3 acts are weak monobasic Lewis acid.
 - (i) $B(OH)_3 + NaOH \rightarrow Na[B(OH)_4]$

On addition of cis 1, 2 diol in H₃BO₃ solution, acidic strength of H₃BO₃ increases due to chelation effect.

14. (c) Ag + ion can not give borax bead test because formed silver metaborate AgBO₂ is white/colourless.

15. (b) Al

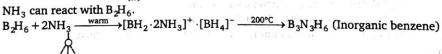
NaOH_(aq.)

$$(P)$$

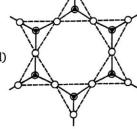
Na(Al(OH)₄] + H₂↑

Na(Al(OH)₄) + H₂↑

16. (d) BF₃ + LiAlH₄ $\xrightarrow{\text{Ether}}$ B₂H₆ + LiF + AlF₃



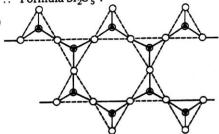




Total No. of oxygen atoms per silicon atom = $\frac{1}{2}$ +

:. Formula Si₂O₅²-.

21. (b)



One tetrahedral shares three corners while other adjacent one shares only two corners hence average shared corners = $\frac{3+2}{2} = 2\frac{1}{2}$

- 25. (d) (i) Pyro silicates : (1 corner O-atom per tetrahedron is shared)
 - (ii) Cyclic silicates : (2 corner O-atom per tetrahedron is shared)
 - (iii) Double chain silicates (One unit shares two corner O-atom while one unit shares three corner O-atom)
 - (iv) Single chain silicate : (2 corner O-atom are shared)
 - (v) 3D silicate: (4 corner O-atom are shared)
 - (vi) Sheet silicates: (3 corner O-atom are shared)
- 26. (c) Due to inert effect the stability of lower oxidation state gradually increases while stability of higher oxidation state gradually decreases down the group in elements of group 13th to 15th. So correct orders are:

 - (iii) $Pb^{2+} > Pb^{4+}$, $Bi^{3+} > Bi^{5+}$ (iv) $Sn^{2+} < Pb^{2+}$, $Sn^{4+} > Pb^{4+}$
- 27. (d) $\begin{bmatrix} -\Pi \\ NH_4 \end{bmatrix} \stackrel{+\Pi}{NO_2} \stackrel{\Delta}{\longrightarrow} N_2 \uparrow + 2H_2O \uparrow$

$$NaN_3 \xrightarrow{\Delta} Na + \frac{3}{2}N_2 \uparrow$$

$$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 \uparrow + Cr_2O_3(s) + 4H_2O \uparrow$$
(green)

28. (a) NO(g)+NO₂(g)
$$\xrightarrow{243 \text{ K}}$$
 N₂O₃
(Blue coloured solid)

Anion of HNO2: NO2

shape : Triangular planar

29. (a) Na +NH₃(g)
$$\xrightarrow{\Delta}$$
 NaNH₂ $\xrightarrow{N_2O}$ NaN₃ $\xrightarrow{\Delta}$ N₂↑ [Y]

30. (d) (a)
$$H_4P_2O_5$$

(b)
$$H_4P_2O_7$$

(c) H P (c)

31. (d) NH₃ is a weak reducing agent than PH₃, because X—H bond strength decreases down the group. Due to absence of H-bonding, only weak van der Waals force of attraction exists in PH₃, it has lower critical temperature than NH₃.

33. (b)
$$AgNO_3 \longrightarrow Ag + \frac{1}{2}O_2 + NO_2$$

 $2NaNO_3 \xrightarrow{500^{\circ}C} 2NaNO_2 + O_2$
 $4NaNO_3 \xrightarrow{800^{\circ}C} 2Na_2O + 5O_2 + 2N_2$

36. (b)
$$PCl_5 + H_2O \longrightarrow POCl_3 + 2HCl$$

(A) (B) (B) (C) (A) (B)

41. (d)
$$PH_3 + H^+ \longrightarrow PH_4^+$$

According to Drago's rule lone pair on phosphorus resides in almost pure s-orbital, hence due to non-directional nature, its overlapping tendency is greatly reduced in comparison to a lone pair present in hybrid orbital, which is directional as present in NH₃.

- 45. (a) (F); As the size of halogen atom increases crowding on Si atom will increase, hence, tendency of attack of Lewise base decreases.
 - (b) (T); M.P. of NH₃ is highest due to intermolecular H-bonding in it. Next lower M.P. will be of SbH₃ followed by AsH₃ due to high mol. wt. of SbH₃.
 - (c) (F); M.P. and B.P. of increase from PH₃ to SbH₃ via AsH₃ due to increase in mol. wt. NH₃ does not follow this trend due to inter molecular H-bonding. Increasing B.P. order: PH₃ < AsH₃ < NH₃ < SbH₃
 - (d) (T); Value of bond moment decreases.
- **48.** (c) $NH_4Cl + NaNO_2 \longrightarrow NH_4NO_2 + NaCl$

$$\begin{array}{ccc} \mathrm{NH_4NO_2} & \stackrel{\Delta}{\longrightarrow} & \mathrm{N_2} \uparrow + 2\mathrm{H_2O} \\ & \mathrm{Ba(N_3)_2} & \longrightarrow & \mathrm{Ba} + 3\mathrm{N_2} \downarrow \\ 2\mathrm{NH_4Cl} + \mathrm{CaO} & \longrightarrow & \mathrm{CaCl_2} + 2\mathrm{NH_3} \uparrow + \mathrm{H_2O} \end{array}$$

49. (a) NF₃ + H₂O
$$\longrightarrow$$
 S_{N^1} NCl₃ + H₂O \longrightarrow S_{N^2} (b) P₄O₁₀ \longrightarrow $S_{N^{AE}}$ SiCl₄ \longrightarrow S_{N^2} (c) SF₄, TeF₆ \longrightarrow Both S_{N^2} (d) SiCl₄, SiF₄ \longrightarrow Both S_{N^2}

- 50. (d) PH₃ (Lewis base) can react with B₂H₆ (Lewis acid).
- 51. (b) In NCl₃ molecule, H₂O molecule attacks on less electronegative Cl-atom rather than central N-atom.
 NCl₃ + 3H₂O → NH₃ + 3HOCl
- **52.** (c) Reducing character $\propto \frac{1}{E H'}$ bond dissociation enthalpy

Hence, correct reducing character is $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$.

54. (c) M exhibits two oxidation states +3 and +5 but covalency can not be 5; hence M can not expand its valence shell. Therefore, M will be nitrogen having atomicity two.

56. (a) :
$$\overline{\bigcirc}$$
 : $\overline{\bigcirc}$:

According to Bents rule $x_1 > x_2 > x_3$.

57. (a) a :
$$2OF \xrightarrow{Dimerisation} F \xrightarrow{-1} \xrightarrow{-1} \xrightarrow{-1} F$$

b : $H_4P_2O_8 \xrightarrow{+H_2O} 2H_3PO_4 + H \xrightarrow{-1} \xrightarrow{-1} \xrightarrow{-1} H$
c : $2Na \xrightarrow{excess O_2} Na \xrightarrow{+} O^- = O_3Na \xrightarrow{+} H$

58. (d) S Hyb.:
$$sp^2$$
, structure: V-shape, planar



Hyb.: sp2, structure: Triangular planar

$$\gamma - SO_3 : Cyclic trimer :$$
 $O = S = O$
 $O = S = O$

59. (c) SO₂ soluble in water. So can not be collected over water.

$$SO_2 + H_2O \longrightarrow H_2SO_4$$

61. (d) Aqueous solution of SO2 acts as a reducing agent

$$SO_2 + 2H_2O \longrightarrow H_2SO_4 + 2H$$
nascent hydrogen

Thus, SO₂ in presence of moisture is used as bleaching agent. This is due to the reducing nature of SO₂. For delicate articles

Coloured matter + H ---- Colourless matter

Similarly, Cl2 acts as bleaching agent in presence of moisture

$$Cl_2 + H_2O \longrightarrow 2HCl + [O]$$

Coloured matter + [O] ----- Colourless matter

62. (d) In SF₆, S sterically hindered by six fluorine atoms hence, attack of H₂O molecule will not occur. NF₃ is not hydrolysed due to absence of vacant orbital either on N of F atom.

TeF₆ is hydrolysed due to large size of Te.

TeF₆ is hydrolysed due to large size of 1e.

63. (b)
$$H_2SO_4 + PbO_2 \longrightarrow PbSO_4 \downarrow + \frac{1}{2}O_2 + H_2O$$
 (PbO₂ is not peroxy compound)

 $(NH_4)_2SO_4 \implies 2NH_4^+ + SO_4^2$

At anode:
$$2SO_4^2 \xrightarrow{\text{Electrolysis}} S_2O_8^{2-} + 2e^{-}$$

Peroxo sulphate on hydrolysis, produces H₂O₂.

- **64.** (a) \rightarrow Number of S—S bonds in H₂S_nO₆ are (n-1)
 - → LiNO₃ produces crimson red while BaCl₂ produces green colour in fire works
 - → Hydrides of Be and Mg are covalent and polymeric
- 65. (d) Hypo form of '-ic' acid is derived from its pyro form, and HClO₃ does not have its pyro form therefore its hypo form is not possible.
- **67.** (d) $PCl_3(sp^3)$, $H_3PO_3(sp^3)$
 - $SF_4(sp^3d)$, $H_2SO_3(sp^3)$
 - $BCl_3(sp^2)$, $H_3BO_3(sp^2)$
 - $XeF_6(sp^3d^2), XeO_3(sp^3)$
- 68. (c) Acidic character: HOCl < HClO₂ < HClO₃ < HClO₄
 Oxidising power: HOCl > HClO₂ > HClO₃ > HClO₄
 Thermal stability: HOCl < HClO₂ < HClO₃ < HClO₄
 'Cl—O' bond order: HOCl < HClO₂ < HClO₃ < HClO₄

 +III +III +V
- **69.** (c) \Rightarrow $\underset{B.O. = 1.0}{\overset{+1}{\text{ClO}}}^{-}$ Hyb. of Cl: sp^3
- ClO_2^- B.O. = 1.5
 Hyb. of Cl: sp^3
- ClO_3^- B.O. = 1.67 Hyb. of Cl: sp^3
- ClO_4^- B.O. = 1.75
 Hyb. of Cl: sp^3

- **70.** (b) $Cl_2O_6 + HF \longrightarrow [Cl_{(P)}^+]_{(P)}^+ + HClO_4$
 - $\stackrel{\leftarrow}{\text{Cl}} O_2: O \stackrel{\bigcirc}{\underset{<120^{\circ}}{\longleftrightarrow}} O \text{ Hyb.} : sp^2;$
- ClO_{4}^{-} : O Hyb.: sp^{3} O $\angle OClO = 109$
- 71. (c) $3Br_2 + 3Na_2CO_3 \longrightarrow 5NaBr + NaBrO_3 + 3CO_2 \uparrow$ ΔH_2SO_4 $3Br_2 \uparrow + Na_2SO_4$ (Pure)
- 74. (b) $6Cl_2 + 2Ba(OH)_2 \longrightarrow Ba(ClO_3)_2 + 5BaCl_2 + 6H_2O$ (X)
 - $Ba(ClO_3)_2 + H_2SO_4 \longrightarrow 2HClO_3 + BaSO_4 \downarrow$ (Y)

$$2HClO_3 \xrightarrow{\Delta}_{\Delta>365 \text{ K}} 2ClO_2 + H_2O + \frac{1}{2}O_2$$

- 75. (d) $6CaOCl_2 \xrightarrow{Auto} Ca(ClO_3)_2 + 5CaCl_2$
- 77. (a) $X = CH_4$, Y = NaH, Z = HBr
- 78. (c) Correct order b.pt.

- **80.** (c) $XeF_2 + H_2O \xrightarrow{R.T.} Xe + 2HF + \frac{1}{2}O_2 \uparrow$
 - $XeF_6 + 3H_2O \xrightarrow{R.T.} XeO_3 + 6HF$
- **81.** (c) $MF + XeF_4 \longrightarrow M^+[XeF_5^-]$ sp^3d^3 , Pentagonal planar

-Block Element

- 83. (b) HF + XeF₆ \longrightarrow XeF₅⁺ + HF₂
- 84. (d) Due to small size of He, it escapes from interstitial spaces/voids of molecular lattice of quinols.
- **85.** (b) $XeF_4 + SbF_5 \longrightarrow [XeF_3]^+ [SbF_6]^- \longrightarrow$ $[SbF_6]^$ sp^3d^2 sp^3d bent T-shape octahedral
- 87. (b) The compound XeO₃ is an uncommon hydrolysis product between XeF₂ and XeF₄.

(i)
$$XeF_2 + H_2O \longrightarrow Xe + \frac{1}{2}O_2 + 2HF$$

(ii)
$$3XeF_4 + 6H_2O \longrightarrow XeO_3 + 2Xe + \frac{3}{2}O_2 + 12HF$$

88. (b)
$$XeF_6$$

$$+Excess H_2O \rightarrow XeO_3 + HF$$

$$(X)$$

$$+2H_2O \rightarrow XeO_2F_2 + HF$$

$$(Y)$$

Y is not an oxyacid of xenon.

89. (b) Both He and Ne do not form clathrate compound due to their small size.

90. (b)
$$\rightarrow O$$
; Hybridization of Si $-sp^3$, bond angle = 109°28'

 $\angle Cl - N - Cl$ in NCl_3 is greater than $\angle Cl - P - Cl$ in PCl_3 because participation of s-orbital in hybridization decreases from NCl₃ to PCl₃

- $\angle Cl P Cl$ in $PCl_3 > \angle H Sb H$ in SbH_3 , as in SbH_3 , bond pairs are formed by overlapping of almost pure p-orbitals.
- \angle H Sb H in SbH $_3$ < \angle H Te H in H $_2$ Te because two lone pairs are present on Te while at Sb there is one lone pair.
- 91. (c) Correct order of Arrhenious acid character

 $H_2S < H_2Se < H_2Te$

the value of K_a is maximum for H_2 Te, due to least bond energy among given hydrides.

(II)

HO P P O H CI P N: CI P
$$N$$
 (III) (IV)

95. (a,b)

$$C = N$$

$$N = C$$
(SCN)₂ molecule having non-polar as well as polar bonds but the

molecule as a whole is polar due to its open book like structure like H2O2.

Passage-1

1. (b) As HNO₃ can not form its pyro oxyacid hence its peroxy form having two central atoms is not possible.

2. (a)
$$\overset{H\ddot{\circ}}{\circ}$$
 $\overset{\circ}{\circ}$ $\overset{\circ$

3. (c)
$$O^{-}$$
 $S \stackrel{+V}{=} S \stackrel{+III}{=} O^{-}$ O^{-} O^{-}

Passage-3

(ii)
$$BCl_3 + 3H_2O \longrightarrow H_3BO_3 + 3HCl$$

(Q) (R)

(iii) BN + 3H₂O
$$\longrightarrow$$
 H₃BO₃ + 3HCl

(Q) (R)
(iii) BN + 3H₂O
$$\longrightarrow$$
 H₃BO₃ + 3HCl
(R)
(iv) 4BCl₃ + 3LiAlH₄ \longrightarrow 2B₂H₆ + 3LiCl + 3AlCl₃
(Q) (S)

-Block Element

(v)
$$B_2H_6 + 6H_2O \longrightarrow 2H_3BO_3 + 6H_2 \uparrow$$

(S) (R)

(vi)
$$B_2H_6 + 2NaH \longrightarrow 2NaBH_4$$

(S) (T)

passage-4

$$2\text{Pb}(\text{NO}_3)_2 \longrightarrow 2\text{PbO} + 4\text{NO}_2 \uparrow + \text{O}_2 \uparrow$$

$$NO_2 + \text{NO} \xrightarrow{\text{low}} \qquad N_2O_3$$

$$(B) \quad (H) \qquad \text{temp.} \qquad (\text{Blue colour liquid})$$

$$N_2O_3 + \text{H}_2O \longrightarrow 2\text{HNO}_2$$

$$(C) \qquad (D)$$

$$2\text{HNO}_2 + 2\text{FeSO}_4 + \text{H}_2\text{SO}_4 \longrightarrow \text{Fe}(\text{SO}_3)_3 + 2\text{NO} + 2\text{H}_2\text{O}$$

$$\text{FeSO}_4(aq) + \text{NO} \longrightarrow [\text{Fe}(\text{H}_2\text{O})_5\text{NO}]\text{SO}_4$$

$$(E) \qquad (\text{Brown ring})$$

$$\text{Pb}(\text{NO}_3)_2 + \text{H}_2\text{S} \longrightarrow \text{PbS}\downarrow \longrightarrow \text{Pb}(\text{NO}_3)_2 + \text{S} + \text{NO}\uparrow + \text{H}_2\text{O}$$

$$(G) \qquad \text{Black ppt.}$$

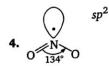
$$\text{Pb}(\text{NO}_3)_2 + \text{K}_2\text{CrO}_4 \longrightarrow \text{PbCrO}_4\downarrow + 2\text{K}^+ + 2\text{NO}_3^-$$

$$(I) \qquad (\text{yellow ppt.})$$

1.
$$NO_2^- + 2H^+ + I^- \longrightarrow I_2 \uparrow + NO \uparrow + H_2O$$

(gas)

2.
$$PbCrO_4 + 4OH^- \longrightarrow [Pb(OH)_4]^2 + CrO_4$$
soluble
$$2PbCrO_4 + 4HNO_3 \longrightarrow 2Pb(NO_3)_2 + H_2Cr_2O_7 + H_2O$$



Passage-6

Inert pair effect phenomenon is exclusively applicable to sixth period elements belonging to 13, 14 and

Hence, Tl+does not act as reducing agent.

$$\begin{array}{ccc} & \ln^{+} & \longrightarrow & \ln^{3+} + 2e^{-} \\ [\text{Kr}] 4d^{10} 6s^{2} & [\text{Kr}] 4s^{10} \\ (\text{Less stable}) & (\text{More stable}) \end{array}$$

Hence, In + can act as stronger reducing agent than Tl+.

Passage-8

$$H_{2}SO_{5} \stackrel{+\bullet O'}{\longleftarrow} H_{2}SO_{4} \stackrel{+H_{2}SO_{4}}{\longrightarrow} H_{2}S_{2}O_{7} \stackrel{-\bullet O'}{\longrightarrow} H_{2}S_{2}O_{6}$$

$$H_{2}S_{2}O_{8} \bigoplus_{\uparrow} O$$

$$H_{2}S_{2}O_{8} \bigoplus_{\uparrow} O$$

2. (c) In $SO_3(D)$, S is sp^2 -hybridised.

One Or More Answers is/are Correct

1. (a, b, c)

According to Bent's rule: $x_1 > x_2$ $\alpha < \beta$ x + y + z = 4 + 3 + 2 = 9

O-Block Element

$$XeF_6 + 6H_2O \longrightarrow XeO_3 + 6HF$$

$$XeF_6 + H_2O \xrightarrow{-0} XeOF_4 + 2HF$$

 $XeF_6 + 6H_2O \xrightarrow{-6} XeO_3 + 6HF$ $XeF_6 + H_2O \xrightarrow{-2} XeOF_4 + 2HF$ XeF_6 act as fluoride donor when it reacts with non-metal fluoride.

4. (a, b, c, d)

$$\begin{array}{c}
SOCl_2 + H_2O \longrightarrow SO_2 + 2HCl \\
+ PCl_5 \\
\hline
POCl_3(B)
\end{array}$$

Hybridization of 'P' atom is sp^3 , $\mu_D \neq 0$, has plane of symmetry.

7. (b, c, d)

$$2XeF_{2}+2H_{2}O \xrightarrow{R.T.} 2Xe+4HF+O_{2}$$

$$6XeF_{4}+12H_{2}O \xrightarrow{R.T.} 4Xe+2XeO_{3}+24HF+3O_{2}\uparrow$$

$$XeF_{6}+3H_{2}O \xrightarrow{R.T.} XeO_{3}+6HF$$

$$4HF+SiO_{2} \xrightarrow{R.T.} SiF_{4}\uparrow +2H_{2}O$$

$$\downarrow P$$

$$\begin{array}{c}
\text{Silica} \\
6\text{HF} + \text{Na}_{2}\text{SiO}_{3} \xrightarrow{\text{R.T.}} 2\text{NaF} + \text{SiF}_{4} \uparrow + 3\text{H}_{2}\text{O}
\end{array}$$

9. (a, b)

(a)
$$Cl_t \bigcirc Cl_b \bigcirc Cl_t$$
 (I—Cl_t) and bridge bond are in same plane.

(b)
$$Cl_t - Fe$$
 $Fe - Cl_t$ $(Fe - Cl_t)$ and bridge bond are in same plane.

10. (b, c, d)

$$H_t$$
 H_t
 H_t

- (a) Maximum Cl-H -atom can lie in a plane.
- (b) Maximum 6-atom can lie in a plane (H, H, B, H, H, B)
- (c) Bond strength $(B ---H_b ---B) > (B ---H_t)$
- (d) $(H_t B H_t) > (H_b B H_b) = 0$ $(H_t B H_t) < (H_t H$

12. (a, c, d)

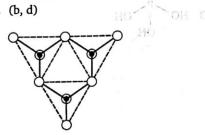
COOH
$$+ BO_{2}^{-} + HOOC$$

$$+ BO_{3} + H_{2}O \Rightarrow [B(OH)_{4}]^{-} + H^{+}$$

$$+ 2H_{2}O$$

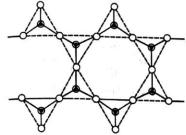
- →Opically resolvable due to asymmetric structure →Two six membered rings.
- **18.** (a, c, d) Phenomenon of inert effect increases downward.

HO



Cyclic silicate having three Si atoms (Si₃O₉⁶⁻) contains three Si—O—Si linkage

THO . OHY . "



One tetrahedron shares three oxygen atoms while other share two oxygen atoms and these two tetrahedrons constitute one unit. Therefore, no. of oxygen atoms shared per tetrahedron or Si atom

$$=\frac{3+2}{2}=2\,\frac{1}{2}$$

 \Rightarrow General formula of double chain silicates : $(Si_4O_{11})_n^{6n-}$

As the tendency of formation of multiple bond increases the extent of polymerization decreases. Silicon has large size hence, it forms less effective $p\pi$ - $p\pi$ overlapping with oxygen.

44. (b, d)

White phosphorus dissolves in CS2 and also dissolves in alkali solution to form PH3 and hypophoshite salt, whereas red phosphorus is not soluble in CS2 and also it does not react with alkali solution.

45. (a, b)

$$2H_{3}PO_{4} \xrightarrow{220^{\circ}C} H_{4}P_{2}O_{7} + H_{2}O$$
O
O
HO
P
O
P
OH
OH
OH

46. (a, b, d)

Only H₂S acts as a reducing agent while HNO₂, H₂O₂ and SO₂ act boh oxodising as well as reducing

58. (c, d)

$$NH_4NO_3 \xrightarrow{\Delta} N_2O + 2H_2O$$

 $ZnO + 2NaOH \longrightarrow Na_2ZnO_2 + H_2O$

59. (a, b, d)

Fluorine is the most reactive among all halongens hence, called super halogen. Basic character increases downward.

ClO₂ is powerful oxidising agent, also strong chlorinating agent. Its bleaching power is almost 30 times stronger than Cl₂. IN alkaline solution undergoes disproportionation

r than
$$Cl_2$$
. IN alkaline solution undergoes disproper $2ClO_2 + 2NaOH \longrightarrow NaClO + NaClO_3 + H_2O$

93. (a, b, c)

As trend for decreasing bond energy in the given hydrides is H₂O > H₂S > H₂Se > H₂Te, hence their enthalpy of formation also varies in the same trend.

As extent of delocalization of lone pair on central atom into vaccant d-orbital increases downward hence bond angle decreases from H₂O to H₂Te.

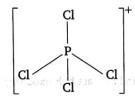
Order of B.P. $H_2O > H_2Te > H_2Se > H_2S$ Order of B.P. $H_2O > H_2Ie > H_2O$ and H_2Se and H₂O is greater than van der Waals' forces of attraction among any other given molecular species.

95. (a, c)

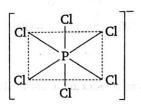
In gaseous or vapour phase PCl₅ exists as discrete molecule.

(In vapour state) $d_{(P-CI)}$ axial $> d_{(P-CI)}$ equatorial

Whereas in solid state it exists as [PCl₄]⁺[PCl₆]⁻



Hybridisation of P: sp3



Hybridisation of P: sp^3d^2 Bond angle : 90° & 180°

96. (a, b, c, d)

- (a) Thermal stability : $H_2O > H_2S > H_2Se > H_2Te$
- (b) Bond dissociation energy : $Cl_2 > Br_2 > F_2 > I_2$
- (c) Melting point: NH₃ > SbH₃ > AsH₃ > PH₃
- (d) X C X bond angle: $COCl_2 > COF_2$

97. (a, b, c)

- (a) $2HNO_3 \xrightarrow{-H_2O} N_2O_5$ (oxide of nitrogen)
- (b) $H_2SO_4 \xrightarrow{-H_2O} SO_3$ (oxide of sulphur)
- (c) $2HClO_4 \xrightarrow{-H_2O} Cl_2O_7$ (oxide of chlorine)
- (d) $2H_2SO_4 \xrightarrow{-H_2O} H_2S_2O_7$ (oxo-acid)
- (a), (b) and (c) are oxides and not oxo-acids.

Match the Column

3. $CaH_2 + 2H_2O \xrightarrow{R.T.} Ca(OH)_2 + H_2 \uparrow$

POCl₃ +3H₂O R.T. H₃PO₄ +3HCl

Proton donor oxyacid No back bonding

$$NCl_3 + 3H_2O \xrightarrow{R.T.} NH_3 \uparrow + 3HOCl$$

Proton donor oxyacid $p\pi$ - $d\pi$ back bonding

 $B_2H_6 + 6H_2O \xrightarrow{R.T.} 2H_3BO_3 + 6H_2 \uparrow$

does not furnish proton $p\pi$ - $d\pi$ back bonding

 $R_2SiCl_2 + 2H_2O \xrightarrow{R.T.} R_2Si(OH)_2 + 2HCl$

Silanol an alcohol not oxyacid

4. (a)
$$\stackrel{+V}{POCl}_3 \xrightarrow{H_2O} \stackrel{}{H_2O} \longrightarrow \stackrel{}{HO} \stackrel{}{\longrightarrow} \stackrel{}{OH} \stackrel{}{OH} + 3HCl$$

- ⇒ Complete hydrolysis
- ⇒ Hybridization of P in POCl₃: sp³
- ⇒ Hybridization of P in H₃PO₄: sp³
- ⇒ H₃PO₄ does not undergo Tautomeric change due to absence of lone pair at P-atom.

$$(b) \bigcirc \bigvee_{F}^{\circlearrowleft} \bigvee_{F}^{H_2 \circlearrowleft} \bigcirc \bigvee_{OH}^{\circlearrowleft} \bigvee_{OH}^{+ 2HF}$$

⇒ Complete hydrolysis

- ⇒ Complete hydrolysis
- ⇒ HF reacts with glass

$$SiO_2 + 4HF \longrightarrow SiF_4 + 2H_2O$$

⇒ Hybridization of S-atom remains sp³

(c)
$$XeOF_4 \xrightarrow{H_2O} XeO_2F_2 \xrightarrow{H_2O} XeO_3 + 2HF$$

- \Rightarrow XeOF4 can be partially hydrolysed to XeO2F2
- ⇒ HF forms which reacts with glass
- \Rightarrow Hybridization Xe in XeOF₄ is sp^3d^2 while in XeO₃ it is sp^3

(d)
$$H_2^{\text{SI}} \circ g \circ H_2^{\text{SO}} \circ H_2^{\text$$

- \Rightarrow H₂S₂O₈ can be partially hydrolysed to H₂SO₅
- \Rightarrow Hybridization S-atom in $H_2S_2O_8$ as well as in H_2SO_4 remains : sp^3

5. (a)
$$NCl_3 + 3H_2O \xrightarrow{R.T.} NH_3 + 3HO Cl$$

- → Non-redox hydrolysis
- → HOCl can act as both oxidizing and reducing agent.
- → NH₃: Monodentate ligand

(b)
$$NO_2 + H_2O \xrightarrow{R.T.} HNO_2 + HNO_3$$

- → NO₂, NO₃ can act as flexidentate ligand.
- → HNO₂ can act as both oxidizing and reducing agent
- → NO₂, NO₃ can act as monodentate ligand.

(c)
$$\text{H}_2\text{S}_2\text{O}_8 + 2\text{H}_2\text{O} \xrightarrow{\text{R.T.}} 2\text{H}_2^{\text{VI}} + \text{H}_2^{\text{-I}}$$

- → H2SO4: Dibasic acid
- → SO₄ can act as flexidentate ligand
- \rightarrow H_2O_2 can act as both oxidizing and reducing agent
- → SO₄ can act as monodentate ligand.
- → Non-redox reaction

(d)
$$SF_4 + 3H_2O \xrightarrow{R.T.} H_2SO_3 + 4HF$$

- → H₂SO₃: Dibasic acid
- → SO₃⁻⁻ can act as flexidentate ligand
- → H₂SO₃ can act as both oxidizing and reducing agent
- → SO₃⁻⁻ can act as monodentate ligand
- $T \rightarrow$: Non-redox hydrolysis
- 6. (a) Disproportionation in alkaline medium/heating

Cl₂
$$\xrightarrow{\text{alkaline medium}} \bar{O} \text{ Cl} + \text{Cl}^{-}$$

$$NO_2 \xrightarrow{\text{alkaline medium}} NO_2^- + NO_3^-$$

$$NaH_2PO_3 \xrightarrow{\Delta} Na_2HPO_4 + PH_3$$

(b) Oxidizing agent : Cl2, NO2, XeF6

(c)
$$Cl_2 + H_2O \rightarrow HOCl + HCl$$

 $2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$

$$XeF_6 + H_2O \rightarrow XeOF_4 + 2HF \xrightarrow{H_2O} XeO_2F_2 + 2HF \xrightarrow{H_2O} XeO_3 + 2HF$$

$$NaH_2PO_3 + H_2O \rightarrow NaOH + H_3PO_3$$

$$(NH_4)_2S + H_2O \rightarrow NH_4OH + H_2S$$

(d)
$$NaH_2PO_3 \xrightarrow{\Delta} Na_2HPO_4 + PH_3 \uparrow$$

 $(NH_4)_2S \xrightarrow{} H_2S + NH_3 \text{ (basic gas)}$

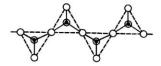
7.
$$A \rightarrow Q, B \rightarrow P, C \rightarrow S, D \rightarrow R$$

8.
$$A \rightarrow S$$
, $B \rightarrow P$, $C \rightarrow Q$, $D \rightarrow R$

 PbI_4 is unstable compound Pb^{4+} is highly oxidising and I^- is a reducing agent. Chlorine bleaches by oxidation and SO_2 by reduction.

3

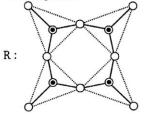
9. P:



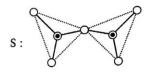
- → No. of terminal oxygen atoms = 10
- → Total no. of shared corners = 3
- → Silicon atom is present at the centre of geometry and oxygen atoms are present at corner of tetrahedron.
- → Non-planar



- → No. of terminal oxygen atoms = 4
- → Silicon atom is present at the centre of tetrahedron and oxygen atoms are present at the corner of tetrahedron.
- Non-planar



- → No. of terminal oxygen atoms = 8
- → Silicon atom is present at the centre of tetrahedron atoms are present at the corner of tetrahedron.
- → Non-planar geometry.



- \rightarrow No. of terminal oxygen atoms = 7
- → Silicon atom is present at the centre of tetrahedron and oxygen atoms are present at the corner of tetrahedron.
- → Non-planar.
- 10. $A \rightarrow R$, $B \rightarrow S$, $C \rightarrow Q$, $D \rightarrow P$
- (A) N_2 and CO: CuCl + 2CO $\xrightarrow{\text{high}}$ CuCl 2CO ammonical
 - (B) N_2 and O_2 : O_2 is absorbed in alkaline pyrogallol.
 - (C) N_2 and NH_3 : $2NH_3 + H_2SO_4 \longrightarrow (NH_4)_2SO_4$, while N_2 is a neutral gas.
 - (D)PH₃ and NH₃: NH₃ is highly soluble in water and PH₃ is least soluble in water so can be separated by use of water.

$$NH_3 + H_2O \longrightarrow NH_4OH \rightleftharpoons NH_4^+ + OH^-$$

11.
$$A \rightarrow Q$$
; $B \rightarrow R$; $C \rightarrow S$; $D \rightarrow P$

(A) Mg + 2HNO₃
$$\longrightarrow$$
 Mg(NO₃)₂ + H₂ \uparrow
very dil.

(B)
$$4Zn + 10HNO_3 \longrightarrow 4Zn(NO_3)_2 + N_2O^{\uparrow} + 5H_2O$$

(B)
$$4\text{Zn} + 10\text{HNO}_3 \longrightarrow 4\text{Zn}(\text{NO}_3)_2 + \text{N}_2\text{O}^{\uparrow} + 5\text{H}_2\text{O}$$

(C) $4\text{Sn} + 10\text{HNO}_3 \longrightarrow 4\text{Sn}(\text{NO}_3)_2 + \text{NH}_4\text{NO}_3 + 3\text{H}_2\text{O}$
(D) $3\text{Pb} + 8\text{HNO}_3 \longrightarrow 3\text{Pb}(\text{NO}_3)_2 + 2\text{NO}^{\uparrow} + 4\text{H}_2\text{O}$

(D)
$$3Pb + 8HNO_2 \longrightarrow 3Pb(NO_2)_2 + 2NO \uparrow + 4H_2O$$

12.
$$A \rightarrow S$$
; $B \rightarrow R$; $C \rightarrow Q$; $D \rightarrow P$

13.
$$A \rightarrow R$$
, $B \rightarrow P$, $C \rightarrow T$, $D \rightarrow Q$

14.
$$A \rightarrow P$$
, $B \rightarrow R$, $C \rightarrow P$, $D \rightarrow Q$

Halogen being non-polar is nature does not dissolve readily in water (polar solvent)

Solubility decreases:
$$F_2 > Cl_2 > Br_2 > I_2$$

due to dense electronic arrangement two molecules arrange at maximum disstance in the case of fluorine. Moreover, F2 has least and I2 has maximum van der Waals' force thats why F2 has maximum van der Waals' radius. Bond dissociation energy for Cl₂ is maximum and F₂ has less because of interelectronic repulsion.

15.
$$A \rightarrow S$$
; $B \rightarrow R$; $C \rightarrow P$; $D \rightarrow Q$

16.
$$A \rightarrow Q$$
, T; $B \rightarrow R$; $C \rightarrow S$; $D \rightarrow P$

17.
$$A \rightarrow P, Q, S; B \rightarrow P, Q, S; C \rightarrow Q, R; D \rightarrow Q, R, S$$

(P) HO—P—P—OH; Basicity = 4
OH OH

$$sp^{3} sp^{3}$$

(R)
$$H_3BO_3 + OH \rightleftharpoons [B(OH)_4]^-$$

(L.B.) (L.B.) borate ion

(S)
$$HO \longrightarrow P \longrightarrow H$$
; Basicity = 1
 H
 Sp^3

18.
$$A \rightarrow P, Q; B \rightarrow P, Q; C \rightarrow P, R, S; D \rightarrow Q$$

19.
$$A \rightarrow P, S; B \rightarrow P; C \rightarrow Q, R, S; D \rightarrow Q, R$$

20.
$$A \rightarrow P$$
, S; $B \rightarrow P$, Q, R; $C \rightarrow R$; $D \rightarrow S$

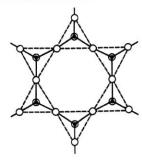
21.
$$A \rightarrow R$$
, S; $B \rightarrow P$, S; $C \rightarrow S$; $D \rightarrow Q$, R, S

(A) Sheet silicate:

General formula = $(Si_2O_5)^{2-}$

Non-planar

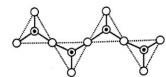
3-corner oxygen atoms are shared



(B) Pyroxenes:

General formula = $(SiO_3)_n^{2n}$

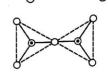
Non-planar



(C) Pyrosilicate:

General formula = $Si_2O_7^{6-}$

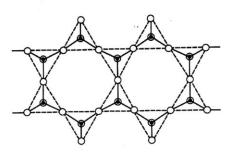
Non-planar



(D) Amphibole:

General formula = $(Si_4O_{11})_n^{6n}$

Non-planar



Assertion-Reason Type Questions

8.
$$2Al + 2NaOH + 2H_2O \longrightarrow 2NaAlO_2 + 3H_2 \uparrow$$

$$2AI + 2NaOH + 2H_2O \longrightarrow Na_2ZnO_2 + H_2$$

Zn + 2NaOH \longrightarrow Na_znO_2 + H_2↑

sod. zincate

$$4S + 6NaOH \longrightarrow 2Na_2S + Na_2S_2O_3 + 3H_2O$$

$$P_4 + 3NaOH + 3H_2O \longrightarrow 3NaH_2PO_2 + PH_3$$

sod. hypophosphite

 $Cl_2 + 2NaOH \longrightarrow NaClO + H_2O$

- 9. Reason is the correct explanation of the assertion.
- 10. $PCl_5 \xrightarrow{\Delta} PCl_3 + Cl_2$

PCl₅ decomposes into PCl₃ and Cl₂ as in its structure two P—Cl axial bonds are longer than other three

11. First, HBr is released, being reducing in character, it is oxidised into Br_2 by conc. H_2SO_4

NaBr +
$$H_2SO_4 \longrightarrow NaHSO_4 + HBr$$

$$2HBr + H2SO4 \longrightarrow Br2 \uparrow + SO2 \uparrow + 2H2O$$

- 12. H—S bond is weaker than H—O bond hence, H₂S is more acidic than H₂O.
- 13. Due to dissociation of IF_5 into IF_4^+ and IF_6^- , the liquid IF_5 conducts electricity.

14. Red phosphorus is less volatile than white phosphorus because it exists in linked tetrahedral structures

15. As Al(OH)₃ is amphoteric in nature hence, it can act as an antacid.

$$Al(OH)_3 + 3H^+ \longrightarrow Al^{3+} + 3H_2O$$

16. $3Cl_2 + 6NaOH \longrightarrow 5NaCl + NaClO_3 + 3H_2O$ (hot)

$$Cl_2 + 2NaOH \longrightarrow NaCl + NaClO + H_2O$$
(cold)

27. HO OH

(Tautomerism)

о н О н

(A) Less stable form

(B) More stable form

In more stable structure (B) one H-atom is non-ionizable hence its basicity is 2.

Subjective Problems

X = 6

Y = 6

 $Y \times Z - X = 6 \times 1 - 6 = 0$

2.

$$P = 3$$

Q = 2

R = 4

R + Q - P = 4 + 2 - 3 = 3

$$x = y = z = 2$$
$$x + y + z = 6$$

4. For any oxyacid of sulphur number of H-atoms = 2; $H_{n_1}S_2O_{n_2}H_2S_2O_3$, $H_2S_2O_4$, H2S2O5, H2S2O6, H2S2O7, H2S2O8.

For
$$H_2S_2O_4$$
; $\frac{n_2}{n_1} = 2$; \Rightarrow Oxidation state of sulphur atom = +3

For $H_2S_2O_6$; $\frac{n_2}{n_1} = 4$; \Rightarrow Oxidation state of sulphur atom = +6

Sum of oxidation state = 3 + 6 = 9

5. Species are: SiCl₄, PCl₃, AsCl₃, P₄O₆, P₄O₁₀

$$\begin{array}{c|c} O & & \\ & \downarrow \\ Cl & & Cl \\ Cl & & Cl \\ T.S. & & \end{array}$$

Hybridization of Si : sp^2d

Total number of σ -bonds = 18 Total number of lone pairs = 18

7.
$$x = 6$$

$$y = 6$$

$$z = 12$$

$$z = 12 \\
0 \\
S \\
-(S)_n^0 = S^{+5} \\
0 \\
0$$

Bond order of 'S—O' bond is 1.66 (5/3) average oxidation state of 'S' atom is:

$$\frac{10}{2+n} = \frac{5}{3}$$

$$\frac{2+n}{2+n} - \frac{3}{3}$$
(or)
$$\frac{10}{2+n} = \frac{10}{6} \implies 2+n=6 \implies n=4$$

9. Borax : 2Na + [B₄O₅(OH)₄]²⁻ ·8H₂O

 sp^2 -hybridized Boron atoms only participate in $p\pi$ - $p\pi$ back bonding.

10. (ii)
$$CuSO_4 + PH_3 \rightarrow Cu_3P_2$$
(Black)

(iii)
$$SbF_5 + XeF_4 \rightarrow [XeF_3]^+[SbF_6]^-$$

11. Correct order is:

- (1) H₂SO₄ > H₂SO₃: Boiling point
- (2) H₂O > HF: Extent of H-bond
- (6) Ethylene glycol > Phenol : Viscosity
- (7) 1, 3-Dichlorobenzene > 1, 3, 5-Trichlorobenzene : Strength of molecular force

15.
$$\Rightarrow$$
 $2H_3 \stackrel{\text{II}}{\text{PO}_2} \xrightarrow{\Delta} H_3 \stackrel{\text{V}}{\text{PO}_4} + \stackrel{\text{-III}}{\text{PH}_3}$

16.
$$x = 10, y = 2, z = 8$$

$$\frac{10 - 2}{8} = 1$$

17.
$$1+5+3=9$$

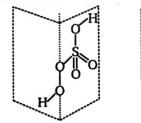
20.
$$x = 12$$



The value of $\frac{x \cdot y}{z} = \frac{12 \times 4}{6} = 8$

21.
$$H_2S_2O_8$$
 + $H_2O \longrightarrow H_2SO_5 + H_2SO_6$
Marshall's acid (A) (B)

$$H_2SO_5 + H_2O \longrightarrow H_2O_2 + H_2SO_4$$
(A) (C) (B)



Q = 3

$$P - Q = 5 - 3 = 2$$

P = 5

Compound 22.

(iii) C₃O₂

•		Compoun	۱
	(i)	CO	

(ii) CO₂

0 = C = 00 = C = C = C = 0

12

1 3

0

23.
$$2 \text{ClO}_3 \xrightarrow{\text{cool}} O$$

Completion of octet

$$2\,\text{GaH}_3 \xrightarrow[\text{dimerization}]{\text{cool}} \xrightarrow[\text{H}]{\text{Hypovalent}} H$$

$$2\text{AlCl}_3 \xrightarrow[\text{dimerization}]{\text{cool}} \xrightarrow[\text{Cl}]{\text{Cl}} \text{Al} \xleftarrow[\text{Cl}]{\text{Cl}} \text{Completion of octet}$$

$$2ICl_3 \xrightarrow[\text{dimerization}]{\text{cool}} \xrightarrow[Cl]{\text{Cl}} Cl \xrightarrow[Cl]{\text{Hypervalent}}$$

$$2BeH_2 \xrightarrow{cool} H - Be \xrightarrow{H} Be - H$$
 Hypovalent

$$2NO_2 \xrightarrow{\text{cool}} O = N - N = O$$
Completion of octet value of $\frac{yz}{x} = \frac{3 \times 2}{2} = 3$

24. $X = \text{Total number of } (2c - 2e^{-}) \text{ bond } = 10$

 $Y = Total number of (3c - 2e^{-}) bond = 0$

 $Z = Total number of (3c - 4e^{-}) bond = 2$

$$H = \ddot{Q}$$
 $H = \ddot{Q}$
 $H = \ddot{Q}$

25.

Compound	Solid sate
N_2O_5	$[NO_2]^+[NO_3]^-$ sp sp^2
Cl ₂ O ₆	(180°) (120°) [ClO ₂] ⁺ [ClO ₄] ⁻ sp ² sp ³ (<120°) (109°28')
PCl _s	[PCl ₄] ⁺ [PCl ₆] ⁻ sp ³ sp ³ d ² (109°28') (90°)
I ₂ Cl ₆	[ICl ₂] ⁺ [ICl ₄] ⁻ sp ³ sp ³ d ² (<109°28') (90°)
XeF ₆	[XeF ₅] ⁺ F ⁻ sp ³ d ² (< 90°)
PBr _S	[PBr ₄] ⁺ Br ⁻ sp ³ (109°28')
x=1+1+1+1=4 y=1+1=2	

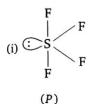
$$x=1+1+1+1=4$$

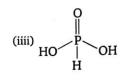
 $y=1+1=2$
 $z=1+1+1=3$
 $x+y+z=4+2+3=9$

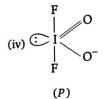
26.		b.p.	l.p
	(A) XeF ₄	4	2
	(B) XeF ₅	5	1
	(C) XeF ₅	5	2
	(D)XeF ₆	6	1
	(E) XeF ₈ ²⁻	8	1
		28	7
	:0: ^{sp²}	sp ³ Ep-E σ	
29.	S sp ³	\tilde{S}	≅ö ^{sp²}
	sp ² Ö pr.dr.	sp^3 sp^3	
	· prida	S Sprag	

$$p = 6$$
, $q = 6$; $\frac{p}{q} = \frac{6}{6} = 1$

30.



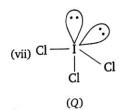


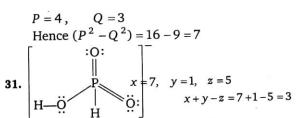


(P)

(Q)

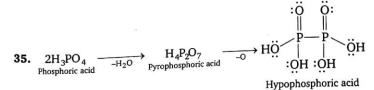
(Q)





32. CH₃⁺, (C₃H₅)₃Al, HCHO, TiCl₄, CO₂, SiCl₄, BF₃

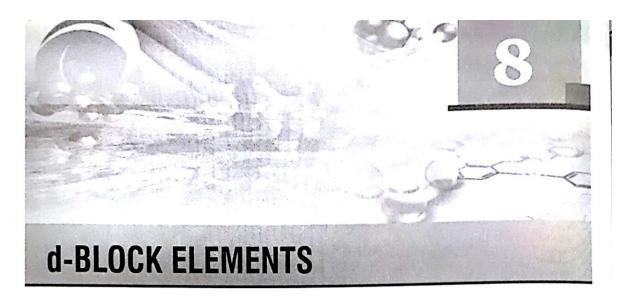
33. $x = \text{GeH}_4$, BCl₃, AlBr₃, PCl₅, CO₂; $y = \text{PH}_3$, $(5-1)^2 = 16$



x = 12; y = 2 $\therefore \frac{x}{y} = \frac{12}{2} = 6$

36. x = 12, y = 4, z = 6The value of $\frac{XY}{Z} = \frac{12 \times 4}{6} = 8$





Level

1.	CrO ₄ ²⁻ (yellow) change	es to $Cr_2O_7^{2-}$ (orange) in	pH=	x and vice-versa in	pH = y. Hence, x and y
	are:				
	(a) 6, 8	(b) 6, 5			(d) 7, 7
2.	Manganese ions (Mn ²⁺) can be oxidised by Per	rsulp	hate ions $S_2O_8^{2-}$ acc	cording to the following
	half-equations,				
		$S_2O_8^{2-} + 2e^-$		→ 2SO ₄ ²⁻	
		$Mn^{2+} + 4H_2O$	_	\rightarrow MnO ₄ ⁻ +8H ⁺ +	5e ⁻
	How many moles of S	₂ O ₈ ²⁻ are required to or	xidis	e 1 mole of Mn ²⁺ ?	
	(a) 2.5	(b) 2.0	(c)	11.0	(d) 0.4
3.	AgCl on fusion with N				· ·
	(a) Ag_2CO_3	(b) Ag ₂ O	(c)	Ag	(d) Ag_2C_2
4.	Formula of Rust is:				
	(a) Fe_2O_3		(c)	$Fe_2O_3 \cdot xH_2O$	(d) $Fe_3O_4 \cdot xH_2O$
5.	CrO ₃ dissolves in aque	eous NaOH to give :			
	(a) $Cr_2O_7^{2-}$	(b) CrO_4^{2-}	(c)	Cr(OH) ₃	(d) Cr(OH) ₂
6.	Chemically philosophe	er of wool is :			<u>.</u>
	(a) ZnO	(b) BaO	(c)	HgCl	(d) Hg ₂ Cl ₂
7.	Boiling CuCl ₂ with Cu	in conc. HCl gives :			02-2
	(a) CuCl	(b) CuCl ₂	(c)	H[CuCl ₂]	(d) Cu ₂ Cl
8.	Thermal decompositio	n of zinc nitrate give :			2
	(a) Zn	(b) ZnO		$Zn(NO_3)_2$	(d) NO
9.	Malachite and azurite				
	(a) Blue and green pi		(b)	Red and green pig	gment
	(c) Green and blue pi	gment	(d)	Green and red pig	gment

10.	Mercury is transported	in the containers made	e of :	
	(a) Ag ((b) Pb	(c) Al	(d) Fe
11.	The higher oxidation sta	ates of transition eleme	ents are found to be in	n the combination with A
	and B , which are :			
		(b) O, N	(c) O, S	(d) F, Cl
12.	White vitriol is:			4D = 60
		(b) ZnSO ₄		(d) ZnCO ₃
13.	Among the following m			(1)14
			(c) platinum	(d) gold
14.	Silver nitrate is usually	kept in coloured bottl	les because it is :	1: -h+
	(a) oxidised in air		(b) decomposes in s	uniigiii - aunlight
	(c) explodes in sunligh		(d) reacts with air in	
15.	Which of the following	is arranged in order o	of increasing meiting	7n
	(a) $Zn < Cu < Ni < F$		(b) Fe < Ni < Cu <	
	(c) Ni $<$ Fe $<$ Zn $<$ C		(d) Cu < Zn < Fe <	. IVI
16.	Calomel is the name of		(a) HaCl + Ha	(d) $Hg_2Cl_2 + Hg$
		(b) Hg ₂ Cl ₂	(c) $HgCl_2 + Hg$	(d) 1182-12 0
17.	The iron salt used in b		(c) K ₄ Fe(CN) ₆	(d) FeSO ₄
	2 1	(b) $Fe_2(C_2O_4)_3$	(C) K4re(CIV)6	(=)
18.	Percentage of gold in 1		(c) 40	(d) 14
	(a) 58	(b) 80	of first and second	transition series elements
19.	The maximum and m	ed with .	Of first unit seesan	
	respectively are obtain (a) Cr and Zn	(b) Cr and Hg	(c) Cr and Cd	(d) Mo and Cd
••	ZnO shows yellow cold	our on Heating due to	:	
20.	() 1 1 noition		(b) G-1 specta	
	1 1 1 1 1 1 1 1 1	n caused by Zn ²⁺ ion	(d) F-centres	
01	(c) Higher polarisation When steam is passed	over red hot iron, the	Substances formed a	re:
21.	(a) $\operatorname{Fe}_2 \operatorname{O}_3 + \operatorname{H}_2$	(b) $Fe_3O_4 + H_2$	(c) $FeO + H_2$	(d) $FeO + H_2 + O_2$
20	() 2 0			
22.	Verdigris is : (a) Basic copper aceta	ite	(b) Basic lead aceta	ate
	(c) Basic lead		(d) None	
22	Corrosive sublimate is	:	() II O	(4) II- Cl
			(c) Hg ₂ Cl	(d) Hg_2Cl_3
24	(a) HgCl ₂ The product of I ⁻ with	n MnO 4 in alkaline me	edium is :	
				(d) IO_4^-
	(a) I_2 Which of the following	a is the correct formul	la for a compound of	scandium and oxygen?
25.	Which of the following	(b) ScO	(c) Sc_3O_2	(d) Sc_2O_3
	(a) Sc ₂ O	ith aqua-regia gives :	529	
26	(a) Sc ₂ O Mercury on heating w	(b) HgCl ₂	(c) $Hg(NO_2)_2$	(d) Hg_2Cl_2
	(a) $Hg(NO_3)_2$	(0)8-2		
27	Chloroplatinic acid is	(b) dibasic	(c) tribasic	(d) tetrabasic
	(a) monobasic	(0)		

382 INORGANIC CHEMISTRY

20.	(a) Mercurous ion		ncorrect?			
		is diamagnetic and	exists as d	imer Hg 2+		
	(c) Mercurous ion			02		
		allic bond between	two Hg + io	ons		
29.	Fe is made passive		J			
3	(a) dil. H ₂ SO ₄	<i>J</i> .	(b)	dil. HCl		
	(c) conc. HNO ₃			conc. H ₂ SO ₄		
30	9	A	25-22-25	_		
30.	$Na_2CO_3 + Fe_2O_3$	$\xrightarrow{-}$ A+CO ₂ what				
	(a) NaFeO ₂			Na ₃ FeO ₃		
91	(c) Fe ₃ O ₄		(b)	Na ₂ FeO ₂		
31.	Ferrous sulphate or	n heating gives:	4.5	00		
	(a) SO ₂ and SO ₃			SO ₂ only		
22	(c) SO ₃ only	11		H ₂ S only		
	Photographic films (a) silver oxide	or plates have				
	(c) silver thiosulph	anto		silver bromide		
33	In comparison of fe			silver nitrate		
33.	(a) more stable	errous saits, terric sa		less stable		
	(c) equally stable			none of these		
34	Chrome yellow is o	hemically known as		none of these		
54.	(a) lead chromate	inclinically known as		lead sulphate		
	(c) lead iodide			basic lead acetate		
35.	. 100	h is not characterist				
00.	(a) variable oxidat			tendency to form	com	nleves
	(c) formation of co			none of these	COIII	pickes
36.	Iron is protected by					
	(a) Cu	(b) Zn	(c)		(d)	Mg
37.	An oxide of copper	which is red in col-	our has the	formula:	(-)	0
	(a) CuO	(b) Cu ₂ O		CuO ₂	(d)	Cu ₂ O ₂
38.		es, as the atomic nu	mber increa	ases, paramagnetis		202
	(a) increases gradu					
	(b) decreases gradu					
	(c) first increases to		then decrea	ses		
	(d) first decreases					
39.	The formula of azu	rite is :				
	(a) CuCO ₃ ·Cu(OH)2	(b)	2CuCO ₃ ·Cu(OH)	2	
	(c) CuCO ₃ · 2Cu(OI		(d)	CuSO ₄ ·Cu(OH) ₂		
40.	Oxide of metal catio			and the second s		
	(a) Al^{3+}	(b) Cr ³⁺	2.00	Fe ³⁺	(d)	Zn 2+
41.	The most abundant	transition metal in	earth crus	t is:		
	(a) Zn	(b) Fe	(c)		(d)	Au

d-Block Elements 383

42.	CuSO ₄ solution + lime is called :			
			(b) Bafoed's reagent	
	(c) Fehling solution A		(d) Bordeaux mixture	
43.	Preparation of looking mirrors involves the use of:			
	(a) red lead (b) ammonical silver nitrate (c) ammonical AgNO ₃ + red lead (d) ammonical AgNO ₃ + red lead + HCHO			
	(c) ammonical AgNO	₃ + red lead	(d) ammonical AgNO	3 + red lead + HCHO
44.	When ammonia is added to a cupric salt solution, the deep blue colour is observed it is due to			
	the formation of:	(b) [Cu(NH ₃) ₄] ²⁺	() (0 (11 0) (2011)	12+ (d) [Cu(H ₀ O), 1 ²⁺
45.	Philosopher's wool wh			(d) BaZnO ₂
	(a) $BaCdO_2$ (b) $Ba + ZnO_2$ (c) $BaO_2 + Zn$ (d) $BaZnO_2$ The electrons which take part in order to such his variable evidation states by transition			eates by transition metals
46.	The electrons which take part in order to exhibit variable oxidation states by transition metals are:			
	(a) ns only		(b) $(n-1) d$ only	
	47/1724 T.			
	(c) ns and $(n-1)$ d only but not np (d) $(n-1)$ d and np only but not ns . On heating $ZnCl_2 \cdot 2H_2O$, the compound obtained is:			
47.	the state of the s			(d) ZnH ₂
	(a) ZnCl ₂	(b) Zn(OH) ₂	(c) ZnO	(4)
48.	During estimation of			(d) MnSO ₄
	(a) KMnO ₄	(b) oxalic acid	(c) K ₂ SO ₄	(4) 1.220 4
49.	Iron is rendered passi		(c) conc. HNO ₃	(d) HCl
	(a) H ₂ SO ₄ (dil.) (b) H ₂ PO ₄ (c) conc. HNO ₃ (d) HG When KMnO ₄ solution is added to hot oxalic acid solution, the decolorisation is slow in the			
50.	beginning but becomes instantaneous after some time. This is because:			
	(a) Mn ²⁺ acts as auto catalyst		(b) CO ₂ is formed	
	(c) Reaction is exothermic		(d) MnO ₄ catalysis the reaction	
51.	(a) Auric chloride	olves in a aqua-regia forming : (b) Aurous chloride		
		(u) Autous intrate		
52	The solubility of silver bromide in hypo solution is due to the formation of			ation of:
	(a) Ag ₂ SO ₂	(b) $Ag_2S_2O_3$	(c) [13(0203)]	(d) $[Ag(S_2O_3)_2]^{3}$
52	Metal used for makin	ng joints in jewellery is	:	()
				(d) Cd
54.	1 1- not chow variable valency because.			
	a 1 baballe	are completely inter		
	() .1i- d cubchells a	are partially inice		
	(d) they are relative	y soit metale	ency because :	
55	(d) they are relatively soft metals Zn and Cd metals do not show variable valency because: (a) They have only two electrons in the outermost subshells			
	1 - anitt fW/) PIP(II UII) III III UII			
	(a) They have only two electrons (b) Their d-subshells are completely filled (c) Their d-subshells are partially filled			
	(c) Their d-substients are partially (d) They are relatively soft metals			
	(d) They are relative	-,		

Level 2

		The region of the state of the	No. of Street,	
1.	Which of the followin	ng is called Wilkinson's	catalyst ?	
	(a) [Ph ₃ P) ₃ RhCl]		(b) $TiCl_4 + (C_2H_5)_3 A$	Al
	(c) $(C_2H_5)_4Pb$		(d) $[PtCl_2(NH_3)_2]$	
2.	Which of the following	ig is not a consequence	of the Lanthanoid con	tractions
		s have a higher IE ₁ tha	n 3d or 4d series	
	(b) Zr and Hf have a	comparable size		
		together in the earth on the sixth period element		
3.	A metal M and its cor	nnound can give the fo	llowing observable chai	nges in a consequence of
	reactions		The same of the sa	T NECONOMICIOS
	M	$\xrightarrow{\text{dilute}} \begin{bmatrix} \text{Colourless} \\ \text{solutions} \end{bmatrix}$	NaOH White precipitate	
	Г	l H₂S	Γ .] exces	s
		White ← 2	− [Colourless solution] ← exces	aq.)
	L	precipitate		
	(a) Mg	(b) Pb	(c) Zn	(d) Sn
4.	Sodium thiosulphate			n photographic films by
			, the coordination numl	
	(a) 2	(b) 4	(c) 6	(d) 8
5.		(b) V(OH) ₄	the +V oxidation state (c) VO ²⁺	e except : (d) [VO ₃ ·OH] ²⁻
_	(a) VO ₂ ⁺	(-) ()4	ith gaseous ammonia fo	
ь.			(c) [Hg(NH ₃) ₄]Cl ₂	
7.				copper scrap and dilute
	H ₂ SO ₄ . Dilute HNO ₃	is also added:		
			rm CuSO ₄ with dilute	
		iron (III) sulphate, w	hich remains in solution	on after crystallisation of
	CuSO ₄	onisation of H ₂ SO ₄ to	give SO ² - ions	
	Cu ²⁺			xture and oxidises Cu to
8.			he amphoteric characte	r of Zn(OH) ₂ ?
	Set $1 : Zn(OH)_2(s)$ an			
	Set 2 : Zn(OH) ₂ (s) an			
	Set 3: $Zn(OH)_2(s)$ an			
	Set $4 : Zn(OH)_2(s)$ an	$dNH_3(aq)$	(-) 0 1 :	
	(a) 1 and 2	(b) 1 and 3	(c) 2 and 4	(d) 3 and 4

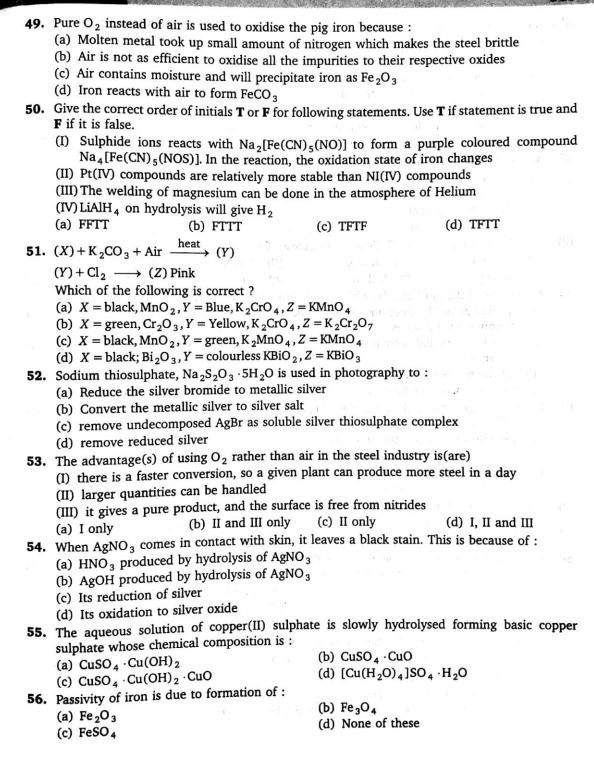
9.	The false statement abo	out iron (III) hydroxid	le is that :	
	(a) it is a weaker base	than Fe(OH) ₂		
	(b) with concentrated	KOH, it forms a comp	$lex K_3[Fe(OH)_6]$	
	(c) it gradually loses w	ater and transforms i	nto Fe ₂ O ₃	
	(d) it exhibits amphote	eric properties with its	predominating acidic	nature
10.	$AgNO_3 \xrightarrow{\Delta} (W) + (X)$	()+0,		
	$(X) + H_2O \longrightarrow HNO$	+ HNO		
	$(Y) + Na_{\circ}S_{\circ}O_{\circ}(evcess)$	10 + 11 ₂ 0		No. 20 Telephone State of the S
	Identify (W) to (Z).	$(2) + NaNO_3$		
		O V - AcNO 7 - No	[100]	
	(b) $W = Ag_{\bullet}O X = NC$	$V = AgNO_3 Z = Na$	$1_2[Ag(S_2O_3)_2]$	
	(c) $W = Ag$ $X = NC$	$V = AgNO_3 Z = N_0$	$a_3[Ag(S_2O_3)_2]$	
	(d) $W = Ag_0O X = N_0$	V = AgNO Z = Nc	13[Ag(S ₂ O ₃) ₂]	
11.				one react with
				ils react with .
				(d) I only
12.				
12.				
	- 1 miles and a respect to the state of the control of the contro			
		•		
	species in solution			
		rdination complex of	the metal ion with hyd	rochloric acid
	(d) protonation of the	metal ion		
13.	Limestone is present in	the blast furnace pro	duction of iron in orde	er to :
	(I) provide a source of	CaO		
	(II) remove some impu	ırities		
	(III) supply CO ₂			t p ² -y
	(a) I, II, III		(c) II, III	(d) I only
14.	Paramagnetism is not e	exhibited by :		
	(a) CuSO ₄ ·5H ₂ O	y - 1	(b) CuCl ₂ ·5H ₂ O	
	(c) CuI		(d) NiSO ₄ -6H ₂ O	
15.	Which of the compariso	on regarding Zn, Cd,	Hg is/are incorrect?	
-0.	(I) 70Cl is ionic whe	reas CdCl ₂ and HgCl ₂	are covalent	
	(II) 7n and Cd dissolve	es in dilute acid (HCl)	liberating H ₂ but Hg	can not
	(III) Zn and Cd formin	g with ppt. of Zn(OH	$)_2$ and Cd(OH) $_2$ but H	Ig forms coloured ppt. of
	Hg(OH) ₂	- postorii		
	(IV) all form A ₂ ²⁺ type	ion		
		HNO ₂ + HNO ₃ $_3 \longrightarrow Y + NO + H_2O$ $_2O_3(\text{excess}) \longrightarrow (Z) + NaNO_3$ W to (Z). $_3 \times N_2O Y = \text{AgNO}_3 Z = \text{Na}_2[\text{Ag}(S_2O_3)_2]$ $_3 \times N_2O Y = \text{AgNO}_3 Z = \text{Na}_3[\text{Ag}(S_2O_3)_2]$ $_3 \times N_2O Y = \text{AgNO}_3 Z = \text{Na}_3[\text{Ag}(S_2O_3)_2]$ $_3 \times N_2O Y = \text{AgNO}_3 Z = \text{Na}_3[\text{Ag}(S_2O_3)_2]$ $_3 \times N_2O Y = \text{AgNO}_3 Z = \text{Na}_3[\text{Ag}(S_2O_3)_2]$ go $_2O \times N_2 Y = \text{AgNO}_3 Z = \text{Na}_3[\text{Ag}(S_2O_3)_2]$ ion state of copper changes when aqueous copper (II) ions react with: aq) (II) Fe(s) (III) KI(aq) I (b) II only (c) II, III (d) I only but solution of transition metal salt changes colour from pink to blue, when ed hydrochloric acid is added to it. The change in colour is due to: ion of hydrogen that changes the oxidation state of the metal ion ion of hydrogen that changes the oxidation state of the metal ion ion of a coordination number of the metal ion from 6 to 4 and formation of new in in solution ion of a coordination complex of the metal ion with hydrochloric acid lation of the metal ion is present in the blast furnace production of iron in order to: a source of CaO the comparison regarding turnace production of iron in order to: 5 to 2 I (b) I, II (c) II, III (d) I only thism is not exhibited by: 5 to 2 I (b) CuCl ₂ 5t ₂ O (d) NiSO ₄ 6t ₂ O the comparison regarding Zn, Cd, Hg is/are incorrect? is ionic whereas CdCl ₂ and HgCl ₂ are covalent if Cd dissolves in dilute acid (HCl) liberating H ₂ but Hg can not d Cd forming with ppt. of Zn(OH) ₂ and Cd(OH) ₂ but Hg forms coloured ppt. of II (b) I, III, IV (c) I and III (d) all of these on in which the oxidation state of the central atom is same as its group number in		
16	(a) only III	the oxidation state of	the central atom is sai	ne as its group number in
10.	The oxoanion in which	ше одишения		or and be a special and and
	the periodic table is:	(b) VO ₂	(c) MnO_4^{2-}	(d) $Cr_2O_7^{2-}$
	(a) SO_4^{2-}	•= 7 1000 #	per (55) 7 <u>8</u> 5	<i>=</i> ,

INORGANIC CHEMISTRY

17.	Which compound is for	ormed when iron reac		
	(a) FeC ₂	(b) Fe ₃ C	(c) FeC ₃	(d) Fe_2C
18.	Which of the followin	g compound can prod	luce Riemann's green	n with Co(NO ₃) ₂ solution?
	(a) ZnO		(b) $3Zn(OH)_2 \cdot Zr$	1CO ₃
	(c) ZnSO ₄		(d) All of these	
19.	Which of the following	g electronic configurat	ion is associated with	the highest stable oxidation
	state?			
	(a) $[Ar] 3d^1 4s^2$	(b) $[Ar] 3d^5 4s^1$	(c) $[Ar] 3d^5 4s^2$	(d) $[Ar] 3d^6 4s^2$
20.	A blood red colour is	obtained when ferric	chloride solution rea	acts with:
	(a) KCN	(b) KSCN	(c) $K_4[Fe(CN)_6]$	(d) $K_3[Fe(CN)_6]$
21.	Metal-metal bonding	is more frequent in 4		
		nalpies of atomisation		
			ticipates in the meta	1-metal bond formation
	(c) their ability to in	volve both ns and $(n -$	-1) d electrons in the	bond formation
	(d) the comparable s	size of 4d and 5d serie	es elements	
22.				sition series respectively are
	obtained with:	•		
	(a) Cr and Zn	(b) Cr and Cd	(c) Cr and Hg	(d) Mo and Cd
23.				ed with ammonia, the blue
		es on evaporation. The		
		·H ₂ O (square planar)		
		(Octahedral)		
24.				erter due to the reaction :
	(a) $2Cu_2O \longrightarrow 4C$		(b) 2CuO + CuS	
		→ 6Cu + SO ₂		
25.	The compound in wh			
		(b) (CH ₃ COO) ₂ Ni		(d) $NiCl_2(PPh_3)_2$
26.	A metal M which is	not affected by strong	g acids like conc. Hi	NO ₃ , conc. H ₂ SO ₄ and conc.
	solution of alkalies li	ke NaOH, KOH forms	MCl_3 , which finds us	e for tanning in photography
	The metal M is:	4) 11	(A)	
	(a) Ag	(b) Hg	(c) Au	(d) Cu
27 .		s reddish brown precip	oitate with potassium	ferrocyanide. The formula of
	the precipitate is:	(b) Cu [Fo(CN)]	(a) C., [F-(CM)	
		(b) Cu ₂ [Fe(CN) ₆]		
28.		ig electronic configura	non would be associa	ited with the highest magnetic
	moment? (a) [Ar] 3d ⁸	(b) $[Ar] 3d^3$	(c) [Ar]3d ⁶	(4) 14 20 17
				(d) $[Ar] 3d^7$
29.	The correct statemen			
		ation state of iron is +		
	(II) that the iron sho	ows +2 oxidation stat	with six electrons	in the 3d orbitals
		adation state of iron is		ed electrons in the 3d orbital
	(a) I, II, III	(b) I, II	(c) II, III	(d) I only

30.	Many transition metals form interstitial compounds. The characteristics of these interstitial compounds are :
	(I) They have high melting points, higher than those of pure metals
	(II) They are very hard
	(III) They retain metallic conductivity
	(IV) They are chemically more reactive than the pure metals
	(a) I, II, III (b) I, III (c) II, IV (d) IV only
31.	Technetium, the element below manganese in the Periodic Table, would be expected to have
	high values for its:
	(I) melting point (II) boiling point (III) density
	(a) I, II, III (b) I, II (c) II, III (d) I only
32.	All Zn(+II) compounds are white because:
	(a) Zn^{2+} has a d^{10} configuration and the <i>d</i> -subshell is full
	(b) Zn^{2+} shows d-d transition
	(c) Zn ²⁺ has no electron in the 4s-subshell
	(d) Zn is not a transition element
33.	Identify the wrong statement regarding copper sulphate :
	(a) It reacts with KI to give I ₂
	(b) It reacts with KCl to give Cl ₂
	(c) It's tartarate complex reacts with NaOH and glucose to give Cu ₂ O
	(d) It gives CuO on strong heating in air
34.	The transition metals exhibit higher enthalpies of atomisation due to:
	(a) their ability to show variable oxidation states
	(b) the presence of incompletely filled d-subshell
	(c) their ability to exist in the solid state with unpaired electrons(d) strong interatomic interaction aries because of having large number of unpaired electrons
	in their atoms
	Which of the following statements are correct about Zn, Cd and Hg?
35.	(I) they exhibit high enthalpies of atomisation as the d-subshell is full
	(I) they exhibit high children of the children
	(III) Compound of Zn, Cd and Hg are paramagnetic in nature
	(IV) Zn, Cd and Hg are called soft metals
	(a) I II III (b) I, III (c) II, IV (d) IV only
36	When mercury (II) chloride is treated with excess of stannous chloride, the products obtained
30.	are:
	(a) liquid Hg and SnCl ₄ (b) Hg ₂ Cl ₂ and SnCl ₄
	(c) $\operatorname{Hg}_{2}\operatorname{Cl}_{2}$ and $[\operatorname{SnCl}_{4}]^{2-}$ (d) Liquid Hg and $[\operatorname{SnCl}_{4}]^{2-}$
27	Which of the following is NOT a characteristic of the transition elements in the series from
37.	scandium to zinc?
	() The formation of coloured cations
	(b) The presence of at least one unpaired electron in a a-orbital of a cation
	(a) The ability to form complex ions
	(d) The possession of an oxidation state of +1
	(m) **** L

	Spiegeleisen is an al	All The Control of th						
	(a) Cu + Zn + Ni	(b) Ni + Cr	(c) Mn + F		(d) Fe	+ Cr + Ni		
39.	The treatment of zin			es:		+		
	(a) NO	(b) N ₂ O	(c) NO ₂		(d) NH	4		
Ю.	Sodium chromate, N	a ₂ CrO ₄ is made	commercially by:					
	(a) heating mixture					C		
			and sodium carbona	te in the	presence	or oxygen		
	(c) heating sodium	dichromate with	sodium carbonate					
1	(d) reacting NaOH							
••	Anhydrous mercurou	is chioride can i	be prepared by :					
	(a) the reduction of(b) the reaction of I	IngCl ₂ with Ha	12 solution	11	1			
	(c) the reaction of I		mount of Cl.					
40. So (a) (b) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d	(d) the reaction of 1							
2.	When aqueous sodiu			solution	of chromi	um (III) ions, a		
			l which re-dissolves to					
	colour is due to:		· · · · · · · · · · · · · · · · · · ·					
	(a) $[Cr(H_2O)_6]^{3+}$	•	(b) CrO ₄ ²⁻					
	(c) [Cr(OH) ₄] ⁻		(d) [Cr(OH]	(H ₂ O)	3]			
3.	HgCl ₂ is a covalent compound, sparingly soluble in water, the solubility increases by the							
	addition of chloride					•		
	(a) common ion eff	ect	(b) formati	on of cor	nplex [Hg	Cl ₄] ²⁻		
	(c) weakening of H		(d) strong i					
4.	Amongst TiF ₆ ²⁻ , CoF	3-, Cu ₂ Cl ₂ and I	NiCl ₄ - the colourless	species a	re:			
	(a) CoF ₆ ³⁻ and NiCl	2-	(b) TiF ₆ ²⁻ a	nd CoF ₆	-,			
	(c) Cu ₂ Cl ₂ and NiC		(d) TiF ₆ ²⁻ a	1.50				
_	Which of the follow	- I I I I I I I I I I I I I I I I I I I		-	4	O) 13+ 2		
J.	(-) DM=(H O) 14+	(b) [Mn(H ((c) [Fe(H ₂ () 1 ³⁺	(4) [C.	20)6] !		
						I(H ₃ N) ₄]-		
5.	Silver nitrate solution	n is kept in bro	wn dotties in laborate	ory becau	ıse :			
	(a) it reacts with or							
	(b) brown bottles co	not react with	it mant unrough			200		
	(c) brown bottles do not react with it (d) ordinary bottles catalyse its decomposition							
_	Copper is very slowly			iving a gr	een coatin	a afriandiania is		
/.	(a) Cu ₂ O	Oxidised on the	(b) CuCO ₃		cen coatii	ig of verdigits is		
	(c) Cu(CH ₃ COO) ₂ .	Cu(OH)	(d) CuSO ₄					
٥	Fe(OH) ₂ is precipita				turns dark	green and the		
σ.	brown due to the fo	rmation of:			Turno darr	Siccii and the		
	(a) Fe(OH) ₂ and Fe		(b) only Fe	(OH) ₃				
			(d) Fe_2O_3					



INORGANIC CHEMISTRY 57. Zinc carbonate is precipitated from zinc sulphate solution by the addition of : (a) Na₂CO₃ (b) CaCO₃ (c) MgCO₃ (d) NaHCO₃ 58. Mark the correct statements: (a) Hg forms an amalgam with iron (b) Hg vapour is non-poisonous (c) Hg is mono atomic and monovalent in mercurous compound (d) Oxysalts of mercury are thermally unstable 59. Mercury is the only metal which is liquid at 0°C. This is due to its: (a) Very high ionisation energy and weak metallic bond (b) Low ionisation potential (c) High atomic weight (d) High vapour pressure 60. A white precipitate of AgCl dissolves in excess of : (I) $NH_3(aq)$ (II) Na₂S₂O₃ (III) NaCN (a) III only (b) I, II, III (c) I, II (d) I only **61.** In context of the lanthanoids, which of the following statements is not correct? (a) Availability of 4f electrons results in the formation of compounds in +4 state for all the members of the series (b) There is a gradual decrease in the radii of the members with increasing atomic number in the series (c) All the members exhibit +3 oxidation state (d) Because of similar properties the separation of lanthanoids is not easy 62. Properties common to the elements manganese, iron, cobalt, nickel and copper include the ready formation by them all of (I) coloured ions in aqueous solution (II) oxides of nitrogen are formed on reaction with concentrated HNO 3 (III) chlorides of formula MCl2 and MCl3 (b) I, II (c) II, III (a) I, II, III (d) I only 63. Which of the following process is not associated with steel making? (b) Open-Hearth process (a) Bessemer process (d) Auto-oxidation (c) Kaldo process 64. Oxygen in absorbed by molten Ag, which is evolved on cooling and the silver particles are

(b) spitting of silver

(d) hairing of silver

scattered, this phenomenon is known as:

65. Which of the following statements regarding copper salts is not true?

(d) The water of crystallization of copper sulphate is five

(a) Copper (I) disproportionates to copper and copper (II) ion in aqueous solution

(b) Copper (I) can be stablised by the formation of insoluble complex compounds such as

(a) silvering of mirror

CuCl₂ and Cu(CN)₂

(c) Copper (II) oxide is red powder

(c) frosting of silver

d-Block Elements

66.	Zinc (II) ion on reaction with NaOH first give NaOH due to the formation of :	a white precipitate which dissolves in excess of
	(a) ZnO (c) [Zn(OH) ₄] ²⁻	(b) Zn(OH) ₂ (d) [Zn(H ₂ O) ₄] ²⁺
	(c) II, III	requires the addition of : (II) transition elements (IV) silica (b) I, II (d) I only
68.	(a) NO gas (c) N ₂ gas	rates: Which is the following and the dollar was a specific and the dollar was a specific and the dollar was a specific and the specific and t
69.	Which of the following double salt does not	
	(a) $(NH_4)_2SO_4 \cdot CuSO_4 \cdot 6H_2O$	(b) $(NH_4)_2SO_4 \cdot FeSO_4 \cdot 6H_2O$
	(c) (NH ₄) ₂ SO ₄ · ZnSO ₄ · 6H ₂ O	(d) $(NH_4)_2SO_4 \cdot NiSO_4 \cdot 6H_2O$
70	When steam is passed over red hot iron, the	•
/0.	(a) $Fe_2O_3 + H_2$	(b) H ₂ + FeO
		(d) $\text{Fe}_3\text{O}_4 + \text{H}_2\text{O}$
71	(c) Fe ₃ O ₄ + H ₂ The oxoanion which contains all equivalent	
/1.	(I) CrO_4^{2-} (II) MnO_4^{-}	(III) Cr ₂ O ₇ ²
	* .	300 300 III
	(a) III only	(b) I, II, III
	(c) I, II	(d) I only
72.	In the extraction of silver by Mac-Arther cyal added as a flux. The function of KNO ₃ is: (a) to oxidise Ag in the native form to Ag ⁺	anide process, a small amount of KNO ₃ is also
	(a) to oxidise Ag in the native form to the	San
	 (b) to oxidise lead and zinc impurities (c) to form a complex with Ag⁺ which is th 	en reduced to metallic silver by using zinc
	(c) to form a complex with Ag which is the	confedence to include silver by using zinc
	(d) to oxidise the sulphur in the argentite o	re to SO ₂ which escapes from the reaction
73.	$FeCr_2O_4 + Na_2CO_3 + O_2 \xrightarrow{Fusion} [X] \xrightarrow{H}_2$	$\xrightarrow{\frac{1}{Q}} [Y] \xrightarrow{H_2Q_2/H^*} [Z]$
	solution into Cr and dioxygen (c) Saturated solution of [Y] gives bright concentrated H ₂ SO ₄	the compounds [X], [Y] and [Z]? is in +6 oxidation state inpound which decomposes rapidly in aqueous it orange compound, chromic anhydride, with
74.	(d) All of these CuSO _(aq.) $\xrightarrow{H_2S\uparrow} M \downarrow \xrightarrow{\text{Excess}} N + O$	
	Then final products N and O are respectively	y.
	(a) [Cu(CN) ₄] ³⁻ , (CN) ₂	(b) CuCN, (CN) ₂
	(a) $[Cu(CN)_4]^{2^-}$, $(CN)_2$	(d) Cu(CN) ₂ , K ₂ S
	(c) [Cu(CN)4] , (3.7)2	

75. Consider the following transformation:

$$2CuX_2 \xrightarrow{Room temperature} 2CuX + X_2 \uparrow$$

Then X^- can be :

(a) F-, Br-

(b) Cl-, Br-

(c) CN-, I-

(d) Cl-, F-

76. Acidified permanganate solution does not oxidize :

(a) $C_2O_4^{2-}$ (aq.)

(b) $NO_3^-(aq.)$

(c) S^{2-} (aq.)

(d) F⁻(aq.)

77. Which of the following solid salt on heating with solid $\rm K_2Cr_2O_7$ and conc. $\rm H_2SO_4$ orange red vapours are evolved which turn aquous NaOH solution yellow?

(a) NaBr

(b) NaCl

(c) NaNO₃

(d) NaI

Level 3

PASSAGE 1

In salts of polyatomic anion, as polarising power of cation increases, thermal stability of the salt decreases and decomposed species may further undergo redox reaction.

1.	Which of	the	following	species	undergoes	non-redox	thermal	decomposition	reaction	OI
	heating?		Į.							

(a) FeSO₄

(b) SnSO₄

(c) H₂C₂O₄

(d) Na₂HPO₄

2. Water soluble salt (x) was heated into three products A, B and C and B and C are two different paramagnetic gases. A is red in hot condition, then salt (x) is:

(a) $Hg(NO_3)_2$

(b) FeC₂O₄

(c) ZnSO₄

(d) $Pb(NO_3)_2$

PASSAGE 2

Light green (Compound 'A') $\xrightarrow{\Delta}$ White Residue (B) $\xrightarrow{\text{High}}$ C + D + E

(i) 'D' and 'E' are two acidic gas.

(ii) 'D' is passed through HgCl2 solution to give yellow ppt.

(iii) 'E' is passed through water first and then H2S is passed, white turbidity is obtained.

(iv) A is water soluble and addition of HgCl₂ in it, yellow ppt is obtained but white ppt does not turn into grey on addition of excess solution of 'A'.

1. 'D' and 'E' are respectively.

(a) SO₂ and SO₃

(b) SO₃ and SO₂

(c) SO_2 and CO_2

(d) CO₂ and CO

2. Yellow ppt in the above observation is:

(a) Mercuric oxide

22 2 3

(c) Basic mercury (II) sulphate

(b) Basic mercury (II) sulphite(d) Mercuric iodide

3. 'C' is soluble in :

(a) dil. HCl

(b) dil. H₂SO₄

(c) conc. CH₃COOH

(d) Boiled conc. HCl

4. The no. of water of crystallisation in 'A' is :

(a) 0

(b) 2

(c) 7

(d) 5

PASSAGE 3

Transition metal and their compounds are used as catalysts in industry and in biological system. For example, in the Contact Process, vanadium compounds in the +5 state (V_2O_5 or VO_3^-) are used to oxidise SO_2 to SO_3 :

$$SO_2 + \frac{1}{2}O_2 \xrightarrow{V_2O_5} SO_3$$

It is thought that the actual oxidation process takes place in two stages. In the first step, V^{5+} in the presence of oxide ions converts SO_2 to SO_3 . At the same time, V^{5+} is reduced to V^{4+} .

$$2V^{5+} + O^{2-} + SO_2 \longrightarrow 2V^{4+} + SO_3$$

In the second step, V^{5+} is regenerated from V^{4+} by oxygen :

$$2V^{4+} + \frac{1}{2}O_2 \longrightarrow 2V^{5+} + O^{2-}$$

The overall process is, of course, the sum of these two steps:

$$SO_2 + \frac{1}{2}O_2 \longrightarrow SO_3$$

- 1. Transition metals and their compounds catalyse reactions because :
 - (a) they have completely filled s-subshell
 - (b) they have a comparable size due to poor shielding of d-subshell
 - (c) they introduce an entirely new reaction mechanism with a lower activation energy
 - (d) they have variable oxidation states differ by two units
- 2. During the course of the reaction:
 - (a) catalyst undergoes changes in oxidation state
 - (b) catalyst increases the rate constant
 - (c) catalyst is regenerated in its original form when the reactants form the products
 - (d) all are correct
- 3. Catalytic activity of transition metals depends on :
 - (a) their ability to exist in different oxidation states
 - (b) the size of the metal atoms
 - (c) the number of empty atomic orbitals available
 - (d) none of these
- 4. Which of the following ion involved in the above process will show paramagnetism?
 - (a) V^{5+}
- (b) V4
- (c) 0^{2}
- (d) VO3

PASSAGE 4

 $\rm MnO_2$ is the most important oxide of manganese. $\rm MnO_2$ occurs naturally as the black coloured mineral pyrolusite. It is an oxidising agent, and decomposes to $\rm Mn_3O_4$ on heating to 530°C. It is used in the preparation of potassium permanaganate and in the production of $\rm Cl_2$ gas. Over half a million tonnes per year of $\rm MnO_2$ is used in dry batteries.

1.	In the laboratory, MnO_2 is made by : (a) heating Mn in O_2	
	(b) oxidising Mn ²⁺ in air	
,715	(c) electrolytic oxidation of MnSO ₄	t garage while up to
	(d) precipitating MnO ₂ from solution when medium	n performing titration of KMnO ₄ in alkaline
2.	When MnO ₂ is fused with KOH in the presen	nce of air, the product formed is:
	(a) purple colour KMnO ₄	(b) green colour K ₂ MnO ₄
	(c) colourless MnO ₄	(d) purple colour K ₂ MnO ₄
3.	MnO_2 dissolves in concentrated HCl to form	gragos sound willo (c)
	(a) Mn ⁴⁺ ion and Cl ₂ so section or nation	(b) Mn ²⁺ ion and Cl ₂
4.	In which of the following species, the colour	is due to charge transfer?
	(I) [M-(OII) 12- (II) M 02-	CITY IN CO.
lovi	(a) I, II, III correct	(b) II. IV correct
	(c) I, III correct	(d) only IV correct
	The property of the property of the	
P	60101	Mn in O ₂ g Mn ²⁺ in air yrtic oxidation of MnSO ₄ ating MnO ₂ from solution when performing titration of KMnO ₄ in alkaline of the product formed is a colour KMnO ₄ (b) green colour K ₂ MnO ₄ (colour KMnO ₄ (d) purple colour K ₂ MnO ₄ (d) purple colour K ₂ MnO ₄ (d) purple colour K ₂ MnO ₄ (d) only [MnCl ₄] ²⁻ (d) only [MnCl ₄] ²⁻ (d) only [MnCl ₄] ²⁻ (d) only [MnO ₂ (IV) KMnO ₄ (d) purple colour K ₂ MnO ₄ (d) only [MnO ₄ (d) only [MnCl ₄] ²⁻ (d) only [MnO ₂ (IV) KMnO ₄ (d) only IV correct (e) (e) (e) (e) (f) (f) (f) (f) (f) (f) (f) (f) (f) (f
	Most of the Fe (+II) salts are pale green and	contain $[Fe(H_2O)_6]^{2+}$ ion. $Fe(+11)$ compounds
	K ₄ [Fe(CN) ₆] notation On the disk course and	to obtain pure Fe form many complexes like
	K4[Fe(CN)6]. nothing O.H thiw count not	1. What of the cocur when addified CrO; and one of the cocur.
1.	Anhydrous FeCl ₂ is made by:	1. What charges occur when acidified GrO; and anionness of the solution turns blue
	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl	enid anno nointles to me (b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas
	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl	enid anno nointles to me (b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas
	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl (c) reacting Fe with conc. HCl K ₃ [Fe(CN) ₆] is used in the detection of Fe ²⁴	(b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas ion with which it gives a deep blue colour. This
	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl (c) reacting Fe with conc. HCl K ₃ [Fe(CN) ₆] is used in the detection of Fe ²⁴ colour is due to the formation of:	(b) heating Fe with gaseous HCl (in) with which it gives a deep blue colour. This
2.	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl (c) reacting Fe with conc. HCl K ₃ [Fe(CN) ₆] is used in the detection of Fe ²⁴ colour is due to the formation of: (a) K ₂ Fe[Fe(CN) ₆]	(b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas ion with which it gives a deep blue colour. This (b) Fe ₄ [Fe(CN) ₆] ₃ (d) Fe ₃ [Fe(CN) ₆] ₂
2.	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl (c) reacting Fe with conc. HCl K ₃ [Fe(CN) ₆] is used in the detection of Fe ²⁴ colour is due to the formation of: (a) K ₂ Fe[Fe(CN) ₆] (c) Fe[Fe(CN) ₆]	(b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas ion with which it gives a deep blue colour. This (b) Fe ₄ [Fe(CN) ₆] ₃ (d) Fe ₃ [Fe(CN) ₆] ₂ and nitrites. In this test, a freshly prepared FeSO ₄
2.	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl (c) reacting Fe with conc. HCl K ₃ [Fe(CN) ₆] is used in the detection of Fe ²⁴ colour is due to the formation of: (a) K ₂ Fe[Fe(CN) ₆] (c) Fe[Fe(CN) ₆] FeSO ₄ is used in brown ring test for nitrates	(b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas ion with which it gives a deep blue colour. This (b) Fe ₄ [Fe(CN) ₆] ₃ (d) Fe ₃ [Fe(CN) ₆] ₂ and nitrites. In this test, a freshly prepared FeSO ₄ O ₂ or NO ₃ and the conc. H ₂ SO ₄ is run down the
2.	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl (c) reacting Fe with conc. HCl K ₃ [Fe(CN) ₆] is used in the detection of Fe ²⁴ colour is due to the formation of: (a) K ₂ Fe[Fe(CN) ₆] (c) Fe[Fe(CN) ₆] FeSO ₄ is used in brown ring test for nitrates	(b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas ion with which it gives a deep blue colour. This (b) Fe ₄ [Fe(CN) ₆] ₃ (d) Fe ₃ [Fe(CN) ₆] ₂ and nitrites. In this test, a freshly prepared FeSO ₄ O ₂ or NO ₃ and the conc. H ₂ SO ₄ is run down the tor is shaken,
2.	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl (c) reacting Fe with conc. HCl K ₃ [Fe(CN) ₆] is used in the detection of Fe ²⁴ colour is due to the formation of: (a) K ₂ Fe[Fe(CN) ₆] (c) Fe[Fe(CN) ₆] FeSO ₄ is used in brown ring test for nitrates solution is mixed with solution containing N side of the test tube. If the mixture gets ho	(b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas ion with which it gives a deep blue colour. This (b) Fe ₄ [Fe(CN) ₆] ₃ (d) Fe ₃ [Fe(CN) ₆] ₂ and nitrites. In this test, a freshly prepared FeSO ₄ O ₂ or NO ₃ and the conc. H ₂ SO ₄ is run down the tor is shaken, (II) NO is evolved
2.	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl (c) reacting Fe with conc. HCl K ₃ [Fe(CN) ₆] is used in the detection of Fe ²⁴ colour is due to the formation of: (a) K ₂ Fe[Fe(CN) ₆] (c) Fe[Fe(CN) ₆] FeSO ₄ is used in brown ring test for nitrates solution is mixed with solution containing N side of the test tube. If the mixture gets ho	(b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas ion with which it gives a deep blue colour. This (b) Fe ₄ [Fe(CN) ₆] ₃ (d) Fe ₃ [Fe(CN) ₆] ₂ and nitrites. In this test, a freshly prepared FeSO ₄ O ₂ or NO ₃ and the conc. H ₂ SO ₄ is run down the tor is shaken, (II) NO is evolved
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2.	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl (c) reacting Fe with conc. HCl K ₃ [Fe(CN) ₆] is used in the detection of Fe ²⁴ colour is due to the formation of: (a) K ₂ Fe[Fe(CN) ₆] (c) Fe[Fe(CN) ₆] FeSO ₄ is used in brown ring test for nitrates solution is mixed with solution containing N side of the test tube. If the mixture gets ho (I) the brown colour disappear (III) a yellow solution of Fe ₂ (SO ₄) ₃ is form (a) I, II, III correct	(b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas ion with which it gives a deep blue colour. This (b) Fe ₄ [Fe(CN) ₆] ₃ (d) Fe ₃ [Fe(CN) ₆] ₂ and nitrites. In this test, a freshly prepared FeSO ₄ O ₂ or NO ₃ and the conc. H ₂ SO ₄ is run down the tor is shaken, (II) NO is evolved med (b) I, III correct (d) only I correct
2.	Anhydrous FeCl ₂ is made by: (a) heating Fe with dilute HCl (c) reacting Fe with conc. HCl K ₃ [Fe(CN) ₆] is used in the detection of Fe ²⁴ colour is due to the formation of: (a) K ₂ Fe[Fe(CN) ₆] (c) Fe[Fe(CN) ₆] FeSO ₄ is used in brown ring test for nitrates solution is mixed with solution containing N side of the test tube. If the mixture gets ho (I) the brown colour disappear (III) a yellow solution of Fe ₂ (SO ₄) ₃ is form (a) I, II, III correct	(b) heating Fe with gaseous HCl (d) heating Fe with Cl ₂ gas ion with which it gives a deep blue colour. This (b) Fe ₄ [Fe(CN) ₆] ₃ (d) Fe ₃ [Fe(CN) ₆] ₂ and nitrites. In this test, a freshly prepared FeSO ₄ O ₂ or NO ₃ and the conc. H ₂ SO ₄ is run down the tor is shaken, (II) NO is evolved med (b) I, III correct (d) only I correct

PASSAGE 6

Iron forms iron halide salts by reacting the metal directly with halogen. FeI₃ does not exist. FeF₃ is white solid inspite of five unpaired electrons with d^5 configuration. FeCl₃ is soluble in water and is used as a mordant in dyeing industry.

- 1. FeI₃ does not exist because:
 - (a) of large size
 - (b) Fe³⁺ oxidises I⁻ to I₂
 - (c) of low lattice energy
 - (d) iodine is not highly electronegative enough to oxidise Fe to Fe³⁺
- 2. Anhydrous FeCl₃ can be prepared by reaction of :
 - (a) Fe with dry chlorine

- (b) Fe with dil. HCl in the presence of O2
- (c) Fe(OH)3 with conc. HCl
- (d) Fe₂O₃ with conc. HCl
- **3.** FeCl₃ solution added to K₄[Fe(CN)₆] gives A while with KSCN gives B. A and B respectively are:
 - (a) $Fe_3[Fe(CN)_6]_2$, $Fe(CNS)_3$
- (b) Fe₄[Fe(CN)₆]₃, KFe(CNS)₃
- (c) $Fe_4[Fe(CN)_6]_3$, $K_3[Fe(CNS)_6]$
- (d) $Fe_4[Fe(CN)_6]_3$, $K_3[Fe(SCN)_6]$



ONE OR MORE ANSWERS IS/ARE CORRECT

- 1. What changes occur when acidified CrO₄²⁻ ion reacts with H₂O₂ solution in presence of ether solvent?
 - (a) Orange colour of solution turns blue
 - (b) Oxidation state of Cr-atom decreases
 - (c) Oxidation state of Cr-atom remains constant
 - (d) Orange colour of solution turns green
- 2. Mercury is a liquid at 0°C because of:
 - (a) very high ionisation energy
- (b) weak metallic bonds
- (c) high heat of hydration
- (d) high heat of sublimation
- 3. An element of 3d-transition series shows two oxidation states x and y, differ by two units then:
 - (a) compounds in oxidation state x are ionic if x > y
 - (b) compounds in oxidation state x are ionic if x < y
 - (c) compounds in oxidation state y are covalent if x < y
 - (d) compounds in oxidation state y are covalent if y < x
- 4. The metal oxide which decomposes on heating is/are:
 - (a) ZnO

(b) Al₂O₃

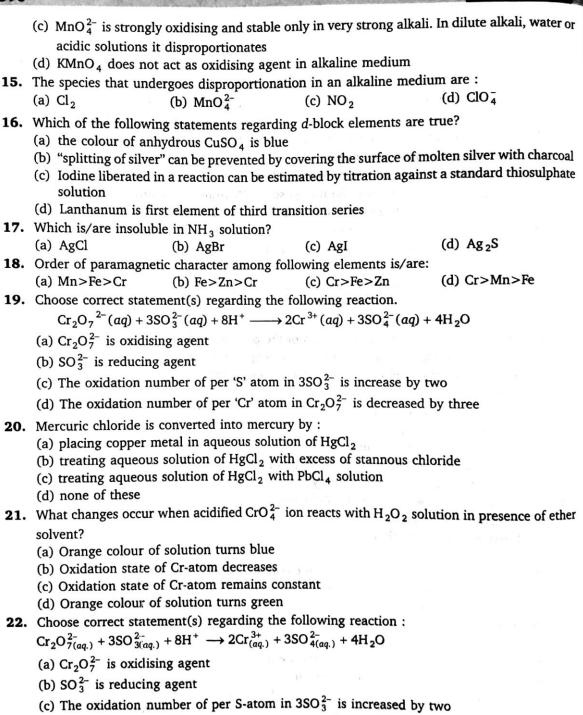
(c) Ag_2O

(d) HgO

397

- 5. Which of the following acids attack(s) on copper and silver? (a) dilute HNO₃ (b) dilute HCl (c) conc. H₂SO₄ (d) aqua regia 6. Which of the following statements are true for Mohr's salt? (a) it decolourizes KMnO₄ solution (b) it is a double salt (c) it is colourless salt (d) it is a primary standard substance 7. Which of the following statement(s) is/are correct? (a) The chief ore of zinc is cinnabar (b) Mac-Arther's process is used to extract silver (c) Na₂S₂O₃ is used to remove the unexposed AgBr from the photographic films (d) Nessler's reagent is a complex of zinc in +2 oxidation state 8. Roasting of copper pyrites is done: (a) to remove moisture and volatile impurities (b) to oxidise free sulphur (c) to decompose pyrites into Cu₂S and FeS (d) to decompose Cu₂S into blister copper 9. Identify the correct statements: (a) Iron belongs to first transition series of the periodic table (b) The purest form of commercial iron is wrought iron (c) Anhydrous ferrous sulphate is called as yellow vitriol (d) Iron is the most abundant transition metal 10. Which statements about mercury are correct? (a) Hg is a liquid metal (b) Hg forms two series of salts (c) Hg forms no amalgam with iron and platinum (d) Hg does not show variable valency 11. Which statements about corrosive sublimate (HgCl₂) are correct? (a) It sublimes on heating (b) It oxidises stannous chloride (c) It is highly poisonous (d) It is prepared by heating mercury in chlorine 12. Which statements are correct regarding copper sulphate? (a) It reacts with NaOH and glucose to give Cu2O (b) It reacts with KCl to give Cu2O (c) It gives CuO on heating in air (d) It reacts with KI to give brown colouration 13. To an acidified dichromate solution, a pinch of Na 2O 2 is added and shaken. What is observed?
- (a) Blue colour (b) Orange colour changing to green (c) Copious evolution of oxygen (d) Bluish-green precipitate
- 14. Pick out the correct statement(s):
 - (a) MnO₂ dissolves in conc. HCl, but does not form Mn⁴⁺ ions
 - (b) Decomposition of acidic KMnO₄ is not catalysed by sunlight

398



(d) The oxidation number of per Cr-atom in Cr₂O_{7(aq.)} is decreased by three



Entries of Column-I are to be matched with entries of Column-II. Each entry of Column-I may have the matching with one or more than one entries of Column-II.

 Column-I contains four statements following reason and Column-II consists of four options P, Q, R, S

Answer the following:

- $P \rightarrow If$ both statement and reason are true and reason is correct explanation of statement.
- $Q \rightarrow If$ both statement and reason are true and reason is not correct explanation of statement.
- $R \rightarrow If$ statement is correct and reason is incorrect.
- $S \rightarrow If$ both statement and reason are incorrect.

Column-I	Column-II
(A) Statement : The reaction of oxalic acid with acidified KMnO ₄ is first slow and then speeds up by itself. Reason : KMnO ₄ decomposes into MnO ₂ in sunlight.	(P)
 (B) Statement: Anh. ZnCl₂ can't be made by heating ZnCl₂·2H₂O. Reason: It undergoes hydrolysis to produce Zn(OH)₂ and HCl. 	(Q)
(C) Statement : KMnO ₄ is not used as a primary standard substance. Reason : It is deliquescent in nature.	(R)
(D) Statement : K ₂ Cr ₂ O ₇ has orange colour due to polarisation. Reason : In dichromate ion all Cr—O bonds are identical.	(8)

2.	Column-I	Column-II
	(A) Kipp's apparatus waste	(P) (NH ₄) ₂ SO ₄ ·FeSO ₄ ·6H ₂ O
	(B) Green coloured compound	(Q) Cu(OH) ₂ ·CuCO ₃
	(C) leave(s) brown residue on heating	(R) FeSO ₄ solution
	(D) leave(s) black residue on heating	(S) CuCl ₂ ·2H ₂ O

400 INORGANIC CHEMISTRY

3. Column-I

Wxyz

(A) $\mathbf{w} \text{MnO}_{4}^{-}(aq) + \text{xIO}_{3}^{-}(aq) + \text{H}_{2}\text{O}(l)$ $\longrightarrow \text{yMnO}_{2}(s) + \text{zIO}_{4}^{-}(aq) + 2\text{OH}^{-}(aq)$ (B) $\mathbf{w} \text{Cu}(\text{OH})_{2}(s) + \text{xN}_{2}\text{H}_{4}(aq)$ $\longrightarrow \mathbf{y} \text{ Cu}(s) + \text{zH}_{2}\text{O}(l) + \text{N}_{2}(g)$ (C) $\text{CrO}_{4}^{-}(aq) + \text{wFe}(\text{OH})_{2}(s) + \text{xH}_{2}\text{O}(l)$ $\longrightarrow \mathbf{y} \text{Fe}(\text{OH})_{3}(s) + \text{zCr}(\text{OH})_{4}^{-}(aq) + \text{OH}^{-}(aq)$ (D) $\mathbf{w} \text{ClO}_{4}^{-}(aq) + \text{xH}_{2}\text{O}_{2}(aq)$ $\longrightarrow \mathbf{y} \text{ ClO}_{2}^{-}(aq) + \text{zH}_{2}\text{O}(l) + 2\text{O}_{2}(g)$ (S) 2, 3, 2, 3

4.	Column-I	Column-II
	(A) Co ²⁺ (aq)	(P) Pink / light pink
	(B) Mn ²⁺ (aq)	(Q) Purple
	(C) V ²⁺ (aq)	(R) Outer orbital complex and magnetic moment = $\sqrt{15}$ BM.
	(D) Ti ³⁺ (aq)	(S) Inner orbital complex and magnetic moment = $\sqrt{3}$ BM.
		(T) Paramagnetic

2, 1, 1, 3

ASSERTION-REASON TYPE QUESTIONS

These questions consists of two statements each, printed as assertion and reason, while answering these questions you are required to choose any one of the following responses.

- (A) If both assertion and reason are true and the reason is a correct explanation of assertion
- (B) If both assertion and reason are true but reason is not a correct explanation of assertion
- (C) If assertion is true but the reason is false
- (D) If assertion is false but the reason is true
- 1. Assertion: Melting point of Mn is more than that of Fe.

Reason: Mn has higher number of unpaired e^- than Fe in atomic state.

2. Assertion: $Cu^+_{(aq.)}$ is less stable than $Cu^{2+}_{(aq.)}$ but $Fe^{3+}_{(aq.)}$ is more stable than $Fe^{2+}_{(aq.)}$.

Reason: Half filled and completely filled subshells are more stable.

3. Assertion: Zn gives H2 gas with dil. HCl and also with dil. H2SO4.

Reason : NO₃ ion is reduced in preference to hydronium ion.

4. Assertion KMnO₄ has different equivalent weights in acid, neutral or alkaline medium.

In different medium, change in oxidation number shown by manganese is Reason

altogether different.

 $Cu_{(aq.)}^{2+}$ is more stable than $Cu_{(aq.)}^+$. 5. Assertion:

Electrode potential is more important in determining stable oxidation state Reason

than electronic configuration.

6. Assertion: Concentrated aqueous solution of CuCl₂ is green in colour.

The solution contains two complex ions i.e. $[Cu(H_2O)_4]^{2+}$ and $[CuCl_4]^{2-}$ in Reason

equilibrium.

7. Assertion: KMnO₄ is purple in colour due to charge transfer.

There is no electron present in d-orbitals of manganese in MnO₄. Reason

8. Assertion: CrO₃ reacts with HCl to form chromyl chloride gas.

Chromyl chloride (CrO2Cl2) has tetrahedral shape. Reason

Hg is the only metal which is liquid at 0°C. 9. Assertion:

It has very high I.P. and weak metallic bond. Reason

CuSO₄·5H₂O and FeSO₄·7H₂O are blue and green colour compounds 10. Assertion:

respectively.

Both compounds have their specific colour due to phenomenon of Reason

polarisation of anion.

FeSO₄ and Fe₂(SO₄)₃ undergo intramolecular redox reaction on thermal 11. Assertion:

decomposition.

Both salts give brown solid of Fe₂O₃ after decomposition. Reason

Zn(OH)2is dissolved in both NH4OH and NaOH solution. 12. Assertion

Both NaOH and NH $_4$ OH being basic can dissolve amphoteric Zn(OH) $_2$. Reason

Increasing order of covalent character among given compounds is 13. Assertion :

 $HgCl_2 < CdCl_2 < ZnCl_2$.

Order of size of cations is $Zn^{2+} < Cd^{2+} < Hg^{2+}$. Reason

AgNO₃ reacts with KCN to form white ppt. of AgCN. This white ppt. 14. Assertion:

disappears when excess KCN is added.

AgCN decomposes to form silver-carbide and evolve N $_{\rm 2}$ gas. Reason

Zero and negative oxidation state of d-block metal ion are not possible in their 15. Assertion:

complex compound.

Low oxidation state of metal ions are found when a complex compound has Reason

ligands capable of π -acceptor character in addition to the σ -bonding.

Aquated copper (I) cation undergoes disproportionation as : 16. Assertion:

 $2Cu^{+}_{(aq.)} \rightarrow Cu^{2+}_{(aq.)} + Cu$

Hydration energy of Cu2+ is higher than that of Cu+ which compensates Reason

second ionisation energy of Cu.

402



SUBJECTIVE PROBLEMS

- 1. Calculate the magnetic moment of a high-spin octahedral complex that has six electrons in 3d -orbitals
- 2. How many π -bonds are present in ferrocene ?
- **3.** The magnetic moment of a transition metal ion is found to be 3.87 Bohr Magneton (BM). The number of unpaired electrons present in it is:

ANSWERS

Level

1.	(a)	2.	(a)	3.	(c)	4.	(c)	5.	(b)	6.	(a)	7.	(a)	8.	(b)	9.	(c)	10.	(d)
11.	(a)	12.	(c)	13.	(a)			The second second		16.	4			174 11			(c)	20.	(d)
21.	(b)	22.	(a)	23.	(a)			1236000000000000000000000000000000000000		NUMBER OF STREET		A STATE OF STATE OF					(c)	30.	(a)
31.	(a)	32.	(b)	70 000		Charles and Control		Experience of the second		CONTRACT OF THE						39.			(c)
41.	(b)	42.	(d)			EDMONIAL STREET		Bernard Co. P. J. St. St.		The State of the S	5 100 100-17	BEST DOUBLES						50.	(a)
51.	(c)	52.	(d)	4 5 10 2 1 2 1		Marie Colores of	1	STATE OF STREET STATE OF STREET				Opposition to the state of				(8)	,5	3(4)	1

Level 2

1.	(a)	2.	(d)	3.	(c)	4.	(b)	· 5.	(c)	6.	(a)	7.	(a)	8.	(b)	9.	(b,d)	10.	(c)
11.	(c)	12.	(b)	13.	(b)	14.	(c)	15.	(b)	16.	(d)	17.	(b)	18.	(d)	19.	(c)	20.	(b)
21.	(a)	22.	(b)	23.	(a)	24.	(c)	25.	(a)	26.	(c)	27.	(b)	28.	(c)	29.	(a)	30.	(a)
31.	(a)	32.	(a)	33.	(b)	34,	(d)	35.	(c)	36.	(a)	37.	(a,d)	38.	(c)	39.	(d)	40.	(b)
41.	(b)	42.	(c)	43.	(b)	44.	(d)	45.	(a)	46.	(b)	47.	(c)	48.	(c)	49.	(a)	50.	(b)
51.	(c)	52.	(c)	53.	(d)	54.	(c)	55.	(a)	56.	(b)	57.	(d)	58.	(d)	59.	(a)	60.	(b)
61.	(a)	62.	(b)	63.	(d)	64.	(b)	65.	(c,d)	66.	(c)	67.	(b)	68.	(a)	69.	(a)	70.	(c)
71.	(c)	72.	(b)	73.	(d)	74.	(a)	75.	(c)	76.	(b,d)	77.	(b)						

Level 3

Passage-1	1.	(d)	2.	(d)					and the second
Passage-2	1.	(b)	2.	(c)	3.	(d)	4.	(c)	
Passage-3	1.	(c)	2.	(d)	3.	(a)	4.	(b)	
Passage-4	1.	(d)	2.	(b)	3.	(b)	4.	(d)	
Passage-5	1.	(b)	2.	(d)	3.	(a)			
Passage-6	1.	(b)	2.	(a)	3.	(d)			

One or More Answers is/are correct

7. (b,c) 8. (a,b,c) 1. (a,c) 2. (a,b) 3. (b,c) 4. (c,d) 5. (a,c,d) 6. (a,b,d)

15. (a,b,c) 16. (b,c,d) 9. (a,b,d) 10. (a,b,c,d) 11. (a,b,c,d) 12. (a,c,d) 13. (a,c) 14. (a,c)

17. (c,d) 18. (c,d) 19. (a,b,c,d) 20. (a,b) 21. (a,c) 22. (a,b,c,d)

Match the Column

1. $A \rightarrow Q$; $B \rightarrow P$; $C \rightarrow R$; $D \rightarrow S$ 2. $A \rightarrow R$; $B \rightarrow P, Q, R, \omega$, 3. $A \rightarrow S$; $B \rightarrow R$; $C \rightarrow Q$; $C \rightarrow Q$; $C \rightarrow Q$, $C \rightarrow$ $D \rightarrow Q, S$ $D \rightarrow P$

 $D \rightarrow Q, S, T;$

Assertion-Reason Type Questions

1. (D) 2. (B) 3. (B) 4. (A) 5. (A) 6. (A) 7. (B) 8. (B) 9. (A)

10. (C) 11. (D) 12. (C) 13. (D) 14. (C) 15. (A) 16. (A)

Subjective Problems

1. 4.9 ≈ 5.

2. 6

3. 3

Hints and Solutions

Level 1

1. (a)
$$2\text{CrO}_4^{2-} + 2\text{H}^+ \longrightarrow \text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{O}$$

 $\text{Cr}_2\text{O}_7^{2-} + 2\text{OH}^- \longrightarrow 2\text{CrO}_4^{2-} + \text{H}_2\text{O}$

16. (b)
$$Zn(OH)_2 + 2OH^- \longrightarrow ZnO_2^{2^-} + 2H_2O$$
Acid Base $Zn(OH)_2 + 2H^+ \longrightarrow Zn^{2^+} + 2H_2O$
Base Acid $Zn(OH)_2 + 2H^+ \longrightarrow Zn^{2^+} + 2H_2O$
Salt Water

17. (a)
$$2CrO_4^{2-} + 2H^+ \longrightarrow Cr_2O_7^{2-} + H_2O$$

 $Cr_2O_7^{2-} + 2OH^- \longrightarrow 2CrO_4^{2-} + H_2O$

21. (c) Among d-block elementsMax M.P. of first transition series = CrMin. M.P. of second transition series = Cd

26. (b)
$$MnO_4^- + I^- + H_2O \longrightarrow 2MnO_2 + IO_3^- + 2OH^-$$

29. (b) Chloroplatinic acid is H₂[PtCl₆], which is dibasic.

Level 2

 (a) Wilkinson's catalyst is [RhCl(PPh₃)₃], Red-violet in colour and has square planar structure. It is used for selective hydrogenation of organic molecules at room temperature and pressure.

 $TiCl_4 + (C_2H_5)_3Al$ is Zeigler Natta catalyst. $(C_2H_5)_4Pb$ is an anti-knocking agent. cis-platin is used as an anti-cancer agent]

3. (c)
$$Z_{N} \xrightarrow{\text{dil.HNO}_3} Z_{N}(ZO_3)_2 \xrightarrow{\text{NaOH}} Z_{N}(ZO_3)_2 \xrightarrow$$

8. (b)
$$Zn(OH)_2 + 2OH^- \longrightarrow ZnO_2^{2^-} + 2H_2O$$
 $Salt$ Water
$$Zn(OH)_2 + 2H^+ \longrightarrow Zn^{2^+} + 2H_2O$$
 $Salt$ Water
$$Zn(OH)_2 + 2H^+$$
 $Acid$ Salt Water

17. (b) Interstitial compound Fe₃C (cementide) is formed.

50. (b) Na₂[Fe(NO)(CN)₅] + Na₂S
$$\longrightarrow$$
 Na₄[Fe(CN)₅(NOS)]

51. (c)
$$2\text{MnO}_2 + 2\text{K}_2\text{CO}_3 + \text{O}_2 \xrightarrow{\text{(air)}} \xrightarrow{\Delta} 2\text{K}_2\text{MnO}_4 + 2\text{CO}_2 \uparrow$$

$$2\text{K}_2\text{MnO}_4 + \text{Cl}_2 \longrightarrow 2\text{KMnO}_4 + 2\text{KCl}$$
(Z) 2Pink

74. (a) CuSO_{4(aq.)}
$$\xrightarrow{\text{H}_2S}$$
 2CuS $\xrightarrow{\text{Excess}}$ [Cu(CN)₄]³⁻+(CN)₂↑ (o)

- 75. (c) Cu(CN)₂ and CuI₂ being unstable spontaneously decomposes into CuCN ↓ and CuI ↓ respectively at room temperature.
- **76.** (d) Practically F⁻ ion being very weak R.A. has no reducing property.

77. (b) NaCl_(s) + K₂Cr₂O_{7(s)} + H₂SO₄(few drops)
$$\xrightarrow{\text{Non-redox}}$$
 CrO₂Cl₂ \uparrow + HO

$$\text{CrO}_2\text{Cl}_2 + \text{OH}^-_{(aq.)} \rightarrow \text{CrO}_{4(aq.)}^{2^-} + \text{Cl}^- + 2\text{H}_2\text{O}$$
Yellow solution

Level 3

Passage-1

1. (d)
$$2\text{FeSO}_4 \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + \text{SO}_2 \uparrow + \text{SO}_3 \uparrow$$

 $\text{SnSO}_4 \xrightarrow{\Delta} \text{SnO}_2 + \text{SO}_2 \uparrow$
 $\text{H}_2\text{C}_2\text{O}_4 \xrightarrow{\Delta} \text{CO} \uparrow + \text{CO}_2 \uparrow + \text{H}_2\text{O}$
 $2\text{Na}_2\text{HPO}_4 \xrightarrow{\Delta} \text{Na}_4\text{P}_2\text{O}_7 + \text{H}_2\text{O}$

2. (d)
$$Pb(NO_3)_2 \xrightarrow{\Delta} PbO_{Red in hot} + 2NO_2 \uparrow + \frac{1}{2}O_3$$
Two different Paramagnetic gases

$$\Rightarrow Hg(NO_3)_2 \xrightarrow{\Delta} Hg + 2NO_2 \uparrow + O_2 \uparrow$$

$$\Rightarrow FeC_2O_4 \xrightarrow{\Delta} FeO + CO \uparrow + CO_2 \uparrow$$

$$\Rightarrow ZnSO_4 \xrightarrow{>800^{\circ}C} ZnO + SO_2 \uparrow + \frac{1}{2}O_2 \uparrow$$

One or more Answers is/are Correct

13. (a,c)
$$Cr_2O_7^{2^-} + 10H^+ + 4Na_2O_2 \longrightarrow \bigcup_{O}^{O} Cr \bigcup_{O}^{O} + 8Na^+ + 5H_2O$$
(blue colour)

In the absence of ether or amyl alcohol, CrO_5 in acidic medium decomposes to Cr^{3+} with evolution of oxygen.

$$\begin{array}{c|c}
O & & & \\
C & & & \\
C & & \\
O & & \\$$

- 14. (a, c)
 - (a) $MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$
 - (b) Decomposition of a cidic KMnO_4 is catalysed by sunlight

(c)
$$3K_2MnO_4 + 2H_2O \longrightarrow 2KMnO_4^- + MnO_2 \downarrow + 4KOH$$

green $2KMnO_4^- + MnO_2 \downarrow + 4KOH$

(d) KMnO_4 also acts as an oxidizing agent in alkaline medium :

$$MnO_4^- + 2H_2O + 3e^- \longrightarrow MnO_2 + 4OH^-$$
; $E^\circ = +1.23$ volt

15. (a, b, c)

 MnO_4^{2-} , Cl_2 and NO_2 undergo disproportionation, oxidation and reduction simultaneously take place in the alkaline medium.

$$Cl_2 + 2NaOH \longrightarrow NaCl + NaOCl + H_2O$$

 $2NO_2 + 2NaOH \longrightarrow NaNO_2 + NaNO_3 + H_2O$

 MnO_4^{2-} is stable in strong alkali solution and disproportionates into MnO_4^- and MnO_2 is less basic, Acidic and Neutral medium.

Assertion-Reason Type Questions

3. (B)
$$Zn + 2HCl \longrightarrow ZnCl_2 + H_2 \uparrow$$

 $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2 \uparrow$
 $dil. \longrightarrow 4Zn(NO_3)_2 + N_2O + 5H_2O$

4. (A) KMnO₄ (R.A.) Acidic medium
$$\rightarrow$$
 MnO₄²⁻ (green) MnO₂ (brown)

15. (A) In case of π -acceptor ligands (like CO, NO) zero and negative oxidation state of d-block metal ion is possible due to phenomenon of Synergic bonding.

Subjective Problems

3. $\mu_{\text{eff}} = 3.87 \text{ B. M.} = \sqrt{n(n+2)}$

Hence value of ni.e., no. of unpaired electrons = 3



Level

Assign A, B, C, D from given type of reactions.

A for precipitate formation reaction.

B for precipitate dissolution reaction.

C for precipitate exchange reaction.

D for no reaction.

- 1. $Pb(NO_3)_2 + 2NaOH \longrightarrow Pb(OH)_2 \downarrow + 2NaNO_3$
- 2. $Zn(OH)_2 \downarrow + 2NaOH \longrightarrow Na_2ZnO_2 + 2H_2O$
- 3. $2Na[Al(OH)_4] + CO_2 \longrightarrow 2Al(OH)_3 \downarrow + Na_2CO_3$
- 4. $CuSO_4 + 2NaOH(excess) \longrightarrow Cu(OH)_2 \downarrow + Na_2SO_4$
- **5.** Fe(OH)₃ \downarrow + NaOH(excess) \longrightarrow No reaction
- **6.** $Mg(OH)_2 \downarrow + 2HCl \longrightarrow MgCl_2 + 2H_2O$
- 7. $Mn(NO_3)_2 + 2NaOH \longrightarrow Mn(OH)_2 \downarrow + 2NaNO_3$
- 8. $CH_3COOAg \downarrow + HNO_3 \longrightarrow AgNO_3 + CH_3COOH$
- 9. $Hg(NO_3)_2 + NH_3(soln.) \longrightarrow HgO \cdot HgNH_2NO_3 \downarrow$
- **10.** $Cu(OH)_2 \downarrow +4NH_3(soln.) \longrightarrow [Cu(NH_3)_4]^{2+} +2OH^{-1}$
- 11. $CaC_2O_4 \downarrow + CH_3COOH \longrightarrow No reaction$
- 12. $BaC_2O_4 \downarrow + 2AcOH \longrightarrow Ba(AcO)_2 + H_2C_2O_4$
- 13. $Fe(CN)_2 \downarrow + 4KCN \longrightarrow K_4[Fe(CN)_6]$
- 14. $SrC_2O_4 \downarrow + 2HCl \longrightarrow SrCl_2 + H_2C_2O_4$
- **15.** $Fe(CN)_3 \downarrow + KCN \longrightarrow K_3Fe(CN)_6$
- **16.** $CaSO_3 \downarrow + SO_2 + H_2O \longrightarrow Ca(HSO_3)_2$
- 17. $K_4[Fe(CN)_6] + ZnSO_4 \longrightarrow Zn_2[Fe(CN)_6] \downarrow$

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TYPES OF REACTIONS
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 409
18. 3PbS \downarrow +8HNO_3(dil.) \longrightarrow 3Pb(NO_3)_2 +3S +2NO \uparrow_0 OS_3 A = 100 A =
19. K_4[Fe(CN)_6] + 2CuSO_4 \longrightarrow Cu_2[Fe(CN)_6] \downarrow \hat{} CO + COSA - TOBS
20. MnS \downarrow + 2HCl \longrightarrow MnCl_2 + H_2S \uparrow
21. AgCl \downarrow +2KCN \longrightarrow K[Ag(CN)_2] + KCl
22. HgS \downarrow + Na_2S \Longrightarrow Na_2[HgS_2]
                                                                                                                                                                                                                                             MI 100) 1 18 50 4 - 2000 A F 1550
23. CuSO_4 + 2KCN \longrightarrow CuCN \downarrow + (CN)_2 \uparrow + K_2SO_4 \cap_2 HS
24. FeS \downarrow +2HCl \longrightarrow FeCl<sub>2</sub> + H<sub>2</sub>S \uparrow
                                                                                                                                                                                                                                                                         Caroni - Caroni - H-O
25. Cd(CN)_2 \downarrow + 2KCN \longrightarrow K_2[Cd(CN)_4] \bigcirc H + 1 \bigcirc GO + 1 \bigcirc GO = 1 \bigcirc GO
                                                                                                                                                                                                                                                                                                                                                                                                                           65. CarOHIS
                                                                                                                                                                                                                                                                        0,11+1,000,000-000
 26. 2AgF + MgCl_2 \longrightarrow MgF_2 \downarrow + 2AgCl \downarrow
                                                                                                                                                                                                                                                                  66. Na,SO . - Ball . - - - Ball - - 2NaCl
  27. Pb(NO_3)_2 + 2 KI \longrightarrow PbI_2 \downarrow + 2KNO_3
 28. PbCl_2 \downarrow + Hot water \longrightarrow Pb^2(aq.) + 2Cl^-(aq.) HODAS+ \sqrt{2}dq \leftarrow -2\sqrt{11} + \sqrt{2}dq \leftarrow \sqrt{
                                                                                                                                                                                                                                                                                         68. NaC. + Ago T. -- AgCI L + NaO.
 29. HgI_2 \downarrow + KI \Longrightarrow K_2[HgI_4]
                                                                                                                                                                                                                                                                                                                              69. Mal. - 25 - 18 [Hgt.]
  30. AgI \downarrow +2Na_2S_2O_3 \longrightarrow Na_3[Ag(S_2O_3)_2] + NaI
                                                                                                                                                                                                                                                                   70. PhOg + HINO (dil.) -- No discolution
 31. CuSO_4 + 2KI \longrightarrow CuI \downarrow + \frac{1}{2}I_2 + K_2SO_4
                                                                                                                                                                                                                                       71. PbDg + HN Conc. + Pb(NO )g + H O
                                                                                                                                                                                                            72. F. Cd(CN) = H_0S = -CdS + 2RCN + 2HCN
   32. KNO_2 + AgF \longrightarrow AgNO_2 \downarrow + KF
  33. BaSO_4 \downarrow + Na_2CO_3 \longrightarrow BaCO_3 \downarrow + Na_2SO_4^{C_2} + Sa_2O_7Od9 \leftarrow - C_2O_7Od9 \leftarrow - C
                                                                                                                                                                                                                                                                                 74. Nam - AgNO - -- AgBr - HaNO.
   34. FeCl_3 + Na_3PO_4 \longrightarrow FePO_4 \downarrow + 3NaCl
   35. BaSO<sub>4</sub> ↓ + dil.HCl (Excess) → No reaction
   36. 2AgNO_3 + Na_2C_2O_4 \longrightarrow Ag_2C_2O_4 \downarrow + 2NaNO_3
    37. 2BaCrO_4 \downarrow + 4HCl \longrightarrow 2BaCl_2 + H_2Cr_2O_7 + H_2O
    38. PbCrO_4 \downarrow + 4NaOH(Excess) \longrightarrow Na_2[Pb(OH)_4]
    39. BaCrO<sub>4</sub> \downarrow + CH<sub>3</sub>COOH (Excess) \longrightarrow No reaction
    40. PbCl_2 \downarrow + H_2SO_4 \Longrightarrow PbSO_4 \downarrow + 2HCl
   41. Ba(NO_3)_2 + Na_2SO_4 \longrightarrow BaSO_4 \downarrow + 2NaNO_3
    42. Pb(NO_3)_2 + H_2SO_4 \longrightarrow PbSO_4 \downarrow + 2HNO_3
    43. SrCrO_4 \downarrow + 2AcOH (Excess) \longrightarrow Sr(AcO)_2 + H_2Cr_2O_7
    44. MCrO_4 \downarrow (M^{2+} = Ba^{2+}Pb^{2+}) + AcOH \longrightarrow No dissolution
    45. CaCl_2 + Na_2C_2O_4 \longrightarrow CaC_2O_4 \downarrow + 2NaCl
    46. CaSO_4 + Pb(NO_3)_2 \longrightarrow PbSO_4 \downarrow + Ca(NO_3)_2
    48. BaCO<sub>3</sub> \downarrow + 2HCl \longrightarrow BaCl<sub>2</sub> + CO<sub>2</sub> \uparrow + H<sub>2</sub>O
    49. AlCl_3 + 3NaOH \longrightarrow Al(OH)_3 \downarrow + 3NaCl
                                                                                                                                                                                                                                                                                                                                                 102. H + - 0 - H + . 02
     50. BaCO<sub>3</sub> \downarrow +CO<sub>2</sub> +H<sub>2</sub>O \longrightarrow Ba(HCO<sub>3</sub>)<sub>2</sub>
                                                                                                                                                                                                                                                                             209 H - 109 H - - O H + 30.4
     51. ZnS \downarrow +2HCl \longrightarrow ZnCl_2 + H_2S \uparrow
     52. NiCl<sub>2</sub> + 2dmg \xrightarrow{\text{NH}_4\text{OH}} Ni(dmg)<sub>2</sub> \downarrow
      53. CaCl_2 + Na_2SO_4 \longrightarrow No reaction
      54. BaCO<sub>3</sub> \downarrow + 2AcOH \longrightarrow Ba(AcO)<sub>2</sub> + CO<sub>2</sub> \uparrow + H<sub>2</sub>O
       55. \operatorname{Na}_{2}\operatorname{S}_{2}\operatorname{O}_{3} + \operatorname{BaCl}_{2} \longrightarrow \operatorname{BaS}_{2}\operatorname{O}_{3} \downarrow + 2\operatorname{NaCl}
```

56. Ba(AcO)₂ + K₂CrO₄ \longrightarrow BaCrO₄ \downarrow + 2AcOK

INORGANIC CHEMISTRY

57.
$$3AgNO_3 + Na_3PO_4 \longrightarrow Ag_3PO_4 \downarrow + 3NaNO_3$$

58.
$$Ag_2CO_3 \downarrow + 2HCl \longrightarrow AgCl \downarrow + CO_2 \uparrow + H_2O$$

59.
$$BaSO_3 \downarrow + H_2SO_4 \longrightarrow BaSO_4 \downarrow + SO_2 \uparrow + H_2O$$

60.
$$HgS \downarrow + HNO_3$$
 (Conc.) \longrightarrow No dissolution

61.
$$Sr(AcO)_2 + Ag_2SO_4 \longrightarrow 2AcOAg \downarrow + SrSO_4 \downarrow$$

62.
$$Ca(OH)_2 + 2HF \longrightarrow CaF_2 \downarrow + 2H_2O$$

63.
$$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 \downarrow + H_2O$$

64.
$$CaSO_3 \downarrow + H_2SO_4 \longrightarrow CaSO_4 + SO_2 \uparrow + H_2O$$

65.
$$Ca(OH)_2 + SO_2 \longrightarrow CaSO_3 \downarrow + H_2O$$

66. Na₂SO₃ + BaCl₂
$$\longrightarrow$$
 BaSO₃ \downarrow + 2NaCl

67.
$$Pb(AcO)_2 + H_2S \longrightarrow PbS \downarrow + 2AcOH$$

68. NaCl + AgNO₃
$$\longrightarrow$$
 AgCl \downarrow +NaO₃

69.
$$HgI_2 \downarrow + 2KI \longrightarrow K_2[HgI_4]$$

70.
$$PbO_2 + HNO_3(dil.) \longrightarrow No dissolution$$

71.
$$PbO_2 + HNO_3(Conc.) \longrightarrow Pb(NO_3)_2 + H_2O + [O]$$

72.
$$F_2[Cd(CN)_4] + H_2S \longrightarrow CdS \downarrow + 2KCN + 2HCN$$

73.
$$Pb(AcO)_2 + Na_2CrO_4 \longrightarrow PbCrO_4 \downarrow + 2AcONa$$

74. NaBr + AgNO₃
$$\longrightarrow$$
 AgBr \downarrow + NaNO₃

In the following reactions assign for underlined atom for product of complete hydrolysis at R.T.

- A. If product is oxy acid with -ic suffix.
- B. If product is oxy acid with -ous suffix.
- C. If product are two oxy acids one with -ic suffix and otherone with -ous suffix.
- D. If product is not oxy acid, neither with -ic suffix nor with -ous suffix.

75.
$$\underline{B}_2O_3 + H_2O \longrightarrow H_3BO_3 + H_2O \Longrightarrow H[B(OH)_4] + H^+$$

76.
$$SO_2 + H_2O \longrightarrow H_2SO_3$$

77.
$$BF_3 + H_2O \longrightarrow H_3BO_3 + H[BF_4]$$

78.
$$\underline{\text{T}}eF_6 + H_2O \longrightarrow H_6TeO_6 + HF$$

79.
$$H_4\underline{P}_2O_5 + H_2O \longrightarrow H_3PO_3$$

80.
$$CO + H_2O \longrightarrow No reaction$$

81.
$$SO_3 + H_2O \longrightarrow H_2SO_4$$

82.
$$H_4P_2O_6 + H_2O \longrightarrow H_3PO_3 + H_3PO_4$$

83.
$$BCl_3 + H_2O \longrightarrow H_3BO_3 + HCl$$

84.
$$IF_7 + H_2O \longrightarrow HIO_4 + HF$$

85.
$$CO_2 + H_2O \longrightarrow H_2CO_3$$

86.
$$Cl_2O + H_2O \longrightarrow HClO$$

87.
$$H_4P_2O_7 + H_2O \longrightarrow 2H_3PO_4$$

88.
$$CCl_4 + H_2O \longrightarrow No reaction$$

TYPES OF REACTIONS 411

89.
$$ClF_5 + H_2O \longrightarrow HClO_3 + HF$$

90.
$$\underline{N}_2O + H_2O \longrightarrow No reaction$$

91.
$$\underline{Cl} O_2 + H_2 O \longrightarrow HClO_2 + HClO_3$$

92.
$$H_4 \underline{P}_2 O_8 + H_2 O \longrightarrow H_3 PO_4 + H_2 O_2$$

93.
$$NF_3 + H_2O \longrightarrow No reaction$$

94.
$$\underline{Br}F_5 + H_2O \longrightarrow HBrO_3 + HF$$

95.
$$\underline{N}O + H_2O \longrightarrow No reaction$$

96.
$$\underline{Cl}O_3 + H_2O \longrightarrow HClO_3 + HClO_4$$

97.
$$H\underline{NO}_4 + H_2O \longrightarrow HNO_3 + H_2O_2$$

98.
$$\underline{NCl}_3 + H_2O \longrightarrow HOCl + NH_3$$

99.
$$IF_5 + H_2O \longrightarrow HIO_3 + HF$$

100.
$$\underline{N}_2O_3 + H_2O \longrightarrow HNO_2$$

101.
$$\underline{Cl}_2O_7 + H_2O \longrightarrow HClO_4$$

102.
$$H_3 \underline{P} O_5 + H_2 O \longrightarrow H_3 \underline{P} O_4 + H_2 O_2$$

103.
$$\underline{Si}F_4 + H_2O \longrightarrow H_4SiO_4 + HF$$

104.
$$ICl_3 + H_2O \longrightarrow HIO_2 + HCl$$

105.
$$\underline{N}_2O_4 + H_2O \longrightarrow HNO_3 + HNO_2$$

106.
$$I_2O_5 + H_2O \longrightarrow HIO_3$$

107.
$$H_2SO_5 + H_2O \longrightarrow H_2SO_4 + H_2O_2$$

108.
$$\underline{Si} Cl_4 + H_2O \longrightarrow H_4SiO_4 + HCl$$

109.
$$\underline{CrO}_2Cl_2 + 2H_2O \longrightarrow H_2CrO_4 + 2HCl$$

110.
$$\underline{N}_2O_5 + H_2O \longrightarrow HNO_3$$

111.
$$\underline{P}Cl_3 + H_2O \longrightarrow H_3PO_3 + HCl$$

112.
$$\underline{Cl} F_3 + H_2 O \longrightarrow HClO_2 + HF$$

113.
$$\underline{SiO}_2 + H_2O \longrightarrow No reaction$$

114.
$$H_4\underline{B}_2O_5 + H_2O \longrightarrow H_3BO_3$$

115.
$$H_2S_2O_6 + H_2O \longrightarrow H_2SO_3 + H_2SO_4$$

116.
$$PCl_5 + H_2O \longrightarrow H_3PO_4 + HCl$$

117.
$$ClF + H_2O \longrightarrow HOCl + HF$$

118.
$$\underline{P}_4O_6 + H_2O \longrightarrow H_3PO_3$$

118.
$$\underline{P}_4 O_6 + H_2 O \longrightarrow H_3 BO_3 + H_2 O_2$$

120.
$$H_6 \underline{Si}_2 O_7 + H_2 O \longrightarrow H_4 SiO_4$$

121.
$$\underline{SF_4} + \underline{H_2O} \longrightarrow \underline{H_2SO_3} + \underline{HF}$$

121.
$$\underline{Br}F + H_2O \longrightarrow HBrO + HF$$

123.
$$H_2 \underline{S}_2 O_7 + H_2 O \longrightarrow H_2 SO_4$$

124.
$$H_2 \underline{S}_2 O_8 + H_2 O \longrightarrow H_2 SO_4 + H_2 O_2$$

125.
$$SF_6 + H_2O \longrightarrow No reaction$$

126.
$$ICl + H_2O \longrightarrow HIO + HCl$$

127.
$$P_4O_8 + H_2O \longrightarrow H_3PO_3 + H_3PO_4$$

128.
$$P_4O_{10} + H_2O \longrightarrow H_3PO_4$$

129.
$$\underline{P}_4O_{10} + H_2O \longrightarrow H_3PO_4 + HCI$$

130.
$$IOF_5 + H_2O \longrightarrow HIO_4 + HF$$

131.
$$\underline{P}_4 + \underline{H}_2O \longrightarrow No reaction$$

132.
$$NaH + H_2O \longrightarrow NaOH + H_2 \uparrow$$

133.
$$\underline{B}_2H_6 + H_2O \longrightarrow H_3BO_3 + H_2 \uparrow$$

134.
$$\underline{Cl}_2 + H_2O \longrightarrow HOCl + HCl$$

135.
$$\underline{S}_8 + H_2O \longrightarrow No reaction$$

136.
$$\underline{SOCl}_2 + \underline{H}_2O \longrightarrow \underline{H}_2SO_3 + \underline{HCl}$$

137.
$$SO_2Cl_2 + H_2O \longrightarrow H_2SO_4 + HCl$$

138.
$$\underline{SiH}_4 + \underline{H}_2O \longrightarrow \underline{H}_4SiO_4 + \underline{H}_2$$

139.
$$I_2 + H_2O \longrightarrow No reaction$$

140.
$$\underline{SOF}_4 + H_2O \longrightarrow H_2SO_4 + HF$$

141.
$$\underline{F}_2 + \underline{H}_2 O \longrightarrow HF + O_2$$
 (Ozonide Oxygen)

Assign A, B, C, D from given type of reactions.

A for disproportionation reaction.

B for comproportionation reaction.

C for either intermolecular redox reaction or displacement reaction.

D for either thermal combination redox reaction or thermal decomposition redox reaction.

142.
$$C(s) + O_2(g) \xrightarrow{\Delta} CO_2 \uparrow$$

143.
$$3Mg(s) + N_2(g) \longrightarrow Mg_3N_2$$

144. NaH(s) + H₂O
$$\longrightarrow$$
 NaOH + H₂ \uparrow

145.
$$CuSO_4(aq.) + Zn(s) \longrightarrow ZnSO_4 + Cu \downarrow$$

146. Na(s) + H₂O(
$$l$$
) $\xrightarrow{R.T.}$ NaOH + H₂ \uparrow

147. Ca(s) + H₂O(
$$l$$
) $\xrightarrow{\text{R.T.}}$ Ca(OH)₂ + H₂ \uparrow

148.
$$Mg(s) + H_2O(l) \xrightarrow{Warm} Mg(OH)_2 + H_2 \uparrow$$

149.
$$\operatorname{Fe}(s) + \operatorname{H}_2\operatorname{O}(l) \xrightarrow{\operatorname{Boil}} \operatorname{Fe}_3\operatorname{O}_4 + \operatorname{H}_2 \uparrow$$

150.
$$Zn(s) + 2HCl \longrightarrow ZnCl_2 + H_2$$

151.
$$Mg(s) + 2HCl \longrightarrow MgCl_2 + H_2$$

152.
$$Fe(s) + 2HCl \longrightarrow FeCl_2 + H_2$$

153.
$$Cl_2(g) + KI(aq.) \longrightarrow KCl + I_2$$

154.
$$H_2O_2 \xrightarrow{R.T.} H_2O + \frac{1}{2}O_2$$

155.
$$P_4 + NaOH \longrightarrow PH_3 \uparrow + NaH_2PO_2$$

156.
$$S_8 + NaOH \longrightarrow Na_2S + Na_2S_2O_3$$

157.
$$Cl_2 + NaOH \longrightarrow NaCl + NaOCl$$

158.
$$I_2 + NaOH \longrightarrow NaI + NaOI$$

TYPES OF REACTIONS

159.
$$Pb_3O_4 + HCl(dil.) \xrightarrow{Warm} PbCl_2 \downarrow + Cl_2 + H_2O$$

160.
$$Pb_3O_4 + HNO_3(dil.) \xrightarrow{R.T.} Pb(NO_3)_2 + PbO_2 \downarrow$$

161.
$$PbO_2 + HCl(dil.) \xrightarrow{Warm} PbCl_2 \downarrow + Cl_2 \uparrow + H_2O$$

162.
$$\operatorname{Cr}_2\operatorname{O}_7^{2-} + \operatorname{H}^+ + \operatorname{SO}_3^{2-} \longrightarrow \operatorname{Cr}^{3+}(aq.) + \operatorname{SO}_4^{2-}$$

163.
$$MnO_4^- + H^+ + Br^- \longrightarrow Mn^{2+} (aq.) + Br_2 \uparrow$$

164. Fe²⁺ (aq.) + Cr₂O₇²⁻ + H⁺
$$\longrightarrow$$
 Fe³⁺ (aq.) + Cr³⁺

165.
$$I_2 + S_2O_3^{2-} \longrightarrow I^- + S_4O_6^{2-}$$

166.
$$Cu^{2+}(aq.) + 2I^{-} \longrightarrow CuI \downarrow + \frac{1}{2}I_{2}$$

167.
$$CuO + H_2 \longrightarrow Cu \downarrow + H_2O$$

168.
$$H_3PO_2 + AgNO_2 \longrightarrow Ag \downarrow + H_3PO_4 + NO$$

169.
$$H_3PO_2 + CuSO_4 \longrightarrow Cu \downarrow + H_3PO_4 + HNO_3$$

170. NaNO₃
$$\xrightarrow{\Delta}$$
 NaNO₂ + O₂

171.
$$N_2O_3 \xrightarrow{R.T.} NO + NO_2$$

172.
$$Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2$$
 or $Ca(OCl)Cl$

173.
$$XeF_4 + H_2O \longrightarrow Xe + XeO_3 + HF + O_2$$

174.
$$CO + I_2O_5(s) \longrightarrow CO_2 + I_2$$

174.
$$CO + I_2O_5(S) \longrightarrow CO_2 + I_2$$

175. $FeCr_2O_4 + Na_2CO_3 + O_2 \longrightarrow Fe_2O_3 \downarrow + Na_2CrO_4$

176.
$$MnO_2 + 2KOH + \frac{1}{2}O_2 \longrightarrow K_2MnO_4 + H_2O$$

177.
$$K_2MnO_4 + H^+ \longrightarrow KMnO_4 + MnO_2 \downarrow$$

178.
$$KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2 \uparrow$$

179.
$$K_2Cr_2O_7 \xrightarrow{\Delta} K_2CrO_4 + Cr_2O_3 + O_2 \uparrow$$

180.
$$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 \uparrow + Cr_2O_3 \downarrow + H_2O \uparrow$$

181.
$$NH_4Cl + NaNO_2 \xrightarrow{\Delta} N_2 \uparrow + NaCl + H_2O$$

182.
$$Ba(N_3)_2 \xrightarrow{\Delta} Ba + N_2 \uparrow$$

183.
$$N_2 + O_2 \xrightarrow{\text{High temp.}} NO \uparrow \text{-Heat}$$

184.
$$N_2 + 3H_2 \longrightarrow NH_3$$

185.
$$NH_4NO_3 \xrightarrow{\Delta} N_2O + H_2O$$

185.
$$NH_4NO_3 \longrightarrow N_2O_4 \longrightarrow [Fe(H_2O)_5NO]SO_4$$

186. $NaNO_2 + FeSO_4 + H_2SO_4 \longrightarrow [Fe(H_2O)_5NO]SO_4$

(Ring complex)

187. NO + NO₂
$$\xrightarrow{-11^{\circ}C}$$
 N₂O₃

414

188.
$$Pb(NO_3)_2 \xrightarrow{\Delta} PbO + NO_2 + O_2$$

189.
$$P_4 + 6Cl_2 \xrightarrow{\Delta} PCl_3$$

190.
$$P_4 + 10Cl_2 \xrightarrow{\Delta} PCl_5$$

191.
$$Ag + PCl_5 \xrightarrow{\Delta} AgCl + PCl_3$$

192.
$$Sn + PCl_5 \xrightarrow{\Delta} SnCl_4 + PCl_3$$

193.
$$PCl_5 \xrightarrow{\Delta} PCl_3 + Cl_2$$

194. Red P + Alkali
$$\longrightarrow$$
 Na₄P₂O₆ + P₂H₄

195.
$$H_3PO_3 \xrightarrow{\Delta} H_3PO_4 + PH_3 \uparrow$$

196.
$$\operatorname{Se}_{2}\operatorname{Cl}_{2} \xrightarrow{\Delta} \operatorname{SeCl}_{4} + \operatorname{Se}$$

197.
$$Na_2S + H_2SO_4(Conc.) \longrightarrow S \downarrow + SO_2 + Na_2SO_4$$

198.
$$MnO_2 + NaCl + H_2SO_4(Conc.) \longrightarrow MnSO_4 + Cl_2 \uparrow$$

199. NaBr + MnO₂ + H₂SO₄(Conc.)
$$\longrightarrow$$
 MnSO₄ + Br₂ \uparrow

200.
$$NaI + H_2SO_4(Conc.) \longrightarrow Na_2SO_4 + I_2 \uparrow + SO_2$$

201. NaI + MnO₂ + H₂SO₄(Conc.)
$$\longrightarrow$$
 MnSO₄ + I₂ \uparrow

202. NaNO₃ + H₂SO₄(Conc.)
$$\xrightarrow{\text{Hot}}$$
 Na₂SO₄ + NO₂ \uparrow + O₂ \uparrow

203.
$$\text{Na}_2\text{C}_2\text{O}_4 + \text{H}_2\text{SO}_4(\text{Conc.}) \longrightarrow \text{Na}_2\text{SO}_4 + \text{CO} + \text{CO}_2$$

204.
$$3PbS + 8HNO_3(Dil.) \longrightarrow 3Pb(NO_3)_2 + 3S \downarrow + 2NO + 4H_2O$$

205. S+HNO₃(Dil.)
$$\longrightarrow$$
 H₂SO₄ +NO \uparrow

206.
$$CuSO_4 + Zn(s) \longrightarrow ZnSO_4 + Cu$$

Assign A, B, C, D from given type of reactions.

A for coloured ppt./Black ppt.

B for coloured solution.

C for clear/colourless solution

D for white ppt.

207.
$$2\text{NaOH} + \text{Zn(OH)}_2 \downarrow \longrightarrow \text{Na}_2\text{ZnO}_2 + 2\text{H}_2\text{O}$$

208.
$$Mn(OH)_2 + H_2SO_4 \longrightarrow MnSO_4 + 2H_2O$$

209.
$$2AgNO_3 + 2NaOH \longrightarrow Ag_2O \downarrow + 2NaNO_3 + H_2O$$

210.
$$Cr(OH)_3 \downarrow + NH_3(Excess) \longrightarrow [Cr(NH_3)_6]^{3+}$$

211.
$$CuSO_4 + NH_3(Excess) \longrightarrow [Cu(NH_3)_4]^{2+}$$

212. NiCl₂ + NH₃(Excess)
$$\longrightarrow$$
 [Ni(NH₃)₆]²⁺

213.
$$FeCl_3 + NH_3(Excess) \longrightarrow Fe(OH)_3 \downarrow$$

214.
$$Na_2[Zn(OH)_4] + 4HCl \longrightarrow ZnCl_2 + NaCl + H_2O$$

215.
$$[Cr(NH_3)_6]^{3+} + 6HCl \longrightarrow Cr^{3+}(aq.) + 6NH_4Cl$$

TYPES OF REACTIONS

216.
$$2KCN + Pb(NO_3)_2 \longrightarrow Pb(CN)_2 \downarrow + 2KNO_3$$

217.
$$4KCN + Fe(CN)_2 \downarrow \longrightarrow K_4[Fe(CN)_6]$$

218.
$$3KCN + Fe(CN)_3 \downarrow \longrightarrow K_3[Fe(CN)_6]$$

219.
$$CuSO_4 + KCN(Excess) \longrightarrow K_3[Cu(CN)_4] + \frac{1}{2}(CN)_2$$

220.
$$K_3[Fe(CN)_6] + FeCl_3 \longrightarrow Fe[Fe(CN)_6] \downarrow$$

221.
$$K_3[Fe(CN)_6] + FeCl_2 \longrightarrow Fe_3[Fe(CN)_6]_2 \downarrow$$

222.
$$KI + BiI_3 \downarrow \longrightarrow K[BiI_4]$$

223.
$$2KI + HgI_2 \downarrow \longrightarrow K_2[HgI_4]$$

224. KI + AgNO₃
$$\longrightarrow$$
 AgI \downarrow

225.
$$2KI + FeCl_2 \longrightarrow No reaction$$

226.
$$2KI + CuSO_4 \longrightarrow CuI \downarrow + \frac{1}{2}I_2 + K_2SO_4$$

227. BaCO₃
$$\downarrow$$
 + CO₂ + H₂O \longrightarrow Ba(HCO₃)₂

228.
$$Ba(OH)_2 + CO_2 \longrightarrow BaCO_3 \downarrow + H_2O$$

229. BaSO₃
$$\downarrow$$
 +SO₂ +H₂O \longrightarrow Ba(HSO₃)₂ who expects any contract to be

230.
$$Ba(OH)_2 + SO_2 \longrightarrow BaSO_3 \downarrow + H_2O$$

231.
$$Na_2CO_3 + PbSO_4 \longrightarrow PbCO_3 \downarrow + Na_2SO_4$$

232.
$$\text{Na}_2\text{CO}_3 + \text{Pb}(\text{NO}_3)_2 \longrightarrow \text{PbCO}_3 \downarrow + \text{NaNO}_3$$

233. Na₂CO₃ + KNO₃
$$\longrightarrow$$
 No reaction

234.
$$Na_2CO_3 + AgNO_3 \longrightarrow Ag_2CO_3 \downarrow + NaNO_3$$

235.
$$Na_3PO_4 + Fe_2(SO_4)_3 \longrightarrow FePO_4 \downarrow + Na_2SO_4$$

236.
$$NiCl_2(Solution) + NaNO_3(Solution) \longrightarrow No reaction$$

237.
$$CuSO_4(Solution) + ZnCl_2(Solution) \longrightarrow No reaction$$

238.
$$FeSO_4 + Na_2S \longrightarrow FeS \downarrow$$

239.
$$\operatorname{FeCl}_3 + \operatorname{KI} \longrightarrow \operatorname{Fe}^{2+}(aq.) + \operatorname{KI}_3$$

240. AlCl₃ + Na₃PO₄
$$\longrightarrow$$
 AlPO₄ \downarrow

241.
$$CrCl_3(Solution) + ZnSO_4(Solution) \longrightarrow No reaction$$

241.
$$CrC_3$$
(Solution) + $H_2Cr_2O_7 + Na_2SO_4$
242. $Na_2CrO_4 + HCl \longrightarrow H_2Cr_2O_7 + Na_2SO_4$

243.
$$K_2Cr_2O_7 + NaOH \longrightarrow CrO_4^2$$

244.
$$Na_2CrO_4 + AgF \longrightarrow Ag_2CrO_4 \downarrow + NaF$$

245.
$$KMnO_4 + NaNO_3 \longrightarrow No$$
 reaction

246.
$$MnSO_4 + Sr(NO_3)_2 \longrightarrow SrSO_4 \downarrow$$

246.
$$MnSO_4 + Sr(NO_3)_2 \longrightarrow Sloc_4$$

247. $ZnSO_4(Solution) + MgCl_2(Solution) \longrightarrow No reaction$

249.
$$(NH_4)_2SO_4 + Ba(OH)_2 \longrightarrow BaSO_4 \downarrow + 2NH_3 \uparrow$$

249.
$$(NH_4)_2SO_4 + Ba(OH)_2 \longrightarrow SrSO_4 \downarrow + 2NH_3 \uparrow$$

250. $(PH_4)_2SO_4 + Sr(OH)_2 \longrightarrow SrSO_4 \downarrow + 2NH_3 \uparrow$

1 (25) 1

1.	. Which of the following metal nitrate produces g solution?	gaseous product v	when reacts with KCN
		$d(NO_3)_2$	(d) $Pb(NO_3)_2$
2.	. Which of these reaction is correct?		
	(a) $Cl^- + Br_2 \longrightarrow Br^- + Cl_2$,:ä	
	(b) Mohr's salt $\xrightarrow{\text{NaOH solution}} \text{NH}_3 \uparrow (g)$		
	1.5		
	(c) $K_2Cr_2O_7$ solution $\xrightarrow{SO_3}$ Green colour solution	1	
	(d) $FeCl_2 \xrightarrow{NaOH}$ (ppt. coloured) $\xrightarrow{Excess NaOH}$ Sol	luble complex	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
3.	3. Compound which on heating produces paramagnet	tic acidic gas?	
	(a) $Mg(NO_3)_2$ (b) $Fe_2(SO_4)_3$ (c) F	eCO ₃	(d) HgC_2O_4
4.	 Which compound on heating produces coloured me 	etal oxide finally?	
	(a) $Al_2(SO_4)_3$ (b) H	$\frac{1}{3}$ GCO ₃ 3Hg(OH) ₂	
	(a) $Al_2(SO_4)_3$ (b) For a constant (CO) (c) $Cu(NO_3)_2$ (d) B (c) $Cu(NO_3)_2$ (d) B (d) CO (coloured solution)	Ba(OH) ₂	2811
5.	6. $P + BaCl_2 \longrightarrow Q \downarrow + R$ (Coloured solution) (Coloured solution)		
	(winte)	death, the end	0.
	Then salt 'P' in above reaction is: $(P' \cap P')$	1000 m e - 1	V
_	(a) Na ₂ CrO ₄ (b) ZnSO ₄ (c) C		
6.	5. Oxygen gas is not produced from the following dec		on:
	(a) $K_2Cr_2O_7 \xrightarrow{\Delta}$ (b) A	$Ag_2C_2O_4 \xrightarrow{\Delta}$	
	(c) $Pb(NO_3)_2 \xrightarrow{\Delta}$ (d) A	$Ag_2CO_3 \xrightarrow{\Delta}$	
7.	Consider the following reaction and select incorrect	t statement about	gas (P) :
	$Zn + HNO_3(Dilute) \longrightarrow Zn(NO_3)$	$_2 + P \uparrow$	
	(a) Gives neutral solution in water (b) (Contains more O ₂	than Air
	(c) Forms Brown ring with FeSO ₄ solution (d) I		
8.	8. Which of the following ionic/molecular species do	es not disproporti	onate in water at room
	temperature? (a) NO ₂ (b) Cu ⁺ (c) N	vr-∞2-	
	(a) NO_2 (b) Cu^{\dagger} (c) NO_2	MnO ₄ ²⁻	(d) Ca(OCl)Cl
9.	9. Which halogen oxidizes water at room temperature	but does not und	ergo disproportionation
	into it? (a) F_2 (b) Cl_2 (c) F_2	Qr.	(4) *
10	0. Which of the following combination doesn't evolve	Cl rac 2	(d) 1 ₂
LU.		HCl + MnO ₂	
		$HCl + F_2$	
11.	1. Which of the following combination does not liber	•	
		Heating of NH ₄ Cl	
		Li ₃ N + H ₂ O	

 $I^-(aq.) + MnO_4^-(aq.) \xrightarrow{\text{Neutral or}} Y + MnO_2$

 $MnO_4^-(aq.) + Mn^{2+}(aq.) \xrightarrow{ZnSO_4} Z + 4H^+$

Products X, Y and Z are respectively:

(c) FeS (d) Cr_2S_3

PC + Percent) - A Blue colour ppr

(b) MnS

22. $I^{-}(aq.) + MnO_{4}^{-}(aq.) \xrightarrow{H^{+}} X + Mn^{2+}(aq.)$

(a) ZnS

(a)
$$I_2$$
, IO_3^- , MnO_2^- (b) IO_3^- , I_2 , MnO_2^- (c) I_2 , IO_3^- , MnO_4^{2-} (d) IO_3^- , I_2 , MnO_4^{2-}

23. Br₂ + NaOH $\xrightarrow{R.T.} Y + Z$

If Y gives precipitate with AgNO₃, then Z does not undergo reaction with:
(a) $Cr^{3+}(aq.)$ (b) $Fe^{2+}(aq.)$ (c) $AI^{3+}(aq.)$ (d) $Sn^{2+}(aq.)$

24. $(P) \xrightarrow{\Delta} (Q)$ metallic solid $+(R) \uparrow + (S) \uparrow$
 $P \& X$ are respectively:
(a) AgNO₃, LiNO₃ (b) AgNO₃, Pb(NO₃)₂
(c) $H_3 c(NO_3)_2$, Ca(NO₃)₂ (d) NaNO₃, Zn(NO₃)₂

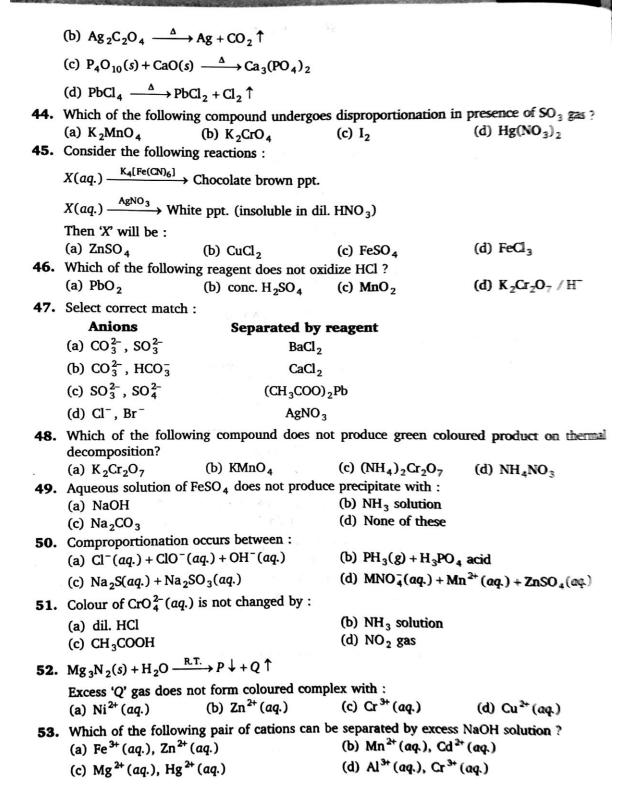
25. Iodine is not oxidized to Iodic acid/iodicanhydride by:
(a) conc. HNO₃ (b) conc. $H_2 SO_4$ (c) Excess CI_2 water (d) conc. $H_3 PO_4$

26. Colourless gas that has oxidising as well as reducing properties:
(a) CO_2 (b) SO_2 (c) NO_2 (d) SO_3

27. Pb + dil. HNO₃ $\xrightarrow{Wamm} P + Q \uparrow + H_2 O$
incorrect statement for Q is:
(a) Paramagnetic colourless gas
(b) It is oxidized to paramagnetic coloured gas by air
(c) It combines with $Fe_2(SO_4)_3$
(d) It is also obtained by disproportionation of HNO₂

28. Which reaction has positive value of ΔG^o ?
(a) $F_2 + H_2 O \xrightarrow{R.T.} + CIH + HOCI$
(c) $CI_2 + H_2 O \xrightarrow{R.T.} + CIH + HOCI$
(c) $CI_2 + H_2 O \xrightarrow{R.T.} + CIH + HOCI$
(d) $CI_2 + H_2 O \xrightarrow{R.T.} + CIH + HOCI$
(e) $CI_2 + H_2 O \xrightarrow{R.T.} + CIH + HOCI$
(f) $CI_2 + H_2 O \xrightarrow{R.T.} + CIH + HOCI$
(g) $CI_2 + H_2 O \xrightarrow{R.T.} + CIM + CIH + CIH$

32.	In which of the following reaction SO ₂ gas is not produced?
	(a) $S_8 + \text{conc. H}_2SO_4 \xrightarrow{\text{Warm}}$
	(b) $S_8 + \text{conc. } HNO_3 \xrightarrow{\text{Warm}} O_3 \stackrel{\text{Warm}}{\longrightarrow} O_3 \text{W$
	A
	CO 106 1 22 20 20 20 3 Gosanon appropriate cognobrar analysis of the control of t
	(u) $res_2 + O_2 \longrightarrow$
33.	Which metal gives NH ₄ NO ₃ , when react with dilute HNO ₃ acid?
	(a) Zn (b) Pb (c) Cu (d) Au
34.	Select the salt whose aqueous solution is not green:
	(a) FeSO ₄ (b) CrCl ₃ (c) NiCl ₂ (d) MnCl ₂
35.	Select the ion exchange reaction, which proceeds to forward direction in aqueous medium:
	(a) $2AgCl + CaF_2 \xrightarrow{Aqueous} 2AgF + CaCl_2$
	(b) BaSO ₄ + 2NaOH $\xrightarrow{\text{Aqueous}}$ Ba(OH) ₂ + Na ₂ SO ₄ \longrightarrow and (b)
	(c) $Pb(NO_3)_2 + 2CH_3COONa \xrightarrow{Aqueous} Pb(OAc)_2 + 2NaNO_3$
	Anons Separated by research
	(d) $Na_2CIO_4 + BaCI_2 \longrightarrow BaCIO_4 + 2NaCI$
36.	Which of the following metal hydroxide is not soluble in excess of NH ₃ solution?
	(a) $Fe(OH)_2$ (b) $Ni(OH)_2$ (c) $Cd(OH)_2$ (d) $Cu(OH)_2$
37.	Which of the following combination of reagents does not undergo redox reaction in aqueous medium?
1	(a) SnCl ₂ + HgCl ₂ does neets extracted from (b) CuSO ₄ + KCN to be tent to find W .84
	(d) $Ag_0O + SO_0$
38.	$K_4[Fe(CN)_6] + M^{x+}(aq.) \longrightarrow M_4[Fe(CN)_6]_x \downarrow$ Coloured precipitate
	Fig. 18 18 Colonica Presidente de la la 18 18 18 18 18 18 18 18 18 18 18 18 18
	Which of the following cation does not respond to the above reaction? (d) None of these
	(a) $Cu^{2+}(aq.)$ (b) $Fe^{3+}(aq.)$ (c) $Zn^{2+}(aq.)$ (d) None of these
39.	Sodium salt solution + AgNO ₃ soln. — Coloured precipitate.
	If coloured precipitate is soluble in both dil. HNO ₃ and excess conc. NH ₃ solution then which of the following anion is present in the salt solution?
	of the following anion is present in the salt solution? (a) $S^{2-}(aq.)$ (b) $I^{-}(aq.)$ (c) $PO_{4}^{3-}(aq.)$ (d) $Br^{-}(aq.)$
	(a) S ² (aq.) (b) I (uq.)
40.	Chlorine gas is not produced by heating: (a) SOCl ₂ (b) PbCl ₄ (c) FeCl ₃ (d) Hg ₂ Cl ₂
4	(a) SOCl ₂ (b) FBCl ₄ (c) FBCl ₂ (d) Hg ₂ Cl ₂ Which of the following anion does not produce precipitate with BaCl ₂ solution however gives
41.	
	(a) C_{2}^{2} (a) (b) $C_{2}O_{4}^{2}$ (aq.) (c) $MnO_{4}(aq.)$ (d) S_{2}^{2} (aq.)
42.	Which of the following compound is completely water soluble?
	(h) Ba(OH) ₂ (C) Al(OH) ₂ (U) Car ₂
43.	Which chemical reaction contains incorrect products?
	(a) $SnSO_4 \xrightarrow{\Delta} SnO_2 + SO_3 \uparrow + SO_2 \uparrow$



54. Consider following reaction	n:
---------------------------------	----

$$Cl_2(g) + H_2O \xrightarrow{R.T.} P + Q$$

If molecular weight of P is less than Q then incorrect statement is:

- (a) On warming 'P' can form deep red coloured vapours with CrO₃
- (b) 'Q' exhibits bleaching property
- (c) MnO₂ can change 'P' into Cl₂ gas on warming
- (d) 'P' reacts with H2S gas while 'Q' does not good brace not galworld and to
- **55.** Which of the following reagent can dissolves precipitate of HgS↓?
 - (a) NH₃ solution

(b) conc. HCl

(c) conc. HNO₃

(d) Na₂S solution

KNO

- **56.** Which of the following reaction is incorrect?
 - (a) $PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl$ may all willidules galacerons by
 - (b) $NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$
 - (c) $SbCl_3 + 3H_2O \longrightarrow H_2SbO_3 + 3HCl$
 - (d) BiCl₃ + H₂O → BiOCl + 2HCl (1) 124 1396 (2.24) Surge of Village of the resolution of the second of the se
- 57. Concentrated sodium hydroxide can seperate a mixture of : (a) Al and Cr 3+ (b) Cr 3+ and Fe 3+ (c) Al 3+ and Zn 2+

- (d) Zn²⁺ and Pb²⁺
- 58. Select correct set of species which can't react with water but react with NaOH:
 - (i) NO₂
- . Home suic (ii) P4 oh un triom di

(iii) Al (iv) I₂

(a) Only (iv)

(b) (iii) and (iv)

(c) (ii), (iii) and (iv)

- (d) All (i), (ii), (iii) and (iv)
- **59.** Fe(Finely powdered) + HCl(dil.) $\longrightarrow P + Q \uparrow$ compound 'P' does not precipitate with:

(a) AgNO₃

- (b) $K_3[Fe(CN)_6]$
- (c) $(NH_4)_2S$
- (d) NH₄Cl+NH₄OH
- 60. Which combination gives maximum number of products?
 - (a) $P_4 + SOCl_2$

(b) $P_4 + SO_2Cl_2$

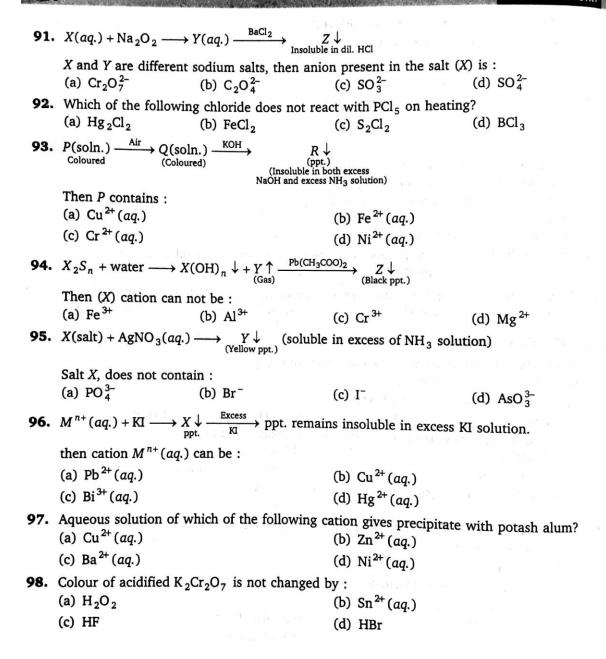
(c) $XeF_4 + H_2O$

- (d) $NH_4NO_3 + Zn + Excess NaOH$
- **61.** Cu²⁺ (aq.) does not undergo redox reaction with solution of :
 - (a) $(NH_4)_2S$
- (b) $Na_2S_2O_3$
- (c) KI days and a second
 - (d) NH₄SCN
- 62. Hydrolysis of which of the following compound liberates acidic gas?
 - (a) Li₂NH
- (b) Al_2S_3
- (c) CaC₂
- (d) CaNCN
- 63. The non-metal which does not react with water but reacts with alkali?
 - (a) Boron
- (b) Bromine
- (c) P₄
- (d) Fluorine
- 64. A very dilute acidic solution of Cd²⁺ & Ni²⁺ gives only yellow ppt. of CdS on passing H₂S, this
 - (a) Solubility product (K_{sp}) of CdS is more than that of NiS.
 - (b) Solubility product (K_{sp}) of CdS is less than that of NiS.
 - (c) Cd²⁺ belong to II B group while Ni²⁺ belongs to IVth group.
 - (d) CdS is insoluble in yellow ammonium sulphide (YAS).

65.	Thermal decomposition of which of the sal simultaneouly?	t listed below yield a	basic and acidic oxides
	(a) NH ₄ ClO ₄	(b) CaCO ₃	
	(c) NaNO ₃	(d) NH ₄ NO ₂	
66.	What are formed products, when aqueous so		$H_4)_2$ S are mixed?
	(a) $CuS(aq.)$ and $NH_4Cl(s)$	(b) CuS(s) and NH ₄ Cl	(aq.)
_	(c) CuS(aq.) and NH ₄ Cl(g)	(-,,	
67.	Which of the following compound does not it		
	(a) PbO (b) PbO ₂	(c) FeSO ₄	(d) PbCl ₂
68.	The incorrect order of solubility in water is:		
	(a) $Ca(OH)_2 < Sr(OH)_2 < Ba(OH)_2$	(b) $\text{Li}_2\text{CO}_3 < \text{Na}_2\text{CO}_3$	
		(d) BeS2O3 < MgS2O3	$<$ CaS $_2$ O $_3$
69.	The correct order of increasing solubility in v	water is:	
	(a) KF < NaF < LiF	(b) $NaHCO_3 < KHCO_3$	
70	(c) K ₂ CO ₃ < Na ₂ CO ₃ < Li ₂ CO ₃	(d) $LiNO_3 < NaNO_3 < 1$	KNO ₃
70.	Bromine is commercially prepared from sea		eaction
	$Cl_2 + 2Br^-(aq.) \longrightarrow$		
	Br ₂ gas thus formed is dissolved into solution	n of Na ₂ CO ₃ and then j	pure Br ₂ is obtained by
	treatment of the solution with:		
- 1	(a) Ca(OH) ₂ (b) NaOH	(c) H_2SO_4	(d) HI
71.	Which of the following metal on burning in i	noist air does not give s	smell of ammonia?
70	(a) Mg (b) Ca	(c) K	(d) Li
/2.	Gas that cannot be collected over water is:	() a=	
79	(a) N ₂ (b) O ₂	(c) SO ₂	(d) PH ₃
/3.	Compound having lowest thermal stability is (a) NaHCO ₃ (b) KHCO ₃	(a) Di 1100	
74	(a) NaHCO ₃ (b) KHCO ₃	(c) KPHCO ³	(d) CsHCO ₃
/4.	Which of the following statement is incorrect (a) Fe ³⁺ gives brown colour solution with po	regarding Fe and Fe	³⁺ cations?
	(b) Fe ²⁺ gives blue precipitate with potassiu	m familia i i	
	(c) Fe ³⁺ gives red colour solution with potassit	ili ierricyanide	
	(d) Fe ²⁺ gives brown colour with ammonium	siulii thiocyanate	
75.	$(NH_4)_2Cr_2O_7$ on heating liberates a gas. Th	i unocyanate	
,	(a) Heating NH ₄ NO ₂	(b) Hearing Will be obta	ined by :
	(c) Heating (NH ₄) ₂ SO ₄	(b) Heating NH ₄ NO ₃	
76.	Which of the following compound liberates a	(d) Treating Mg ₃ N ₂ w	ith H ₂ O
	(a) Ca ₃ P ₂ (b) AlN	(a) A1 a	-
77.	Which of the following combination does not	evolve Cl.	(d) CaH ₂
	(a) HCl(aq.) + KMnO ₄		
	(c) HCl + Br ₂	(b) HCl + MnO ₂ (d) HCl + F ₂	
78 .	NH ₃ gas does not liberate by which of the fo	llowing combined	
	(a) Heating of NH ₄ ClO ₄	(b) Heating of Mr. of	
	(c) $(NH_4)_2CO_3 + NaOH$	(b) Heating of NH ₄ Cl (d) Li ₃ N + H ₂ O	
	/100m 150 170 170 1	3.1 1130	

TYPES OF REACTIONS

79.	if sait Q undergoes rec		in acidic medit	um then v	which of the following	5
	species can not be poss				n = 1 ()1 (a)	
	(a) MnO $_4^{2-}$ (aq.)	(b) S	(c) MnO ₂	(d) Both (a) and (c)	
80.	Metal sulphate (A) —He	$\xrightarrow{\text{eat}} \text{Oxide } (B) + \text{Gas } (C)$	C) + Gas (D) -	Cr ₂ O ₇ ²⁻ /H ⁺	→ Green solution	
	- 9 11.		. 12	10	$\xrightarrow{\text{Na }_2\text{O }_2} \xrightarrow{\text{Excess}} \xrightarrow{\text{E}} \underset{\text{solution}}{\text{Ellow}}$	1
	Compand A P C D as			1 1000		
	Compund A, B, C, D as (a) FeSO ₄ , Fe ₂ O ₃ , SO		. 1 3			
	(a) 1630_4 , 16_20_3 , 30 (b) $Al_2(SO_4)_3$, Al_2O_3					
	(c) CuSO ₄ , CuO, SO ₃		ł.		Dikas Z	
	(d) $ZnSO_4$, ZnO , SO_3				(pa t 1 (p)	
81.	Which of the following	radical does not liber	ate gas with (Z	n + dil. F	HCl) on warming?	
	(a) S^{2-}	(b) SO_3^{2-}	(c) NO_3^-	The late of	d) CH ₃ COO	
82.	Which of the following	g cation does not give p	precipitate with	H ₂ S in n	eutral medium?	
	(a) Fe ³⁺		(c) Bi ³⁺		d) Ag ⁺	
83.	NaCl(solid) + K ₂ Cr ₂ O	₇ (solid) + conc. H ₂ SO	4 - Warm Rec	ldish brow	vn fumes of 'X'.	
	The oxidation state of	central atom in compo	ound 'X' is:		5 9 500	
	(a) $+6$	(b) +3	(c) +2	5d)	d) Zero	
84.	Diamagnetic gas neutr	ral towards water is:	() 110		A) NI O	
	(a) N ₂ O	(b) NO ₂	(c) NO		d) N ₂ O ₃	
85.	Which of the following	g reagent can be used	to separate Ago	olution	f .	
	(a) dil. HNO_3		(b) NH ₄ OH so (d) Na ₂ S ₂ O ₃		to find.	
	(c) KCN solution	t thon ou		Solution		
86.	When PbO ₂ reacts wit	th conc. HNO ₃ then ev	(c) N ₂	. ((d) N ₂ O	
	(a) NO ₂	(b) O ₂	CO and O	gas Whic	ch sequence of reager	nt
87.	(a) NO ₂ In a closed container t	rote them?	2, CO ₂ and O ₂	gas. Will	an sequence of reager	ııı
	can be helpful to sepa	(d) N) ⁴⁶ (oq.)			pp. S. H 137	
	(I) Limewater (II) Acidified potassium	- dichromate	seculo uso si	and a state of	whitese a metallical	
	(II) Acidified potassium	-1 and find (d)			.0.11.16)	
	(III) Alkaline pyragallo	or ('bb) -10 (0)	(b) (II), (I), ((III)	M fai	
	(a) (I), (II) and (III)	(b) HB ₁	(d) (III), (I),			
	(c) (III), (II), (I)	?	(4) (44)			
	Which salt is colourles		(c) Na ₂ CrO ₄		(d) CoCl ₂	
	(a) KMnO ₄ Which of the followin	a Venon compound do	es not produce	explosive	XeO ₃ on its comple	te
89.	Which of the following	8 Velion comboning do	F			
	hydrolysis?	(b) XeF ₂	(c) XeF ₄		(d) XeF ₆	
	(a) XeO ₂ F ₂ FeSO ₄ ·7H ₂ O (Green	Vitriol) salt on therma	l decomposition	n does not	produce :	
90.	FeSO ₄ ·7H ₂ O (Green	(b) O ₂	(c) SO ₃		(d) H ₂ O vapour	
	(a) SO_2	(0) 02	escence (E.)			



Level 3

PASSAGE 1

$$P(aq.) \xrightarrow{\text{Zn + dil. HCl}} Q \uparrow \xrightarrow{\text{FeCl}_3} R \downarrow + T$$

$$A \downarrow R \qquad \qquad \downarrow \text{MnO}_4^- / H^+$$

$$S \qquad \qquad R \downarrow + \text{Mn}^{2+} (aq.)$$

$$(White)$$

$$(turbidity) \qquad \text{and an add a$$

- 1. Species P and S are respectively:
 - (a) $SO_3^{2-}(aq.)$, S

- (b) $SO_3^{2-}(aq.)$, $S_2O_3^{2-}(aq.)$
- (c) $S_2O_3^{2-}(aq.)$, $SO_3^{2-}(aq.)$
- (d) None of these
- 2. 'T' cannot be identified by:
 - (a) NH₃ solution
 - (c) $(NH_4)_2S$

- (b) NH₄SCN
- (d) Excess KCN

PASSAGE 2

Consider three P, Q, R salts among them P and Q salts have different cations and also have different coloured polyatomic anion due to charge transfer phenomenon while P and R salts have same cation but have different anions. Salt R decomposes into an acidic gas and a basic gas.

- 1. Salt R can not be:
 - (a) NH₄NO₃

(b) $(NH_4)_2CO_3$

(c) $(NH_4)_2S$

- (d) NH₄Cl
- 2. Salt P decomposes on heating into a coloured solid, neutral gas and neutral vapour, then which of the following can not be the product of salt P after decomposition?
 - (a) N₂

(b) Cr_2O_3

(c) I₂

- (d) H_2O
- 3. If salt Q undergoes redox reaction with H₂S in acidic medium then which of the following species can not be possible product?
 - (a) $MnO_4^{2-}(aq.)$

(b) S

(c) MnO₂

(d) Both (a) and (c)

PASSAGE 3

Three compounds X, Y and Z were taken into three different laboratory vessels and they were carried out by a chemist in his car. The car caught fire due to short circuit and the chemist came out of the car and noticed following observations:

1. Compound X changed into white substance along with liberation of neutral oxide and then white substance decomposed into three products among which two are acidic oxides. Among these oxides non-polar oxide can undergo polar cyclic polymer on cooling. The compound X will be:

(a) MgSO₄·7H₂O

(b) ZnSO₄·7H₂O

(c) CaSO₄ · 2H₂O

(d) FeSO₄·7H₂O

2. Compound Y produced two oxides, among these one oxide turns anhydrous CuSO₄ into blue and other gas slows down fire in the car, then Y is:

(a) NH₄NO₂

(b) NaHCO₃

(c) MgC₂O₄

(d) NH₄NO₃

Salmus afroncy T'S

3. Which of the following compound does not react with cold and dil. HNO₃?

(a) PbO

(b) PbO₂

(c) FeSO₄

(d) PbCl₂

PASSAGE 4

In salts of polyatomic anion, as polarising power of cation increases, thermal stability of the salt decreases, and decomposed species may further undergo redox reaction.

1. Which of the following species undergoes non-redox thermal decomposition reaction on heating?

(a) FeSO₄

(b) SnSO₄

(c) $H_2C_2O_4$

(d) Na₂HPO₄

2. Water soluble salt (x) was heated into three products A, B and C and B and C are two different paramagnetic gases. A is red in hot condition, then salt (x) is:

(a) $Hg(NO_3)_2$

(b) FeC₂O₄

(c) ZnSO₄

(d) $Pb(NO_3)_2$

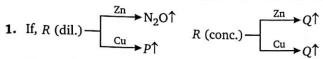
PASSAGE 5

Dioxygen directly reacts with nearly all metals and non-metals except some metals (e.g., Au, Pt) and some noble gases and form oxide(s). Oxides can be simple (e.g., MgO, Al₂O₃) or mixed (Pb₃O₄, Fe₃O₄). Simple oxides can be classified on the basis of their acidic, basic or amphoteric character. An oxide that combines with water to give an acid is termed acidic oxide (e.g., SO₂, Cl₂O₇, CO₂, N₂O₅). For example, SO₂ combines with water to give H₂SO₃, an acid.

Gaseous non-metal (A) $\xrightarrow{O_2} P \uparrow \xrightarrow{O_2} Q \uparrow \xrightarrow{H_2O} R$ (oxy acid) + $P \uparrow$

Solid non-metal (B) $\xrightarrow{O_2} X \uparrow \xrightarrow{O_2} Y \uparrow \xrightarrow{H_2O} Z$ (oxy acid) + Heat

TYPES OF REACTIONS 427



Then select correct statement with respect to gas 'Q':

(a) Paramagnetic gas

(b) Neutral oxide

(c) Colourless gas

(d) Diatomic gas

Baryta water

Milkyness

$$Cr_2O_7^{2-}/H^+$$

Green solution

Green solution

then 'X' is:

(a) NO

(c) SO₂

(b) CO₂

(d) SO₃

3. If,
$$Z$$
 (dil.) \longrightarrow $H_2 \uparrow$ Z (conc.) \longrightarrow Z (Z (Z (Z (Z) Z

Then select incorrect statement with respect to gas X:

- (a) Burning sulphur smell
- (b) Reacts with Cl₂
- (c) Residue of sulphur with H2S
- (d) Does not react with Ca(OCl)Cl

nsider the tellowing transformation.

PASSAGE 6

Consider the following reactions and answer the following questions.

M (Double salt) + NH₄Cl(s) + NH₄OH \longrightarrow No ppt.

M (Double salt) + NaOH solution \longrightarrow N \uparrow + P \downarrow (coloured ppt.)

1. Which of the following pair of cations are present in salt M?

(a) PH_4^+ , Mg^{2+}

(b) NH_4^+ , Fe^{3+}

(c) PH₄, Zn²⁺

(d) NH_4^+ , Fe^{2+}

2. $P \downarrow + \text{conc. HCl} \longrightarrow Q$ (coloured solution)

Incorrect statement about Q is:

- (a) It can exist in dimeric form
- (b) Its aqueous solution is acidic
- (c) It is used in methylene blue test for H₂S
- (d) On passing Cl2 gas colour of aqueous solution of Q changes
- 3. Reaction does not occur with salt M and gas N:
 - (a) NaNO₂ + dil. $H_2SO_4 + M$ (salt solution) \longrightarrow
 - (b) $HgI_2 + N \uparrow \longrightarrow$
 - (c) M (salt solution) $+ H_2S \longrightarrow$
 - (d) M (salt solution) + $Br_2 \longrightarrow$

PASSAGE 7

Compound (X)
$$\xrightarrow{\Delta}$$
 $Y(s)$ + $Z(g)$ \downarrow dil. HCl \downarrow Ba(OH)₂ Water soluble White ppt. compound

- 1. Compound 'X' is:
 - (a) NaNO₃
- (b) $Ag_2C_2O_4$
- (c) PbSO₄
- (d) ZnCO₃

- 2. Incorrect statement for 'Y' and 'Z' is:
 - (a) Colour of 'Y' changes on heating
 - (c) 'Y' can react with NaOH
- (b) 'Z' is anhydride of H₂CO₃
- (d) 'Z' does not act as Lewis acid

PASSAGE

The unique behaviour of Cu, having a positive E° (Reduction potential) accounts for its inability to liberate H_2 from acids. Only oxidising acids (nitric acid and hot concentrated sulphuric acid) react with Cu. The high energy to transform Cu(s) to Cu²⁺(aq.) is not balanced by its hydration enthalpy.

On the other hand, all Cu (II) halides are known except iodide. In this case, Cu^{2+} oxidises I⁻ to I₂:

$$2Cu^{2+} + 4I^{-} \longrightarrow 2CuI(s) + I_{2}$$

However, copper (I) compounds are unstable in aqueous solution and undergo disproportionation.

$$2Cu^+(aq.) \longrightarrow Cu^{2+}(aq.) + Cu$$

The stability of $Cu^{2+}(aq.)$ rather than $Cu^{+}(aq.)$ is due to the much more negative ΔH_{Hyd} of $Cu^{2+}(aq.)$ than $Cu^{+}(aq.)$.

1. Consider the following transformation:

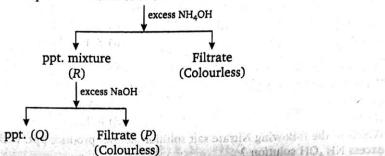
$$CuSO_4(aq.) + KI (Excess) \longrightarrow Product$$

Select the correct statement:

- (a) Product contains [Cu(H2O)4]2+ ion.
- (b) Presence of brown colouration in product is due to I₃ ion
- (c) Oxidation state of sulphur in reactant and product is different
- (d) White ppt. of CuI2 is observed in product
- 2. Select the correct chemical change:
 - (a) $Cu + dil. H_2SO_4 \longrightarrow CuSO_4 + H_2(g)$
 - (b) $Cu + dil. HNO_3 \longrightarrow Cu(NO_3)_2 + N_2O(g)$
 - (c) $CuSO_4(aq.) + KCN (excess) \longrightarrow K_2[Cu(CN)_4]$
 - (d) $CuSO_4(aq.) + NH_4OH \longrightarrow Cu(OH)_2 \downarrow$

PASSAGE 9

Aqueous solution of two water soluble salts



- 1. When H₂S gas was passed into filtrate (P), a coloured precipitate was obtained, then cation present in the filtrate is:
 - (a) $Zn^{2+}(aq.)$

(b) Cr 3+ (aq.)

(c) $Al^{3+}(aq.)$

- (d) $Pb^{2+}(aq.)$
- 2. Precipitate (Q) was treated with dil. HCl and coloured solution was obtained. On passing H₂S gas into this solution no precipitate was obtained but colour of the solution changes, then cation present in the precipitate (Q) can be identified by:
 - (a) Na₂S₂O₃ solution

(b) KI + Starch

(c) $K_4[Fe(CN)_6]$

(d) All



ONE OR MORE ANSWERS IS/ARE CORRECT

1.	Which of the	he following	combination of	of species	can	evolve O2	, ?	
----	--------------	--------------	----------------	------------	-----	-----------	-----	--

(a) PbO₂ + warm conc. H₂SO₄

(b) NaOH + F_2

(c) PbO₂ + conc. HNO₃

(d) $XeF_2 + H_2O$

2.
$$SO_2(g) + Cl_2(g) \longrightarrow X \xrightarrow{P_4} Y + Z$$

Then X, Y and Z can be:

(a) SOCl₂

(b) SO₂Cl₂

(c) SO₂

(d) PCl₅

3. Which of the following Nitrate salt solution neither produce ppt. with excess NaOH nor with excess NH₄OH solution?

(a) $Al(NO_3)_3$

(b) $Zn(NO_3)_2$

(c) $Cr(NO_3)_3$

(d) $Pb(NO_3)_2$

4. Which of the following compound(s) give two acids on dissolution in H₂O?

(a) P₄O₈

(b) POCl₃

(c) NO₂

(d) C_3O_2

5.
$$Xe + F_2 \xrightarrow{1:20} X \xrightarrow{H_2O} Y \xrightarrow{H_2O} Z \xrightarrow{H_2O} XeO_3$$

Select correct option(s) for X, Y, Z and given chemical change:

(a) X, Y and Z are in same oxidation state

(b) All have equal number of lone pair on central atom

(c) All are non-planar

(d) All have equal number of covalent bonds

6. Which of the following sulphide(s) does/do not liberate H₂S on warming with dil. HCl?

(a) HgS

(b) ZnS

(c) FeS

(d) CuS

7.
$$I_2 + \text{Na}_2\text{CO}_3 \text{ soln.} \xrightarrow{\text{Hot}} X + Y$$

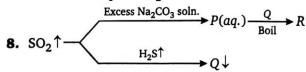
If 'X' gives coloured ppt. with $Pb(CH_3COO)_2$ solution, then 'Y' will respond to which of the following?

(a)
$$Y + H^+(aq.) + H_2S$$

(b)
$$Y + Cr_2O_7^{2-}(aq.) + OH^{-}(aq.)$$

(c)
$$Y + H^+(aq.) + SO_2$$

(d)
$$Y + H^+(aq.) + I^-(aq.)$$



Incorrect statement about 'R' is:

(a) Antichlor agent

- (b) Fixing agent in photography
- (c) Forms ppt. with CaCl₂ solution
- (d) Reduces Cu²⁺ (aq.) cation

9. NO₂ gas evolves on thermal decomposition of which of the following compound(s)?

- (a) $Hg(NO_3)_2$
- (b) KNO₃
- (c) N₂O₄
- (d) N_2O_3

10.	Which of the following precipitate(s) is/ar	re dissolved to colour	less solution on adding
	sufficient amount of dillute HCl?		
	(a) CaCO ₃	(b) BaCrO ₄	
	(c) MgC ₂ O ₄	(d) BaSO ₄	11 -1
11.	Which of the following combination of reas medium?		*
	(a) $Ba(OH)_2$ solution $+SO_2(g)$	(b) AgF solution + Na	
	(c) Pb(OAc) ₂ solution + Na ₂ CO ₃ solution		
12.	Which of the following species is/are not lil 25°C?	berating oxygen gas o	n reaction with water at
	(a) Na_2O_2 (b) Cl_2	(c) P ₄	(d) KO_2
13.	Hydrogen gas is not evolved by:		
	(a) $Mg + NH_3$ (liq.)	(b) $B_2H_6 + H_2O$	
	(c) NaNH ₂ + H ₂ O	(d) Be $+ H_2O$	
14.	Which of the following metal sulphide does	not undergo hydrolysis	
	(a) Cr_2S_3 (b) Al_2S_3	(c) MgS	(d) FeS
15.	Which of the following gas is not dried by co	onc. H ₂ SO ₄ ?	
	(a) HCl (b) HBr	(c) H ₂ S	(d) SO ₂
16.	$X \xrightarrow{\Delta} \text{conc. H}_{3}PO_{4} \longrightarrow Y \uparrow \xrightarrow{CrO_{3} \text{ vapour}} Z \uparrow \text{(coloured vapours)}$		
	conc. H ₃ PO ₄ (coloured		
	$Q\uparrow$		
	(soluble in excess conc. NH ₃ solution)		
	Which of the following anion cannot be in X		
	(a) F^- (b) Cl^-	(c) Br	(d) I ⁻
17.	When ozone reacts with an excess of potassiu	ım iodide solution buff	ered with a borate buffer
	(pH 9.2) iodine is liberated which can be to	for actimating O	dard solution of sodium
	thiosulphate, this is a quantitative method sodium thiosulphate will react, then product	is/are:	. When indefated 12 and
	sodium thiosulphate will react, then product (a) $S_*O_*^{2-}$ (b) SO_*^{2-}	(c) S ₂ O ₄ ²⁻	(d) S ⁰
			(-)
18.	In which of the following reactions NH ₃ gas	evolution occurs:	
	(a) NO $_3^-$ + Zn + dil. H ₂ SO ₄ $\xrightarrow{\text{warm}}$	(b) NH ₄ salt + NaOH	I — →
	(c) AIN + steam	(d) CH ₃ COONH ₄ —	
19.	Which of the following compound(s) during h	eating undergo redox d	ecomposition reaction?
	(b) $Ag_2G_2O_4(s)$	(c) $recl_3 \cdot or_2O(s)$	(a) $K_2Cr_2O_7(s)$
20.	Which of the following combination of specie	es undergo(es) compro	portionation?
	(a) $MnO_4^-(aq.) + Mn^{2+}(aq.) \xrightarrow{ZnO/ZnSO_4}$	(b) $S + conc. H_2SO_4$	warm
	(a) MnO ₄ (aq.) + Mn. (aq.)	(excess)	
	() PV . H PO	(d) NO(g) + NO ₂ (g)	Cool
	(c) $PH_3 + H_3PO_4 \longrightarrow$	210	



MATCH THE COLUMN

Entries of Column-I are to be matched with entries of Column-II. Each entry of Column-I may have the matching with one or more than one entries of Column-II.

1. Column-I (Ionic Compounds)

inverse probabling play a fall

- (A) HgCO₃
- (B) FeSO₄
- (C) BeC₂O₄
- (D) AgNO₃

2. Column-I

- (A) $Na_2S_2O_3 + dil$. HCl
- (B) $ICl_3 + H_2O$

Place of SET OF

- (C) $FeCl_3 + H_2S/H^+$
- (D) $H_2SO_3 \xrightarrow{\Delta}$

3. Column-I (Halide compound)

- (A) PCl₃
- (B) NF₃
- (C) SbCl₃
- (D) BF₃

Column-II (Possible observations on thermal decomposition)

- (P) Acidic gas evolves
- (Q) Metallic residue is obtained as final product
- (R) Metal cation of salt undergoes redox reaction
- (S) Metallic oxide can be obtained
- (T) Neutral gas is evolved

Column-II

- (P) Disproportionation reaction
- (Q) Yellow ppt.
- (R) Redox reaction
- (S) One of the product gives white fumes with NH₃

Column-II (Characteristics)

- (P) Can act as π -acid ligand
- (Q) Final hydrolysed product is a proton donor oxyacid
- (R) Can act as classical/normal ligand
- (S) Undergoes partial hydrolysis
- (T) Final hydrolysed product has $(p\pi p\pi)$ bond

4.

Column-I (Anions)

- (A) SO_3^{2-}
- (B) CO_3^{2-}
- (C) Cl-
- (D) NO_2^-

Column-II [Reaction of anion(s) with dil. HCl/conc. H₂SO₄]

- (P) Colourless volatile product is formed
- (O) Coloured volatile product is formed
- (R) Volatile product forms precipitate with Ba(OH)₂ solution
- (S) Volatile product forms precipitate with AgNO₃ solution
- (T) Formed volatile product decolourizes MnO₄/H⁺ solution

5.

Column-I (Reactions)

- (A) $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta}$
- (B) FeSO₄ $\xrightarrow{\Delta}$
- (C) $Pb(NO_3)_2 \xrightarrow{\Delta}$
- (D) $P_4 \xrightarrow{NaOH} \Delta$

6.

Column-I (Complete hydrolysis)

- (A) $NCl_3 \xrightarrow{H_2O}$
- (B) NO₂ $\xrightarrow{\text{H}_2\text{O}}$
- (C) $H_2S_2O_8 \xrightarrow{H_2O}$
- (D) $SF_4 \xrightarrow{H_2O}$

Column-II (Characteristics of any one product)

- (P) Amphoteric species
- (Q) Basic species
- (R) Non-polar gas
- (S) Polar acidic gas
- (T) Coloured residue

Column-II (Characteristics of any hydrolysed product/hydrolysis)

- (P) Dibasic acid
- (Q) Can act as flexidentate ligand
- (R) Can act as both oxidising and reducing agent
- (S) Can act as monodentate ligand
- (T) Non-redox hydrolysis

7. Column-I (Reaction with Salt/Radical)

- (A) $Zn + dil. H_2SO_4$
- (B) dil. HCl
- (C) NaOH (excess)
- (D) KI

(R) $MnO_4^-(aq.)$

(S) $Hg_2^{2+}(aq.)$

(P) $Pb(NO_2)_2$

 $(Q) (NH_4)_2 S$

(T) Bi³⁺ (aq.)

8. Column-I

- (A) Disproportionation in alkaline medium
- (B) Oxidizing agent
- (C) Reacts with water
- (D) Basic gas evolves on heating

Column-II

Column-II

(Salt/Radical)

- (P) Cl₂
- (Q) NO₂
- (R) XeF₆
- (S) NaH₂PO₃
- (T) (NH₄)₂S

9. Column-I

- (A) NO_2
- (B) SOF₂
- (C) XeF₄
- (D) ClF₅

Column-II

- (P) Hydrolysis occurs through redox reaction
- (Q) Hydrolysed product can undergo tautomeric change
- (R) All hydrolysed products are acids
- (S) Hybridization of central atom remains same in final hydrolysed product
- (T) One of the hydrolysed product reacts with glass

10. Column-I (Acidic Radicals)

- (A) $S^{2-}(aq.)$
- (B) $SO_3^{2-}(aq.)$
- (C) $NO_{2}^{-}(aq.)$
- (D) $S_2O_3^{2-}(aq.)$

Column-II (Observations)

- (P) Redox reaction with alkaline Br₂
- (Q) Evolution of diamagnetic gas with dil. HCl on warming
- (R) White ppt. with Pb(CH₃COO)₂ and pptremains white even after boiling
- (S) Evolution of gas with (Al + NaOH solution).
- (T) Evolution of same gas with dil. HCl as well as with conc. H₂SO₄ on warming

11.			Column-I					Column-II	
	(A)	Undergoes mechanism	hydrolysis	via.	S _{N²}	(P)	BCl ₃		
	(B)	Undergoes mechanism	hydrolysis	via.	SNAE	(Q)	NCl ₃		
	(C)	Hybridisation state cl	on of central a	tom in	transi- ysis	(R)	SOF ₂		
	(D)		or oxy acid is f	15	as final	(S)	POCl ₃		
				World.		(T)	ClF ₃	102m2	

SUBJECTIVE PROBLEMS

1.	Find total number o	f reagents which can pro	oduce I ₂ from KI solut	ion.
	Conc. H ₂ SO ₄ ,	Hg(NO ₃) ₂ solution,	CuSO ₄ solution,	Conc. H ₃ PO ₄ ,
	$K_2Cr_2O_7/H^+$,	Cl ₂ water,	Pb(CH ₃ COO) ₂ solut	ion,

NaNO₂ + dil. HCl Ca(OCl)Cl/H+,

2. Find total number of metal cations which are ppted as metal sulphide on passing H₂S gas through metal salt solution.

 $Mg^{2+}(aq.),$ $\operatorname{Sn}^{2+}(aq.),$ $Cr^{3+}(aq.),$ $Pb^{2+}(aq.),$ $Mn^{2+}(aq.),$ $Al^{3+}(aq.),$ $Ni^{2+}(aq.)$ $Ag^+(aq.),$ $Cu^{2+}(aq.),$ $Hg^{2+}(aq.),$

3. Consider the following reaction $P_4 + KOH \longrightarrow PH_3 + X$ How many P—H bonds are present in species X?

4. Which of the following species/reagent can reduce $Fe^{3+}(aq.)$ into $Fe^{2+}(aq.)$ at normal conditions?

 $Sn^{2+}(aq.),$ $CN^{-}(aq.),$ NaNO2, HI, $(NH_4)_2S$, $SCN^{-}(aq.),$ Acidified NaIO 3 Na₂S₂O₃, SO₂,

5. Find out number ionic compound(s) which is/are water insoluble at room temperature. CaCl₂, $PbCO_3$, $Mg(OH)_2$, AgNO₃, BaSO₄, $Ca_3(PO_4)_2$, $(NH_4)_2S$ CH₃COOAg,

KMnO₄, **6.** Find the value of expression |x - y| for following compounds.

x = Total number of water insoluble salts.

y =Total number of salts, which can liberate non-polar acidic gas during their complete thermal decomposition. CsHCO₃,

CaC₂O₄, AgNO₃, PbSO4, BaCO₃, Pb(NO₃)₂ $Mg(OH)_2$, CH3COOAg, Na₃PO₄,

436 INORGANIC CHEMISTRY

Find out total number of coloured compound(s) from following:
 BaCO₃, HgO, PbSO₄, Ag₂S, HgI₂, PbO, CdS, AgNO₂, PbCrO₄

- 8. Find out total number of cation(s) that produce precipitate with aqueous solution of Na ₂CO₃. Cu²⁺ (aq.), Mg ²⁺ (aq.), Fe³⁺ (aq.), Pb ²⁺ (aq.), Al³⁺ (aq.), Hg ²⁺ (aq.), Zn ²⁺ (aq.), NH₄⁺ (aq.), Cs⁺ (aq.)
- 9. $P_4 + SOCl_2 \xrightarrow{\Delta} Products$

Find out total number of non-planar and polar molecules of products in balanced equation for one mole of P_4 .

10. What is average oxidation state of sulphur in product formed in given reaction?

$$Na_2SO_3 + Na_2S + I_2 \longrightarrow \dots + NaI$$

11. Find out total number of coloured/black water insoluble compound(s) from following substances:

$$Ag_2O$$
, HgI_2 , FeS , Ag_3PO_4 , $Ba(MnO_4)_2$, Na_2CrO_4 , PbI_2 , $AgNO_2$, $Ag_2C_2O_4$

12. Find out toal number of compounds which on heating undergo redox reactions.

$$PbCl_4$$
, $Mg(NO_3)_2$, HgC_2O_4 , Ag_2CO_3 , $Pb(CN)_4$, $Al(OH)_3$, $Cu(CN)_2$

- 13. How many following Ammonium salts will evolve N₂ gas on heating?

 (NH₄)₂CO₃,(NH₄)₂Cr₂O₇,NH₄NO₂,NH₄ClO₄,NH₄Cl,(NH₄)₂S,(NH₄)₂C₂O₄
- **14.** How many following metals evolve NO (Nitric oxide) gas with dil. HNO 3 (20%)? Hg, Cu, Pb, Zn, Fe, Al, Ag, Au, Mn
- 15. Find number of basic radicals among the following cations, which can form soluble complex on adding excess of NH₃ solution:

$${\rm Cd}^{2+}(aq.), {\rm Pb}^{2+}(aq.), {\rm Ni}^{2+}(aq.), {\rm Mn}^{2+}(aq.), {\rm Zn}^{2+}(aq.), {\rm Ag}^{+}(aq.), {\rm Hg}^{2+}(aq.), {\rm Fe}^{3+}(aq.), {\rm Mg}^{2+}(aq.)$$

- 16. Calculate difference between oxidation state of chromium (Cr) in blue and green coloured chromium species formed during the following given transformation.
- 17. If hydrolysis of interhalogen compound can be represented by following general reaction:

$$XY_{n_1} \xrightarrow{\text{water}} n_1 HY + HXO_{n_2}$$

If given interhalogen compound is polar and non-planar, then calculate value of $n_1 + n_2$.

18. Total number of species that can be oxidized by acidic permanganate ion (MnO_4^-/H^+) .

$$I^-, Fe^{2+}, CO_2, C_2O_4^{2-}, S^{2-}, SO_3^{2-}, NO_2^-, PO_4^{3-}, SO_4^{2-}$$

19. How many following metals evolve N_2O gas with dil. HNO₃ (20%)?

- 20. How many following Ammonium salts will evolve NH $_3$ gas on heating? $(NH_4)_2CO_3, (NH_4)_2Cr_2O_7, CH_3COONH_4, NH_4ClO_4, NH_4Cl, (NH_4)_2S, (NH_4)_2C_2O_4, (NH_4)_2SO_4, NH_4NO_3$
- 21. Find out the number of cation(s) which form(s) black ppt. (soluble in hot and dilute HNO₃) on passing H₂S gas into their salt solution?

Mg
$$^{2+}$$
 (aq.), Cu $^{2+}$ (aq.), Ba $^{2+}$ (aq.), Fe $^{3+}$ (aq.), Ag $^{+}$ (aq.), Al $^{3+}$ (aq.), Hg $^{2+}$ (aq.), Pb $^{2+}$ (aq.), Mn $^{2+}$ (aq.)

ANSWERS

Level

1.	(A)	2.	(B)	3.	(A)	4.	(A)	5.	(D)	6.	(B)	7.	(A)	8.	(B)	9.	(A)	10.	(B)
11.	(D)	12.	(B)	13.	(B)	14.	(B)	15.	(B)	16.	(B)	17.	(A)	18.	(B)	19.	(A)	20.	(B)
21.	(B)	22.	(B)	23.	(A)	24.	(B)	25.	(B)	26.	(A)	27.	(A)	28.	(B)	29.	(B)	30.	(B)
31.	(A)	32.	(A)	33.	(C)	34.	(A)	35.	(D)	36.	(A)	37.	(B)	38.	(B)	39.	(D)	40.	(C)
41.	(A)	42.	(A)	43.	(B)	44.	(D)	45.	(A)	46.	(A)	47.	(A)	48.	(B)	49.	(A)	50.	(B)
51.	(B)	52.	(A)	53.	(D)	54.	(B)	55.	(A)	56.	(A)	57.	(A)	58.	(C)	59.	(C)	60.	(D)
61.	(A)	62.	(A)	63.	(A)	64.	(B)	65.	(A)	66.	(A)	67.	(A)	68.	(A)	69.	(B)	70.	(D)
71.	(B)	72.	(A)	73.	(A)	74.	(A)	75.	(A)	76.	(B)	77.	(A)	78.	(A)	79.	(B)	80.	(D)
81.	(A)	82.	(C)	83.	(A)	84.	(A)	85.	(A)	86.	(B)	87.	(A)	88.	(D)	89.	(A)	90.	(D)
91.	(C)	92.	(A)	93.	(D)	94.	(A)	95.	(D)	96.	(A)	97.	(A)	98.	(D)	99.	(A)	100.	(B)
101.	(A)	102.	(A)	103.	(A)	104.	(B)	105.	(C)	106.	(A)	107.	(A)	108.	(A)	109.	(A)	110.	(A)
111.	(B)	112.	(B)	113.	(D)	114.	(A)	115.	(C)	116.	(A)	117.	(B)	118.	(B)	119.	(A)	120.	(A)
121.	(B)	122.	(B)	123.	(A)	124.	(A)	125.	(D)	126.	(B)	127.	(C)	128.	(A)	129.	(A)	130.	(A)
131.	(D)	132.	(D)	133.	(A)	134.	(B)	135.	(D)	136.	(B)	137.	(A)	138.	(A)	139.	(D)	140.	(A)
141.	(D)	142.	(D)	143.	(D)	144.	(B,C)	145.	(C)	146.	(C)	147.	(C)	148.	(C)	149.	(C)	150.	(C)
151.	(C)	152.	(C)	153.	(C)	154.	(A,D)	155.	(A)	156.	(A)	157.	(A)	158.	(A)	159.	(C)	160.	(C)
161.	(C)	162.	(C)	163.	(C)	164.	(C)	165.	(C)	166.	(C)	167,	(C)	168.	(C)	169.	(C)	170.	(D)
171.	(A,D)	172.	(A)	173.	(A)	174.	(C)	175.	(C)	176.	(C)	177.	(A)	178.	(D)	179.	(D)	180.	(D)
181.	(B)	182.	(D)	183.	(C,D)	184.	(D)	185.	(B,D)	186.	(C)	187.	(B,D)	188.	(D)	189.	(C,D)	190.	(C,D)
191.	(C)	192.	(C)	193.	(D)	194.	(A)	195.	(A,D)	196.	(A,D)	197.	(C)	198.	(C)	199.	(C)	200.	(C)
201.	(C)	202.	(D)	203.	(A)	204.	(C)	205.	(C)	206.	(C)	207.	(C)	208.	(B)	209.	(A)	210.	(B)
211,	(B)	212.	(B)	213.	(A)	214.	(C)	215.	(B)	216.	(D)	217.	(B)	218.	(B)	219.	(C)	220.	(B)
221.	(A)	222.	(B)	223.	(C)	224.	(A)	225.	(B)	226.	(D)	227.	(C)	228.	(D)	229.	(C)	230.	(D)
231.	(D)	232.	(D)	233.	(C)	234.	(D)	235.	(A)	236.	(B)	237.	(B)	238.	(A)	239.	(B)	240.	(D)
241.	(B)	242.	(B)	243.	(B)	244.	(A)	245.	(B)	246.	(D)	247.	(C)	248.	(C)	249.	(D)	250.	(D)

438 INORGANIC CHEMISTRY

Level 2

1.	(a)	2.	(b)	3,	(a)	4.	(c)	5.	(c)	6.	(b)	7.	(c)	8.	(d)	9.	(a)	10.	(c
11.	(a)	12.	(c)	13.	(a)	14.	(b)	15.	(d)	16.	(a)	17.	(a)	18.	(c)	19.	(c)	20.	(a
21.	(d)	22.	(a)	23.	(c)	24.	(b)	25.	(d)	26.	(b)	27.	(c)	28.	(d)	29.	(c)	30.	(d
31.	(a)	32.	(b)	33.	(a)	34.	(d)	35.	(d)	36.	(a)	37.	(c)	38.	(c)	39.	(c)	40.	(0
41.	(d)	42.	(b)	43.	(a)	44.	(a)	45.	(b)	46.	(b)	47.	(b)	48.	(d)	49.	(d)	50.	(0
51.	(b)	52.	(b)	53.	(a)	54.	(d)	55.	(d)	56.	(c)	57.	(b)	58.	(c)	59.	(d)	60.	(0
61.	(a)	62.	(b)	63.	(c)	64.	(b)	65.	(b)	66.	(b)	67.	(b)	68.	(d)	69.	(b)	70.	(0
71.	(c)	72.	(c)	73.	(a)	74.	(d)	75.	(a)	76.	(c)	77.	(c)	78.	(a)	79.	(d)	80.	(a
81.	(c)	82.	(a)	83.	(a)	84.	(a)	85.	(b)	86.	(b)	87.	(b)	88.	(b)	89.	(b)	90.	(b
91.	(c)	92.	(d)	93.	(b)	94.	(a)	95.	(c)	96.	(b)	97.	(c)	98.	(c)				

Level 3

Passage-1	1.	(b)	2.	(b)		
Passage-2	1.	(a)	2.	(c)	3.	(d)
Passage-3	1.	(d)	2.	(b)	3.	(b)
Passage-4	1.	(d)	2.	(d)	4	
Passage-5	1.	(a)	2.	(c)	3.	(d)
Passage-6	1.	(d)	2.	(c)	3.	(c)
Passage-7	1.	(d)	2.	(d)		
Passage-8	1.	(b)	2.	(d)		
Passage-9	1.	(d)	2.	(d)		a) ja

TYPES OF REACTIONS 439

One or More Answers is/are correct

1. (a, b, c, d) 2. (b, c, d) (a, d) 5. (a, b, c, d) 6. (b, c) (a, b, c) 7. (a, c, d) 8. (c) 12. (b, c) 9. 11. (a, c, d) (a, c, d) 10. (a, c) 13. (a, c, d) (b, c, d) 14. 18. (d) 15. 17. (a) (b, c) 16. (a, d)

19. (a, b, d) 20. (a, d)

Match the Column

 $B \rightarrow P, R, S;$ 1. $A \rightarrow P, Q, R, S, T$; $D \rightarrow P, Q, R, S, T$ $C \rightarrow S, T;$ 2. $A \rightarrow Q$; $B \rightarrow S$; $D \rightarrow P$ $C \rightarrow R$; 3. $A \rightarrow P, Q$; $D \rightarrow S, T$ $B \rightarrow R, T;$ $C \rightarrow S, T;$ 4. $A \rightarrow P, R, S, T$; $D \rightarrow Q, S, T$ $B \rightarrow P, R, S;$ $C \rightarrow P, S, T;$ $D \rightarrow Q$ **5.** $A \rightarrow P, R, T;$ $C \rightarrow P, R, S, T;$ $B \rightarrow Q, R, S, T;$ $D \rightarrow P, Q, R, S, T$ **6.** $A \rightarrow R, S, T$; $C \rightarrow P, Q, R, S, T;$ $B \rightarrow Q, R, S;$ $D \rightarrow P, R, S, T$ 7. $A \rightarrow P, Q, R, S, T$; $B \rightarrow P, Q, R, S;$ $C \rightarrow P, Q, R, S, T;$ $C \rightarrow P, Q, R, S, T;$ $D \rightarrow S, T$ $B \rightarrow P, Q, R;$ **8.** $A \rightarrow P, Q, S;$ $C \rightarrow P, T;$ $D \rightarrow Q, R, T$ $B \rightarrow Q, R, S, T;$ 9. $A \rightarrow P, Q, R, S$; $C \rightarrow P, S, T;$ $D \rightarrow P, Q, T$ $B \rightarrow P, Q, R, T;$ 10. $A \rightarrow P, Q, S$; $D \rightarrow Q, R, S, T$ $C \rightarrow P, R, S, T;$ $B \rightarrow R, S;$ 11. $A \rightarrow P, Q, T$;

Subjective Problems

1. (6) **2.** (5) **3.** (2) **4.** (5) **5.** (5) **6.** (0) **7.** (6) **8.** (7) **9.** (6) **10.** (2)

11. (5) 12. (6) 13. (3) 14. (4) 15. (4) 16. (3) 17. (8) 18. (6) 19. (5) 20. (6)

21. (3)

Hints and Solutions

Level 2

(a)
$$2Cu(NO_3)_2 + 4KCN \longrightarrow KNO_3 + 2CuCN + (CN)_2 \uparrow$$

(b)
$$AgNO_3 + KCN \longrightarrow KNO_3 + AgCN \downarrow$$
 (ppt. formation)

(c)
$$Cd(NO_3)_2 + 2KCN \longrightarrow 2KNO_3 + Cd(CN)_2 \downarrow (ppt. formation)$$

(d)
$$Pb(NO_3)_2 + 2KCN \longrightarrow 2KNO_3 + Pb(CN)_2 \downarrow$$
 (ppt. formation)

2. (b) Any NH_4^+ salt when react with base gives NH_3 as product

$$NH_4^+ + OH^- \longrightarrow NH_3 \uparrow + H_2O$$

(a)
$$Mg(NO_3)_2 \xrightarrow{\Delta} MgO + NO_2 \uparrow O_2 \uparrow$$

(Paramagnetic)

(b)
$$\operatorname{Fe}_2(\operatorname{SO}_4)_3 \xrightarrow{\Delta} \operatorname{Fe}_2\operatorname{O}_3 + \operatorname{SO}_3 \uparrow$$

(c)
$$FeCO_3 \xrightarrow{\Delta} FeO + CO_2 \uparrow$$

(d)
$$HgC_2O_4 \xrightarrow{\Delta} Hg + CO \uparrow + CO_2 \uparrow + \frac{1}{2}O_2 \uparrow$$

4. (c)

(a)
$$Al_2(SO_4)_3 \xrightarrow{\Delta} Al_2O_3 + SO_3 \uparrow$$

(b)
$$HgCO_3 \cdot 3Hg(OH)_2 \xrightarrow{\Delta} Hg + O_2 \uparrow + CO_2 \uparrow + H_2O$$

(c)
$$Cu(NO_3)_2 \xrightarrow{\Delta} CuO_1 + 2NO_2 \uparrow + \frac{1}{2}O_2 \uparrow$$

(d) Ba(OH)₂
$$\xrightarrow{\Delta}$$
 BaO + H₂O \uparrow

5. (c)

(a)
$$Na_2CrO_4 + BaCl_2 \longrightarrow BaCrO_4 \downarrow + 2NaCl_{yellow ppt}$$
 yellow ppt clear solution

(b)
$$ZnSO_4 + BaCl_2 \longrightarrow BaSO_4 \downarrow + ZnCl_2$$

clear solution white ppt clear solution

(c)
$$CuSO_4 + BaCl_2 \longrightarrow BaSO_4 \downarrow + CuCl_2$$

blue solution white ppt blue solution

(d)
$$2AgNO_3 + BaCl_2 \longrightarrow 2AgCl \downarrow + Ba(NO_3)_2$$

clear solution white ppt clear solution

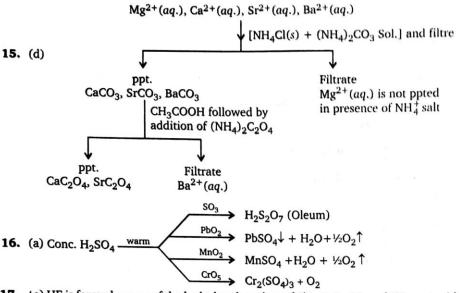
6. (b)
$$2K_2Cr_2O_7 \xrightarrow{\Delta} 2K_2CrO_4 + Cr_2O_3 + \frac{3}{2}O_2$$

$$Ag_2C_2O_4 \xrightarrow{\Delta} 2Ag + 2CO_2$$

$$Pb(NO_3)_2 \xrightarrow{\Delta} PbO + 2NO_2 + \frac{1}{2}O_2$$

$$Ag_2CO_3 \xrightarrow{\Delta} 2Ag + CO_2 + \frac{1}{2}O_2$$

- 7. (c) Zn + HNO₃(dil.) → Zn(NO₃)₂ + N₂O
 N₂O is neutral, contain 33.3% oxygen which is more than air.
 NO gas forms brown ring complex with FeSO₄ solution, whereas N₂O gas does not.
- 8. (d) $2NO_2 + H_2O \longrightarrow HNO_3 + HNO_2 \xrightarrow{R.T.} HNO_3 + NO$ $2Cu^+(aq.) \xrightarrow{R.T.} Cu + Cu^{2+}(aq.)$ $3 \text{ MnO } {}^{2-}_4(aq.) \xrightarrow{R.T.} 2 \text{ MnO } {}^{-}_4(aq.) + \text{MnO } {}_2 + 4OH^ Ca(OCl)Cl \xrightarrow{\text{Water}} Ca^{2+}(aq.) + Cl^-(aq.) + OCl^-(aq.)$
- 9. (a) $F_2 + H_2O \longrightarrow 2HF + \frac{1}{2}O_2$ $Cl_2 + H_2O \longrightarrow HCl + HOCl$ $Br_2 + H_2O \longrightarrow HBr + HOBr$ $I_2 + H_2O \longrightarrow No reaction [\Delta G > 0 at R. T.]$
- 10. (c) $8HCl + KMnO_4 \longrightarrow MnCl_2 + \frac{5}{2}Cl_2 \uparrow + KCl + 4H_2O$ $4HCl + MnO_2 \longrightarrow MnCl_2 + Cl_2 \uparrow + 2H_2O$ $HCl + I_2 \longrightarrow No reaction$ $HCl + F_2 \longrightarrow HF + Cl_2 \uparrow$
- 11. (a) $2NH_4ClO_4 \xrightarrow{\Delta} N_2 \uparrow + Cl_2 \uparrow + 2O_2 \uparrow + 4H_2O$ $NH_4Cl \xrightarrow{\Delta} NH_3 \uparrow + HCl \uparrow$ $(NH_4)_2CO_3 + 2NaOH \longrightarrow 2NH_3 + Na_2CO_3 + H_2O$ $Li_3N + 3H_2O \longrightarrow 3LiOH + NH_3 \uparrow$
- 12. (c) $MgCl_2 \cdot 6H_2O \xrightarrow{\Delta} MgO + 2HCl + 5H_2O$ $2K_2Cr_2O_7 \xrightarrow{\Delta} 2K_2CrO_4 + Cr_2O_3 + \frac{3}{2}O_2 \uparrow$ $K_2CO_3 \xrightarrow{\Delta} does not decompose but melts$ $Cu(NO_3)_2 \xrightarrow{\Delta} CuO + 2NO_2 \uparrow + \frac{1}{2}O_2 \uparrow$
- 13. (a) $NCl_3 + 3H_2O \longrightarrow NH_3 + 3HOCl$ $PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl$ $AsCl_3 + 3H_2O \longrightarrow H_3AsO_3 + 3HCl$ $BiCl_3 + H_2O \Longrightarrow BiOCl + 2HCl$ turbidity
- 14. (b) $MgCl_2 \cdot 6H_2O \xrightarrow{\Delta} MgO + 2HCl + 5H_2O$



17. (a) HF is formed as one of the hydrolysed product of ClF₅, XeF₂, SF₄ and HF react with silica of glass vessel. While in case of hydrolysis of BF₃

4BF₃ + 3H₂O
$$\xrightarrow{\text{R.T.}}$$
 H₃BO₃ + $\xrightarrow{\text{does not react}}$ does not react with silica (SiO)

- **18.** (c) $BaS_2O_3 + HCl \xrightarrow{Warm} BaCl_2 + SO_2 \uparrow \xrightarrow{FeSO_4 \text{ sol.}} No \text{ reaction hence solution remains green.}$ $Ag_2SO_3 + HCl \xrightarrow{Warm} AgCl \downarrow + SO_2 \uparrow \xrightarrow{FeSO_4 \text{ sol.}} No \text{ reaction hence solution remains green.}$ $AgNO_2 + HCl \xrightarrow{Warm} AgCl \downarrow + NO_2 \uparrow \xrightarrow{FeSO_4 \text{ sol.}} Fe^{3+}(aq.) \text{ (yellow sol.)}$
 - ⇒ Pb(NO₃)₂ salt is not decompose by dose HCl acid.
- 20. (a) $\operatorname{Cr}^{3+}(aq.) + \operatorname{Na}_{2}O_{2}\operatorname{sol.} \longrightarrow \operatorname{CrO}_{4}^{2-}(aq.)$ $\operatorname{Fe}^{3+}(aq.) + (\operatorname{NH}_{4})_{2}S \longrightarrow \operatorname{FeS} \downarrow$ $\operatorname{Mn}^{2+}(aq.) + \operatorname{H}_{2}O_{2} + \operatorname{NH}_{3} \longrightarrow \operatorname{MnO}(\operatorname{OH})_{2} \downarrow \operatorname{or} \operatorname{MnO}_{2} \downarrow \cdot 2\operatorname{H}_{2}O$ $\operatorname{Fe}^{2+}(aq.) + \operatorname{Na}_{2}O_{2}\operatorname{sol.} \longrightarrow \operatorname{Fe}(\operatorname{OH})_{3} \downarrow$
- **21.** (d) ZnS, MnS, FeS do not dissolve in excess NH₃ solution due to their low K_{sp} values.

$$Cr_2S_3 + 6NH_3 \iff [Cr(NH_3)_6]^{3+} + S^{2-}(aq.)$$

- **22.** (a) MnO₄ in basic medium is better oxidant than acidic medium, hence oxidises I⁻(aq.) ion upto IO₃ (aq.) ion.
- 23. (c) $Br_2 + NaOH \longrightarrow NaBr(Y) + NaBrO(Z)$ NaBrO is an oxidising agent which can oxidize $Cr^{3+} \longrightarrow Cr^{6+}, Fe^{2+} \longrightarrow Fe^{3+}, Sn^{2+} \longrightarrow Sn^{4+}$ but oxidation of Al^{3+} is not possible.
- 24. (b) $AgNO_3 \xrightarrow{\Delta} Ag + NO_2 \uparrow + \frac{1}{2}O_2 \uparrow$ $Pb(NO_3)_2 \xrightarrow{\Delta} PbO_{Amphoteric} + 2NO_2 + \frac{1}{2}O_2 \uparrow$

25. (d)
$$I_2$$
 $\xrightarrow{\text{conc. H}_2\text{SO}_4}$ \Rightarrow $\text{HIO}_3 + \text{SO}_2 \uparrow$ $\xrightarrow{\text{conc. HNO}_3}$ \Rightarrow $\text{HIO}_3 + \text{NO}_2$ $\xrightarrow{\text{conc. HNO}_3}$ \Rightarrow $\text{HIO}_3 + \text{NO}_2$ $\xrightarrow{\text{Cl}_2 \text{ water}}$ \Rightarrow $\text{HIO}_3 + \text{Cl}^ \xrightarrow{\text{R.T.}}$ $\xrightarrow{\text{H}_3\text{PO}_4}$ \Rightarrow No reaction

- 26. (b) $S \downarrow \xleftarrow{\text{Reducing agent}} SO_2 \uparrow \xrightarrow{\text{Oxidising agent}} SO_4^2 (aq.)$ SO₂ is colourless gas.
- 27. (c) Pb + dil. $HNO_3 \longrightarrow Pb(NO_3)_2 + NO \uparrow + H_2O$ $NO(15 e^-)$ paramagnetic, colourless gas $NO \uparrow \xrightarrow{O_2} NO_2 \uparrow$ paramagnetic, coloured gas $HNO_2 \longrightarrow HNO_3 + NO \uparrow + H_2O$
- **28.** (d) $I_2 + H_2O \xrightarrow{R.T.} 2HI + 1/2O_2$, ΔG of this reaction is positive, hence oxidation of $I^-(aq.)$ into I_2 is feasible.
- 29. (c) $H_2S\uparrow + SO_2\uparrow \xrightarrow{Comprop.} S\downarrow + H_2O$ $I\lceil (aq.) + IO_3\lceil (aq.) + H^+(aq.) \xrightarrow{Comprop.} I_2 + H_2O$ $K_2MnO_4 + H^+(aq.) \xrightarrow{disprop.} KMnO_4 + MnO_2\downarrow \text{ defined by}$ $MnO_4\lceil (aq.) + Mn^{2+}(aq.) \xrightarrow{Comprop.} MnO_2\downarrow$
- **30.** (d) $Fe^{2+} + [Fe(CN)_6]^{4-} \longrightarrow White colour ppt. Let us the description of the colour ppt.$
- 31. (a) Cu²⁺(aq.) has oxidizing property it oxidizes I⁻(aq.) CN⁻(aq.) SCN⁻(aq.) into I₂, (CN)₂, (SCN)₂ respectively but does not oxidize Cl⁻(aq.) as it is weaker reductant.

32. (b)
$$\frac{1}{8}S_8 + \text{conc. } 2H_2SO_4 \xrightarrow{\text{Warm}} 3SO_2 + 2H_2O$$

 $\frac{1}{8}S_8 + \text{conc. } 6HNO_3 \xrightarrow{\text{Warm}} 6NO_2 + H_2SO_4 + 2H_2O$
 $PbS + \frac{3}{2}O_2 \xrightarrow{\Delta} PbO + SO_2 \uparrow$
 $2FeS_2 + \frac{11}{2}O_2 \xrightarrow{\Delta} Fe_2O_3 + 4SO_2 \uparrow$

- 33. (a) Zn reacts with very dil. HNO₃ while Pb, Cu, Au metals do not react with very dil. HNO₃.
- 34. (d) Aq. solution of MnCl₂ is light pink or colourless.
- 35. (d)

(d)
(a)
$$2AgCl \downarrow + CaF_2(aq.) \xrightarrow{Aqueous} 2AgF(aq.) + CaCl_2(aq.)$$
(Insoluble) (Soluble) (Soluble) (Soluble)

(b)
$$BaSO_4 \downarrow + 2NaOH \xrightarrow{Aqueous} Ba(OH)_2 + Na_2SO_4$$
(Soluble) (Soluble) (Soluble)

(c)
$$Pb(NO_3)_2$$
 + $2CH_3COONa \xrightarrow{Aqueous} Pb(OAc)_2$ + $2NaNO_3$ (Soluble) (Soluble)

(d)
$$Na_2CrO_7$$
 + $BaCl_2$ $\xrightarrow{Aqueous}$ $BaCrO_4 \downarrow$ + $2NaCl_2$ (Soluble) (Soluble)

36. (a) Fe(OH)₂ is insoluble in NH₃ solution.

(a)
$$SnCl_2 + HgCl_2 \xrightarrow{Redox} Hg \downarrow + SnCl_4$$

(b) CuSO₄ + KCN
$$\longrightarrow$$
 K₂SO₄ + Cu(CN)₂ \downarrow $\xrightarrow{\text{Spontaneous} \atop (R.T.)}$ Cu(CN) \downarrow + (CN)₂ \uparrow $\xrightarrow{\text{Intramolecular} \atop \text{redox}}$

(d)
$$Ag_2O + SO_2 \xrightarrow{Redox} Ag + SO_3 \uparrow$$

38. (c)
$$K_4[Fe(CN)_6] + Zn^{2+}(aq.) \longrightarrow Zn_2[Fe(CN)_6] \downarrow$$
(White ppt.)

39. (c) Na₂S+AgNO₃
$$\longrightarrow$$
 Ag₂S \downarrow +NaNO₃ (Black ppt.)

$$NaI + AgNO_3 \longrightarrow AgI \downarrow + NaNO_3$$
(Yellow ppt.)

$$Na_3PO_4 + AgNO_3 \longrightarrow Ag_3PO_4 \downarrow + NaNO_3$$
(Yellow ppt.)

$$NaBr + AgNO_3 \longrightarrow AgBr \downarrow + NaNO_3$$
(Pale Yellow ppt.)

- * Ag ₂S is insoluble in NH₃ solution.
- * AgBr is insoluble in dil. HNO₃ and soluble in conc. NH₃.
- * AgI is insoluble in dil. HNO₃ and conc. NH₃.
- * Ag 3PO4 is soluble in both dil. HNO3 and conc. NH3.
- 40. (d) Hg 2Cl2 do not produce chlorine gas.
- **41.** (d)

(a)
$$CO_3^{2-}(aq.)$$
 \longrightarrow $BaCO_3 \downarrow$

$$AgNO_3 \rightarrow Ag_2CO_3 \downarrow$$
(b) $C_2O_4^{2-}(aq.)$ \longrightarrow $AgNO_3 \rightarrow Ag_2C_2O_4 \downarrow$

$$AgNO_3 \rightarrow Ag_2C_2O_4 \downarrow$$
(c) $MnO_4^{-}(aq.)$ \longrightarrow $AgNO_3 \rightarrow$ No reaction $[Ba(MnO_4)_2 \downarrow$ is water soluble.]
$$AgNO_3 \rightarrow$$
 No reaction $[AgMnO_4]$ is water soluble.]

(d)
$$S^{2-}(aq.)$$
 No reaction [BaS is water soluble.]

AgNO₃ Ag₂S \downarrow

- 42. (b) Ba(OH)2 is water soluble.
- 43. (a) $SnSO_4 \xrightarrow{\Delta} SnO_2 + SO_2 \uparrow (SO_3 \text{ is not formed.})$
- **44.** (a) The green solution of MnO₄²⁻(aq.) is stable only in strong basic medium, in neutral (or) acidic (or) less basic medium it disproportionates into MnO₂ and MnO₄⁻.

$$K_2MnO_4(Green) \xrightarrow{In \text{ presence of} \atop SO_3/acidic medium} KMnO_4(Purple) + MnO_2 (Dark brown)$$

- **45.** (b) $2\text{CuCl}_2(aq.) \xrightarrow{K_4[\text{Fe}(\text{CN})_6]} \text{Cu}_2[\text{Fe}(\text{CN})_6] \downarrow (\text{Chocolate brown ppt.}) + 4\text{KCl}(aq.)$ $CuCl_2(aq.) \xrightarrow{2AgNO_3} 2AgCl(white ppt.) \downarrow +Cu(NO_3)_2(aq.)$
- 46. (b) Cl being weak reducing nature it can only be oxidize by strong oxidizing agent.
 - (a) $2HCl + PbO_2 \longrightarrow PbO + Cl_2 \uparrow + H_2O$
 - (b) $HCl + conc. H_2SO_4 \longrightarrow No reaction$
 - (c) $4HCl + MnO_2 \longrightarrow MnCl_2 + 2Cl_2 \uparrow + 2H_2O$
 - (d) $2HCl + K_2Cr_2O_7 + 12H^+ \longrightarrow 2Cr^{3+}(aq.) + 2K^+(aq.) + Cl_2 \uparrow + 7H_2O$
- 47. (b) CO_3^{2-} , $HCO_3^{-} \xrightarrow{CaCl_2 \text{ sol.}} CaCO_3 \downarrow (ppt.) + HCO_3^{-} (Soluble) \xrightarrow{Filtrate} HCO_3^{-}$
- 48. (d)

(a)
$$2K_2Cr_2O_7(Orange) \xrightarrow{\Delta} 2K_2CrO_4(Yellow) + Cr_2O_3(Green) + \frac{3}{2}O_2 \uparrow$$

- (b) $2KMnO_4(Purple) \xrightarrow{\Delta} K_2MnO_4(Green) + MnO_2(Black) + O_2 \uparrow$
- (c) $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} Cr_2O_3(Green) + N_2 \uparrow + 4H_2O_3$
- (d) $NH_4NO_3 \xrightarrow{\Delta} N_2O(g)$ (Colourless) + $2H_2O$
- **49.** (d)
 - (a) $Fe^{2+}(aq.) \xrightarrow{NaOH \text{ soln.}} Fe(OH)_2 \downarrow (Dirty \text{ green ppt.})$
 - (b) Fe²⁺(aq.) $\xrightarrow{NH_3 \text{ soln.}}$ Fe(OH)₂ \downarrow (Dirty green ppt.)
 - (c) $Fe^{2+}(aq.) \xrightarrow{Na_2CO_3} FeCO_3 \downarrow (Brown ppt.)$
- **50.** (d) MnO₄⁻(aq.) + Mn²⁺(aq.) $\xrightarrow{\text{Comproportionation Reaction}} \text{MnO}_2$
- **51.** (b) $\text{CrO}_4^{2-}(aq.) \stackrel{\text{pH}<7}{\underset{\text{(basic)}}{\longleftarrow}} \text{Cr}_2\text{O}_7^{2-}(aq.)$

 $\mathrm{NH_3}$ being basic in solution, does not change yellow colour of $\mathrm{CrO_4}^2$ -(aq.).

52. (b)
$$Mg_3N_2(s) + H_2O \xrightarrow{R.T.} Mg(OH)_2 \downarrow + NH_3 \uparrow$$

$$\operatorname{Zn}(aq.) + 4\operatorname{NH}_3 \Longrightarrow [\operatorname{Zn}(\operatorname{NH}_3)_4]^{2+}$$
 $\operatorname{(3d^{10}4s^0)}$
(colourless complex ion)

Fe³⁺(aq.),
$$Zn^{2+}$$
(aq.)

NaOH (excess)

ppt.
Filtrate
Fe(OH)₃
 $[Zn(OH)_4]^{2-}$

54. (d) $Cl_2(g) + H_2O \xrightarrow{R.T.} HCl + HClO_{(p)}$

Fe(OH)₃

- $H_2S(g) + HCl \longrightarrow No reaction$ $H_2S(g) + HCIO \longrightarrow HCI + S\downarrow + H_2O$
- 55. (d) $HgS + Na_2S(aq.) \rightleftharpoons Na_2[HgS_2]$
- **56.** (c) $SbCl_3 + H_2O \Rightarrow SbOCl + 2HCl$

57. (b) NaOH separates when one of the metal cation form amphoteric oxide and other form basic oxide Al3+, Cr3+, Zn2+, Pb2+ amphoteric; Fe3+ basic.

58. (c)
$$NO_2 + H_2O \longrightarrow HNO_2 + HNO_3$$
 $NO_2 + NaOH \longrightarrow NaNO_2 + NaNO_3$
 $P_4 + H_2O \longrightarrow No \ reaction$ $P_4 + NaOH \longrightarrow NaH_2PO_2 + PH_3$
 $Al + H_2O \longrightarrow No \ reaction$ $Al + NaOH \longrightarrow NaAlO_2 + H_2 \uparrow$
 $I_2 + H_2O \longrightarrow No \ reaction$ $I_2 + NaOH \longrightarrow NaI + NaOI$

59. (d)
$$S_8 + \text{con.} H_2SO_4 \longrightarrow SO_2 \uparrow$$

 $SO_2 + H_2O \Longrightarrow H_2SO_3$
 $S_8 + \text{con.} HNO_3 \longrightarrow H_2SO_4 + NO_2 \uparrow$
 $B + \text{con.} H_2SO_4 \longrightarrow B_2O_3$
 $B_2O_3 + H_2O \longrightarrow H_3BO_3 \Longrightarrow H^+[B(OH)_4]^-$
 $B + \text{con.} HNO_3 \longrightarrow H_3BO_3 + NO_2 \uparrow$
 $Si + \text{con.} H_2SO_4 \longrightarrow SiO_2$

$$SiO_2 + H_2O \longrightarrow No reaction$$

Si + con. HNO₃ $\longrightarrow H_4SiO_4 + NO_2 \uparrow$

(a)
$$P_4 + SOCl_2 \longrightarrow PCl_3 + SO_2 + S_2Cl_2$$

(b)
$$P_4 + SO_2Cl_2 \longrightarrow PCl_5 + SO_2$$

(b)
$$P_4 + SO_2Cl_2 \longrightarrow PCl_5 + SO_2$$

(c) $XeF_4 + H_2O \longrightarrow Xe + XeO_3 + HF + O_2$

(d)
$$NH_4NO_3 + Zn + excess NaOH \longrightarrow NH_3 \uparrow + Na_2ZnO_2 + H_2O$$

61. (a)
$$Cu^{2+}(aq.)$$
 do not undergo redox reaction with $(NH_4)_2S$.

63. (c)
$$Ce^{4+}(aq.)$$
 act as oxidising agent.

Thus it accepts electrons from reducing agents and get reduced to $Ce^{3+}(aq.)$.

$$Ce^{4+}(aq.)+e^{-}\longrightarrow Ce^{3+}(aq.)$$

64. (b) Basic radicals are classified on the basis of increasing order of K_{sp} . Cd^{2+} in II group while Ni^{2+} in IV group.

65. (b)
$$2NH_4CIO_4 \xrightarrow{\Delta} N_2 \uparrow + CI_2 \uparrow + 2O_2 \uparrow + 4H_2O$$

$$CaCO_3 \xrightarrow{\Delta} CaO + CO_2 \uparrow$$

$$NH_4NO_2 \xrightarrow{\Delta} N_2 \uparrow + 2H_2O$$

$$NaNO_3 \xrightarrow{below} NaNO_2 + \frac{1}{2}O_2 \uparrow$$

$$2NaNO_3 \xrightarrow{800^{\circ}C} Na_2O + N_2 \uparrow + \frac{5}{2}O_2 \uparrow$$

66. (b)
$$CuCl_2 + (NH_4)_2S \longrightarrow CuS\downarrow + 2NH_4Cl_{soluble}$$
 soluble

67. (b) PbO2 does not react with cold dil. HNO3 due to its more acidic nature.

69. (b) Order of solubility in water

TYPES OF REACTIONS

70. (c)
$$3Br_2 + 3Na_2CO_3 \longrightarrow 5NaBr + NaBrO_3 + 3CO_2 \uparrow$$

$$\Delta \downarrow H_2SO_4$$

$$3Br_2 \uparrow + Na_2SO_4$$
(Pure)

71. (c) In I group only Li form nitride and all II group metal form nitride.

$$\begin{array}{c} \operatorname{Mg} + \operatorname{N}_2 \longrightarrow \operatorname{Mg}_3 \operatorname{N}_2 \xrightarrow{\operatorname{H}_2\operatorname{O} \; (\operatorname{moist})} \to \operatorname{Mg}(\operatorname{OH})_2 + \operatorname{NH}_3 \\ \operatorname{Ca} + \operatorname{N}_2 \longrightarrow \operatorname{Ca}_3 \operatorname{N}_2 \xrightarrow{\operatorname{H}_2\operatorname{O} \; (\operatorname{moist})} \to \operatorname{Ca}(\operatorname{OH})_2 + \operatorname{NH}_3 \\ \operatorname{Li} + \operatorname{N}_2 \longrightarrow \operatorname{Li}_3 \operatorname{N} \xrightarrow{\operatorname{H}_2\operatorname{O} \; (\operatorname{moist})} \to \operatorname{Li}\operatorname{OH} + \operatorname{NH}_3 \\ \operatorname{K} + \operatorname{N}_2 \longrightarrow \operatorname{No} \; \operatorname{reaction} \end{array}$$

72. (c) SO_2 soluble in water. So cannot be collected over water.

73. (a)
$$\phi$$
 of metal cation $\propto \frac{1}{\text{T. S. of ionic compound poly atomic anion}}$
NaHCO₃ < KHCO₃ < RbHCO₃ < CsHCO₃

74. (d)

(a)
$$Fe^{3+} + K_3[Fe(CN)_6] \longrightarrow Fe[Fe(CN)_6]$$

Brown Colour

(b)
$$Fe^{2+} + K_3[Fe(CN)_6] \longrightarrow Fe_3[Fe(CN)_6]_2$$
Turn Bull's blue

(c)
$$Fe^{3+} + KSCN$$
Pot. thioyanate
Pe(SCN)₃
Blood red colou

(d)
$$Fe^{2+}$$
 + KSCN \longrightarrow No reaction

75. (a)
$$(NH_4)_2Cr_2O_7 \longrightarrow N_2 + Cr_2O_3 + 4H_2O$$

(a)
$$NH_4NO_2 \longrightarrow N_2 + H_2O$$

76. (c)

(a)
$$Ca_3P_2 + 6H_2O \longrightarrow 3Ca(OH)_2 + 2PH_3 \uparrow$$
Basic Basic gas

(b) AlN + 3H₂O
$$\longrightarrow$$
 Al(OH)₃ + NH₃ \uparrow
Basic gas

(c)
$$Al_2S_3 + 6H_2O \longrightarrow 2Al(OH)_3 + 3H_2S \uparrow$$
Basic gas

(d)
$$CaH_2 + 2H_2O \longrightarrow Ca(OH)_2 + 2H_2 \uparrow$$
Neutral gas

77. (c)

(a)
$$HCl + KMnO_4 \longrightarrow Mn^{2+} + Cl_2 \uparrow$$

(b)
$$HCl + MnO_2 \longrightarrow Mn^{2+} + Cl_2 \uparrow$$

(c)
$$HCl + Br_2 \longrightarrow No \text{ reaction } (\Delta G = +ve, \text{ because } Br_2 \text{ is weaker oxidant than } Cl_2)$$

(d)
$$HCl + F_2 \longrightarrow HF + Cl_2 \uparrow (\Delta G = -ve, because F_2 is stronger oxidant than Cl_2)$$

78. (a)

(a)
$$2NH_4ClO_4 \xrightarrow{\Delta} N_2 \uparrow + Cl_2 \uparrow + 2O_2 \uparrow + 4H_2O$$

(b)
$$NH_4Cl \xrightarrow{\Delta} NH_3 \uparrow + HCl \uparrow$$

(c)
$$(NH_4)_2CO_3 \xrightarrow{+2NaOH} NH_3 + 2H_2O + Na_2CO_3(NH_4^+Salt decomposition reaction)$$

(d)
$$\text{Li}_3\text{N} \xrightarrow{+3\text{H}_2\text{O}} 3\text{LiOH} + \text{NH}_3$$

79. (d) 'Q' salt +
$$H_2S \xrightarrow{H^+} S + Mn^{2+}(aq.)$$

80. (a)
$$\operatorname{FeSO_4}(s) \xrightarrow{\Delta} \operatorname{Fe_2O_3}(s) + \operatorname{SO_3}(g) + \operatorname{SO_2}(g)$$
(A) (B) (C) (D)
$$\downarrow \operatorname{Cr_2O_7^{2-}/H^+}} \operatorname{Na_2CrO_4} \xleftarrow{\operatorname{Na_2O_2}} \operatorname{Cr^{3+}}(aq.)$$
(Yellow solution)
(Green solution)

81. (c)

(a)
$$S^{2-} + \underbrace{Zn + dil. HCl}_{St. Reducing agent} \xrightarrow{[H]} H_2S^{\uparrow}$$

(b)
$$SO_3^{2-} + Zn + dil.HCl \xrightarrow{[H]} H_2S^{\uparrow}$$

(c)
$$NO_3^- + \underbrace{Zn + dil. HCl}_{St. Reducing agent} \xrightarrow{[H]} NH_3 \xrightarrow{dil. HCl} NH_4Cl(s)$$

(d)
$$CH_3COO^- + \underbrace{Zn + dil. HCl}_{St. Reducing agent} \xrightarrow{[H]} C_2H_6$$

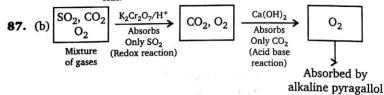
82. (a)
$$Fe^{3+}(aq.) + H_2S \xrightarrow{\text{Redox}} S \downarrow + Fe^{2+}(aq.) \xrightarrow{\text{Neutral } H_2S} \text{No ppt.}$$

83. (a) NaCl(s) +
$$K_2Cr_2O_7(s)$$
 + Conc. H_2SO_4 $\xrightarrow{Non-Redox\ reaction}$ $\xrightarrow{+6}$ $Cr\ O_2Cl_2$ (Reddish brown fumes)

84. (a)

- (a) N₂O --- Diamagnetic, Neutral
- (b) NO₂ → Paramagnetic, Acidic
- (d) N₂O₃ → Diamagnetic, Acidic
- 85. (b) AgCl and AgI both are insoluble in dil. HNO₃, and both are soluble in complexing agents (CN⁻ solution and Hypo solution), but AgCl is soluble in dil. NH₃ solution whereas AgI is insoluble even in highly conc. NH₃ solution.

86. (b)
$$PbO_2 + 2HNO_3 \longrightarrow Pb(NO_3)_2 + H_2O + \frac{1}{2}O_2 \uparrow$$



88. (b)

(a) KMnO₄ : Pink/Purple (b) BaSO₄ : Colourless (c) Na₂CrO₄ : Yellow

(d) CoCl₂ : Blue compound

89. (b)

(a)
$$XeO_2F_2 + H_2O \longrightarrow XeO_3 + 2HF$$

(b)
$$2XeF_2 + 2H_2O \longrightarrow 2Xe + 4HF + O_2$$

(c)
$$6XeF_4 + 12H_2O \longrightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$$

(d)
$$XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$$

90. (b)
$$2\text{FeSO}_4 \cdot 7\text{H}_2\text{O} \xrightarrow{300^{\circ}\text{C}} 2\text{FeSO}_4 \xrightarrow{\Delta} \text{Fe}_2\text{O}_3(s) + \text{SO}_2 \uparrow + \text{SO}_3 \uparrow$$

Level 3

Passage-1

1. (b)
$$SO_3^{2-}(aq.) \xrightarrow{Zn+dil. HCl} H_2S \uparrow \xrightarrow{FeCl_3} S^{\circ} \downarrow + Fe^{2+} \text{(pale green)}$$

$$\Delta \downarrow S^{\circ} \qquad \qquad \downarrow MnO_4^{-}/H^{+}$$

$$S_2O_3^{2-} \qquad \qquad S^{\circ} \downarrow + Mn^{2+}(aq.) \text{(white turbidity)}$$

2. (b) *
$$Fe^{2+} + NH_4SCN \longrightarrow No$$
 reaction.
* $Fe^{3+} + NH_4SCN \longrightarrow Fe(SCN)_3$ blood red.

Passage-2

1. (a) For salt 'R'

(a)
$$NH_4NO_3 \xrightarrow{\Delta} N_2O + H_2O$$

(Neutral) (Neutral)

(b)
$$(NH_4)_2CO_3 \xrightarrow{\Delta} NH_3 \uparrow + CO_2 \uparrow + H_2O$$

(Basic) (Acidic)

(c)
$$(NH_4)_2S \xrightarrow{\Delta} NH_3 \uparrow + H_2S \uparrow$$
(Basic) (Acidic)

(d)
$$NH_4Cl \xrightarrow{\Delta} NH_3 \uparrow + HCl \uparrow (Acidic)$$

2. (c) Salt 'P' can be (NH₄)₂CrO₄:

$$\begin{array}{c} (\mathrm{NH_4})_2\mathrm{CrO}_7 \stackrel{\Delta}{\longrightarrow} \mathrm{N_2} + \mathrm{Cr}_2\mathrm{O}_3 + \mathrm{H}_2\mathrm{O} \\ \mathrm{(Orange)} & \mathrm{(Neutral gas)} & \mathrm{(Coloured solid)} & \mathrm{(Neutral vapours)} \end{array}$$

3. (d)
$${}^{\circ}Q{}^{\circ}$$
 salt + ${}^{\circ}H_2S$ $\xrightarrow{H^+}$ S+Mn²⁺(aq.)

Passage-3

1. (d)
$$FeSO_4 \cdot 7H_2O \xrightarrow{\Delta \\ (Green)} FeSO_4 \xrightarrow{(White \\ from 2 \text{ moles})} Fe_2O_3 + SO_2 \uparrow + SO_3 \uparrow \\ (Brown) \downarrow (\mu_D \neq 0)} + SO_3 \uparrow \downarrow (\mu_D \neq 0)$$

$$3SO_3(g) \xrightarrow{cool} S_3O_9 \downarrow (\mu_D \neq 0)$$

2. (b)
$$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + CO_2 \uparrow + H_2O \uparrow$$
(Extinguishes fire) $\downarrow CuSO_4$ (White)

$$CuSO_4 \cdot 5H_2O$$
(Blue)

3. (b) PbO₂ does not react with cold dil. HNO₃ due to its more acidic nature.

Passage-4

1. (d)
$$\Rightarrow 2\text{FeSO}_4 \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + \text{SO}_2 \uparrow + \text{SO}_3 \uparrow$$

 $\Rightarrow \text{SnSO}_4 \xrightarrow{\Delta} \text{SnO}_2 + \text{SO}_2 \uparrow$
 $\Rightarrow \text{H}_2\text{C}_2\text{O}_4 \xrightarrow{\Delta} \text{CO} \uparrow + \text{CO}_2 \uparrow + \text{H}_2\text{O}$
 $\Rightarrow 2\text{Na}_2\text{HPO}_4 \xrightarrow{\Delta} \text{Na}_4\text{P}_2\text{O}_7 + \text{H}_2\text{O}$
2. (d) $\Rightarrow \text{Pb}(\text{NO}_3)_2 \xrightarrow{\Delta} \text{PbO}_{\text{Red in hot}} + 2\text{NO}_2 \uparrow + \frac{1}{2} \text{O}_3$
 $\xrightarrow{\text{Two different paramagnetic gases}}$
 $\Rightarrow \text{Hg}(\text{NO}_3)_2 \xrightarrow{\Delta} \text{Hg} + 2\text{NO}_2 \uparrow + \text{O}_2 \uparrow$
 $\Rightarrow \text{FeC}_2\text{O}_4 \xrightarrow{\Delta} \text{FeO} + \text{CO} \uparrow + \text{CO}_2 \uparrow$
 $\Rightarrow \text{ZnSO}_4 \xrightarrow{>800^{\circ}\text{C}} \text{ZnO} + \text{SO}_2 \uparrow + \frac{1}{2} \text{O}_2 \uparrow$

Passage-5

1. (a)
$$\Rightarrow N_2(g) \xrightarrow{O_2 \atop 3000^{\circ}C} NO \uparrow \xrightarrow{O_2 \atop (P)} NO_2 \uparrow \xrightarrow{H_2O} HNO_3 + NO \uparrow$$

dil. $HNO_3 \xrightarrow{Cu} NO \uparrow$
 $Cu \atop (P)} NO \uparrow$
 $Cu \atop (P)} NO \uparrow$
 $Cu \atop (P)} Conc. $HNO_3 \xrightarrow{Cu} NO_2 \uparrow$
 $Cu \atop (P)} OO$$

NO2 is an acidic oxide, brown colour triatomic paramagnetic gas.

2. (c)
$$\Rightarrow$$
 S₈(B) $\xrightarrow{O_2}$ SO₂ \uparrow $\xrightarrow{Approp. catalyst}$ SO₃ \uparrow $\xrightarrow{H_2O}$ H₂SO₄+Heat
SO₂ + Ba(OH)₂ \longrightarrow BaSO₃ \downarrow
(Baryta water) \downarrow (White turbidity)
BaSO₃ \downarrow + SO₂ \uparrow + H₂O \longrightarrow Ba(HSO₃)₂
(Excess) \uparrow + CO₂ \uparrow + H⁺(aq.) \longrightarrow 2Cr³⁺(aq.) + 3SO₄²⁻(aq.) + H₂O
SO₂ \uparrow + H₂S \uparrow \longrightarrow S \downarrow
SO₂ \uparrow + Cl₂ \uparrow \longrightarrow SO₂Cl₂

3. (d) Ca(OCl)Cl + SO₂ $\uparrow \longrightarrow$ CaSO₄ + 2Cl

Passage-6

1. (d)
$$FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O + NH_4Cl(s) + NH_4OH \longrightarrow No ppt.$$

$$\underbrace{Fe^{2+}(aq.) + NH_4^+(aq.)}_{From double salt (M)} + NaOH(soln.) \longrightarrow NH_3 \uparrow + Fe(OH)_2 \downarrow \stackrel{(P)}{\downarrow}_{Green}$$

2. (c)
$$\Rightarrow$$
 Fe(OH)₂ \downarrow +conc. HCl \longrightarrow FeCl₂ $\xrightarrow{\text{Cl}_2(g)}$ FeCl₃(aq.) (Yellow soln.)
$$\Rightarrow \text{Cl} - \text{Fe} \qquad \text{Fe} - \text{Cl}$$

⇒ In methylene blue test for H₂S gas FeCl₃ is used.

3. (c) NaNO₂ + dil. H₂SO₄ + Fe²⁺ (aq.)
$$\longrightarrow$$
 [Fe(H₂O)₅(NO)]²⁺ (Brown ring complex)

$$\begin{split} & \operatorname{HgI}_2 + \operatorname{NH}_3 \uparrow + \operatorname{H}_2 \operatorname{O} \longrightarrow \operatorname{HgO} \cdot \operatorname{Hg}(\operatorname{NH}_2) \operatorname{I} \downarrow \\ & \stackrel{\text{(Brown ppt)}}{} \end{split}$$

$$\operatorname{Fe}^{2+}(aq.) + \operatorname{NH}_4^+(aq.) + \operatorname{H}_2 \operatorname{S} \uparrow \longrightarrow \operatorname{No \ reaction}$$

$$\operatorname{Fe}^{2+}(aq.) + \operatorname{Br}_2 \longrightarrow \operatorname{Fe}^{3+}(aq.) + \operatorname{Br}^-(aq.)$$

$$\stackrel{\text{(Green)}}{} \end{split}$$

Passage-7

1. (d)
$$ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2 \uparrow$$

$$\downarrow dil. HCl \qquad \downarrow Ba(OH)_2$$

$$ZnCl_2 \qquad BaCO_3 \downarrow$$
(Water (White ppt.)

- **2.** (d)
 - (a) ZnO is yellow when hot and white when cold.
 - (b) CO_2 is the acid anhydride of H_2CO_3 .
 - (c) $ZnO + NaOH \xrightarrow{aq.} Na_2[Zn(OH)_4]$ or $Na_2ZnO_2 + 2H_2O$
 - (d) CO2 is a lewis acid.

Passage-8

1. (b) CuSO₄(aq.)+3I⁻(aq.)
$$\longrightarrow$$
 CuI \downarrow +I₃⁻(aq.)+SO₄²⁻(aq.)
Excess Brown Colour

2. (d)
$$Cu^{2+}(aq.) + 2CN^{-}(aq.) \longrightarrow Cu(CN)_2 \xrightarrow{I.M.R.} CuCN \downarrow + (CN)_2 \uparrow$$
Unstable

$$CuCN \downarrow + 3KCN \underset{Excess}{\longleftrightarrow} K_3[Cu(CN)_4]$$

Passage-9

- 1. (d) PbS (Black ppt.)
- (d) Fe(OH)₃ (Q) undergo redox reaction with Na₂S₂O₃ solution, KI + Starch, K₄[Fe(CN)₆] showing change in colour.

One or more than one correct

(a)
$$PbO_2 + warm conc. H_2SO_4 \longrightarrow PbSO_4 \downarrow + O_2 \uparrow$$

(b)
$$2\text{NaOH} + \text{F}_2 \longrightarrow 2\text{NaF} + \frac{1}{2}\text{O}_2 + \text{H}_2\text{O}$$

(c)
$$2PbO_2 + conc.2HNO_3 \longrightarrow 2PbNO_3 + \frac{5}{2}O_2 + H_2O_3$$

(d)
$$XeF_2 + H_2O \longrightarrow Xe + \frac{1}{2}O_2 + 2HF$$

$$SO_2(g) + Cl_2(g) \longrightarrow SO_2Cl_2 \xrightarrow{P_4} PCl_5 + SO_2$$

$$\begin{array}{c} \text{Al}^{3+} & \xrightarrow{\text{NaOH}} & \text{Al}(\text{OH})_3 \downarrow \xrightarrow{\text{NaOH}} & \text{Na}[\text{Al}(\text{OH})_4] \text{ soluble} \\ \\ \text{(s-block)} & \xrightarrow{\text{NH}_3} & \text{Al}(\text{OH})_3 \downarrow \xrightarrow{\text{NH}_3} & \text{insoluble} \end{array}$$

$$Zn^{2+} \xrightarrow[(d-block)]{NaOH} Zn(OH)_{2} \downarrow \xrightarrow{NaOH} Na_{2}[Zn(OH)_{4}] \text{ soluble}$$

$$Zn^{2+} \xrightarrow[NH_{3}]{NH_{3}} Zn(OH)_{2} \downarrow \xrightarrow{NH_{3}} [Zn(NH_{3})_{4}]^{2+} \text{ soluble}$$

$$\begin{array}{c} \text{Cr}^{3+} & \xrightarrow{\text{NaOH}} & \text{Cr}(\text{OH})_3 \downarrow \xrightarrow{\text{NaOH}} & \text{Na}[\text{Cr}(\text{OH})_4] \text{ soluble} \\ \\ \text{Cr}^{(d\text{-block})} & \xrightarrow{\text{NH}_3} & \text{Cr}(\text{OH})_3 \downarrow \xrightarrow{\text{NH}_3} & [\text{Cr}(\text{NH}_3)_6]^{3+} \text{ soluble} \\ \end{array}$$

$$\begin{array}{c} \text{Pb}^{2+} & \xrightarrow{\text{NaOH}} & \text{Pb(OH)}_2 \downarrow \xrightarrow{\text{NaOH}} & \text{Na[Pb(OH)}_4] \text{ soluble} \\ \\ \text{Pb}^{2+} & \xrightarrow{\text{NH}_3} & \text{Pb(OH)}_2 \downarrow \xrightarrow{\text{maoH}} & \text{insoluble} \end{array}$$

$$P_4O_3 + H_2O \longrightarrow H_3PO_3 + H_3PO_4$$

 $POCl_3 + H_2O \longrightarrow H_3PO_4 + HCl$
 $NO_2 + H_2O \longrightarrow HNO_2 + HNO_3$

$$Xe + F_2 \xrightarrow{1:20} XeF_6 \xrightarrow{H_2O} XeOF_4 \xrightarrow{H_2O} XeO_2F_2 \xrightarrow{H_2O} XeO_3$$

	Geometry	Oxidation state of Xe	Lone pair on Xe	No. of Covalent bonds
XeF ₆	distorted octahedral	+6	1	6
XeOF ₄	square pyramidal	+6	1	6
XeO_2F_2	see-saw	+6	1	6
(1)				•

6. (a, d)

Black colour sulphide (HgS, CuS) do not react with non-oxidizing acids dil. HCl except FeS $ZnS + 2HCl \longrightarrow ZnCl_2 + H_2S \uparrow$

$$3I_2 + 6OH^-_{\text{(hot } qq. \text{sol. of Na}_2CO_3)} \longrightarrow 5I^-(aq.) + IO_3^-(aq.) + 3H_2O$$

$$IO_3^- + H^+ + H_2S \uparrow \longrightarrow S \downarrow + I_3^-$$

$$IO_3^- + H^+ + SO_2 \uparrow \longrightarrow SO_4^- + I_3^-$$

$$IO_3^- + H^+ + I^- \xrightarrow{\text{comprop.}} I_2$$

Cr₂O₇²⁻ does not exhibit oxidising property in alkaline medium.

8. (c)
$$SO_2$$

$$Na_2CO_3 \rightarrow Na_2SO_3 \downarrow \xrightarrow{S} Na_2S_2O_3$$

$$(P) \qquad (R)$$

$$H_2S \rightarrow S \downarrow$$

$$(Q)$$

CaS2O3 is water soluble.

$$Hg(NO_3)_2 \longrightarrow HgO + NO_2 + O_2$$
 $Hg + O_2$

$$KNO_3 \longrightarrow KNO_2 + O_2$$

$$N_2O_4 \longrightarrow 2NO_2$$

$$N_2O_3 \longrightarrow NO + NO_2$$

10. (a, c)

(a)
$$CaCO_3 \downarrow + dil. HCl \longrightarrow CaCl_2(aq.) + H_2CO_3$$

(b) BaCrO₄
$$\downarrow$$
 +dil. HCl \longrightarrow BaCl₂(aq.) + H₂Cr₂O₇ (Organe solution

(c)
$$MgC_2O_4 \downarrow + dil. HCl \longrightarrow MgCl_2(aq.) + H_2C_2O_4$$

(d)
$$BaSO_4 + dil$$
. $HCl \longrightarrow (No reaction)$

11. (a, c, d)

(a)
$$Ba(OH)_2(aq.) + SO_2(g) \longrightarrow BaSO_3 \downarrow$$

(b)
$$AgF(aq.) + NaNO_3(aq.) \longrightarrow No reaction$$

(c)
$$Pb(OAc)_2(aq.) + Na_2CO_3(aq.) \longrightarrow PbCO_3 \downarrow + CH_3COONa(aq.)$$

(d)
$$CuCl_2(aq.) + NH_3(Excess) \longrightarrow [Cu(NH_3)_4]Cl_2$$
(Deep blue solution)

12. (b, c)

(a)
$$Na_2O_2 + H_2O \xrightarrow{25^{\circ}C} NaOH + O_2 \uparrow$$

(a)
$$\text{Na}_2\text{O}_2^2 + \text{H}_2\text{O} \xrightarrow{25^{\circ}\text{C}} \text{HCl} + \text{HOCl}$$

(c)
$$P_4 + H_2O \xrightarrow{25^{\circ}C} No reaction$$

(d)
$$KO_2 + H_2O \xrightarrow{25^{\circ}C} KOH + O_2 \uparrow$$

13. (a, c, d)

(a)
$$Mg + NH_3(l) \longrightarrow No$$
 Interaction

(b)
$$B_2H_6 + H_2O \longrightarrow H_3BO_3 + H_2 \uparrow$$

(c)
$$NaNH_2 + H_2O \longrightarrow NaOH + NH_3 \uparrow$$

(d) Be +
$$H_2O \longrightarrow$$
 No reaction

- 14. (d) Hgl₂, HgS, HgCO₃ are insoluble. Thus addition of KI, H₂S and Na₂CO₃ can shift reaction in backward direction.
- 15. (b, c)

Conc. H2SO4 oxidizes both HBr and H2S.

16. (a, d)

AgCl and AgBr dissolve in excess of conc. ammonia solution.

AgI does not dissolve in excess conc. NH3 solution.

17. (a)
$$I_2 + 2S_2O_3^{2-} \longrightarrow 2I^- + S_4O_6^{2-}$$

- 18. (b, c, d)
 - (a) $NO_3^- + Zn + dil$. $H_2SO_4 \xrightarrow{\Delta}$ Formed NH_3 is neutralized to NH_4^+ by H_2SO_4 and NH_3 is not liberated.
 - (b) $NH_4Cl + NaOH \xrightarrow{\Delta} NH_3 \uparrow + NaCl + H_2O$
 - (c) $2AlN + 3H_2O \xrightarrow{\Delta} Al_2O_3 + 2NH_3 \uparrow$
 - (d) $CH_3COONH_4 \xrightarrow{\Delta} CH_3COOH + NH_3 \uparrow$
- 19. (a, b, d)

(a)
$$\overset{(+2)}{\text{Hg}} CO_3 \xrightarrow{\Delta} \overset{(0)}{\text{(Redox)}} + CO_2(g) + \frac{1}{2} O_2(g)$$

(b)
$$Ag_2C_2O_4 \xrightarrow{\Delta} 2Ag + 2CO_2(g)$$

(c)
$${}^{(+3)}_{2\text{Fe}}\text{Cl}_{3} \cdot 6\text{H}_{2}\text{O} \xrightarrow[\text{Non-Redox})]{\Delta} {}^{(+3)}_{\text{Fe}_{2}}\text{O}_{3}(s) + 6\text{HCl} + 9\text{H}_{2}\text{O}$$

(d)
$$2K_2Cr_2O_7 \xrightarrow{\Delta} 2K_2CrO_4(s) + Cr_2O_3(s) + \frac{3}{2}O_2(g)$$

Match the column:

1. (A)
$$HgCO_3 \xrightarrow{\Delta} HgO + CO_2$$

 $\downarrow_{\Delta} Hg + O_2$

(B)
$$FeSO_4 \xrightarrow{\Delta} Fe_2O_3 + SO_2 + SO_3$$

$$\downarrow^{\Delta} SO_2 + O_2$$

(C)
$$BeC_2O_4 \xrightarrow{\Delta} BeO + CO_2 + CO$$

$$(D) AgNO_3 \xrightarrow{\Delta} Ag_2O + NO_2 + O_2$$
$$\xrightarrow{\Delta} Ag + O_2$$

2.
$$Na_2S_2O_3 + 2HCl \xrightarrow{R.T.} 2NaCl + H_2S_2O_3$$

NaCl +
$$H_2S_2O_3$$

$$\downarrow I.M.R.$$

$$H_2O + S \downarrow + SO_2 \uparrow$$
(Yellow)

$$ICl_3 + 2H_2O \xrightarrow{R.T.} HIO_2 + 3HCl$$

$$2\text{FeCl}_3 + \text{H}_2\text{S}(aq.) \xrightarrow{\text{R.T.}} 2\text{Fe}^{2+}(aq.) + \text{S} \downarrow + 2\text{HCl} + 4\text{Cl}^-(aq.)$$

$$H_2^{+IV} \longrightarrow S + H_2^{+VI} \longrightarrow S + H_2^{+VI}$$

- 3. PCl_3 : due to presence of vacant d-orbital it can act as π -acid ligand it does not act as classical ligand.
 - \Rightarrow PCl₃ + 3H₂O $\xrightarrow{R.T.}$ H₃PO₃ + 3HCl : undergoes only complete hydrolysis

 NF_3 : No vacant d-orbital or π^* M. O, and N-atom has lone pair; hence does not act as π -acid ligand but act as classical ligand.

⇒ Undergoes complete hydrolysis under drastic conditions

$$2NF_3 + 3H_2O \xrightarrow{300^{\circ}C} Na_2O_3 + 6HF$$

$$\downarrow \\ NO + NO_2 + 6HF$$

 \dot{Sb} Cl₃: Sb has vacant d-orbital, hence it can act as π -acid ligand and does not act as classical ligand.

⇒ Undergoes only partial hydrolysis

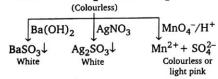
$$SbCl_3 + H_2O \xrightarrow[White turbidity]{R.T.} SbOCl + 2HCl$$

BF₃ \Rightarrow Boron has no lone pair hence it does not act as ligand.

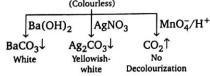
⇒ Undergoes only partial hydrolysis

$$4BF_3 + 3H_2O \xrightarrow{R.T.} H_3BO_3 + 3HBF_4$$

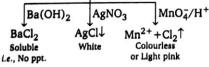
4. (A) $SO_3^{2-} + 2HCl \xrightarrow{\Delta} SO_2 \uparrow + 2Cl^- + H_2O$



(B) CO_3^{2-} + 2HCl $\xrightarrow{R.T.} CO_2 \uparrow$ + 2Cl⁻ + H₂O



(C) Cl⁻(s) +H₂SO₄ $\xrightarrow{\Delta}$ HCl \uparrow + HSO₄ (Colourless)



$$(D)NO_{2}^{-} + HCl \longrightarrow HNO_{2}$$

$$3HNO_{2} \xrightarrow{\Delta} HNO_{3} + 2NO\uparrow + H_{2}O$$

$$\downarrow \text{ atm air }$$

$$NO_{2}\uparrow$$

$$\text{Reddish-Brown}$$

$$\downarrow Ba(OH)_{2} \qquad AgNO_{3} \qquad MnO_{4}^{-}/H^{+}$$

$$Ba(NO_{2})_{2} \qquad AgNO_{2}\downarrow \qquad Mn^{2+} + NO_{3}^{-}$$

$$Soluble \text{ or }$$

$$Ba(NO_{3})_{2} \qquad \text{soluble}$$

$$Soluble \text{ or }$$

$$Soluble \text{ or$$

5. A:
$$(NH_4)_2Cr_2O_7(s) \xrightarrow{\Delta} N_2 \uparrow + Cr_2O_3(s) + 4H_2O$$

Non-polar Green amphoteric

B:
$$2\text{FeSO}_4(s) \xrightarrow{\Delta} \text{Fe}_2\text{O}_3(s) + \text{SO}_2 \uparrow + \text{SO}_3 \uparrow$$
Brown Polar (Basic) Polar acidic Non-polar

$$\text{C}: \text{Pb(NO}_3)_2(s) \xrightarrow{\Delta} \text{PbO}(s) + 2\text{NO}_2 \uparrow + \frac{1}{2} \text{O}_2 \uparrow \\ \text{Red} \\ \text{(Amphoteric)} \quad \text{Polar} \\ \text{acidic} \quad \text{Non-polar}$$

D:
$$P_4 + 3NaOH + 3H_2O \xrightarrow{\Delta} PH_3 \uparrow + NaH_2PO_2$$

6. (A)
$$NCl_3 + 3H_2O \xrightarrow{R.T.} NH_3 + +3HOCl$$

- → Non-redox hydrolysis
- → HOCl can act as both oxidizing and reducing agent.
- → NH₃: Monodentate ligand.

(B)
$$NO_2 + H_2O \xrightarrow{R.T.} HNO_2 + HNO_3$$

- → NO₂⁻, NO₃⁻ can act as flexidentate ligand.
- → HNO₂ can act as both oxidizing and rducing agent.
- → NO₂, NO₃ can act as monodentate ligand.

$$(C)H_2S_2O_8 + 2H_2O \xrightarrow{R.T.} 2H_2SO_4 + H_2O_2$$

- → H₂SO₄: Dibasic acid
- → SO₄²⁻ can act as flexidentate ligand...
- → H₂O₂ can act as both oxidizing and rducing agent.
- \rightarrow SO₄²⁻, can act as monodentate ligand.
- → Non-redox reaction.

(D)SF₄ +3H₂O
$$\xrightarrow{R.T.}$$
 H₂SO₃ +4HF

H₂SO₃: Dibasic acid

 SO_3^{2-} : Can act as flexidentate ligand.

H₂SO₃: Can act as both oxidising and reducing agent.

 SO_3^{2-} : Can act as monodentate ligand.

T: Non-redox hydrolysis.

7. (A)
$$Zn + dil. H_2SO_4$$

$$\begin{array}{c}
 & Pb(NO_2)_2 \\
\hline
 & (NH_4)_2S \\
\hline
 & MnO_4(aq.) \\
\hline
 & Hg_2^2+(aq.) \\
\hline
 & Hg_3^2+(aq.) \\
\hline
 & Hg_4 + Zn^2 + SO_4^2 \\
\hline
 & Mn^2+(aq.) + Zn^2 + \\
\hline
 & Hg_4 + Zn^2 + \\
\hline
 & (Grey black) \\
\hline
 & Bi_4 + Zn^2 + \\
\hline
 & (Grey black) \\
\hline
 & Bi_4 + Zn^2 + \\
\hline
 & (Grey black) \\
\hline
 & Bi_4 + Zn^2 + \\
\hline
 & (Grey black) \\
\hline
 & (Black) \\
\end{array}$$

$$(B) \text{ dil. HCl} \xrightarrow{\text{Pb}(\text{NO}_2)_2} \begin{array}{c} \text{PbCl}_2 \downarrow + \text{HNO}_3 + \text{NO} \uparrow \\ \text{(White)} \end{array}$$

$$\xrightarrow{\text{(NH}_4)_2 \text{S}} \begin{array}{c} \text{H}_2 \text{S} \uparrow + \text{NH}_4^+ + \text{Cl}^- \\ \text{MnO}_4^-(aq.) \end{array} \xrightarrow{\text{Mn}^2 + (aq.) + \text{Cl}_2 \uparrow} \xrightarrow{\text{Hg}_2^2 + (aq.)} \begin{array}{c} \text{Hg}_2^2 + (aq.) \\ \text{(White)} \end{array} \xrightarrow{\text{(White)}} \begin{array}{c} \text{Bi}^{3+} + 3\text{Cl}^- \end{array}$$

(C) NaOH (excess)
$$(C) \text{ NaOH (excess)} \xrightarrow{\text{Pb}(\text{NO}_2)_2} [\text{Pb}(\text{OH})_4]_2^- + \text{NO}_2^- \\ \xrightarrow{(\text{NH}_4)_2 \text{S}} \text{NH}_3^+ + 2\text{Na}^+ + \text{S}^{2-} \\ \xrightarrow{\text{MnO}_4^-(aq.)} \text{MnO}_4^{2-} + \text{O}_2^+ \\ \xrightarrow{\text{(Green)}} \text{Hg}_2^{2+(aq.)} \xrightarrow{\text{Hg} + \text{HgO}} \\ \xrightarrow{\text{Black}} \\ \xrightarrow{\text{Bi}^{3+}(aq.)} \xrightarrow{\text{Bi}(\text{OH})_3} \downarrow \\ \text{(White)}$$

$$(D)KI \xrightarrow{Pb(NO_2)_2} PbI_2 \downarrow + NO_2^-$$

$$(NH_4)_2S \rightarrow No \text{ Reaction}$$

$$MnO_4^-(aq.) \rightarrow Mn^{2+} + I_2 \uparrow$$

$$Hg_2^{2+}(aq.) \rightarrow Hg_2I_2 \downarrow \xrightarrow{Warm} Hg \downarrow + HgI_2 \downarrow$$

$$(Green) \rightarrow BiI_3 \downarrow \xrightarrow{excess} [BiI_4]^-$$

$$(Black) \rightarrow Orange \text{ solution}$$

9. (A)
$$\stackrel{+4}{\text{NO}}_{2}$$
+ $\text{H}_{2}\text{O} \xrightarrow{\text{Redox}} \stackrel{+5}{\text{HNO}}_{3} + \stackrel{+3}{\text{HNO}}_{2}$
 $\stackrel{\text{(sp}^{2})}{\text{(sp}^{2})}$

- * Redox reaction (Disproportionation)
- * HNO₂ can show tautomerism.

$$H-O-N=O \Longrightarrow H-N \Big|_{0}^{O}$$

Hybridisation remain same.

Ans. [P, Q, R, S]

(B)
$$F$$
 F F $2H_2O$ $\xrightarrow{Hydrolysis}$ $2HF$ $+$ S $\xrightarrow{Equilibrium}$ H $=$ S $=$ O $=$

- * Non-redox reaction
- * Sulphurous acid undergoes tautomerism
- All have same hybridisation (sp³)

Ans. [Q, R, S, T]

(C)
$$XeF_4 + H_2O \longrightarrow Xe + O_2 + XeO_3 + HF$$

- Redox reaction
- * HF reacts SiO₂ (Glass)

Ans. [P, T]

()CIF₅+3H₂O
$$\xrightarrow{\text{Non-Redox}}$$
 HClO₃+5HF

- * All hydrolysis product are acids.
- * HF reacts with glass (SiO₂).
- * HClO₃ can undergo tautomerism.

10. (A)
$$S^{2-}(aq.)$$

$$\begin{array}{c}
Br_{2} \\
\hline
dil. HCl \\
\Delta \\
Pb(OAc)_{2}
\end{array}$$

$$\begin{array}{c}
Claimsgnetic) \\
PbS \downarrow \\
(Black) \\
Conc. H_{2}SO_{4}
\end{array}$$

$$\begin{array}{c}
Claimsgnetic) \\
PbS \downarrow \\
(Black) \\
Conc. H_{2}SO_{4}
\end{array}$$

$$\begin{array}{c}
Claimsgnetic) \\
Conc. H_{2}SO_{4}
\end{array}$$

$$\begin{array}{c}
Claimsgnetic) \\
Pb(OAc)_{2}
\end{array}$$

$$\begin{array}{c}
Disproportionation \\
A \\
Conc. H_{2}SO_{4}
\end{array}$$

$$\begin{array}{c}
Claimsgnetic) \\
Pb(OAc)_{2}
\end{array}$$

$$\begin{array}{c}
PbSO_{3} \downarrow \xrightarrow{Boil} PbSO_{4} \downarrow \\
(Conc. H_{2}SO_{4}
\end{array}$$

$$\begin{array}{c}
Conc. H_{2}SO_{4}
\end{array}$$

$$\begin{array}{c}
NO_{3} \\
dil. HCl
\end{array}$$

$$\begin{array}{c}
A \\
Conc. H_{2}SO_{4}
\end{array}$$

$$\begin{array}{c}
NO_{3} \\
Conc. H_{2}SO_{4}$$

$$\begin{array}{c}
NO_{3} \\
Conc. H_{2}SO_{4}
\end{array}$$

$$\begin{array}{c}
NO_{3} \\
Conc. H_{2}SO_{4}$$

$$\begin{array}{c}
NO_{3} \\
Conc. H_{2}SO_{4}
\end{array}$$

$$\begin{array}{c}
NO_{3} \\
Conc. H_{2}SO_{4}$$

$$\begin{array}{c}
N$$

TYPES OF REACTIONS 459

$$(D)S_2O_3^{2-}(aq.) \xrightarrow{\begin{array}{c} Br_2 \\ (Redox) \\ \hline (Al+NaOH) \\ \hline (Black) \\ \hline (Bla$$

11. (P)
$$BCl_3 + H_2O \xrightarrow{SN_2} \begin{bmatrix} & & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & \\ & & & \\ & & \\ & & & \\ &$$

$$(Q) \underbrace{\overset{\frown}{N}}_{\text{Cl}} \underbrace{\overset{\frown}{Cl} + \text{H}_2\text{O}}_{\text{Cl}} : \longrightarrow \underbrace{\begin{bmatrix} \overset{\cdots}{N}}_{\text{Cl}} \\ \overset{\frown}{Cl} \\ \text{Cl} \end{bmatrix}_{\text{Cl}} \underbrace{\overset{\cdots}{N}}_{\text{Cl}^- - \overset{\dagger}{\text{O}}\text{H}_2} \underbrace{]}_{\text{NHCl}_2} + \text{HOCl} \xrightarrow{+2\text{H}_2\text{O}} \text{NH}_3 + 2\text{HOCl} \xrightarrow{\text{(Transition state hybridization : sp}^3)}$$

(R)
$$\ddot{S}OF_2 + H_2O \xrightarrow{SN_{AE}} \left[\begin{array}{c} F \\ \downarrow O \\ F \end{array} \right] \xrightarrow{-HF} SO(OH)F \xrightarrow{H_2O} H_2SO_3 + 2HF$$

Transition state Hyb. (sp³d)

$$(S) \ POCl_3 + H_2O \xrightarrow{SN_{AE}} \begin{bmatrix} \overset{\oplus}{O}H_2 \\ Cl & & \\ & &$$

Subjective

1. Conc.
$$H_2SO_4 + 2KI \longrightarrow K_2SO_4 + HI + \frac{1}{2}I_2 \uparrow$$

 $Hg(NO_3)_2 + 2KI \longrightarrow HgI_2 \downarrow + 2KNO_3$
 $CuSO_4 + KI \longrightarrow Cu_2I_2 \downarrow + K_2SO_4 + I_2$
Conc. $H_3PO_4 + KI \longrightarrow No$ obs.

$$Cr_2O_7^{2-}/H^++KI \longrightarrow Cr^{3+}+I_2$$

$$Pb(CH_3OO)_2 + KI \longrightarrow PbI_2 \downarrow + CH_3COOK$$

 $Ca(OCl)Cl + KI \longrightarrow CaCl_2 + I_2$

 $NaNO_2 + dil. HCl + KI \longrightarrow KCl + NaCl + NO + I_2$

- 2. \Rightarrow H₂S/H⁺ gives ppt. with 1st and 2nd group radicals.
 - $\Rightarrow~H_2S$ gives ppt. with $1^{st},\,2^{nd}$ group radicals and Zn $^{2+}.$
 - ⇒ H₂S/OH⁻ gives ppt. will all cations with form insoluble sulphides.
 - ⇒ Al³⁺,Mg²⁺,Cr³⁺,Fe³⁺ do not form stable sulphides, they hydrolysed and precipitate in form of hydroxide.
- 3. $P_4 + KOH \longrightarrow PH_3 + KH_2PO_2$

4.
$$(NH_4)_2S + Fe^{3+} \longrightarrow FeS + S \downarrow + NH_4^+$$

$$HI + Fe^{3+} \longrightarrow FeI_2 + I_2$$

$$Sn^{2+} + Fe^{3+} \longrightarrow Fe^{2+} + Sn^{4+}$$

$$CN^- + Fe^{3+} \longrightarrow Fe(CN)_3 \downarrow \xrightarrow{Excess} [Fe(CN)_6]^{3-}$$
Yellow brown ppt.

NaNO2+Fe3+ ---- No reaction

$$SO_2 + Fe^{3+} \longrightarrow Fe^{+2} + SO_4^{2-}$$

$$S_2O_3^{2-} + Fe^{3+} \longrightarrow Fe^{+2} + S_4O_6^{2-}$$

$$SCN^- + Fe^{3+} \longrightarrow Fe(SCN)_3$$
 or $[Fe(SCN)(H_2O)_5]^{2+}$
Blood red colour

 $NaIO_3/H^+ + Fe^{3+} \longrightarrow No reaction.$

- 5. BaSO₄, PbCO₃, Mg(OH)₂, CH₃COOAg, Ca₃(PO₄)₂
- **6.** $x = 5(BaCO_3, PbSO_4, CaC_2O_4, CH_3COOAg, Mg(OH)_2)$ $y = 5(BaCO_3, PbSO_4, CaC_2O_4, CsHCO_3, CH_3COOAg)$
- **8.** All carbonates are water insoluble except (NH₄)₂CO₃ and alkali metal carbonates. Thus (NH₄)₂CO₃ and Cs₂CO₃ are only water soluble while others are insoluble.
- $\textbf{9.} \ \ P_{\textbf{4}} + 8SOCl_2 \longrightarrow \underbrace{4PCl_3}_{\text{(Non-planar polar)}} + \underbrace{4SO_2}_{\text{(Planar polar)}} + \underbrace{2S_2Cl_2}_{\text{(Non-planar polar)}}$

- 10. Na₂SO₃ +Na₂S +I₂ \longrightarrow Na₂S₂O₃ +2NaI Average oxidation state of S in S₂O₃²⁻ = 2
- 11. Ag 20, HgI2, FeS, Ag 3PO4, PbI2
- 12. PbCl₄, Mg(NO₃)₂, HgC₂O₄, Ag₂CO₃, Pb(CN)₄, Cu(CN)₂
- 13. ⇒ Ammonium salts having anions NO₂, NO₃, ClO₄ and Cr₂O₇ produce N₂ on heating/strong heating.
- 14. ⇒ Pb, Cu, Ag * Hg evolve NO gas on their reaction with 20% HNO₃.
- 15. Soluble in excess NH₃ solution.

$$Cd^{2+}(aq.)$$
, $Ni^{2+}(aq.)$, $Zn^{2+}(aq.)$, $Ag^{+}(aq.)$

16.
$$\operatorname{CrO}_4^{2-}(aq.) + 2\operatorname{H}_2\operatorname{O}_2 + 2\operatorname{H}^+(aq.) \xrightarrow{\operatorname{Non-Redox}} \operatorname{CrO}_5 + 3\operatorname{H}_2\operatorname{O}_2$$

$$2\operatorname{CrO}_5 \xrightarrow{\operatorname{Aq. Solution}} \operatorname{Cr}_2\operatorname{O}_3 + \frac{7}{2}\operatorname{O}_2$$

$$\operatorname{Cr}_2\operatorname{O}_3 + 6\operatorname{H}^+(aq.) \xrightarrow{\operatorname{Acid-base reaction}} 2\operatorname{Cr}^{3+}(aq.) + 3\operatorname{H}_2\operatorname{O}_2$$

$$\operatorname{Net reaction}:$$

$$\operatorname{CrO}_4^{2-}(aq.) \xrightarrow{\operatorname{H}_2\operatorname{O}_2/\operatorname{H}^+} [\operatorname{CrO}_5] \xrightarrow{\operatorname{Aq. solution}} \operatorname{Cr}^{3+}(aq.)$$

$$\operatorname{Cr}_3\operatorname{Cr}_4(aq.) \xrightarrow{\operatorname{H}_2\operatorname{O}_2/\operatorname{H}^+} [\operatorname{CrO}_5] \xrightarrow{\operatorname{Aq. solution}} \operatorname{Cr}^{3+}(aq.)$$

$$\operatorname{Cr}_3\operatorname{Cr}_4(aq.) \xrightarrow{\operatorname{H}_2\operatorname{O}_2/\operatorname{H}^+} [\operatorname{CrO}_5] \xrightarrow{\operatorname{Aq. solution}} \operatorname{Cr}_3\operatorname{Cr}_4(aq.)$$

17.
$$XY_{n_1} \xrightarrow{\text{water}} n_1 HY + HXO_{n_2}$$

Among all interhalogen compounds, only (XY_5) type compound is polar and non-polar.

$$XY_{5} \xrightarrow{\text{water}} 5HY + HXO_{3} \qquad [n_{2} = 3]$$

$$XY_{5} \xrightarrow{\text{Water}} + 5H_{2}O \longrightarrow 5HY + X$$

$$XY_{6} \xrightarrow{\text{HO}} O$$

Trigonal pyramidal

Ans. $n_1 + n_2 = 8$

18. All the species which are not in their highest oxidation state can be oxidised by MnO_4^-/H^+ .

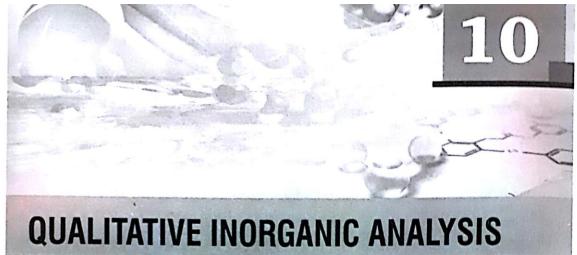
 I^- , Fe^{2+} , $C_2O_4^{2-}$, S^{2-} , SO_3^{2-} , NO_2^{-} , [Six].

19. All those metals which are more electropositive than hydrogen in electrochemical series gives N₂O gas with dil. HNO₃(20%) except Pb and Sn.

→ Cr, Zn, Fe, Al, Mn

20. All those ammonium salts which have anions having nonoxidizing or weak oxidizing character, on heating product NH3 gas.

 $(NH_4)CO_3$, CH_3COONH_4 , NH_4Cl , $(NH_4)_2S$, $(NH_4)_2C_2O_4$, $(NH_4)_2SO_4$ [Total = 6]



		-	
	QUALITATIVE INOR(GANIC A	NAIYSIS
	QUILLINITIVE INCIN	unitio n	IMEIOIO
	4		The state of the s
F	evel		
1.	Fe(OH) ₃ can be separated from Al(OH) ₃ l		(1) NW Cl 0 NW OV
2.	(a) BaCl ₂ (b) Dil. HCl Cations present in slightly acidic solution a	(c) NaOH solu re Al ³⁺ , Zn ²⁺ and	
	added in excess to this solution would ide	ntity and separate	Cu ²⁺ in one step is:
3.	(a) HCl acid (b) NH ₃ solution When a KI solution is added to a metal nitra	(c) NaOH solu ate. a black precipi	. , 2 3
٠.	in an excess of KI to give an orange solution	on. The metal ion	is:
	(a) Hg ²⁺ (b) Bi ³⁺	(c) Cu ²⁺	(d) Pb ²⁺
4.	Which is not easily precipitated from aque (a) Cl^{-} (b) SO_4^{2-}	(c) NO ₃	(d) CO ₃ ²⁻
5.	Soda extract is useful when given mixture		•
	(a) fusing soda and mixture and then extr (b) dissolving NaHCO ₃ and mixture in dil		
	(c) boiling Na ₂ CO ₃ and mixture in dil. HO	C1 -	
	(d) boiling Na ₂ CO ₃ and mixture in distilled		
6.	An aqueous solution of a substance, on tre soluble in hot water. When H ₂ S is passed the	rough the hot acid	e HCl, gives a white precipitate is solution, a black precipitate is
	formed. The substance is:		
	(a) Hg_2^{2+} salt (b) Cu^{2+} salt		(d) Pb ²⁺ salt
7.	$\operatorname{CrCl}_3 \xrightarrow{\operatorname{NH}_4\operatorname{Cl}} (A) \xrightarrow{\operatorname{Na}_2\operatorname{O}_2} (B)$	$\xrightarrow{\text{acetate}}$ (C)	
	In this reaction sequence, the compound (C	C) is:	
	(a) Na ₂ CrO ₄	(b) Na ₂ Cr ₂ O ₇	
	(c) Cr(OH) ₃	(d) PbCrO ₄	

8.	Identify the correct or	der of solubility of Na 2	S, C	SuS and ZnS:	
	(a) $CuS > ZnS > Na_2S$			ZnS > Na ₂ S > CuS	
	(c) $Na_2S > CuS > ZnS$			$Na_2S > ZnS > CuS$	
9.	$2Cu^{2+} + 5I^{-} \longrightarrow 2CuI \downarrow + [X]$			-	
	$[X] + 2S_2O_3^{2-} \longrightarrow 3$	$[Y] + S_4O_6^{2-}; X \text{ and } Y$	are:		
	(a) I_3^- and I^-	(b) I_2 and I_3^-	(c)	I_2 and I^-	(d) I_3^- and I_2
10.	In Nessler's reagent, t	he ion present is:			
	(a) HgI ²⁻	(b) HgI_4^{2-}	(c)	Hg ⁺	(d) Hg ²
11.	tube and the substance original colour. The su	e turns blue. It on cool	ing	water is added to the	es on the sides of the test he residue it turns to its
	(a) Iodine crystals			Copper sulphate c	rystals
	(c) Cobalt chloride cr	•	(d)	Zinc oxide	
12.	Oxalate + MnO ₂ + Dil.	$H_2SO_4 \longrightarrow Gas$			
	The gas evolved is:	(h) (0)	(-)	00	(4) 0
	(a) CO ₂	(b) CO		SO ₂	(d) O ₂
13.	presence of organic la		ea to	o identify bromide	and iodide ions in the
	(a) Chlorine water		55.55	Silver nitrate solut	
	(c) Starch solution			Concentrated sulp	
14.					n ²⁺ along with those of
	Fe ³⁺ , Al ³⁺ and Cr ³⁺ t	he third group solution	sho	ould be:	E.
	(a) Heated with a few	v drops of conc. HNO ₃	(b)	Treated with exces	ss of NH ₄ Cl
	(c) Concentrated			None of these	
15.	Which set gives yellow	v ppt.?			
	(a) KO_3 , Sb_2S_3 , CdS			Sb ₂ S ₃ , CdS, PbCrO	
	(c) PbCrO ₄ , As ₂ S ₃ , Si	nS_2		SnS ₂ , As ₂ S ₃ , PbCr	
16.	Which of the followin	g reagents can separate	e a r	nixture of AgCl and	AgI?
	(a) KCN	(b) $Na_2S_2O_3$	(c)	HNO ₃	(d) NH ₃
17.	Black ppt. (A) dissolve	e in HNO $_3$ gives (B) w	hich	gives white ppt. (C) with NH ₄ OH. (C) on
	reaction with HCl give	s solution (D) gives whit	e tu	rbidity on addition o	of water. What is (D) ?
	(a) Ca(OH) ₂	(b) Bi(OH) ₃		BiOCl	(d) $Bi(NO_3)_3$
18.	Which nitrate on deco	mposition will give me	tal?	1010	(1) 4-110
	(a) $Hg_2(NO_3)_2$	(b) NaNO ₃	(c)	KNO ₃	(d) AgNO ₃
19.	Which of the following	g compounds does not	exis	t?	(d) BiOCl
	(a) C=O Br	(b) CrO ₂ Cl ₂	(c)	POCI ₃	(d) BiOCl
20.	Which one among the	following pairs of ions	car	nnot be separated b	(d) Ni ²⁺ , Cu ²⁺
	(a) Bi^{3+} Sn^{2+}	(b) Al ³⁷ , Hg ²¹	(c)	Zn-,Cu	(d) Ni ,Cu
21.	Salt (A) gives brick red	fumes (B) with conc. H	2SC	and K ₂ Cr ₂ O ₇ Wh	ich gives yellow solution
	(C) with NaOH and it	gives yellow ppt. (D) v	vith	acetic acid and lea	d acetate. What is (C)? (d) NaCl
	(a) Na ₂ CrO ₄	(b) CrO ₂ Cl ₂	(c)	PbCrO ₄	(u) NaCi

INORGANIC CHEMISTRY 22. When a nitrate is warmed with zinc powder and an NaOH solution, a gas is evolved. Which of the following reagents will be turned brown by the gas? (b) Sodium cobaltinitrite (a) Sodium nitroprusside (d) Barium chloride (c) Nessler's reagent 23. To avoid the precipitation of hydroxides of Ni $^{2+}$, Co $^{2+}$, Zn $^{2+}$ and Mn $^{2+}$ along with those of Fe³⁺, Al³⁺ and Cr³⁺ the third group solution should be: (a) Heated with a few drops of conc. HNO₃ (b) Treated with excess of NH₄Cl (d) None of these (c) H₂S gas is passed into solution **24.** Brown ppt. (A) dissolve in HNO $_3$ gives (B) which gives white ppt. (C) with NH $_4$ OH. (C) on reaction with HCl gives solution (D) which gives white turbidity on addition of water. What is (D)? (d) $Bi(NO_3)_3$ (a) BiCl₃ (b) Bi(OH)₃ (c) BiOCl 25. FeSO₄ is used in the brown ring test for a nitrate. What is the oxidation state of Fe in the compound responsible for the brown colour of the ring? (a) 0 (d) + 3(b) 1 (c) + 226. On adding KI solution in excess to a solution of CuSO₄ we get a precipitate 'P' and another liquor 'M'. Select the correct pairs: (a) P is CuI and M is I2 solution (b) P is CuI_2 and M is I_2 solution (c) P is CuI and M is KI₃ solution (d) P is CuI2 and M is KI3 solution 27. On heating a mixture of NaBr and conc. H₂SO₄ we obtain: (b) HBr (a) HOBr (c) Br₂ (d) HBrO₃ 28. Which of the following ions is responsible for the brown colour in the ring test for a nitrate? (a) $[Fe(H_2O)_5NO]^{2+}$ (b) $[Fe(CN)_5NO]^{2-}$ (c) $[Fe(NO_2)_6]^{4-}$ (d) $[Fe(H_2O)_5NO_2]^+$ 29. There is mixture of Cu(II) chloride and Fe(II) sulphate. The best way to separate the metal ions from this mixture in qualitative analysis is: (a) hydrogen sulphide in acidic medium, where only Cu(II) sulphide will be precipitated (b) ammonium hydroxide buffer, where only Fe(II) hydroxide will be precipitated (c) hydrogen sulphide in acidic medium, where only Fe(II) sulphide will be precipitated (d) ammonium hydroxide buffer, where only Cu(II) hydroxide will be precipitated 30. Which of the following reagents can be used to distinguish between a sulphite and a sulphate in solution? (b) Na₂[Fe(CN)₅NO] (a) FeSO₄ (c) BaCl₂ + dil.HCl (d) $Na_3 [Co(NO_2)_6]$ 31. A doctor by mistake administers a Ba(NO₃)₂ solution to a patient for radiography

investigations. Which of the following should be given as the best to prevent the absorption of

32. A colourless water soluble solid 'X' on heating gives equimolar quantities of Y and Z. Y gives dense white fumes HCl and Z does so with NH_3 . Y gives brown precipitate with Nessler's

reagent and Z gives white precipitate with nitrates of Ag^+ , Pb^{2+} and Hg^+ . 'X' is:

(c) Na₂CO₃

(c) NH₄NO₂

(d) NH₄Cl

(d) FeSO₄

(b) Na₂SO₄

(b) NH₄NO₃

soluble barium?
(a) NaCl

(a) NH₄Cl

33.	The colour of the	iodine solution is disc	harged by shaking wi	ith:	1.7
	(a) sodium sulpha		(b) sodium sul	phide	
	(c) aqueous sulph		(d) sodium bro		
34.	precipitate with ex solution and one f	nples of a solution of a scess ammonia solution ormed a black precipi	on, one formed a witate with H ₂ S. The sa	hite precipitate with lt could be:	
	(a) AgNO ₃	(b) $Pb(NO_3)_2$	(c) $Hg(NO_3)_2$	(d) MnSO ₄	
35.	In an alkaline solu	tion, sodium nitroprus	sside gives a violet co	olour with:	
	(a) S^{2-}	(b) SO_3^{2-}	(c) SO_4^{2-}	(d) NO_2^-	
36.	hydrochloric acid	cipitate and a gas with an aqueous solut	ion containing:		ing dilute
	(a) sulphate ion		(b) sulphide ion		
	(c) thiosulphate io		(d) sulphite ior	ı	
37.	$AgNO_3 \xrightarrow{\Delta} (W)$	$+(X)+O_2$. 01
	$(X) + H_2O \longrightarrow H$	HNO ₂ + HNO ₃			
	$(W) + HNO_3 \longrightarrow$				
	(Y) + Na2S2O3 (ex	$cess) \longrightarrow (Z) + NaN$	O ₃		
	Identify (W) to (Z)):			
		$= N_2O, Y = AgNO_3,$			
		$= NO, Y = AgNO_3,$			
		$= NO_2, Y = AgNO_3,$]	
		$= N_2, Y = AgNO_3,$	$Z = Na[Ag(S_2O_3)_2]$		
38.		ving sequence of tests			
	$M^{n+} + HCl \longrightarrow W$	hite precipitate $\stackrel{\Delta}{\longrightarrow}$ w	vater soluble		
	The metal ion (M^n)	⁺) would be:			
	(a) Hg 2+	(b) Ag ⁺	(c) Pb ²⁺	(d) Sn ²⁺	
30		t for NO3 is due to th	ne formation of the co	omplex ion with for	nula:
37.		. 101 110 3	(b) Fe[NO(CN)		
	(a) [Fe(H ₂ O) ₆] ²⁺	24	(d) [Fe(H ₂ O) (N	J	
	(c) $[Fe(H_2O)_5NO]$			3-	
40 .		ving compounds does	magnesium precipita	te when you test for	it?
	(a) MgCO ₃ ·MgO	(b) MgCO ₃	(c) Mg(OH) ₂	(d) MgNH ₄ P	O ₄ 6H ₂ O
‡1 .		pitated with the carbon	nates of vtn group rac	licals in presence of N	NH ₄ Cl and
	NH ₄ OH because:	ala da NILLOU			
	(a) MgCO ₃ is solul	ole III NH4OH	ce of NH .Cl		
	(b) MgCO ₃ is not]	precipitated in present	te of Milaci		
	(c) MgCO ₃ is solut	ole in water			
	(d) MgCO ₃ is solul	ring calt gives green o	olour mass in cohalt	nitrate charcoal cav	ity teet?
2.		ving salt gives green of (b) Al salts	(c) Alums	(d) Copper s	alts
	(a) Zn salts	AND SERVICE CONTROL	(c) ruunis	(a) coppers	
13 .	Yellow coloured cor		(c) NaOH	(d) K ₄ [Fe(Cl	N) - 1
	(a) NH ₄ CNS	(b) PbCrO₄	(0) 148011	(4) 114[10(0	

466 INORGANIC CHEMISTRY

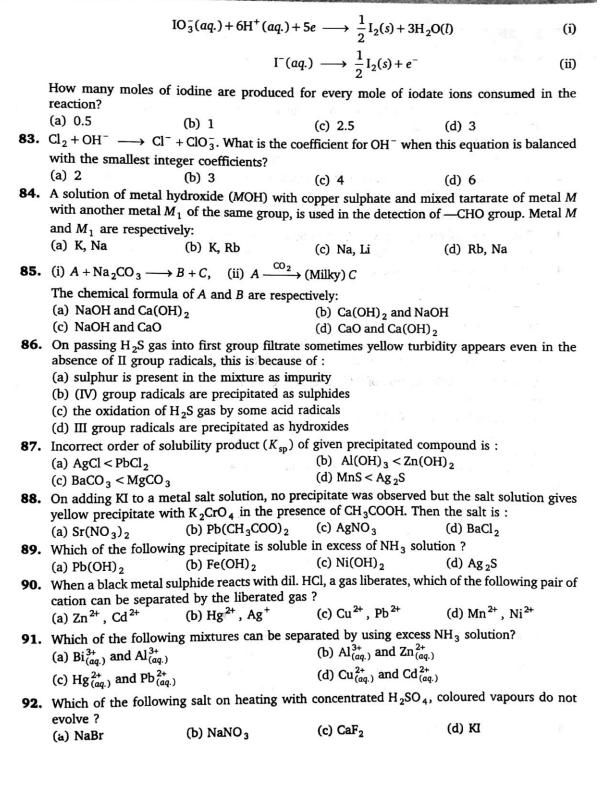
44.	Which of the following tests can you i	dentity K in a sait	1 1:1-1-1-1
	(a) Flame test (violet) and precipitation	on (yellow) with sodium	cobaltinitrite
	(b) Flame test (violet) and precipitation	on (violet) with sodium i	nitroprusside
	(c) Flame test (crimson) and precipitation	ation (yellow) with sodiu	m cobaltinitrite
	(d) Flame test (golden yellow) and pro-	recipitation (violet) with	sodium nitroprusside
45.	A chloride salt on addition of alkali sol	ution gives gas B which gi	ives brown ppt. with Nessler's
10.	reagent. What is A, B and C?	atton green garage	
	(a) NH ₄ Cl, NH ₃ and HgO·Hg(NH ₂) (N	(b) NH .Cl. NH 2	and Hg(NH ₂)Cl
	(c) NH ₄ Cl, NH ₃ and HgO·Hg(NH ₂)Cl	(d) NH Cl NH	and HgO·Hg(NH ₂)I
	An impropries all is a translated and Th	a ===idus is vollow when	hot and white when cold. The
40.	An inorganic salt is strongly heated. The	e residue is yellow when	not and winter the
	salt contains: (a) Pb ²⁺ (b) Zn ²⁺	(c) Hg ²⁺	(d) NH ₄
	(a) Pb^{2+} (b) Zn^{2+}	(c) Hg	(4) 1114
47.	Which of the following sulphides is w	hite ?	ne uma allega distribution de la constantina del constantina della
	(a) CdS (b) PbS	(c) ZnS	(d) SnS
48.	The gas evolved in which of the follow	ing reactions forms the iod	dide of Millon's base on being
	passed through a solution of [HgI4]2-	in KOH?	
	(a) CaSO ₄ treated with dilute HCl	(b) NH ₄ Cl boiled	with NaOH
	(c) ZnS treated with dilute H ₂ SO ₄	(d) MgCO ₃ heate	
40	A white, sublimable inorganic substance		
49.	reagent and a white precipitate (soluble	e in NH) with an AgNO.	solution. The substance is:
		(c) As_2O_3	(d) NH ₄ Cl
	(a) Hg ₂ Cl ₂ (b) HgCl ₂		•
50.	A white sublimable substance, that tu		
	(a) Hg_2Cl_2 (b) $HgCl_2$	(c) As_2O_3	(d) NH ₄ Cl
51.	Rinmann's green is:		collition = e-e v 111
			(d) $Fe(BO_2)_2$
52.	A white crystalline salt imparts a viole	t colour to a Bunsen flam	e, and with hot concentrated
	H ₂ SO ₄ , forms a pungent gas. On trea	tment with an AgNO ₃ sol	ution, this gas forms a white
	precipitate readily soluble in NH ₃ . The	e white crystalline salt m	ay be:
	(a) Na ₂ SO ₄ (b) KCl	(c) CaCl ₂	(d) SrCl ₂
53.	A white solid gives a green residue o	n being subjected to the	cobalt nitrate test. On being
	warmed with concentrated H ₂ SO ₄ , the	e solid gives a brown gas	, which evolves vigorously on
	the addition of Cu turnings. The solid	may be:	
	(a) $Zn(NO_3)_2$ (b) $Al(NO_3)_2$	(c) ZnBr ₂	(d) $Mg(NO_3)_2$
54	Which of the following is blue?		
J7.	(a) Co[Hg(SCN) ₄] (b) Ni(dmg) ₂	(c) Cu ₂ [Fe(CN) ₆	d) Fe(SCN) ₂
	Which of the following pairs of cation		
55.		(c) Zn ²⁺ , Cu ²⁺	(d) A13+ Aa+
	(u) 10)		
56.	Which of the following pairs of cations	can be separated by add	ing NH ₄ Cl and NH ₄ OH to the
	mixture?	21 21	31 31
	(a) Fe^{3+} , Al^{3+} (b) Cr^{3+} , Ni^{2+}	(c) Al ³⁺ , Cr ³⁺	(d) Fe ³⁺ , Cr ³⁺
57	Which of the following pairs of cations		
٠,٠	the mixture and then passing H ₂ S thro	ough it?	, ,
	(a) Co ²⁺ , Ca ²⁺ (b) Ni ²⁺ , Sr ²⁺	(c) Co ²⁺ , Ni ²⁺	(d) Zn^{2+} , Ba^{2+}
	(a) 60 ,60 (5) ,61	*** (***** * **************************	(-, ,

QUALITATIVE INORGANIC ANALYSIS

58.	in order to:	of the plant	10 (A) (C)	ome concentrated HNO 3
	(a) oxidise Fe ²⁺ to Fe ³	•	(b) oxidise Cr 3+ to Cr	$_{2}O_{7}^{2}$
	(c) lower than pH	2 (4)	(d) increase the NO $_3^-$	
59.	Which of the following	pairs of sulphides are	insoluble in dilute HC	1?
	(a) CoS and NiS		(b) CoS and MnS	
	(c) NiS and MnS	. 91	(d) NiS and ZnS	1
60.				NH ₄ Cl and then with
	NH ₄ OH, which of the f (a) Al(OH) ₃	following will precipita		
	(c) Mg(OH) ₂		(b) Ni(OH) (d) Al(OH) ₃ , Ni(OH) ₃	and Mg(OH)
61.	Which of the following	leaves a black residue		
		(b) PbCl ₂	(c) Hg ₂ Cl ₂	(d) HgCl ₂
62.	Which of the following			
	(a) PbS	(b) NiS	(c) CuS	(d) HgS
63.		ring cations will forr	n an insoluble red-b	rown compound with
	[Fe(CN) ₆] ⁴⁻ ?	10.00		
	(a) Hg ²⁺	(b) Pb ²⁺	(c) Cu ²⁺	(d) Cd ²⁺
64.	Which of the following	g, on treatment with KC	CN, will give cyanogen	gas?
	(a) $[Ag(NH_3)_2]^+$			
65.	Which of the following			
	(a) CuS	(b) As ₂ S ₃	(c) Sb ₂ S ₃	(d) SnS
66.	Which of the following	is formed when As ₂ S ₃	(c) AsO $_3^{3-}$	OH and H ₂ O ₂ ?
	(a) As(OH) ₃	1023 - 1523 - 1533 - 1533 - 1533 - 1533 - 1533 - 1533 - 1533 - 1533 - 1533 - 1533 - 1533 - 1533 - 1533 - 1533		
67.	The role of NH ₄ Cl in t	ne precipitation of the	nydroxides of group if	cations is to:
	(a) increase the Cl⁻(b) facilitate the disso	ciation of NH OH		
	(c) suppress the dissor	ciation of NH ₄ OH by th	he common ion effect	
	(d) render the solution	n weakly acidic		67
68.	Which of the following	pairs of cations can be s	separated by using on a	dding NaOH solution?
	(a) Cu ²⁺ , Zn ²⁺	(b) Pb ²⁺ , Al ³⁺	(c) Sn ² ', Pb ² '	(d) Zn ²⁺ , Pb ²⁺
69.	On heating, a salt give solution green. The sal	es a gas which turns l It may be:	lime water milky and	an acidified dichromate
	(a) carbonate	(b) sulphide	(c) sulphate	(d) sulphite
70.	Reaction of Zn(OH) ₂ v	vith NaOH produces:	1/W - 1 - 1 mm - 1 - 1	
	(a) Na ZnO	(b) ZnO	(c) Na ₂ O	(d) None of these
71.	to boil then solution of	fore precipitating out g the salt mixture with a	roup III metal ions as h few drops of concentrat	ydroxides, it is necessary ted HNO 3 is treated. This
	is done to convert: (a) Co ²⁺ to Co ³⁺		(b) Fe ²⁺ to Fe ³⁺	
	CAROLAN ACRES SOCIO		(d) Cr 3+ to CrO 2-	
	(c) Mn^{2+} to MnO_4		(4) 6. 10 6.04	

	The state of the second se	d and the second second	_
72.	A compound 'X' on heating gives a colourles 'Y'. Excess CO ₂ is passed through aqueous s	s gas. The residue is o olution of 'Y' when '2	dissolved in water to obtain Z' is formed. 'Z' on gentle
	heating gives back 'X'. The compound 'X' is:	. 9	For Jeg Suprac Et
	(a) NaHCO ₃	(b) Na ₂ CO ₃	Highlia toured for
	(c) Ca(HCO ₃) ₂ which mention and the form		white a large second
73.	An aqueous solution of a substance gives a wl dissolves on heating, When H ₂ S is passed thr	nite precipitate on trea	atment with dil. HCl which
dilw	obtained. The substance is: (a) Hg ₂ ²⁺ salt (b) Hg ²⁺ salt	(c) Ag ⁺ salt	(d) Pb ²⁺ salt
74.	A solid mixture of AgCl and K2Cr2O7 is hea	ted with conc. H2SO4	and produces:
	(a) greenish yellow gas (HO)/A (P)	(b) colourless gas	- Life, of the
	(c) red coloured gas	(d) no gas	wasted at the state of the
75.	Which of the following has the highest value	of K,?	
	(a) BeCO ₃ (b) MgCO ₃	(c) CaCO ₃	(d) BaCO ₃
76.	When copper sulphate solution is treated with	potassium iodide and	d excess of hypo solution is
diw	added in resulting solution, a white precipita of:	te is formed. The whi	te ppt. is due to formation
	(a) $Na_2S_4O_6$ (b) CuI_2	(c) CuI	(d) NaI
77.	The ferrous ion in a given sample is detected addition of a potassium ferrocyanide solution formula. (a) K ₂ Fe ^{II} [Fe ^{II} (CN) ₆]	on to it. The precipit	ate has the constitutional
		(d) KFe ^{II} [Fe ^{III} (CN)	
78.	Which one is correct group reagent for group (a) Mn ²⁺ Co ²⁺ Zn ²⁺ Ni ²⁺ ; HCl+H ₂ S	p cations?	ra Chiroles (1907) - 58 4 - Of
	(b) Mn ²⁺ Co ²⁺ Zn ²⁺ Ni ²⁺ ; dil. HCl	the potential signature.	1 13 THE HALL OF LESS
	(c) Mn^{2+} Co ²⁺ Zn^{2+} Ni ²⁺ ; NH ₄ Cl+NH ₄ OH		
,	(d) Mn^{2+} Co ²⁺ Zn^{2+} Ni ²⁺ ; $NH_4Cl + NH_4OH$	+H ₂ S	All of plantage of t
79.	Cobalt salt + KNO ₂ + CH ₃ COOH → yello	w ppt. The yellow pr	ecipitate is:
	(a) Potassium cobaltonitrate(c) Cobalt nitrite	(b) Potassium coba(d) Cobalt nitrate	
80.	Sulphide ions react with Na ₂ [Fe(NO) (CI	$N)_5$] to form a pu	rple coloured compound
gat r	$Na_4[Fe(CN)_5(NOS)]$. In the reaction, the ox (a) Changes from +2 to +3	idation state of iron: (b) Changes from	of the residence of the Man
	(c) Changes from +2 to +4 melalus (a)		
01			
81.	White crystal (A) on treatment with AgNO ₃		
	the colour of KMnO ₄ solution but no gas is		dical present in (A) is:
	(a) Cl ⁻ (b) Br ⁻	(c) NO ₂	(d) CO_3^{2-}
82.	Iodate ions (IO_3^-) can be reduced to iodine by the redox reaction are:	y iodide ions. The hal	f equation which represent

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Level 2

- 1. When a reagent (X) reacts with Fe^{3+} salt solution turns red due to the formation of a compound (Y). This reagent causes no change in colour with Fe^{2+} salt solution. Compound (X) and (Y) are respectively:
 - (a) NH₄SCN and Fe(SCN)₃

(b) K₄[Fe(CN)₆] and FeSO₄

(c) Na₂HPO₄ and FeSO₄

- (d) K₃[Fe(CN)₆] and K₂Fe[Fe(CN)₆]
- 2. Which of the following mixtures can be separated by using excess NH₃ solution?
 - (a) Bi^{3+} (aq.) and Al^{3+} (aq.)

(b) Al^{3+} (aq.) and Zn^{2+} (aq.)

(c) Hg^{2+} (aq.) and Pb^{2+} (aq.)

- (d) Cu2+ (aq.) and Cd2+ (aq.)
- 3. Which of the following salt will not give positive brown ring test?

(a) $Cu(NO_3)_2$

(b) Pb(NO₃)₂

(c) $Zn(NO_3)_2$

SCHOOL MINE SET OF A SEC

(d) $Mg(NO_3)_2$

4. Consider the following reactions

$$P + Q \longrightarrow R + K_2SO_4$$

$$R \longrightarrow 2CuI + I_2$$

$$Ag^+ + Q \longrightarrow S + K^+$$

Then according to given information the incorrect match is:

(a) $P = CuSO_A$

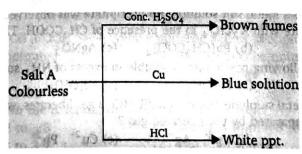
(b) Q = KI

(c) $R = CuI_2$

(d) $S = K[AgI_2]$

- **5.** A very dilute acidic solution of Cd²⁺ and Ni²⁺ gives only yellow ppt. of CdS on passing H₂S, this is due to:
 - (a) Solubility product (K_{sp}) of CdS is more than that of NiS
 - (b) Solubility product (K_{sp}) of CdS is less than that of NiS
 - (c) Cd2+ belong to IIB group while Ni2+ belongs to IVth group
 - (d) CdS is insoluble in yellow ammonium sulphide (YAS)

6.



Identify salt (A) satisfying above chemical property:

(a) $Cu(NO_3)_2$

(b) NaNO₃

(c) AgNO₃

(d) $Pb(NO_3)_2$

- 7. Reddish brown (chocolate) precipitate is formed by mixing solutions containing:
 - (a) Cu²⁺ and [Fe(CN)₆]³⁻ ions

(b) Cu²⁺ and Fe(CN)₆]⁴⁻ ions

(c) Pb 2+ and SO 4- ions

(d) Pb 2+ and I ions

8. Water soluble mixture (i) BaCl₂ White ppt.

	Filtrate + (Hot and conc.) $HNO_3 + BaCl_2$ ——	White ppt.
	The mixture contains:	Market and the second of the s
	(a) SO_4^{2-} (b) SO_3^{2-} (c) both (a) and (b) (d) none of these
9.	. Which of the following compounds after mixin	g can produce blue colouration?
	(I) K ₄ [Fe(CN) ₆] and FeCl ₃ solution (II) NH ₄ OH and CuSO ₄ solution
	(III) Adding anhydrous CuSO ₄ to water (IV) NH ₄ OH + NiSO ₄ solution
	Choose the correct code:	
		c) I, III (d) I, II, III, IV
10.	 A bromide ion does not interfere with the chro 	myl chloride test because when a bromide is
	present:	
	(a) Br ₂ is liberated, which leaves the NaOH so	
	(b) CrO ₂ Br ₂ formed does not volatilise as CrO	₂ Cl ₂ does
	(c) CrO_2Br_2 does not react with NaOH	a produced
11	 (d) no gaseous substance containing bromine in the containing brown in the containi	AND PROPERTY OF THE PROPERTY O
11.	tube result in the formation of yellow sublimate	
		c) HgO (d) $(NH_4)_2Cr_2O_7$
12.	Which of the following reaction(s) is relevant t	
	(a) $Cr_2O_3 + 3B_2O_3 \rightarrow 2Cr(BO_2)_3$	
	(b) $CoO + ZnO \rightarrow CoZnO_2$	
	(c) $CoO + NaPO_3 \rightarrow NaCoPO_4$	
	(d) $Al_2(SO_4)_3 + 3Na_2CO_3 \rightarrow Al_2O_3 + 3Na_2SO_3$	4 + 3CO ₂
13.	. Solid KCl, when heated with solid K2Cr2O7 and	
	that turn NaOH solution yellow (b). The yellow	
	treated with lead acetate, gives a yellow precip	
	respect to a, b and c?	V 8 8
	(a) a and b contain CrO_4^{2-}	b) a and c contain CrO_4^{2-}
		d) a, b and c contain $Cr(VI)$
14.	 Choose the correct code by identifying (X), (Y) a 	nd(Z) in each case for the changes indicated:
	(i) $CrO_2Cl_2 \xrightarrow{KOH} (X) \xrightarrow{conc. H_2SO_4} (Y) \xrightarrow{AgNO_3}$	(Z)
	$(1) \operatorname{CFO}_2 \operatorname{CI}_2 \longrightarrow (X) \longrightarrow (Y)$	
	(ii) $\operatorname{CrCl}_3(aq) \xrightarrow{\operatorname{excess}} (X) \xrightarrow{\operatorname{Na}_2 \circ_2} (Y) \xrightarrow{\operatorname{lead}} (Z)$	7
	(11) CrCl ₃ (aq) NaOH (A) H ₂ O, boil acetate	
	(iii) ZnSO ₄ (aq) $\xrightarrow{\text{Na}_2\text{CO}_3}$ (X) $\xrightarrow{\Delta}$ (Y) $\xrightarrow{\text{cobalt}}$	(7)
	(iii) $ZnSO_4(aq) \longrightarrow (X) \longrightarrow (Y) \xrightarrow{\text{nitrate, } \Delta}$	(2)
	NH ₄ OH HNO ₃ KCN	7)
	(iv) $\operatorname{CuCl}_2(aq) \xrightarrow{\operatorname{NH}_4\operatorname{OH}} (X) \xrightarrow{\operatorname{HNO}_3} (Y) \xrightarrow{\operatorname{excess}} (Y) $	2)
	(a) $X = K_2 \text{CrO}_4$ $Y = K_2 \text{Cr}_2 \text{O}_7$ $Z = \text{Ag}_2 \text{Cr}_2 \text{O}_7$	rO ₄
	(b) $X = [Cr(OH)_4]^ Y = Na_2CrO_4$ $Z = PbCrO_4$	
	(5) 11 - [01(011)4]	- -
	(c) $X = \text{ZnCO}_3$ $Y = \text{ZnO}$ $Z = \text{CoZn}$	O ₂
	(d) $X = \text{CuS}$ $Y = \text{Cu(NO}_3)_2$ $Z = \text{K}_3[\text{Cu}]$	
	(u) A = Cub 1 = Cu(1.03) 2 = Ng[Ol	

.

15.	paper soaked with an	n alkaline solution of K	₂ [HgI ₄] brown. Th	gives a gas that turns a filter ne salt responds to the brown union present in the salt is: (d) None of these
16.	turns $K_2Cr_2O_7$ pape Compound (D) with (A),(B),(C),(D) and	r green while gas (C) conc. HCl forms a Lew (E) are respectively:	forms a trimer in is acid (E) which	(C) and an oxide (D). Gas (B) which there is no S–S bond. exists in a dimer. Compounds
	(a) $FeSO_4$, SO_2 , SO_3	Fe ₂ O ₃ , FeCl ₃ SO ₄ , FeCl ₃		SO ₂ , SO ₃ , Al ₂ O ₃ , FeCl ₃ o ₃ , Fe ₂ (PO ₄) ₃ , FeCl ₂
17.				$late \longrightarrow yellow ppt.$
_,,	Identify X:	1102+1120+3, 1+	Adminomum mory o	inte / jene / je
	men can be William	(b) Sb ₂ S ₅	(c) SnS ₂	(d) CdS
1Ω	7 3	(Y) (gas) $\xrightarrow{\text{dil. HNO}_3}$ Collo		HG, (V)
10.				(d) NiS
10	(a) CuS	(b) FeS	(c) PbS	SO ₄ in a setup such that the
	gaseous mixture eme passed through acidi (a) The BaCl ₂ solution (b) The BaCl ₂ solution unaffected (c) The BaCl ₂ solution (d) Both the solution	orging can pass first threfied K ₂ Cr ₂ O ₇ . Which con remains unaffected aron gives a white precipitation gives a white precipitations remain unaffected	ough a solution of the following wil and the acidified dictate and the acidified the acidified the and the acidified to	BaCl ₂ and then gases mixture lyou observe? aromate solution turns green dichromate solution remains lichromate solution turns green
20.	which turns cobalt ch solution with water. ammonia gives an or	loride paper pink. Gas (C) produces a poganic compound (F) w) and (F) can be found ${}_{2}CONH_{2}$	B) turns lime wate isonous gas (E) withich on further rea	and (C) and neutral oxide (D) is milky and produces an acidic the chlorine gas, this gas with action with (D) gives NH ₃ gas. and NH ₂ CONH ₂ IH ₂ COONH.
21.	Which of the following	ng compounds is/are p	artially soluble or	insoluble in NH ₄ OH solution:
	(1) Fe(OH) ₂	(2) Ag ₂ CrO ₄	(3) $Al(OH)_3$	4
	(4) Ag_2CO_3			
	(a) 1, 3, 5	(b) 2, 3, 4	(c) 1, 3	(d) 2, 3, 5
22.	Which of the follow	ing will be precipitate	ed when a solution	n containing calcium acetate,
	(a) CaSO ₄ and SrSO	d barium acetate is tre	(b) SrSO ₄ and $(NH_4)_2$	
	(c) BaSO ₄ and CaSO	M-0.	(d) SrSO ₄ and (d) SrSO ₄ only	545O ₄
23.				. Use T if statement is true and
	F if it is false.		otatement	. OSC I II STATEMENT IS THE AND
	(i) Cu ⁺ undergoes d	lisproportionation to C	u and Cu ²⁺ in aou	eous solution
	(ii) Hg 2Cl 2 does not	impart chromyl chlori	de test	
	(iii) Sulphide ions rea	ct with sodium nitropr	usside to form a p	arple coloured complex. In this
	recetion oxidation	f !b		

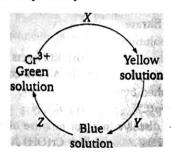
reaction, oxidation state of iron changes.

(b) FTT

(c) TFT

(d) TTF

24. In this sequence X, Y, Z are respectively:



(a) Acidified H₂O₂; Alkaline H₂O₂; Acidified H₂O₂

(b) Alkaline H₂O₂; Acidified H₂O₂; Zn/HCl

(c) Acidified H2O2; Heat; Alkaline H2O2

(d) Alkaline H2O2; Acidified H2O2; On standing

25. What will be the colour of the solution when Mn(OH)₂ is treated with concentrated HNO₃ and sodium bismuthate (or red lead or lead dioxide)?

(a) Yellow

(b) Purple

(c) Green

(d) Blue

26. A white powder "A" on heating gave a non-combustible gas and a white residue. The residue on heating turns yellow. The residue dissolves in dil. HCl and the solution gives a white ppt. with $K_4[Fe(CN)_6]$. "A" would be:

(a) CaCO₃

(b) ZnCO₃

(c) CaSO₃

(d) CuCO₃

27. An aqueous solution of FeSO₄· Al₂(SO₄)₃ and chromium alum is heated with excess of Na₂O₂ and filtered. The material obtained are:

(a) a colourless filtrate and green residue

(b) a yellow filtrate and brown residue

(c) a yellow filtrate and a green residue

(d) a green filtrate and a brown residue

28. When a solution of Na₂Cr₂O₇ is treated with amyl alcohol and acidified H₂O₂, the layer of amyl alcohol turns blue. What is the blue colouration?

(a) Cr^2

(b) CrO₅

(c) CrO₄

(d) $Cr^{2+} + CrO_5$

29. Hg_2^{2+} when reacts with H_2S , black ppt. (A) formed which when reacts with Na_2S followed by filtration leaving behind black ppt. (B). The filtrate with H^+ gives black ppt. (C). A, B and C are:

(a) Hg 2S, Hg, HgS

(b) Hg + HgS, HgS, Hg

(c) Hg + HgS, Hg, HgS

(d) Hg₂S, HgS, Hg

30. (A) light blue coloured compound on heating will convert into black (B) which reacts with glucose gives red compound (C) and (A) reacts with ammonium hydroxide in excess in presence of ammonium sulphate give blue compound (D). What is (A), (B), (C) and (D)?

(a) $[Cu(NH_3)_4]SO_4$, CuO, Cu₂O, CuSO₄

(b) CuSO₄, CuO, Cu₂O, Cu(OH)₂

(c) $Cu(OH)_2$, Cu_2O , CuO, $[Cu(NH_3)_4]SO_4$

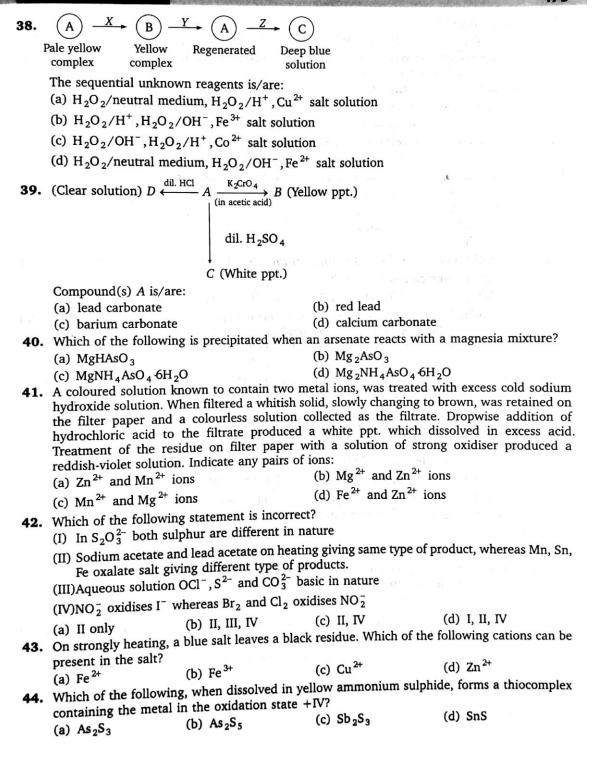
(d) $Cu(OH)_2$, CuO, Cu_2O , $[Cu(NH_3)_4]SO_4$

31. A mixture of ferric alum, chrome alum and potash alum is dissolved in water and treated with an excess of NH₃ solution and warmed with a mixture of NaOH and H₂O₂ and filtered. We will get:

(a) a green residue and a yellow filtrate (b) a brown residue and a yellow filtrate (c) a brown residue and a green filtrate (d) a blue residue and a green filtrate **32.** When KCN is added to CuSO₄ solution: (b) KCN acts as an complexing agent (a) KCN acts an reducing agent (c) K₃[Cu(CN)₄] is formed (d) All are correct 33. Fe²⁺ and Fe³⁺ can be distinguished by: (d) All are correct (a) $K_3[Fe(CN)_6]$ (b) $K_4[Fe(CN)_6]$ (c) KSCN 34. Which of the following will not dissolve in a hot mixture of NaOH and H₂O₂? (d) $Zn(OH)_2$ (a) Fe(OH)₃ (b) Al(OH)₃ (c) Cr(OH)₃ 35. Match the following. (I) HCO₂ (P) Obtained through Solvay's process (Q) Green colouration due to [Cr(H₂O)₆]³⁺ ion (II) K₂CO₃ (III) $S_2O_3^{2-}$ + FeCl₃ solution (R) Reduces $[Cu(C_4H_4O_6)_2]^{2-}$ to red ppt. (IV) $SO_3^{2-} + K_2Cr_2O_7 / H^+$ (S) Green colouration (V) Na₂CO₃ (T) Melts at 850°C (P) (Q) (R) (S) (T) (a) I III V IV II I (b) III II IV V V (c) IV I III II V IV (d) III I II $\xrightarrow{\text{KOH}}$ (Y) (gas turns red litmus blue) + (Z) 36. (X) - $(X) \xrightarrow{\Delta}$ gas (does not support combustion) Identify (X) to (Z): $Y = NH_3$ (a) $X = NH_4NO_2$ $Z = KNO_2$ $Y = NH_3$ (b) $X = (NH_4)_2 Cr_2 O_7$ $Z = Cr_2O_3$ (c) $X = (NH_4)_2 SO_4$ $Y = NH_3$ $Z = K_2SO_4$ (d) $X = NH_4NO_3$ $Y = NH_3$ $Z = KNO_3$ 37. $SO_3^{2-} + S^* \xrightarrow{boil} SS^*O_3^{2-}, SS^*O_3^{2-} + 2H^+ \longrightarrow H_2SO_3 + S^*$

The above reaction sequence proves:

- (a) Two sulphur atoms of thiosulphate are not equivalent
- (b) Both are equivalent
- (c) Both of the above are correct
- (d) None of these



45.	Thenard's blue is:			
	(a) CoAl ₂ O ₄	(b) $Fe_4 [Fe(CN)_6]_3$	(c) K_2 Fe [Fe(CN) ₆]	(d) [Cu(NH ₃) ₄](OH) ₂
46.	A salt imparts a yellow of the bead in a reduc			What would be the colour
	(a) Green	(b) Blue	(c) Red	(d) Violet
47.	BiCl ₃ can be reduced	to metallic bismuth by:		(1) 11 (011) 1
	(a) H_2S	(b) SO ₂	(c) FeSO ₄	(d) $Na_2[Sn(OH)_4]$
48.	The blue colour in an	oxidising flame of a m	icrocosmic bead contain	ning Cu ²⁺ is due to:
	(a) NaCuPO ₄	(b) $Cu(PO_3)_2$	(c) $Cu_3(PO_4)_2$	(d) None of these
49.	Which of the following			bead test?
		$H_2O \rightarrow NaPO_3 + NH_3 +$	- 5H ₂ O	
0	(b) $CoO + NaPO_3 \rightarrow$			
	(c) $CuO + NaPO_3 \rightarrow$	NaCuPO ₄		
	(d) All of these	- !- f ! ! !!		treated with KCN till the
5 0.			when [Cu(NH ₃) ₄] is	treated with KCN till the
	colour of the complex	(b) [Cu(CN) 12-	(c) [Cu(CN) ₄] ³⁻	(d) [Cu(CN), 14-
	(a) Cu(CN) ₂	24 NATO 1012 STOP 100-1012/2000		
51.	A white solid forms F	Unmann's green in the	charcoal cavity test in	an oxidising flame. On an acidified dichromate
	paper green and lead	acetate paper black. Th	ne white solid is:	an acidinea diemomate
	(a) PbS	(b) ZnSO ₃	(c) ZnS	(d) Na ₂ S
52 .			A STATE OF THE STA	eated with concentrated
	H ₂ SO ₄ , the solid give	s violet vapours that tu	rns starch paper blue.	The salt may be:
	(a) NaI	(b) KI	(c) CaBr ₂	(d) MgI ₂
53.	Which of the followin			
	(a) PbCl ₂	(b) PbBr ₂	(c) PbI ₂	(d) All of these
54.	Which of the followin	g pairs of cations canno	ot be separated by usin	g dilute HCl?
			(c) Ag^+ , Cu^{2+}	
55.	If NH ₄ OH in presence	of NH ₄ Cl is added to	a solution containing	Al ₂ (SO ₄) ₃ and MgSO ₄ ,
	which of the following	g will precipitate?		
	(a) Al(OH) ₃ only		(b) Mg(OH) ₂ only	
	(c) Al(OH) ₃ and Mg(0		(d) None of these	
56.	Which of the following	g pairs of cations can be	e separated by adding N	NH_4Cl , NH_4OH and then
	(NH ₄) ₂ CO ₃ to the mi	(b) Ba ²⁺ , Sr ²⁺	(c) Sr ²⁺ , Ca ²⁺	(1) n 2+ a 2+
	(a) Ca ²⁺ , Mg ²⁺		A 5	(d) Ba ²⁺ , Ca ²⁺
57.	H ₂ S is passed through	the solution in an acidic	medium to precipitate	the sulphides of group II
			ite the sulphides of grou re soluble than those of	
				those of group IV cations
	(c) the sulphides of gro	oup II cations are soluble	in an acidic medium, hu	t those of group IV cations
	are not			and of group iv caudin
	(d) the sulphides of gr	roup IV cations are solu	ble in an alkaline medi	um but those of group II
	cations are not			

58.	Which of the following	pairs of cations can be	separated by passing	H ₂ S through the mixture in
	the presence of 0.2 M (a) Pb ²⁺ , Cu ²⁺	(b) Ag ⁺ , Cu ²⁺	(c) Cd^{2+} , Bi^{3+}	(d) Cu^{2+} , Zn^{2+}
59.	Which of the following (a) Cu ²⁺ , Ag ⁺	g pairs of cations can b (b) Pb ²⁺ , Ag ⁺	oe separated by using (c) Ag ⁺ , Zn ²⁺	an NH $_3$ solution ? (d) Cu $^{2+}$, Cd $^{2+}$
60.	(a) Cu ²⁺	(b) Cr ³⁺	(c) Fe ³⁺	microcosmic bead test? (d) Zn ²⁺
61.	(a) Fe ²⁺ and Co ²⁺	(b) Co ²⁺ and Cu ²⁺	(c) Cu^{2+} and Mn^{2+}	e in an oxidising flame? (d) Cu ²⁺ and Cr ³⁺
62.	being passed through a but readily soluble in a observation?	an AgNO $_3$ solution, this an NH $_3$ solution. Which	gas forms a white pre	s with a pungent smell. On cipitate insoluble in HNO $_{ m 3}$ tion can lead to the above
	(a) $MgCl_2 + H_2O$ — (b) $(NH_4)_2CO_3$ — (c) $ZnSO_3$ — $ZnCO_3$ (d) $NaNH_4HPO_4$ —	$2NH_3 + CO_2 + H_2O$		(C)
63.	When NH ₄ Cl is not us cation will not be pre (a) Fe ²⁺	sed together with NH ₄ cipitated? (b) Cr ³⁺	OH in group-III reage (c) Zn ²⁺	nt which of the following (d) Ba ²⁺
64.	(T) imparts violet colour to flame $(W) \xrightarrow{\text{dil. HCl}} (Y) \text{ whi}$, i i mi ge s	/) — NaOH + AgNO ₃ → gas	$(W) \xrightarrow{\text{NH}_3 \text{ soln.}} (X)$ Red ppt.
	$(U) \xrightarrow{\text{NaOH}} (Z) \text{ gas}$		h HCl)	
	Identify (T) to (Z) . (a) $T = \text{KMnO}_A$, $U = \text{H}$	$[Cl, V = Cl_2, W = HgI_2,]$	$X = Hg(NH_2) NO_3, Y$	$= Hg_2Cl_2, Z = N_2$
	(b) $T = K_2 Cr_2 O_7$, $U = Z = NH_3$	NH_4Cl , $V = CrO_2Cl_2$,	$W = \text{Ag}_2\text{CrO}_4$, $X =$	$[Ag(NH_3)_2]^+, Y = AgCl,$
	(d) $T = K_2 MnO_4$, $U =$	NaCl, $V = CrO_3$, $W = A$	$gNO_2, X = (NH_4)_2Cr$	O_4 , $Y = BaCO_3$, $Z = NH_4Cl$ O_4 , $Y = CaCO_3$, $Z = SO_2$
65.	In the separation of C copper (II) sulphate a corresponding cyano c relative stability enabl (a) K ₃ [Cu(CN) ₄] is possible (b) K ₃ [Cu(CN) ₄] and (c) K ₂ [Cu(CN) ₄] inpegation	Cu ²⁺ and Cd ²⁺ in II gr and tetrammine cadmi complexes. Which one of	oup qualitative analy um (II) sulphate rea of the following pairs of 1 ²⁺ and Cd ²⁺ ?] is inperfect completed the complex] perfect complex	rsis of cations tetrammine act with KCN to form the of the complexes and their

66.	The only cations present in a slightly acidic sol	ution are Fe $^{3+}$, Zn $^{2+}$ and Cu $^{2+}$. The reagent that
	when added in excess to this solution would	identify and separate Fe ³⁺ in one step is:
	(a) 2 M HCl	(b) 6 M NH ₃
	(c) 6 M NaOH	(d) H ₂ S gas
67.	The Company of the Co	[Fe(CN) ₆], CO gas was evolved. By mistake,
٠,٠	somebody used dilute H ₂ SO ₄ instead of cond	H _o SO ₄ , then the gas evolved was:
	(a) CO	(b) HCN
	(c) N ₂	(d) CO ₂
68.		\longrightarrow Reddish brown fumes. Which is the correct
	statement regarding the above observation?	/ Italian province
	(a) It confirms the presence of Cl ⁻ ion	and the state of t
	(b) It confirms the presence of Br ion	
	(c) It confirms the presence of both	CALIFORNIA CARA CARA CARA CARA CARA CARA CARA CA
	(d) It neither confirms Cl ⁻ nor Br ⁻ unless it	is passed through NaOH solution
69.		neating gives a compound (B) and a gas (C) . (A)
-	on treatment with dil. HNO 2 gives compound	I(D), brown colour substance (E) and a neutral
	oxide (F) . Compound (D) on warming gives	off again gas (C). Then, (E) will be:
	(a) Mn_3O_4	(b) PbO ₂
	(c) Pb ₃ O ₄	(d) Fe_2O_3
70.	Select correct statement(s):	
	(I) When excess FeCl ₃ solution is adde Fe ^{III} [Fe ^{II} (CN) ₆] ⁻ , Fe ^{II} [Fe ^{III} (CN) ₆] ⁻ is al	d to K ₄ [Fe(CN) ₆] solution, in addition to so formed due to side redox reaction
	(II) When FeCl ₂ is added to K ₃ [Fe(CN) ₆] so	
	Fe III [Fe II (CN) 6] is also formed due to	
	(III) Fe III [Fe II (CN) 6] is paramagnetic while	
	(IV) Fe ^{III} [Fe ^{II} (CN) ₆] is diamagnetic while F	e II [Fe III (CN) c] is paramagnetic
	(a) I, II	(b) III, IV
	(c) both (a) and (b)	(d) None of these
71.		for the detection of acetate and oxalate ions
	respectively?	or decide and oxalate lons
	(a) BaCl ₂ and CaCl ₂	(b) NaOH and BaCl ₂
	(c) FeCl ₃ and CaCl ₂	(d) FeCl ₃ and NaOH
72.	Which of the following mixtures of ions can	be separated by using an excess of an NaOH
	solution?	
		(b) Al ³⁺ and Zn ²⁺
	(c) Fe ³⁺ and Al ³⁺	(d) Sn ²⁺ and Pb ²⁺
73.	which analytical group will the cation be p	ives a solid that forms a green solid with CoO. In recipitate and what will be the colour of the
	precipitate? (a) Group I, white	(b) Croup II well
	(c) Group III, white	(b) Group IV, white
	(-,ap,	(d) Group IV, white
	*	

QUALITATIVE INORGANIC ANALYSIS

74.	excess of KI to give a colourless sol with a solution of cobalt (II) thioc metal ions is:	eated with KI, gives a red precipitate which dis lution. Moreover, the solution of the metal ion of syanate gives rise to a deep blue crystalline pre-	on treatmen	
	(a) Pb ²⁺	(b) Hg ²⁺	3 9	
	(c) Cu ²⁺	(d) Co ²⁺		
75.	A white powder solid A forms a light green solution with water, which on treatment with potassium hexacyanoferrate(III) gives a blue precipitate. On being strongly heated, A leaves brown residue and forms a mixture of two gaseous oxides, which turns a dichromate solution green and forms a white precipitate with a BaCl ₂ solution containing concentrated HCl. A is:			
	(a) CuSO ₄	(b) Fe ₂ (SO ₄) ₃		
	(c) FeSO ₄	(d) $Cr_2(SO_4)_3$		
76.	Which of the following is the comphosphates using ammonium mol	nposition of the yellow precipitate obtained in lybdate?	the test for	
	(a) (NH ₄) ₃ [PMo ₁₂ O ₄₀]	(b) (NH ₄) ₃ [PMo ₁₂ O ₃₆]		
	(c) (NH ₄) ₃ PO ₄ ·10MoO ₃	(d) $(NH_4)_3PO_4 \cdot 14MoO_3$		
77	Which of the following mixtures can be separated by using an NH ₃ solution?			
, , .	(a) Fe ³⁺ and Al ³⁺	(b) Al $^{3+}$ and Zn $^{2+}$	ioms: .5	
	(c) Sn ²⁺ and Pb ²⁺	(d) Cu ²⁺ and Cd ²⁺		

Level 3

PASSAGE 1

A pale yellow inorganic compound K is insoluble in hot and dil. HNO_3 but dissolves in concentrated ammonia solution and compound L is formed. On treatment with dil. HNO_3 compound L produces a metal cation which gives white precipitate M with Hypo solution. When an aqueous solution of (M) is boiled, a black precipitate of (N) is formed which dissolves in hot dil. HNO_3 and on adding HCl gives a white precipitate. When the compound (K) is heated with concentrated H_2SO_4 and MnO_2 brown fumes are observed.

- 1. The compound (K) is:
 - (a) AgI
- (b) AgBr
- (c) AgNO₂
- (d) PbI₂

Mendon and and and and the

- 2. Compound (M) and black precipitate of (N) are respectively:
 - (a) PbI2, PbS
- (b) PbS₂O₃, PbS
- (c) Ag₂S₂O₃, Ag₂S
- (d) AgSO₃, Ag
- 3. Compound (K) on heating with conc. H₂SO₄ and MnO₂ gives :
 - (a) I_3^-
- (b) Br₂
- (c) HI
- (d) NO₂

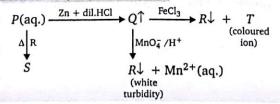
PASSAGE 2

A colourless inorganic compound (A) imparts a green colour to the flame. Its solution gives a white ppt. (B) with H_2SO_4 . When heated with $K_2Cr_2O_7$ and conc. H_2SO_4 , a brown red vapour/gas (C) is formed. The gas/vapour when passed through aqueous NaOH solution, it turns into a yellow solution (D) which forms yellow precipitate (E) with CH_3COOH and $(CH_3COO)_2Pb$. With reference to above information, answer the following questions.

- 1. The colourless inorganic compound (A) is:
 - (a) $Ba(NO_3)_2$
- (b) BaCl₂
- (c) CuCl₂
- (d) CrBr₃

- 2. The liberated gas vapour (C) is:
 - (a) Br₂
- (b) NO₂
- (c) CrO₂Cl₂
- (d) Cl₂
- 3. The yellow ppt. formed when (D) reacts with CH3COOH and (CH2COO)2Pb is:
 - (a) PbI₂
- (b) PbCrO₄
- (c) BaCrO₄
- (d) AgBr

PASSAGE 3



- 1. 'T' can not be identified by:
 - (a) NH₃ solution
- (b) NH₄SCN
- (c) $(NH_4)_2S$
- (d) excess KCN

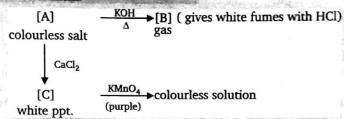
- 2. Species P and S are respectively:
 - (a) $SO_3^{2-}(aq.)$, S
- (c) $S_2O_3^{2-}(aq.)$, $SO_3^2(aq.)$

(d) None of these

(b) $SO_3^{2-}(aq.)$, $S_2O_3^{2-}(aq.)$

PASSAGE





- **1.** The salt [A] is:
 - (a) CaC₂O₄
- (b) $K_2C_2O_4$
- (c) $(NH_4)_2C_2O_4$
- (d) BaC₂O₄

- 2. When gas [B] reacted with excess Cl₂ gives:
 - (a) NOCl
- (b) NCl₃
- (c) NH₄Cl
- (d) NOCl₃
- 3. Which of the following metal chloride gives white ppt. and black ppt. respectively with aqueous solution of gas [B]?
 - (a) HgCl₂,Hg₂Cl₂
- (b) Hg₂Cl₂,HgCl₂
- (c) Hg₂Cl₂,ZnCl₂
- (d) HgCl2, ZnCl2

PASSAGE



A teacher gave a student two salts (A) and (B) told him to identify these salts. The student heated salt (A) strongly and observed two oxides of sulphur. He added NaOH solution to the aqueous solution of (A) and observed a green precipitate, which turned brown on exposure to air.

When he took salt (B) to flame test, green colour was observed. On heating salt (B) with a solid compound (X) and concentrated sulphuric acid, orange red vapours are evolved. When this gas is passed through an aqueous solution of a base, the solution turns yellow.

- 1. The salt (A) can be:
 - (a) $Fe_2(SO_4)_3$

(b) FeSO₄

(c) FeSO₄·7H₂O

- (d) both (b) and (c)
- 2. Salt (B) suggest that the cation and anion in it are respectively:
 - (a) Ba $^{2+}$ and SO $_4^{2-}$

(b) Ba2+ and Cl-

(c) Ba 2+ and S2-

(d) Ba $^{2+}$ and CO $_3^{2-}$

- 3. Compound (X) is:
 - (a) K₂Cr₂O₇

(b) NH₄Cl

(c) CaF₂

(d) Na₂B₄O₇ · 10H₂O

Black solid
$$\xrightarrow{\text{KOH + Air}}$$
 (A) $\xrightarrow{\text{H}_2\text{SO}_4}$ (B) (C)

- (i) KI on reaction with alkaline solution of (B) changes into a compound (D).
- (ii) The colour of the compound (B) disappears on treatement with the acidic solution of FeSO₄
- (iii) With cold conc. H₂SO₄ compound (B) gives (E), which being explosive decomposes to yield (F) and oxygen.
- **1.** Nature of compound (E) is:
 - (a) Acidic oxide

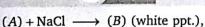
(b) Basic oxide

(c) Amphoteric oxide

- (d) Neutral oxide
- 2. Colour of the solution obtained, when ferrous sulphate reacts with acidic solution of (B):
 - (a) Colourless
- (b) Pink
- (c) Green
- (d) Yellow

- 3. Which of the following options is correct?
 - (a) (C) and (F) are same compounds having same colour.
 - (b) (C) and (F) are different compounds having same colour.
 - (c) Compound (B) forms similar compound (E) with hot and conc. H₂SO₄.
 - (d) Compound (A) does not give same type of reaction in acidic and neutral medium.
- **4.** Type of hybridization in compound (*D*):
 - (a) sp^2
- (b) sp^3
- (c) sp^3d
- (d) No hybridization

PASSAGE



- $(B) + KI \longrightarrow (C)$ (green ppt.)
- $(C) + \underset{(excess)}{\mathsf{KI}} \longrightarrow (D) + (E)$ (colourless solution)
- $(E) + NH_3 + KOH \longrightarrow (F)$
- **1.** Compounds (A) and (B) are respectively:
 - (a) AgNO₃ and AgCl

- (b) Pb(NO₃)₂ and PbCl₂
- (c) $Hg_2(NO_3)_2$ and Hg_2Cl_2
- (d) $Cu_2(NO_3)_2$ and Cu_2Cl_2
- 2. When compound (A) reacts with Na₂CrO₄ solution, the colour of the compound formed is:
 - (a) Black

(b) Red

(c) Yellow

- (d) White
- **3.** Type of hybridization in compound (E) is :
 - (a) d^2sp^3

(b) $sp^{3}d^{2}$

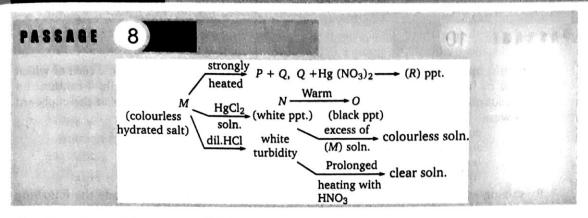
(c) sp^3

- (d) dsp^2
- **4.** Colour of the compound (F) is:
 - (a) Yellow

(b) Blue

(c) White

(d) Brown



- 1. The colour of the compound R is:
 - (a) White
 - (c) Black
- 2. The structure of compound P is:
 - (a) Linear
 - (c) Square pyramidal
- 3. Compound M is used
 - (I) in photography
 - (II) in analytical chemistry
 - (III) as a dehydrating agent
 - (IV) as an oxidizing as well as reducing agent

Choose the correct code:

(a) I, III

(b) I, II and III

(b) Yellow

(d) Brown

(b) Crown shaped

(d) Zig-zag chain

(c) I, II

(d) I, II, III and IV

of the center of whose pot. formed near

PASSAGE 9

A white crystalline solid 'A' on boiling with caustic soda solution gives a gas 'B', which on passing through an alkaline solution of potassium tetraiodomercurate (II) solution gives a brown ppt. The substance 'A' on heating evolves a neutral gas 'C', which is inert at room temperature and reactive is presence of catalyst and does not give brown fumes with nitric oxide.

- 1. The gas 'B' is:
 - (a) H_2S
 - (c) HCl
- 2. The gas 'C' is:
 - (a) N_2O
 - (c) NO
- 3. The substance 'A' is:
 - (a) NH₄Cl
 - (c) NH₄NO₂

- (b) NH₃
- (d) CO_2
- (b) O₂
- $(d) N_2$
- (b) NH₄NO₃
- (d) NaNO₃

A chemist opened a cupboard to find four bottles containing water solutions, each of which has lost its label. Bottles 1, 2, 3 contained colourless solutions, whilst Bottle 4 contained a blue solution. The labels from the bottles were lying scattered on the floor of the cupboard. They were

> copper(II) sulphate sodium carbonate lead nitrate hydrochloric acid

By mixing samples of the contents of the bottles, in pairs, the chemist made the following observations:

(i)	Bottle 1 + Bottle 2	white precipitate
(ii)	Bottle 1 + Bottle 3	white precipitate
(iii)	Bottle 1 + Bottle 4	white precipitate
(iv)	Bottle 2 + bottle 3	colourless gas evolved
(v)	Bottle 2 + Bottle 4	no visible reaction
(vi)	bottle 3 + Bottle 4	blue precipitate

1. Chemical formula of white precipitate in observation (i) is :

(a) CuCl₂

(b) PbCl₂

(c) PbCO₃

(d) CuSO₃

2. Colourless solution present in Bottle-1 is:

(a) CuSO₄

(b) HCl

(c) $Pb(NO_3)_2$

(d) Na_2CO_3

3. Nature of gas evolved in observation (iv) is:

(a) Acidic

(b) Neutral

(c) Basic

(d) Amphoteric

4. Chemical formula of white ppt. formed in observation (iii) is:

(a) PbCl₂

(b) PbCO₃

(c) CuCO₃

(d) PbSO₄

PASSAGE

A coloured compound (A) reacts with dilute H2SO4 to produce a colourless gas (B) and colourless solution (C). The reaction between (B) and the acidified K2Cr2O2 solution produces a green solution and a slightly yellowish precipitate (D). The substance (D) burns in air to produce a gas (E) which also can change the colour of K₂Cr₂O₇ solution.

1. "A" probably, is:

(a) ZnSO₃

(b) CoS

(c) MnS

(d) NiS

2. When "B" reacts with "E":

(a) a new gas F will be produced

(b) it produces D and a colourless liquid

(c) there will be no reaction between them

(d) it yields B and an acidic oxide

3. Which is not correct about E?

(a) It is colourless and highly water soluble (b) The molecule is linear

(c) Its aqueous solution is acidic

(d) It turns starch iodate paper blue

- 4. When D is boiled with alkaline sulphite solution a compound F is formed. F can be used in (II) Bleaching industry to destroy excess Cl₂ (I) Iodine titrations in volumetric analysis (IV) Iodometric titrations (III) Photography for 'fixing' films
 - Choose the correct codes:

(a) I and IV

(b) I, III and IV (d) I, II, III and IV (c) II and III

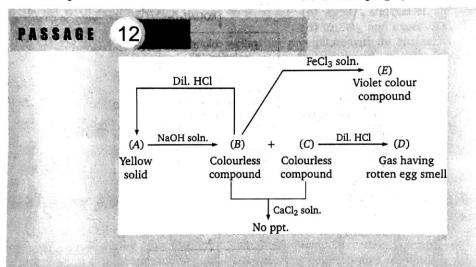
5. When colourless solution (C) reacts with Pb_3O_4/H^+ , it acquires a violet red colour due to formation of:

(a) MnO₄

(b) PbO₂

(c) I_3^-

(d) $[Ni(en)_3]S_2O_3$



- 1. The structure of compound (A) is:
 - (a) Linear

(b) Crown shaped

(c) Square pyramidal

- (d) Zig-zag chain
- 2. Compound (B) on strong heating produces compound(s) which has/have:
 - (a) Chain structure

(b) Tetrahedral structure

(c) Both (a) and (b)

- (d) None of these
- 3. Which of the following statements is/are correct for the gas D?
 - (I) It has the state of hybridisation sp 3
 - (II) Gas can be identified by CaCl2 solution
 - (III) Gas can be identified by Pb(OAc)2 solution
 - (IV) Gas can be identified by passing through sodium nitroprusside solution

(a) I, IV

(b) I, III

(c) III only

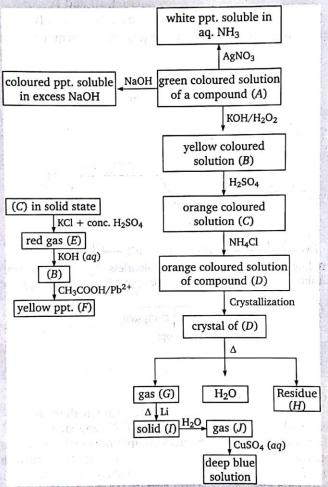
- (d) I, II, IV
- 4. Compound (B) on reaction with [Ni(en)₃] (NO₃)₂ gives a coloured complex exhibiting
 - (a) Optical isomerism

(b) Geometrical isomerism

(c) Linkage isomerism

(d) No isomerism

Read the following short write up and answer subsequent questions based on observations(A) to (J).



- Compound A and B are respectively:
 - (a) FeCl₂; FeCl₃
- (c) CrCl₃; K₂CrO₄
 2. Gas (J) is also produced by:
 - (i) heating NH₄NO₃
 - (iii) heating NH₄Cl (a) (i) and (iii)
- (b) (i) and (ii)
- (b) CuCl₂·2H₂O; [CuCl₄]⁻²
- (d) NiCl₂; NiCl₃
- (ii) heating NH₄NO₂
- (iv) reaction of NH₄Cl and Ca(OH)₂ (c) (i) and (iv) (d) (iii) and (iv)
- Select the incorrect reaction:
 (a) (C) in solid state + KBr + conc. H₂SO₄ → Red gas
 - (b) (C) in solid state + KCl + conc. $H_2SO_4 \longrightarrow Red$ gas

- (c) (C) in solid state + FeCl₃ + conc. $H_2SO_4 \longrightarrow Red$ gas
- (d) (C) in solid state + $HgCl_2$ + conc. $H_2SO_4 \longrightarrow Red$ gas

An unknown mixture contains one or two of the following: CaCO3, BaCl2, AgNO3, Na₂SO₄, ZnSO₄ and NaOH. The mixture is completely soluble in water and solution gives pink colour with phenolphthalein. When dilute hydrochloric acid is gradually added to the solution, a precipitate is formed which dissolves with further addition of the acid.

- 1. Which of the following combination of compounds is soluble in water?
 - (a) BaCl₂ and AgNO₃

(b) AgNO₃ and NaOH

(c) BaCl₂ and Na₂SO₄

(d) ZnSO₄ and excess NaOH

(d) bos (r) (bold ()

- 2. The aqueous solution of mixture gives white precipitate with dil. HCl which dissolves in excess of dil. HCl. It confirms:
 - (a) BaCl₂ + NaOH

(b) Na₂SO₄ + NaOH

(c) ZnSO₄ + NaOH

(d) AgNO₃ + NaOH

- 3. The white precipitate is:

(a) ZnSO₄

(b) Na₂ZnO₂

(c) Zn(OH)₂

(d) ZnCl₂

PASSAGE

Aqueous solution of a salt 'A', when mixed with NaOH solution and warmed, a black precipitate is formed. Black ppt. is filtred and dissolved in dil. H₂SO₄ solution. The resulting solution gives a chocolate coloured precipitate with potassium ferrocyanide solution. The filtrate obtained after filtering off the black precipitate, upon warming with Zn and NaOH evolves a pungent smelling gas. The resulting solution also responds to the ring test. The filtrate does not evolve any gas when it is boiled with urea in the presence of H₂SO₄.

- 1. Salt 'A' consists of:
 - (a) Cu²⁺

(b) Hg 2+

(c) Cu+

- (d) Pb2+
- 2. The filtrate obtained after filtering off the black precipitate consists of:
 - (a) NO₂

(b) NO_3^-

(c) CO_3^2

- (d) Cl-
- 3. The chocolate coloured precipitate is:
 - (a) $Fe_2[Fe(CN)_6]$

(b) Cu₂[Fe(CN)₆]

(c) HgSO₄

(d) [Fe(H₂O)₅(NO)] SO₄

Borax Bead Test is carried out when the original mixture is coloured. It is done with the help of a clean platinum wire on which a small loop is made at the end. When borax is heated on platinum wire loop a transparent glass like bead is obtained. The hot bead is brought in contact with salt till it reacts with fused borax and colour is imparted to the bead. Bead colour is noted.

Colour of the bead	Ion	
1. Blue green	Cu ²⁺	
2. Yellow	Fe ³⁺	
3. Green	Cr 3+	
4. Violet	Mn ²⁺	
5. Dark blue	Co ²⁺	
6. Brown	Ni ²⁺	

- 1. Glassy bead is of:
 - (a) $B_2O_3 + NaBO_2$
 - (c) $Na_2B_4O_7 + B_2O_3$
- 2. Blue bead can be of:
 - (a) $Cu(BO_2)_2$
 - (c) Both (a) and (b)
- **3.** The flame used in Borax Bead Test is: (a) Reducing
 - (c) Both (a) and (b)

- (b) $NaBO_2 + Na_3BO_3$
- (d) $SiO_2 + B_2O_3$
- (b) $Co(BO_2)_2$
- (d) None of these
- (b) Oxidising
- (d) Neither (a) nor (b)

PASSAGE 17

When a crystalline compound X is heated with $K_2Cr_2O_7$ and concentrated H_2SO_4 , a reddish brown gas A is evolved. On passing A into caustic soda, a yellow solution of B is formed. A yellow precipitate of C is obtained when a solution of B is neutralised with acetic acid and then treated with a lead acetate solution. When X is heated with NaOH, a colourless gas is evolved which, when passed into a solution of $K_2[HgI_4]$, gives a reddish brown precipitate of D.

- **1.** Compound (X) is:
 - (a) NH₄Br

(b) NH₄Cl

(c) NH₄NO₂

- (d) NH₄NO₃
- **2.** If the solution *B* is colourless, which of the following ions would not be present in the solid *X*?
 - (a) Cl

(b) Br⁻

(c) NO_3^-

- (d) NO_2^-
- **3.** Which of the following is the composition of the brown precipitate (D)?
 - (a) HgI-

(b) Hg(NH₂)I

(c) HgO

(d) HgO·Hg(NH₂)I

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PASSAGE

A white solid A reacts with dilute H₂SO₄ to produce a colourless gas B and a colourless solution C. The reaction between B and acidified dichromate yields a green solution and a slightly coloured precipitate D. The substance D, when burnt in air, gives a gas E which reacts with B to yield D and a colourless liquid. Anhydrous copper sulphate turns blue with this colourless liquid. The addition of aqueous NH3 or NaOH to C produces a precipitate that dissolves in an excess of the reagent to form a clear solution.

the dromate next

- 1. Which of the following gases are B and E respectively?
 - (a) CO₂ and SO₂

(b) SO₂ and H₂S

(c) H₂S and SO₂

- (d) CO₂ and H₂S
- 2. What would happen if the gas E were passed through an acidified KMnO₄ solution?
 - (a) Bleaching of the permangnate solution without any precipitation
 - (b) Bleaching of the permangnate solution which would show a yellowish white turbidity
 - (c) Bleaching of the permangnate solution and the formation of a brown precipitate
 - (d) No action
- 3. What would appear if the gas B were passed through an aqueous solution of $Pb(NO_3)_2$?
 - (a) A white precipitate soluble in hot dilute HNO₃
 - (b) A black precipitate soluble in hot dilute HNO 3
 - (c) A black precipitate insoluble in hot dilute HNO3
 - (d) A yellow precipitate soluble in hot concentrated HNO 3
- 4. Which of the following reactions are relevant to the action of NH₃ or NaOH solution on C?
 - (a) $Zn(OH)_2 + 4NH_3 \longrightarrow [Zn(NH_3)_4]^{2+} + 2OH^-$ (b) $Zn(OH)_2 + 2OH^- \longrightarrow [Zn(OH)_4]^{2-}$

 - (c) $Pb(OH)_2 + 4NH_3 \longrightarrow [Pb(NH_3)_4]^{2+} + 2OH^{-1}$
 - (d) $Pb(OH)_2 + 2OH^- \longrightarrow [Pb(OH)_4]^{2-}$
- 5. Suppose the solution obtained by the treatment of the solution C with an excess of NaOH is acidified with acetic acid and the gas B is passed through it. Which of the following will obtained?
 - (a) A colourless solution

(b) A yellow precipitate

(c) A black precipitate

(d) A white precipitate

PASSAGE

- (i) An aqueous solution of a compound A is acidic towards litmus and A sublimes at about 300°C.
- (ii) A solution of A, on treatment with an excess of NH₄SCN, gives a red compound B, and on treatment with a solution of K₄[Fe(CN)₆], gives a blue compound C.
- (iii) The solid A, on being heated with an excess of K2Cr2O7 in the presence of concentrated H₂SO₄, evolves deep red vapours of D.
- (iv) On passing the vapours of D into a solution of NaOH and then adding the solutions of acetic acid and lead acetate, a yellow precipitate of a compound E is obtained.

490 INORGANIC CHEMISTRY

1.	Which of the following can be the composition of B and C respectively?	
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- (a) Ni(SCN)₂ and Ni₂ [Fe(CN)₆]
- (b) Co(SCN)₂ and Co₂ [Fe(CN)₆]
- (c) $[Fe(SCN)_6]^3$ and $Fe_3[Fe(CN)_6]_2$
- (d) $Fe(SCN)_3$ and $Fe_4[Fe(CN)_6]_3$
- **2.** Which is the oxidation state of the central atom in vapour D?
 - (a) +VI
- (b) + V
- (c) +III
- (d) -II
- **3.** Can the compound *A* be prepared in the anhydrous form by strongly heating its hydrated crystals?
 - (a) No, because the water molecules are very strongly bound in the hydrated crystals.
 - (b) No, because the salt gets hydrolysed in the process
 - (c) Yes, because the water molecules are loosely bound in the hydrated crystals
 - (d) Yes, because the salt sublimes at 300°C

PASSAGE 20

- (i) A yellow precipitate of the compound A is formed on passing H₂S through a neutral solution of the salt B.
- (ii) The compound A is soluble in hot dilute HNO₃ but insoluble in yellow ammonium sulphide.
- (iii) The solution of B, on treatment with a small quantity of NH₃, gives a white precipitate soluble in an excess of the reagent, forming a compound C.
- (iv) The solution of B gives a white precipitate with a small concentration of KCN. The precipitate is soluble in an excess of the reagent, forming a compound D.
- (v) The solution of D, on treatment with H₂S, gives A.
- (vi) The solution of B in dilute HCl, on treatment with a solution of $BaCl_2$, gives a white precipitate of the compound E, which is almost insoluble in concentrated HNO₃.

1.	Which of the following is t	he cation	present in B ?	
	(a) As ³⁺		(b) S	Sb 3+
	(c) Zn ²⁺		(d) (Cd ²⁺

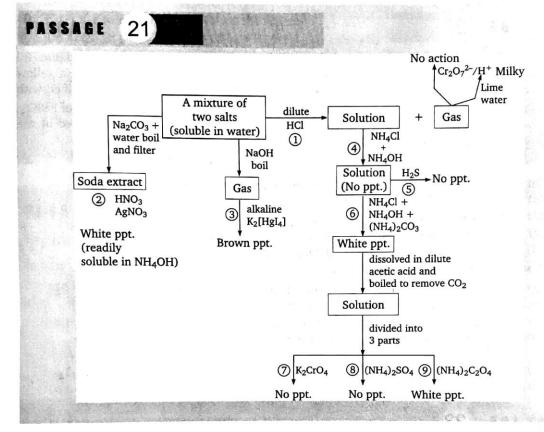
- 2. Which of the following anions is present in B?
 - (a) SO_4^{2-}

(b) CO_3^{2-}

(c) SO_3^{2-}

- (d) S^{2-}
- 3. Which of the following are the white precipitate and the soluble substance formed by the excess of the NaOH reagent, respectively?
 - (a) AsOCl and AsO₃

- (b) SbOCl and SbO₃³
- (c) Zn(OH)₂ and [Zn(NH₃)₄]²⁺
- (d) Cd(OH)₂ and [Cd(NH₃)₄]²⁺
- 4. Which of the following are the white precipitate and the soluble substance formed by the excess of the KCN reagent, respectively, in (iv)?
 - (a) $As(CN)_3$ and $[As(CN)_6]^{3-}$
- (b) $Sb(CN)_3$ and $[Sb(CN)_6]^{3-}$
- (c) $Zn(CN)_2$ and $[Zn(CN)_4]^{2-}$
- (d) $Cd(CN)_2$ and $[Cd(CN)_4]^{2-}$



- The white precipitate obtained in step (2) when filtered, washed with water and dissolved in NH₄OH, furnishes the ions:
 - (a) Ag^+ , NH_4^+ and OH^-

(b) $Ag^+ + NH_4^+ + Cl^-$

(c) $[Ag(NH_3)_2]^+, Cl^-$

- (d) [Ag(OH)₂], NH₄, Cl
- 2. The white precipitate obtained in step (6) is:
 - (a) BaCO₃

(b) SrCO₃

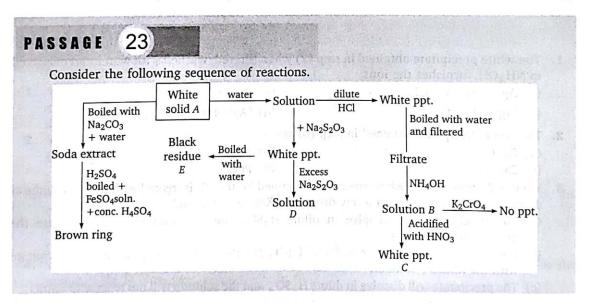
(c) CaCO₃

- (d) PbCO₃
- 3. What will happen if the white precipitate obtained in step (9) is treated with a large volume of dilute H₂SO₄ and then with a few drops of a KMnO₄ solution?
 - (a) The precipitate will dissolve in dilute H₂SO₄ and the solution will decolorise the permangnate solution
 - (b) The precipitate will dissolve in dilute H₂SO₄ and the solution will give a brown precipitate with the KMnO₄ solution
 - (c) The precipitate will dissolve in dilute H_2SO_4 and the solution will not react with KMnO $_4$
 - (d) The precipitate will not dissolve in dilute H₂SO₄ and the mixture will not react with KMnO₄

PASSAGE

An aqueous solution of a white salt A gives a white precipitate B on treatment with dilute HCl in cold condition. B is soluble in boiling water. An aqueous solution of A gives a yellow precipitate on treatment with a solution of K_2CrO_4 . The soda extract of A is acidified with dilute H₂SO₄, boiled to remove CO₂ and treated with a freshly prepared solution of FeSO₄. Concentrated H2SO4 is added to the resulting solution. A brown ring is formed at the junction of the two layers.

- 1. On treatment with a KI solution, an aqueous solution of A will give:
 - (a) a yellow precipitate, soluble in boiling water
 - (b) a yellow precipitate, insoluble in boiling water
 - (c) a white precipitate, soluble in boiling water
 - (d) a white precipitate, insoluble in boiling water
- 2. A solution of A, when treated with NH₃, gives:
 - (a) a white precipitate soluble in an excess of NH₃
 - (b) a white precipitate insoluble in an excess of NH3
 - (c) a grey precipitate soluble in an excess of NH₃
 - (d) a grey precipitate insoluble in an excess of NH3
- **3.** The salt *A* is:
 - (a) PbBr₂
- (b) $Pb(NO_3)_2$ (c) $AgNO_3$
- (d) $Hg_2(NO_3)_2$



- 1. The white solid A is a:
 - (a) Chloride
- (b) Nitrate
- (c) Nitrite
- (d) Bromide

2. The change from B to C involves the reaction:

(a)
$$[Hg(NH_3)_4]^{2+} + 2H^+ + Cl^- \rightarrow Hg(NH_2)Cl \downarrow + 3NH_4^+$$

(b)
$$[Pb(NH_3)_4]^{2+} + 4H^+ + 2Cl^- \rightarrow PbCl_2 \downarrow + 4NH_4^+$$

(c)
$$[Pb(OH)_4]^{2-} + 4H^+ + 2Cl^- \rightarrow PbCl_2 \downarrow + 4H_2O$$

(d)
$$[Ag(NH_3)_2]^{2+} + 2H^+ + Cl^- \rightarrow AgCl \downarrow + 2NH_4^+$$

3. The solution D and the residue E respectively contain:

(a) Hg₂S₂O₃ and Hg₂S

(b) PbS2O3 and Pb

(c) $[Ag(S_2O_3)_2]^{3-}$ and Ag_2S

(d) None of these

PASSAGE

- (i) When an aqueous solution of a colourless mixture of two salts is treated with a drop of chlorine water, the solution becomes brown. Some chloroform is added to the brown solution and the resulting mixture is shaken well. The chloroform layer becomes violet.
- (ii) When chlorine water is again added dropwise to the above mixture, the chloroform layer becomes colourless.
- (iii) On being heated with solid K2Cr2O7 and concentrated H2SO4, the solid mixture gives vapours of a dark colour which form a yellow solution with aqueous NaOH. On acidification with acetic acid followed by treatment with lead acetate, the yellow solution gives a yellow precipitate.
- (iv) When boiled with an NaOH solution, the mixture gives a gas that produces thick white fumes with HCl vapours and turns Nessler's reagent brown. The mixture does not respond to any other test for cations.
- (v) The mixture, on being heated, gets completely sublimed.

1.	The	brown	solution	obtained	in	(i)	is	due	to:
••	1110	D. C							

(a) Br_3

(b) I_3^-

(c) Cl₂

(d) NO₂

2. Which of the following reactions takes place in (ii)?

(a)
$$I_2 + 2Cl^- \longrightarrow 2l^- + Cl_2 \uparrow$$

(b)
$$Br_2 + 2Cl^- \longrightarrow 2Br^- + Cl_2 \uparrow$$

(c)
$$I_3^- + 8Cl_2 + 9H_2O \longrightarrow 3IO_3^- + 16Cl^- + 18H^+$$

(d)
$$Br_3^- + 8Cl_2 + 9H_2O \longrightarrow 3BrO_3^- + 16Cl^- + 18H^+$$

3. The vapours obtained in (iii) contain:

(a) CrO₂Cl₂ and I₂

(b) CrO₂Cl₂ only

(c) I₂ only

(d) CrO₂Br₂

4. What is the oxidation sate of the central atom in the anion constituting the yellow precipitate obtained in (iii)?

(a) 0

(b) +2

(c) +4

(d) +6

5. The original mixture contains:

(a) NH₄Cl and NH₄Br

(c) NH₄Cl and NH₄I

(b) NH₄Br and NH₄I

(d) NH₄Cl and NH₄NO₃

PASSAGE 25

- (i) A white solid mixture of two salts containing a common cation is insoluble in water. It dissolves in dilute HCl producing some gases (with effervescence) that turn an acidified dichromate solution green. After the gases are passed through the acidified dichromate solution, the emerging gas turns baryta water milky.
- (ii) On treatment with dilute HNO $_3$, the white solid gives a solution which does not directly give a precipitate with a BaCl $_2$ solution but gives a white precipitate when warmed with H $_2$ O $_2$ and then treated with a BaCl $_2$ solution.
- (iii) The solution of the mixture in dilute HCl, when treated with NH₄Cl, NH₄OH and an Na₂HPO₄ solution, gives a white precipitate.
- 1. The gases evolved in (i) are:
 - (a) CO₂ and HCl
- (b) SO₂ and CO₂
- (c) SO₂ and H₂S
- (d) NH₃ and CO₂
- 2. The white precipitate obtained in (ii) indicates the presence of a:
 - (a) carbonate
- (b) sulphide
- (c) sulphite
- (d) chloride
- 3. The white precipitate obtained in (iii) consists of:
 - (a) $Ba_3(PO_4)_2$
- (b) $Sr_3(PO_4)_2$
- (c) $Ca_3(PO_4)_2$
- (d) MgNH₄PO₄·6H₂O



ONE OR MORE ANSWERS IS/ARE CORRECT

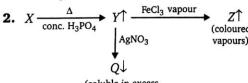
1. Basic radical(s) which can not be identified by borax bead test:

(a) Mg^{2+}

(b) Pb²⁺

(c) Fe^{3+}

(d) Ag+



(soluble in excess conc. NH₃ soln.)

Which of the following anion cannot be in X?

- (a) F
- (b) Cl
- (c) Br -
- (d) I-
- 3. When ozone reacts with an excess of potassium iodide solution buffered with a borate buffer (pH 9.2) iodine is liberated which can be titrated against a standard solution of sodium thiosulphate, this is a quantitative method for estimating O₃ gas. When liberated I₂ and sodium thiosulphate will react, then product is/are:
 - (a) $S_4O_6^{2-}$
- (b) SO_4^{2-}
- $(c) S O^{2}$
- (d) S
- 4. Which of the following pairs of cations cannot be separate by using an NaOH solution?
 - (a) Fe^{3+} , Al^{3+}

(b) Cr³⁺, Al³⁺

(c) Sn²⁺, Pb²⁺

(d) Cu²⁺, Pb²⁺

5. Aq. solution of 'X'

Na₃[CO(NO₂)₆]

Yellow ppt. $H_2[PtCl_6]$ Yellow ppt.

The cation(s) present in 'X' is/are: (c) Mg 2+ (d) K+ (a) NH₄ (b) Na⁺ 6. Potassium chromate solution is added to aqueous solutions of metal nitrate. The yellow precipitate thus obtained are insoluble in acetic acid. These are subjected to flame test, flame colour of individual ppt. is/are: (a) Lilac (b) Apple green (c) Crimson red (d) Blue 7. A white sublimable solid, when boiled with an NaOH solution, gives a colourless gas that turns Nessler's reagent brown. The solid, on being heated with solid K2Cr2O7 and concentrated H₂SO₄, gives red brown vapours. The white solid can be: (a) NH₄I (d) $(NH_4)_2SO_4$ (b) NH_4Br (c) NH_4Cl $KMnO_4 + gas 'B'$ → Aq. suspension $\xrightarrow{[P]}$ H₂SO₄ $H_2O_2 + gas'B'$ 8. Br2 water+gas 'B'-Which of the following option(s) is/are correct regarding 'P' among the following? (b) Excess Cl₂ water (c) conc. HNO₃ (d) HCl 9. In which of the following cases a violet colouration be observed? (a) An alkaline solution of sodium nitroprusside is treated with a solution of Na₂S (b) A solution of sodium cobaltinitrite is treated with one of KCl (c) A solution of Mn(NO₃)₂ is treated with sodium bismuthate or red lead in the presence of concentrated HNO₃ (d) A solution of sodium nitroprusside in aqueous NaOH is treated with Na₂SO₃ 10. Saturated solution of SO₂ is heated at 150°C in a closed container. The product obtained is treated with BaCl2 solution. What is/are the observation(s)? (b) White turbidity (a) No ppt. (d) White ppt. (c) Evolution of SO₂ 11. Which reaction is/are possible? (a) $MgCl_2 + NaNO_3 \longrightarrow$ (b) BaSO₄ + HCl \longrightarrow (d) $BaCO_3 + CH_3COOH \longrightarrow$ (c) $ZnSO_4 + BaS \longrightarrow$ 12. Which of the following combinations in an aqueous medium will give a blue colour or precipitate? (a) $Fe^{2+} + [Fe(CN)_6]^{3+}$ (b) $Fe^{3+} + [Fe(CN)_6]^{4-}$ (c) $Hg^{2+} + SCN^{-} + Co^{2+}$ (d) $Fe^{3+} + SCN^{-}$ 13. Which statement is/are correct with reference to the ferrous and ferric ions? (a) Fe 2+ gives brown colour with potassium ferricyanide (b) Fe²⁺ gives blue colour with potassium ferricyanide (c) Fe³⁺ gives red colour with potassium thiocyanate (d) Fe²⁺ gives brown colour with potassium thiocyanate 14. Which of the following combinations in an aqueous medium will give a red colour or precipitate? (b) $Fe^{2+} + [Fe(CN)_6]^{3-}$ (a) $Fe^{3+} + SCN^{-}$ (c) Ni²⁺ + dimethylglyoxime + NH₃ solution (d) Co²⁺ + SCN⁻

29.	Which of the following ions can be separated by using NH_4Cl and NH_4OH ? (a) Fe ³⁺ and Cr ³⁺ (b) Cr ³⁺ and Co ²⁺ (c) Cr ³⁺ and Al ³⁺ (d) Al ³⁺ and Ba ²⁺
30.	Which of the following cations cannot be separated by passing H_2S through their solutions to which NH_4Cl and NH_4OH have been added? (a) Ca^{2+} and Ni^{2+} (b) Mg^{2+} and Mn^{2+} (c) Ni^{2+} and Mn^{2+} (d) Co^{2+} and Zn^{2+}
31.	Which of the following mixtures of ions in solution can be separated by using NH $_3$ solution? (a) Hg $_2^{2+}$ and Ag $^+$ (b) Bi $_3^{3+}$ and Cu $_2^{2+}$ (c) Ag $_3^+$ and Pb $_2^{2+}$ (d) Cu $_2^{2+}$ and Cd $_2^{2+}$
	Which of the following compounds are coloured? (a) PbCl ₂ (b) PbI ₂ (c) AgCl (d) AgI
	Which of the following mixtures of ions in solution can be separated by using dilute H_2SO_4 ? (a) Zn^{2+} and Pb^{2+} (b) Ba^{2+} and Pb^{2+} (c) Mn^{2+} and Sr^{2+} (d) Sr^{2+} and Ba^{2+}
	Which of the following species will be decomposed on acidification? (a) $[Ag(NH_3)_2]^+$ (b) $[Cu(NH_3)_4]^{2+}$ (c) $[Zn(OH)_4]^{2-}$ (d) $[Pb(OH)_4]^{2-}$
	Which of the following mixtures of ions in solution can be separated by using NaOH solution? (a) Fe $^{3+}$ and Pb $^{2+}$ (b) Pb $^{2+}$ and Sn $^{2+}$ (c) Zn $^{2+}$ and Sn $^{2+}$ (d) Al $^{3+}$ and Cu $^{2+}$
	Which of the following ions can be separated by using dilute HCl? (a) Ag^+ and Cu^{2+} (b) Ag^+ and Hg_2^{2+} (c) Hg_2^{2+} and Cd^{2+} (d) Ag^+ and Al^{3+}
	Which of the following substances will leave a black residue on strong heating? (a) CuSO ₄ ·5H ₂ O (b) ZnCO ₃ (c) PbCO ₃ (d) MnSO ₄
	By which of the following reagents can a sublimate of $HgCl_2$ be distinguished from NH_4Cl ? (a) H_2S (b) $BaCl_2$ (c) $NaNO_3$ (d) $FeCl_3$
	An aqueous solution is prepared by dissolving a mixture containing ZnCl ₂ , CdCl ₂ and CuCl ₂ Now H ₂ S gas is passed through the aqueous solution of salt to form precipitate. (a) CdS (b) CuS (c) ZnS (d) No ppt.
	An aqueous solution containing S ²⁻ ions will not give: (a) Yellow precipitate with the suspension of CdCO ₃ in water (b) Black precipitate with lead acetate solution (c) White precipitate with BaCl ₂ solution (c) White precipitate with sodium thiosulphate solution
41.	Which of the following statement(s) is/are correct when a solid mixture of NaGrand $R_2G_2G_3G_4$; is gently warmed with conc. H_2SO_4 ?
42.	 (a) A deep red vapour is evolved (b) The vapour when passed into NaOH solution gives a yellow solution of Na₂CrO₄ (c) Chlorine gas is evolved (d) Chromyl chloride is formed Choose the correct reaction: (a) BaCl₂ + AcOH + K₂CrO₄ → yellow ppt. (b) BaCO₃(s) + K₂C₂O₄ + AcOH → white ppt. (c) BaCO₃(s) + K₂CrO₄ + AcOH → No ppt. (d) SrCO₃(s) + K₂CrO₄ + AcOH → No ppt.

- **43.** Which of the following aqueous solution of cation(s) give(s) white ppt, with NaOH and NH₄OH solution and formed ppt. is/are further completely dissolved in one of the excess reagent?
 - (a) Cd²⁺
- (b) Cr 3+
- (c) Sn²⁺
- (d) Bi3+

44. Al₂(SO₄)₃ + NH₄OH $\longrightarrow X$

Select the correct statement(s) about compound X:

- (a) X is a white coloured compound
- (b) X is insoluble in excess of NH₄OH

(c) X is soluble in NaOH

- (d) X can be used as an antacid
- **45.** The evolution of a red-brown gas on heating a salt with K₂Cr₂O₇ and concentrated H₂SO₄ can arise from:
 - (a) chloride
- (b) bromide

- (c) nitrate
- (d) nitrite



MATCH THE COLUMN

Column-I and Column-II contains four entries each. Entries of column-I are to be matched with some entries of column-II. Each entry of column-I may have the matching with one or more than one entries of column-II.

1. Column-I (Reaction with Salt/Radical)

- (A) $Zn + dil.H_2SO_4$
- (B) dil. HCl
- (C) NaOH (excess)
- (D) KI

Column-II (Salt/Radical)

- (P) $Pb(NO_2)_2$
- $(Q) (NH_4)_2 S$
- (R) $MnO_4^-(aq.)$
- (S) Hg_2^{2+} (aq.)
- (T) Bi3+ (aq.) since therefore severage of

Column-I

- (A) Colourless gas evolved on addition of dil. H₂SO₄
- (B) White ppt. on addition of AgNO₃
- (C) Black ppt. obtained when HgCl₂ is added in little amount
- (D) The ppt. obtained on addition of AgNO₃ followed by NH₃ solution

Column-II

- (P) S₂O₃²-
- (Q) S2-
- (R) NO 2
- (S) CH₃CO₂

Column-I Column-II (P) Fe 2+ (A) Precipitate with KCN, which is soluble in excess of reagent (B) Precipitate with NaOH and NH4OH, (Q) Hg 2+ which is insoluble in both excess of reagent (C) Coloured ppt. with KI, which is soluble in (R) Pb 2+ excess of reagent (D) Black ppt. with H2S, which is soluble in $(S) Ag^+$ hot and dil. HNO3 Column-I Column-II (A) $ZnCl_2 + H_2S$ (P) Pale green colouration (B) CuSO₄ + Excess KI (Q) Brown solution/ppt. (C) Pb₃O₄ + dil. HNO₃ (R) White turbidity (D) $FeCl_3 + H_2S$ (S) No change is observed Column-I (Radicals) Column-II (Test reagent) (A) Oxalate (P) Sodium nitroprusside (B) Acetate (Q) Conc. H2SO4 (C) Sulphide (R) Neutral FeCl₃ (D) Thiosulphate (S) Dil. H2SO4 Column-II (P) Gives N₂O on heating (A) (NH₄)₂Cr₂O₇ (Q) Gives CO2 on heating (B) FeSO₄ (R) Gives SO₂ and SO₃ on heating (C) Mg(HCO₃)₂ (S) Gives N2 on heating (D) NH₄NO₃ Column-II (P) Colour of acidified KMnO 4 is discharged (A) Gas evolved by the action of dilute H2SO4 on a sulphite (B) Gas evolved by the action of dilute H2SO4 (Q) Acidified dichromate solution is turned on a carbonate green (C) Gas evolved by heating an ammonium salt (R) Nessler's reagent gives a brown precipitate with NaOH (D) Gas evolved by the action of dilute H2SO4 (S) Baryta water turns milky on a sulphide

(T) Alkaline nitroprusside truns violet

500 INORGANIC CHEMISTRY

8.	Column-I	Column-II
	(A) Red vapours	(P) MnSO ₄ + NaBiO ₃ + Conc. HNO ₃
	(B) NaOH solution is turned yellow by the vapours	(Q) KCl + Solid K ₂ Cr ₂ O ₇ + conc. H ₂ SO ₄
	(C) Purple solution	(R) KBr heated with MnO 2 and conc. H2SO4
	(D) A colourless solution results when the evolved gas is absorbed in NaOH solution	(S) $Na_2S + Na_2[Fe(CN)_5(NO)]$
9.	Column-I	Column-II
	(A) Soluble in a concentrated NH ₃ solution	(P) Ag ₂ S
	(B) Soluble in excess KCN solution	(Q) Cu(OH) ₂
	(C) Soluble in excess hypo solution	(R) AgBr
	(D) Insoluble in conc. HCl	(S) AgCl



ASSERTION-REASON TYPE QUESTIONS

These questions consist of two statements each, printed as assertion and reason, while answering these questions you are required to choose any one of the following responses

- (A) If assertion is true but the reason is false
- (B) If assertion is false but reason is true
- (C) If both assertion and reason are true and reason is the correct explanation of assertion
- (D) If both assertion and reason are true but reason is not the correct explanation of assertion
- **1. Assertion**: AgNO ₃ reacts with KCN to form white ppt. of AgCN. This white ppt. disappears when excess KCN is added.
 - **Reason**: AgCN decomposes to form silver-carbide and evolve N₂ gas.
- 2. Assertion: HgCl2 does not respond chromyl chloride test.
 - **Reason**: HgCl₂ being covalent compound ionises upto 2%.
- 3. Assertion: $Zn + HNO_3(conc.) \longrightarrow Zn(NO_3)_2 + NO_2 + H_2O$
 - **Reason**: Nitric acid plays a double role in action on Zn metal, it acts as an acid as well as an oxidising agent.
- **4. Assertion**: If yellow precipitate is obtained on adding ammonium molybdate solution on boiling then phosphate radical is identified.
 - **Reason**: Ammonium phosphomolybdate is a yellow compound.
- 5. Assertion: HgCl2 and SnCl2 cannot exist together in an aqueous solution.
 - Reason: SnCl₂ is a strong reducing agent because Sn shows inert pair effect.
- Assertion : Sometimes a white turbidity is obtained when a solution is prepared in water.
 Reason : Pb²⁺ cations are precipitated as PbCl₂ which is sparingly soluble in water.

7. Assertion: CdS and As_2S_3 are yellow coloured compounds.

Reason: CdS and As₂S₃ can be separated by ammonium sulphide.

8. Assertion: Green edge flame test tells presence of borate ion.

Reason: Green colour of the flame is due to burning of tri ethyl borate.

9. Assertion: A solution of AgCl in NH₄OH gives a white precipitate when acidified with

Reason: [Ag(NH₃)₂]⁺ decomposes in the presence of HNO₃.

10. Assertion: When H₂S is passed through a solution of CuSO₄, no precipitate of CuS is obtained until the solution is acidified with HCl.

Reason: The solubility product constant of CuS is not so high as to require a high concentration of S²⁻ for the precipitation of CuS.

11. Assertion: When H_2S is passed through a solution containing $[Cu(CN)_4]^{3-}$ and $[Cd(CN)_4]^{2-}$ ions, only cadmium precipitates as CdS.

Reason: The oxidation state and co-ordination number of cadmium in [Cd(CN)₄]²⁻ are II and 4 respectively.

12. Assertion: A concentrated solution of BiCl₃ can be hydrolysed with water.

Reason: BiCl₃ does not change in composition with dilution.

13. Assertion : The blue precipitate formed by the action of $K_4[Fe(CN)_6]$ on Fe^{3+} and by that of $K_3[Fe(CN)_6]$ on Fe^{2+} have the same composition.

Reason: $[Fe(CN)_6]^{3-}$ oxidises Fe^{2+} to Fe^{3+} and itself gets reduced to $[Fe(CN)_6]^{4-}$.

14. Assertion: Zn(OH)₂ dissolves in an excess of NaOH solution as well as NH₄OH solution.

Reason: Zn(OH)₂ forms the soluble zincate salts with these alkalies.

15. Assertion: When a solution of Na₂ZnO₂ is acidified with dilute HCl and treated with H₂S, a precipitate of ZnS is formed.

Reason: Na₂ZnO₂ is decomposed by HCl to give Zn²⁺ ions.

16. Assertion: Br ions do not interfere in the chromyl chloride test for chlorides.

Reason: A bromide, on oxidation with K₂Cr₂O₇/ concentrated H₂SO₄, liberates Br₂, which dissolves in NaOH to give a colourless solution.

17. Assertion: Basic radical of V group are precipitated as their carbonates in presence of NH₄Cl.

Reason: NH₄OH maintains the pH of the solution basic.

18. Assertion: NO_3^- ion can not be detected by brown ring test in presence of NO_2^- ion.

Reason: Both NO₂ and NO₃ ions evolve brown NO₂ gas with conc. H₂SO₄ acid.



SUBJECTIVE PROBLEMS

1. Consider the following reaction

$$\begin{array}{ccc}
\operatorname{Na_2SO_4+C} & \xrightarrow{\Delta} & (A) & \xrightarrow{\operatorname{Na_2[Fe(CN)_5NO]}} & (B) \\
& & \downarrow \operatorname{Cd(NO_3)_2} & \operatorname{Purple} \\
& & & \operatorname{complex} \\
& & & & \operatorname{yellow\ ppt.}
\end{array}$$

Then calculate value of $|X^2 - Y^2|$ (where X and Y are total number of electrons present in " t_{2g} " and " e_g " orbitals respectively in d-block metal ion of compound B).

2. Find number of basic radicals among the following cations, which can form soluble complex on adding excess of NH₃ solution:

$$Cd^{2+}$$
 (aq.), Pb^{2+} (aq.), Ni^{2+} (aq.), Mn^{2+} (aq.), Zn^{2+} (aq.), Ag^{+} (aq.), Hg^{2+} (aq.), Fe^{3+} (aq.), Mg^{2+} (aq.)

3. Consider the following reaction

$$Na_3PO_4 + (NH_4)_2MoO_4 + HNO_3(dil.) \longrightarrow 'X'$$
 (canary yellow ppt)

Then calculate total number of atoms of 15^{th} group elements which are sp^3 hybridized in compound 'X'.

4. How many anions will give colourless acid vapour/ gas with conc. H₂SO₄on reaction with following given anions?

$${
m CH}_{3}{
m COO}^{-}, {
m Cl}^{-}, {
m Br}^{-}, {
m S}^{2-}, {
m SO}_{3}^{2-}, {
m BO}_{3}^{3-}, {
m NO}_{2}^{-}, {
m C}_{2}{
m O}_{4}^{2-}, {
m I}^{-}$$

5. $X(s) \xrightarrow{\text{dil HCl}} Y \uparrow \xrightarrow{\text{Na}_2 [\text{Fe}(\text{CN})_5(\text{NO})]} \text{Purple solution Gas } Y \text{ has been allowed to react with}$

following species in neutral/acidic medium:

(e)
$$Cr_2O_7^{2-}$$

(g) Hg

Then calculate value of (P + Q - R)

P: Number of species which undergoes redox reaction with gas Y.

Q: Number of species with which gas Y undergoes precipitation.

R: Number of species with which gas Y produce no observable change.

ANSWERS

Level 1

1.	(c)	2.	(c)	3.	(b)	4.	(c)	5.	(d)	6.	(d)	7.	(d)	8.	(d)	9.	(a)	10.	(b)
11.	(c)	12.	(a)	13.	(a)	14.	(b)	15.	(c)	16.	(d)	17.	(c)	18.	(a,d)	19.	(a)	20.	(a)
21.	(a)	22.	(c)	23.	(b)	24.	(a)	25.	(b)	26.	(c)	27.	(b,c)	28.	(a)	29.	(a)	30.	(c)
31.	(b)	32.	(a)	33.	(b,c)	34.	(b)	35.	(a)	36.	(c)	37.	(c)	38.	(c)	39.	(c)	40.	(d)
41.	(b)	42.	(a)	43.	(b,d)	44.	(a)	45.	(d)	46.	(b)	47.	(c)	48.	(b)	49.	(d)	50.	(a)
51.	(c)	52.	(b)	53.	(a)	54.	(a)	55.	(c)	56.	(b)	57.	(c)	58.	(a)	59.	(a)	60.	(a)
61.	(c)	62.	(d)	63.	(c)	64.	(b)	65.	(a)	66.	(b)	67.	(c)	68.	(a)	69.	(d)	70.	(a)
71.	(b)	72.	(d)	73.	(d)	74.	(d)	75.	(a)	76.	(c)	77.	(a)	78.	(d)	79.	(b)	80.	(d)
81.	(c)	82.	(d)	83.	(d)	84.	(a)	85.	(b)	86.	(c)	87.	(d)	88.	(d)	89.	(c)	90.	(a)
91.	(b)	92.	(c)																
				THE PERSON NAMED IN		Spiriture Print Street, Square,		_						_		-	-	-	

Level 2

1.	(a)	2.	(b)	3.	(b)	4.	(d)	5.	(b)	6.	(c)	7.	(b)	8.	(c)	9.	(d)	10.	(a)
11.	(b)	12.	(c)	13.	(d)	14.	(d)	15.	(b)	16.	(a)	17.	(a)	18.	(b)	19.	(b)	20.	(a)
21.	(c)	22.	(b)	23.	(d)	24.	(d)	25.	(b)	26.	(b)	27.	(b)	28.	(b)	29.	(c)	30.	(d)
31.	(b)	32.	(d)	33.	(d)	34.	(a)	35.	(c)	36.	(a)	37.	(a)	38.	(b)	39.	(c)	40.	(c)
41.	(a)	42.	(a)	43.	(c)	44.	(d)	45.	(a)	46.	(a)	47.	(d)	48.	(a)	49.	(d)	50.	(c)
51.	(c)	52.	(b)	53.	(d)	54.	(a)	55,	(a)	56.	(a)	57.	(b)	58.	(d)	59.	(b)	60.	(d)
61.	(b)	62.	(a)	63.	(d)	64.	(b)	65.	(a)	66.	(b)	67.	(b)	68.	(d)	69.	(b)	70.	(a)
71.	(c)	72.	(c)	73.	(d)	74.	(b)	75.	(c)	76.	(a)	77.	(b)						

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Level 3

Passage-1	1.	(b)	2.	(c)	3 ,	(b)	. 10			
Passage-2	1.	(b)	2.	(c)	3.	(b)				
Passage-3	1.	(b)	2.	(b)						
Passage-4	1.	(c)	2.	(b)	3.	(a)				
Passage-5	1.	(d)	2.	(b)	3.	(a)			in i	
Passage-6	1.	(a)	2.	(d)	3.	(a)	4.	(b)	K ST	
Passage-7	1.	(c)	2.	(b)	3.	(c)	4.	(d)		
Passage-8	1.	(b)	2.	(d)	3.	(c)				
Passage-9	1,	(b)	2.	(d)	3.	(c)				a de di
Passage-10	1.	(b)	2.	(c)	3.	(a)	4.	(d)		
Passage-11	1.	(c)	2.	(b)	3.	(b)	· 4.	(d)	5.	(a)
Passage-12	1.	(b)	2.	(c)	3.	(c)	4.	(a)		
Passage-13	1.	(c)	2.	(d)	3.	(d)				
Passage-14	1.	(d)	2.	(c)	3.	(c)				
Passage-15	1.	(a)	2.	(b)	3.	(b)				
Passage-16	1.	(a)	2.	(c)	3.	(c)	1342			
Passage-17	1.	(b)	2.	(a)	3.	(d)				
Passage-18	1.	(c)	2,	(a)	3.	(b)	4.	(a,b)	5.	(d)
Passage-19	1.	(d)	2.	(a)	3.	(b)				
Passage-20	1.	(d)	2.	(a)	3.	(d)	4.	(d)		
Passage-21	1.	(c)	2.	(c)	3.	(a)				
Passage-22	1.	(a)	2.	(b)	3.	(b)			12,02	
Passage-23	1.	(b)	2.	(d)	3.	(c)				
Passage-24	1.	(b)	2.	(c)	3.	(a)	4.	(d)	5.	(c)
Passage-25	1.	(b)	2,	(c)	3.	(d)	Lite	Mex	100	. 100

One or More Answers is/are Correct

- 1. (a, b, d)
- **2.** (a, d)
- 3. (a)
- 4. (b, c)
- 5. (a, d)
- **6**. (b, d)

- 7. (b, c)
- 8. (a, c, c)
- 9. (a, c)
- **10**. (b, d)
- **11**. (c, d)
- **12**. (a, b, c)

- **13**. (b, c)
- 14. (a, c)
- **15**. (a, c)
- **16.** (c, d)
- 17. (c, d)
- **18**. (b, d)

- **19**. (c, d)
- 20. (b, c, d)
- **21**. (b, d)
- **22**. (a, b, d)
- **23**. (b, c, d)
- 24. (a, b, d)

- **25.** (c)
- **26**. (b, c, d)
- **27**. (b, c, d)
- 28. (a, b, c, d) 29. (b, d)
- 30. (c, d)

- **31**. (a, b, c)
- 32. (b, d)
- 33. (a, c)
- 34. (a, b, c, d) 35. (a, d)
- **36.** (a, c, d)

- 37. (a, d)
- 38. (a) **39**. (a, b)
- **40**. (c, d)
- **41**. (a, b, d)
- **42.** (a, d)

- **43.** (a, c)
- **44.** (a, b, c, d) **45.** (a, b, c, d)

Match The Column

- 1. $A \rightarrow P$, Q, R, S, T;
- $B \rightarrow P, Q, R, S;$
- $C \rightarrow P$, Q, R, S, T; $D \rightarrow P$, R, S, T

- **2.** $A \rightarrow P$, Q, S;
- $B \rightarrow P, R, S;$
- $C \rightarrow Q$;
- $D \rightarrow Q$ $D \rightarrow R$, S

- **3.** $A \rightarrow P, S$; 4. $A \rightarrow S$;
- $B \rightarrow P, Q;$ $B \rightarrow Q$;
- $C \rightarrow Q, R;$ $C \rightarrow Q$;
 - $D \rightarrow P, R$

- 5. $A \rightarrow Q$;
- $B \rightarrow Q$, R, S;
- $C \rightarrow P$, S;
- $D \rightarrow R, S$

- **6.** $A \rightarrow S$;
- $B \rightarrow R$; $B \rightarrow S$;
- $C \rightarrow Q$; $C \rightarrow R$;
- $D \rightarrow P$ $D \rightarrow P, Q, T$

- 7. $A \rightarrow P$, Q, S; 8. $A \rightarrow Q, R$
- $B \rightarrow Q$;
- $C \rightarrow P, S;$ $D \rightarrow R$

- 9. $A \rightarrow Q$, R, S;
- $B \rightarrow P, Q, R, S;$
- $C \rightarrow Q, R, S;$
- $D \rightarrow S$

Assertion-Reason Type Questions

- 1. (A)
- 2. (C)
- 3. (C)
- 4. (B)

- 9. (C) 10. (B)

- 5. (A) 6. (D) 7. (D) 8. (C)

11. (D) 12. (A) 13. (C) 14. (A) 15. (B) 16. (C) 17. (D) 18. (C)

- **Subjective Problems**
 - 1. 36
 - 2. 4 3. 4
 - 4. 6 **5.** 3

Hints and Solutions

Level 1

1. (c)
$$Al(OH)_3 \xrightarrow{NaOH} Na[Al(OH)_4] + H_2O$$

2. (c) (i)
$$Al_{(aq.)}^{3+} + NaOH \longrightarrow Al(OH)_3 \downarrow \xrightarrow{NaOH} Na[Al(OH)_4]$$

White ppt.
(Amphoteric)

(ii)
$$\operatorname{Zn}_{(aq.)}^{2+} + \operatorname{NaOH} \longrightarrow \operatorname{Zn}(\operatorname{OH})_2 \downarrow \xrightarrow{\operatorname{NaOH}} \operatorname{Na}_2[\operatorname{Zn}(\operatorname{OH})_4]$$
White ppt.
(Amphoteric)

(iii)
$$Cu_{(aq.)}^{2+} + OH^{-} \longrightarrow CuOH_{2} \downarrow \xrightarrow{NaOH} No reaction$$
Blue ppt.
(Batrix)

3.
$$(i Bi^{3+} + 3I^{-} \longrightarrow BiI_{3} \xrightarrow{I^{-}} [BiI_{4}]^{-}$$
(black) (orange)
soluble

23. (b) The value of K_{sp} of hydroxides of Fe³⁺, Cr³⁺, Al³⁺ are lower than that of Co²⁺, Ni²⁺, Mn²⁺ and Zn²⁺. Therefore; in the presence of NH₄Cl, dissociation of NH₄OH is suppressed and conc. of OH⁻, furnished from NH₄OH, is such that only third group basic radicals are precipitate.

from NH₄OH, is such that only third group basic radicals are precipitate.

24. (a) Bi₂S₃ + 8HNO₃
$$\xrightarrow{\text{hot}}$$
 2Bi(NO₃)₃ + 3S \downarrow + 2NO + 4H₂O (dil.)

$$\begin{array}{ccc} \text{Bi(NO}_3)_3 + 3\text{NH}_4\text{OH} & \longrightarrow & \text{Bi(OH)}_3 \downarrow + 3\text{NH}_4\text{NO}_3 \\ & & \text{(C)} & & \text{(C)} & & \\ & & \text{Bi(OH)}_3 \downarrow + 3\text{HCl} & \longrightarrow & \text{BiCl}_3 + 3\text{H}_2\text{O} \\ & & & \text{(D)} & & & \end{array}$$

$$BiCl_3 + H_2O \rightleftharpoons BiOCl + 2HCl$$
(D) white turbidity

29. (a) Cu²⁺ is second group radical, gets precipitated first due to having lower solubility product $[\text{CuS-}K_{sp} = 1 \times 10^{-44}]$

31. (b) Ba(NO₃)₂ + Na₂SO₄
$$\longrightarrow$$
 BaSO₄ \downarrow + 2NaNO₃ white ppt.

32. (a)
$$NH_4Cl \xrightarrow{\Delta} NH_3 + HCl$$

$$Y$$

33. (c) I2 is reduced to HI thus decolorisation of the colour takes places.

$$SO_2 + I_2 + 2H_2O \longrightarrow H_2SO_4 + 2HI$$

34. (b)
$$Pb(NO_3)_2 + 2NH_4OH \longrightarrow Pb(OH)_2 + 2NH_4NO_3$$
white ppt.
$$Pb(NO_3)_3 + 2NaCl \longrightarrow PbCl_2 + 2NaNO_3$$

$$Pb(NO_3)_3 + H_2S \longrightarrow PbS_{black ppt.} + 2HNO_3$$

36. (c)
$$S_2O_3^{2-} + 2H^+ \xrightarrow{\Delta} SO_2 + S + H_2O$$
 gas pungent pale yellow odour ppt.

37. (c)
$$AgNO_3 \xrightarrow{\Delta} Ag + NO_2 + \frac{1}{2}O_2$$

$$NO_2 + H_2O \longrightarrow HNO_2 + HNO_3$$

$$(X)$$

$$3Ag + 4HNO_3 \longrightarrow 3AgNO_3 + NO + 2H_2O$$

$$(W)$$

$$AgNO_3 + 2Na_2S_2O_3 \longrightarrow Na_3[Ag(S_2O_3)_2] + NaNO_3$$

72. (d)
$$CaCO_{3} \xrightarrow{\text{heat}} CaO + CO_{2} \uparrow$$

$$CaO_{3} + H_{2}O \longrightarrow Ca(OH)_{2}$$

$$Ca(OH)_{2} + 2CO_{2} \longrightarrow Ca(HCO_{3})_{2}$$

$$Ca(OH)_{2} + 2CO_{2} \longrightarrow Ca(HCO_{3})_{2}$$

73. (d) $Pb^{2+}(aq) + 2HCl$ (dil.) $\longrightarrow PbCl_2$ (white ppt.) White ppt. of PbCl₂ is soluble in hot water. Pb $^{\frac{5}{2}+}$ ions give black ppt. of PbS with H₂S. 82. (d) $\Gamma(aq) \longrightarrow \frac{1}{2} I_2(s) + e^- \} \times 5$

82. (d)
$$\Gamma(aq) \longrightarrow \frac{1}{2} I_2(s) + e^- \} \times 5$$

 $IO_3^-(aq) + 6H^+(aq) + 5e \longrightarrow \frac{1}{2} I_2(s) + 3H_2O(l)$

$$\overline{5I^{-}(aq) + IO_{3}^{-}(aq) + 6H^{+}(aq)} \longrightarrow 3I_{2} + 3H_{2}O(\overline{l})$$
83. (d) $3Cl_{2} + 6OH^{-} \longrightarrow 5Cl^{-} + ClO_{3}^{-} + 3H_{2}O$

84. (a) NaOH + CuSO₄ + Sodium (M) + Potassium (M_1) tartarate solution is known as Fehling's solution and is used in the detection of -CHO group.

85. (b)
$$Ca(OH)_2 + Na_2CO_3 \longrightarrow 2NaOH + CaCO_3 Ca(OH)_2 \xrightarrow{CO_2} CaCO_3 Ca(OH)_2 \xrightarrow{CO_2} CaCO_3$$

86. (c) On passing H₂S gas into first group filtrate sometimes yellow turbidity appears even in the absence of II group radicals, this is because of the oxidation of H2S gas by some acid radicals and form collidal solution of sulphur.

$$Fe_{(aq.)}^{3+} \xrightarrow{(Redox reaction)} Fe_{(aq.)}^{2+} + S\downarrow$$

- $Fe_{(aq.)}^{3+} \xrightarrow{H_2S/H^+} Fe_{(aq.)}^{2+} + S \downarrow$ **87.** (d) Correct order of K_{sp} is Ag ₂S < MnS according to classification of basic radical.
- **88.** (d) (i) $BaCl_2 + KI \rightarrow No ppt.$ (ii) $BaCl_{2(aq)} + CrO_4^{2-} \longrightarrow BaCrO_4 \downarrow$ (insoluble in CH₃COOH acid) Yellow ppt.
- 89. (c) The green ppt. of Ni(OH)₂ is soluble in excess of NH₃ solution. $Ni(OH)_2 \downarrow + 6NH_3 \rightarrow [Ni(NH_3)_6]^{2+} + 2OH^{-1}$
- 90. (a) Both Zn²⁺ and Cd²⁺ cations can be separated by passing H₂S gas in acidic as well as in neutral medium.
 (i) Zn²⁺ + H₂S → No ppt.
 (ii) Cd²⁺ + H₂S → CdS ↓ Yellow ppt.

91. (b) Al^{3+} and Zn^{2+} both form white ppt. with NH_3 solution but white ppt. of $Zn(OH)_2$ is soluble in excess of NH₃.

$$Al^{3+} + 3NH_3 + 3H_2O \longrightarrow Al(OH)_3 \downarrow \xrightarrow{Ex. NH_3 \text{ solution}} No \text{ reaction}$$

 $Zn^{2+} + 2NH_3 + 2H_2O \longrightarrow Zn(OH)_2 \downarrow \xrightarrow{Ex. NH_3 \text{ solution}} [Zn(NH_3)_4]^{2+}$

(a) NaBr +
$$H_2SO_4 \rightarrow Na_2SO_4 + HBr \uparrow \frac{Conc. H_2SO_4}{(Remaining part)} \rightarrow Br_2 \uparrow raddish brown$$

(b) NaNO₃ + H₂SO₄
$$\longrightarrow$$
 NO₂ \uparrow Raddish brown

(c)
$$CaF_2 + H_2SO_4 \longrightarrow CaSO_4 + HF \uparrow_{Colourless}$$

(d) KI +
$$H_2SO_4 \rightarrow K_2SO_4 + 2HI \xrightarrow{Conc. H_2SO_4} I_2 \uparrow$$
(Violet) (Violet)

Level 2

1. (a)
$$Fe^{3+} + 3NH_4SCN \longrightarrow 3NH_4^+ + Fe(SCN)_3$$
(Blood red colour solution)

NH₄SCN has no change in colour with Fe²⁺.

2. (b)
$$Bi^{3+}(aq) + Al^{3+}(aq)$$

(b)
$$Al^{3+}(aq) + Zn^{2+}(aq)$$

Bi(OH)₃
$$\downarrow$$
 +Al(OH)₃ \downarrow (Gelatinous white)

both are not soluble

$$\begin{array}{c} \text{Al(OH)}_3 \downarrow + \text{Zn(OH)}_3 \downarrow \\ \text{(Gelatinous} & \text{(Gelatinous} \\ \text{white)} & \text{white)} \end{array}$$

(c)
$$Hg^{2+}(aq) + Pb^{2+}(aq)$$

(d)
$$Cu^{2+}(aq) + Cd^{2+}(aq)$$

$$HgO \cdot Hg(NH_2)(NO_3) \downarrow + Pb(OH)_2 \downarrow$$
white white

both are not soluble

Cu²⁺(OH)₂
$$\downarrow$$
+Cd(OH)₂ \downarrow
(W)
(Excess of NH₃ sol.

$$[Cu^{2+}(NH_3)_4]^{2+} + [Cd(NH_3)_4]^{2+}$$

both are soluble

3. (b) During Brown ring test, ppt. of PbSO₄ will be formed, which hinder the formation of brown ring.

4. (d)
$$CuSO_4 + 2KI \longrightarrow CuI_2 + K_2SO_4$$

$$2CuI_2 \longrightarrow 2CuI \downarrow + I_2 \uparrow$$

$$Ag^+ + KI \longrightarrow AgI \downarrow + K^+$$

5. (b) Basic radicals are classified on the basis of increasing order of
$$K_{sp}Cd^{2+}$$
 in II group while Ni²⁺ in IV group.
14. (d) (i) $CrO_2Cl_2 \xrightarrow{KOH} K_2CrO_4 \xrightarrow{Conc.} K_2Cr_2O_7 \xrightarrow{AgNO_3} Ag_2Cr_2O_7 \xrightarrow{(Z)}$

(ii)
$$CrCl_3(aq) \xrightarrow{excess} Na[Cr(OH)_4] \xrightarrow{Na_2O_2} Na_2CrO_4 \xrightarrow{lead} No ppt. in basic medium$$

(iii)
$$\operatorname{ZnSO}_4(aq) \xrightarrow{\operatorname{Na}_2\operatorname{CO}_3} \operatorname{ZnCO}_3 \cdot \operatorname{3Zn}(\operatorname{OH})_2 \xrightarrow{\Delta} \operatorname{ZnO} \xrightarrow{\operatorname{cobalt}} \operatorname{CoZnO}_2$$
(Z)

(iv)
$$CuCl_2(aq) \xrightarrow{NH_4OH} CuS_{(X)} \xrightarrow{HNO_3} Cu(NO_3)_2 \xrightarrow{KCN} K_3[Cu(CN)_4]$$

16. (a)
$$2FeSO_4 \longrightarrow Fe_2O_3 + SO_2 + SO_3 (A) (D) (B) (C)$$

$$Fe_2O_3 + 6HCl \longrightarrow 2FeCl_3 + 3H_2O$$

17. (a)
$$As_2S_5 + HNO_3 \longrightarrow H_3AsO_4 + NO_2 + H_2O + S$$
 (ammonium molybdate)
 $H_3AsO_4 + (NH_4)_2MoO_4 \longrightarrow \text{yellow ppt. of } (NH_4)_3AsO_4\cdot 12MoO_3$

18. (b) FeS
$$\xrightarrow{\text{dil. H}_2\text{SO}_4}$$
 $\xrightarrow{\text{gas}}$ $\xrightarrow{\text{dil. HNO}_3}$ $\xrightarrow{\text{S}}$ $\xrightarrow{\text{NO}_2}$ + 2H₂O

$$\begin{array}{c} (B) \\ CO + Cl_2 \longrightarrow \begin{array}{c} COCl_2 \\ (C) \end{array} \xrightarrow{(E)} \begin{array}{c} 2NH_3 \\ -2HCl \end{array} O = C \left\langle \begin{array}{c} NH_2 \\ NH_2 \\ (F) \\ (Urea) \end{array} \right. \xrightarrow{H_2O(D)} CO_2 \uparrow + NH_3$$

21. (c) Ppts. of Ag₂CrO₄, Ag₂CO₃ are soluble in NH₄OH due to formation of [Ag(NH₃)₂]⁺ Green ppt. of Ni(OH)2 is soluble in NH4OH due to formation of [Ni(NH3)6]2+

Ag
$$_2$$
CrO $_4$ ↑ + 4NH $_4$ OH \longrightarrow 2[Ag(NH $_3$) $_2$]⁺ + CrO $_4$ ² + 4H $_2$ O Ag $_2$ CO $_3$ ↑ + 4NH $_4$ OH \longrightarrow 2[Ag(NH $_3$) $_2$]⁺ + CO $_3$ ² + 4H $_2$ O Ni(OH) $_2$ ↑ + 8NH $_4$ OH \longrightarrow [Ni(NH $_3$) $_6$]²⁺ + 2OH⁻ + 6H $_2$ O green ppt.

Fe(OH)₃ is insoluble in NH₄OH. Al(OH)3 is insoluble in NH4OH.

23. (d) (i)
$$2Cu^+(aq) \longrightarrow Cu^{2+}(aq) + Cu(s)$$

(ii) Hg 2Cl2 does not furnish Cl-, for chromyl chloride test.

(iii) [Fe(H₂O)₅NO]²⁺ is unstable, as iron is present in +1 oxidation state

24.(d)
$$X: 2Cr^{3+} + 10OH^{-} + 3H_2O_2 \longrightarrow 2CrO_2^{2-} + H_2O$$
 yellow O

(iii) [Fe(H₂O₅NO] is distable, as not is present

$$X : 2Cr^{3+} + 10 \text{ OH}^- + 3H_2O_2 \longrightarrow 2CrO_4^2 + H_2O$$

green

 $Y : CrO_4^{2-} + 2H_2O_2 + 2H^+ \longrightarrow 0$
 $CrO_4^{2-} + 3H_2O_4$

In aq. solution CrO₅ is unstable and if further decomposes

$$Z: 2CrO_5 \longrightarrow Cr_2O_3 + \frac{7}{2}O_2$$
(Amphoteric)

26. (b)
$$ZnCO_3(s) \longrightarrow ZnO(s) + CO_2(g)$$
 (A)
 $ZnCO_3(s) \longrightarrow ZnO(s) + CO_2(g)$
 (A)
 $ZnO + 2HCI \longrightarrow ZnCI_2 + H_2O$
 $3Zn^{2+} + 2K_4[Fe(CN)_6] \longrightarrow K_2Zn_3[Fe(CN)_6]_2 \downarrow + 6K^+$
white ppt.

or, $2Zn^{2+} + K_4[Fe(CN)_6] \longrightarrow Zn_2[Fe(CN)_6]_1 + 4K^+$
white ppt.

33. (d) $Fe^{2+} + [Fe(CN)_6]^{3-} \Longrightarrow Fe^{3+} + [Fe(CN)_6]^4 \longrightarrow Fe_4[Fe(CN)_6]_3$
Turnbull's blue (Prussian blue)

$$Fe^{3+} + [Fe(CN)_6]^3 \longrightarrow Fe_1[Fe(CN)_6]$$
Brown colour solution
$$Fe^{2+} + K_4[Fe(CN)_6] \longrightarrow K_2Fe_1[Fe(CN)_6]_3$$
Brown colour $Fe^{3+} + 3K_4[Fe(CN)_6] \longrightarrow Fe_4[Fe(CN)_6]_3 + 12K^+$
white ppt.

4 $Fe^{2+} + 3K_4[Fe(CN)_6] \longrightarrow Fe_4[Fe(CN)_6]_3 + 12K^+$
white ppt.

4 $Fe^{2+} + 3K_4[Fe(CN)_6] \longrightarrow Fe_4[Fe(CN)_6]_3 + 12K^+$
white ppt.

5 (c) (1) Fehling's solution: $Color = 10K_2 + 10K_3 + 10K_4 + 10K$

39. (c)
$$\begin{array}{c} BaCO_3 + K_2CrO_4 \xrightarrow{H^+} BaCrO_4 + 2K^+ + CO_3^2 \\ (A) & BaCO_3 + H_2SO_4 \longrightarrow BaSO_4 \downarrow + CO_2 \uparrow + H_2O \\ (C) & \text{white} \\ \\ BaCO_3 + 2HCI \longrightarrow BaCl_2 + CO_2 \uparrow + H_2O \\ Clear sol. \\ (O) & Clear sol. \\ (O) & (O) & (O) & (O) \\ \\ \end{array}$$

63. (d) In the absence of NH₄ ions or NH₄Cl, dissociation of NH₄OH is large i.e., concentration of OH⁻ is considerable to increase ionic products of hydroxides of Fe²⁺, Cr³⁺ and Zn²⁺ from their respective K_{sp} values, hence they will precipitate in IIIrd group. However, Ba(OH)₂ is soluble due to high K_{sp} value.

64. (b)
$$Cr_2O_7^{2-} + 6H^+ + 4NH_4Cl \longrightarrow 2CrO_2Cl_2 + 4NH_4 + 3H_2O$$
(T) (U) (V)

 $CrO_2Cl_2 + 2NaOH \longrightarrow Na_2CrO_4 + 2HCl$
 $Na_2CrO_4 + 2AgNO_3 \longrightarrow Ag_2CrO_4 + 2NaNO_3$
(W)

 $Ag_2CrO_4 + 4NH_3 \longrightarrow 2[Ag(NH_3)_2]^+ + CrO_4^2$
(W) (X)

 $Ag_2CrO_4 + 2HCl \longrightarrow 2AgCl \downarrow + 2H^+ + CrO_4^2$
(Y)

 $NH_4Cl + NaOH \longrightarrow NH_3 \uparrow + NaCl + H_2O$
(U) (Z)

67. (b) $K_4[Fe(CN)_6] + 6H_2SO_4 + 6H_2O \longrightarrow 2K_2SO_4 + FeSO_4 + 3(NH_4)_2SO_4 + 6CO \uparrow$
(conc.)

 $K_4[Fe(CN)_6] + 3H_2SO_4 \longrightarrow 2K_2SO_4 + FeSO_4 + 6HCN \uparrow$
(dil.)

68. (d) When Cl⁻ salt is heated with K₂Cr₂O₇ + Conc. H₂SO₄ red vapours of CrO₂Cl₂ are evolved which on passing into NaOH solution gives yellow solution of CrO₄²⁻ ions. Latter further gives yellow ppt. of PbCrO₄ with Pb(CH₃CO)₂ and acetic acid.

$$4Cl^{-} + Cr_{2}O_{7}^{2^{-}} + 6H^{+} \longrightarrow 2Cr_{2}Cl_{2} \uparrow + 3H_{2}O$$
reddish brown vapours
$$Cr_{2}Cl_{2} + 4OH^{-} \longrightarrow Cr_{2}^{2^{-}} + 2Cl^{-} + 2H_{2}O$$
Yellow soln.

While on heating a bromide salt with conc. H_2SO_4 and $K_2Cr_2O_7$, instead of CrO_2Br_2 reddish brown fumes of Br_2 are formed due to reducing character of HBr formed during the reaction. Br_2 dissolves in NaOH and no colour is produced. $6Br^- + Cr_2O_7^{2-} + H^+ \longrightarrow 3Br_2 \uparrow + Cr^{3+} + 7H_2O$

Reddish brown vapours

$$2NaOH + Br_2 \longrightarrow NaBr + NaCBr + H_2O$$
69. (b)

$$2Pb_3O_4 \xrightarrow{\Delta} 6PbO + O_2(g)$$
(A)
(Red lead)

$$Pb_3O_4 + 4HNO_3 \longrightarrow 2Pb(NO_3)_2 + PbO_2 + 2H_2O$$
(A)
(Conc.)
(Brown)

$$2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + 4NO_2(g) + O_2(g)$$
(D)
(C)

72. (c) NaOH or KOH solution cannot be used to separate a mixture of two cations, of which both oxides/ hydroxides are amphoteric because amphoteric oxides/ hydroxides dissolve in an excess of the alkali to

Fe3+ and Al3+ can be separated as the precipitate of Fe(OH)3 formed does not dissolve in an excess of the alkali whereas that of Al(OH)3 does.

$$Fe^{3+} + 3OH^{-} \longrightarrow Fe(OH)_{3} \downarrow \xrightarrow{OH^{-}} \text{no action}$$

$$Al^{3+} + 3OH^{-} \longrightarrow Al(OH)_{3} \downarrow \xrightarrow{OH^{-}} AlO_{2} + 2H_{2}O$$

73. (d) The formation of a green solid with CoO indicates Zn²⁺ (charcoal cavity test)

$$ZnCO_3 \xrightarrow{heat} ZnO \xrightarrow{CoO} \xrightarrow{heat} CoZnO_2$$
Rinmann's green

74. (b) Hg²⁺ ions react with KI to give a red precipitate of HgI₂, which dissolves in an excess of the reagent.

$$Hg^{2+} + 2I^{-} \longrightarrow HgI_{2} \downarrow \xrightarrow{2I^{-}} [HgI_{4}]^{2-}$$
(red) (colourless)

 $\begin{array}{ccc} & \text{Hg }^{2+} + 2\text{I}^{-} & \longrightarrow & \text{HgI}_{2} \downarrow & \xrightarrow{2\text{I}^{-}} & [\text{HgI}_{4}]^{2-} \\ & \text{(colourless)} & \\ & \text{Hg }^{2+} \text{ ions react with cobalt(II) thiocyanate to give a blue precipitate of Hg[Co(SCN)_{4}], also formulated} \end{array}$ as Co[Hg(SCN)4].

$$Hg^{2+} + Co^{2+} + 4SCN^{-} \longrightarrow Hg[Co(SCN)_{4}] \downarrow$$
(blue)

77. (b) NH₃ solution (NH₄OH) furnishes OH ions as well as NH₃. It can separate one cation from another provided both the cations precipitate as hydroxides but one of the hydroxides forms a soluble complex with NH3 whereas the other does not.

Of the Al(OH)3 and Zn(OH)2 formed first, the latter dissolves in excess of the NH3 solution whereas the former does not.

$$Zn(OH)_2 + 4NH_3 \longrightarrow [Zn(NH_3)_4]^{2+} + 2OH^{-1}$$

Level 3

Passage-1

3. (b)

AgBr(Pale yellow)

(K)

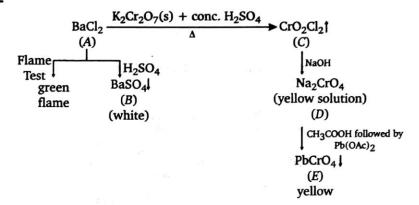
dil.

$$HNO_3$$
 Δ

Insoluble

$$\begin{bmatrix}
Ag(NH_3)_2 \\
(L)
\end{bmatrix}^+ & Br_2 \\
(L)
\end{bmatrix}^+ & Reddish \\
Brown$$
Ag+
$$Ag^+ \xrightarrow{\Delta} Ag_2S_2O_3$$

$$Ag^+ \xrightarrow{Adil.} Ag_2S \xrightarrow{Ag_2S_2O_3} (M) \text{ White}$$
AgCl \downarrow
(W)



Passage-3

2. (b)
$$SO_3^{2-}(aq.) \xrightarrow{Zn + dil.HCl} H_2S \uparrow \xrightarrow{FeCl_3} S \downarrow + Fe^{2+}$$

$$\downarrow MnO_4^{-}/H^+$$

$$S_2O_3^{2-} \qquad S \downarrow + Mn^{2+}(aq.)$$
(white turbidity)

* Fe²⁺ +NH₄SCN \rightarrow no reaction

* $Fe^{3+} + NH_4SCN \rightarrow Fe(SCN)_3$ blood red.

Passage-6

$$2MnO2 + 4KOH + O2 \longrightarrow 2K2MnO4 + 2H2O$$
Black solid
$$3MnO42- + 4H+ \longrightarrow 2MnO4- + MnO2 + 2H2O$$
(B)
(C)
purple

(i)
$$2\text{KMnO}_4 + \text{H}_2\text{O} + \text{KI} \longrightarrow 2\text{KOH} + 2\text{MnO}_2 + \text{KIO}_3$$
(D)

(ii)
$$2KMnO_4 + 8H_2SO_4 + 10FeSO_4 \longrightarrow 2MnSO_4 + 5Fe_2(SO_4)_3 + K_2SO_4 + 8H_2O_4$$

(iii)
$$2KMnO_4 + H_2SO_4 \xrightarrow{\text{cold}} Mn_2O_7 + K_2SO_4 + H_2O$$

$$Mn_2O_7 \longrightarrow 2MnO_2 + \frac{3}{2}O_2$$
(E) (F)

$$6KMnO_4 + 10FeC_2O_4 + 24H_2SO_4 \longrightarrow 6MnSO_4 + 5Fe_2(SO_4)_3 + 20CO_2 + 3K_2SO_4 + 24H_2O_4$$

$$(yellow)$$

$$3NaSCN + FeCl_3 \longrightarrow Fe(SCN)_3 \downarrow + 3NaCl_Bloot red_bloot red_blo$$

$$\begin{array}{c} \operatorname{Hg}_{2}(\operatorname{NO}_{3})_{2} + \operatorname{2NaCl} & \longrightarrow & \operatorname{Hg}_{2}\operatorname{Cl}_{2} \downarrow \\ (A) & (B) \text{ white ppt.} \end{array}$$

$$\operatorname{Hg}(\operatorname{NO}_{3})_{2} + \operatorname{2KI} & \longrightarrow & \operatorname{Hg}_{2}\operatorname{I}_{2} \downarrow (\operatorname{green ppt.}) \\ (A) & (C) & (C) \end{array}$$

$$\operatorname{Hg}_{2}\operatorname{I}_{2} + \operatorname{2KI} & \longrightarrow & \operatorname{K}_{2}[\operatorname{HgI}_{4}] + \operatorname{Hg} \\ (C) & \operatorname{excess} & (E) \operatorname{soluble complex} \end{array}$$

$$\operatorname{NH}_{3} + \operatorname{K}_{2}\operatorname{HgI}_{4} + \operatorname{KOH} & \longrightarrow & \left[\operatorname{Hg} & \bigcirc & \operatorname{Hg}_{2}\operatorname{I}_{2} \right] + \operatorname{Hg} \\ \operatorname{Nessler reagent} & \operatorname{Brown ppt.} (F) \\ \operatorname{Iodide of million's base} \end{array}$$

$$\operatorname{Hg}_{2}(\operatorname{NO}_{3})_{2} + \operatorname{Na}_{2}\operatorname{CrO}_{4} & \longrightarrow & \operatorname{Hg}_{2}\operatorname{CrO}_{4} \\ (A) & \operatorname{Red ppt.} \end{array}$$

$$\operatorname{K}_{2}[\operatorname{HgI}_{4}] & \longrightarrow & \operatorname{sp}^{3} \operatorname{Hybridization}$$

Passage-8

Passage-9

$$\begin{array}{ccc} \mathrm{NH_4NO_2} + \mathrm{NaOH} & \longrightarrow & \mathrm{NH_3} \uparrow + \mathrm{NaNO_2} + \mathrm{H_2O} \\ (A) & (B) & (B) & \\ \mathrm{NH_3} + 2\mathrm{K_2[HgI_4]} + 3\mathrm{KOH} & \longrightarrow & [\mathrm{HgO} \cdot \mathrm{Hg(NH_2)_2}]\mathrm{I} \downarrow + 3\mathrm{H_2O} + 7\mathrm{KI} \\ & & \mathrm{Brown \; ppt.} & \\ \mathrm{NH_4NO_2} & \longrightarrow & \mathrm{N_2(g)} + 2\mathrm{H_2O} \\ & & & & & & & & & & & & & & & & \\ \end{array}$$

1. (b) $Pb(NO_3)_2 + 2HCl \longrightarrow PbCl_2 \downarrow + 2HNO_3$ white

2. (c) $Pb(NO_3)_2 \longrightarrow Completely soluble in water.$

4. (d) $Pb(NO_3)_2 + CuSO_4 \longrightarrow Cu(NO_3)_2 + PbSO_4 \downarrow$ white ppt.

Passage-11

$$\begin{array}{c} \text{MnS} + \text{H}_2\text{SO}_4 & \longrightarrow & \text{H}_2\text{S}(g) + \text{MnSO}_4 \\ \text{(A)} & \text{(dil.)} & \text{(B)} & \text{(C)} \\ \text{Pink/Buff colour} & \text{colourless colourless} \\ \text{K}_2\text{Cr}_2\text{O}_7 + 4\text{H}_2\text{SO}_4 + 3\text{H}_2\text{S} & \longrightarrow & \text{K}_2\text{SO}_4 + \text{Cr}_2(\text{SO}_4)_3 + & 3\text{S}^{\downarrow} \\ \text{(green)} & \text{(yellow)} \text{(D)} \\ \text{S} + \text{O}_2 & \longrightarrow & \text{SO}_2 \\ \text{(E)} \\ \text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 + 3\text{SO}_2 & \longrightarrow & \text{K}_2\text{SO}_4 + \text{Cr}_2(\text{SO}_4)_3 + \text{H}_2\text{O} \\ \text{(green)} & \text{(green)} \\ \text{2H}_2\text{S} + \text{SO}_2 & \longrightarrow & 3\text{S}^{\downarrow} + 2\text{H}_2\text{O} \\ \text{(B)} & \text{(E)} & \text{(D)} \end{array}$$

 $Na_2SO_3 + S \longrightarrow Na_2S_2O_3$

Hypo solution is used as an antichlor to remove excess of Cl2 from bleached articles.

$$\begin{array}{ccc} \text{Na}_2\text{S}_2\text{O}_3 + \text{Cl}_2 + \text{H}_2\text{O} & \longrightarrow & \text{Na}_2\text{SO}_4 + \text{S} + 2\text{HCl} \\ 2\text{Mn}^{2+} + 5\text{PbO}_2 + 4\text{H}^+ & \longrightarrow & 2\text{MnO}_4^- + 5\text{Pb}^{2+} + 2\text{H}_2\text{O} \\ & \text{violet red} \end{array}$$

Passage-12

$$S_8 + 12 \text{NaOH} \longrightarrow 2 \text{Na}_2 S_2 O_3 + 4 \text{Na}_2 S + 6 \text{H}_2 O$$

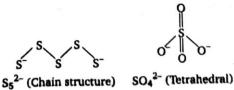
$$(A) \qquad (B) \qquad (C)$$

$$\text{Na}_2 S_2 O_3 + \text{FeCl}_3 \longrightarrow [\text{Fe}(S_2 O_3)_2]^- + 3 \text{Cl}^- + 4 \text{Na}^+ \text{Violet sol. } (E)$$

$$\text{Na}_2 S_2 O_3 + 2 \text{HCl} \longrightarrow 2 \text{NaCl} + S O_2 \downarrow + S \uparrow + \text{H}_2 O$$

$$\text{Na}_2 S_2 O_3 + \text{CaCl}_2 \longrightarrow \text{No ppt. as CaS}_2 O_3 \text{ is soluble}$$

$$\text{Na}_2 S_2 O_3 \longrightarrow \frac{\Delta}{\text{above } 220 \text{C}} \longrightarrow \text{Na}_2 S_5 + \text{Na}_2 S O_4$$



H₂S reacts with sodium nitroprusside only in alkali medium

$$\begin{aligned} \text{Na}_2[\text{Fe}(\text{CN})_5(\text{NO})] + 2\text{NaOH} + \text{H}_2\text{S}^{\uparrow} &\longrightarrow \text{Na}_4[\text{Fe}(\text{CN})_5(\text{NOS})] + 2\text{H}_2\text{O} \\ &\text{purple} \end{aligned}$$

$$\text{Na}_2\text{S}_2\text{O}_3 + [\text{Ni}(\text{en})_3](\text{NO}_3)_2 &\longrightarrow [\text{Ni}(\text{en})_3]\text{S}_2\text{O}_3 \downarrow + 2\text{Na}^+ + 2\text{NO}_3^- \\ &\text{Violet} \\ &\text{(optically active)} \end{aligned}$$

Passage-13

$$\begin{array}{c} \operatorname{CrCl}_3 + 3\operatorname{AgNO}_3 & \longrightarrow 3\operatorname{AgCl} \downarrow + \operatorname{Cr}^{3+} + 3\operatorname{NO}_3^- \\ \operatorname{(A)} & \text{white} \end{array}$$

$$\operatorname{AgCl} + 2\operatorname{NH}_3 & \rightleftharpoons [\operatorname{Ag(NH_3)_2}]^+ + \operatorname{Cl}^- \\ \operatorname{soluble} \end{array}$$

$$\operatorname{CrCl}_3 + 3\operatorname{NaOH} & \longrightarrow \operatorname{Cr(OH)_3} \downarrow + 3\operatorname{Na}^+ + 3\operatorname{Cl}^- \\ \operatorname{(A)} & \text{green} \end{array}$$

$$\operatorname{Cr(OH)_3} \downarrow + \operatorname{OH}^- & \rightleftharpoons [\operatorname{Cr(OH)_4}]^- \\ \operatorname{soluble} \end{array}$$

$$2\operatorname{Cr}^{3+} + 3\operatorname{H}_2\operatorname{O}_2 + 10\operatorname{OH}^- & \longrightarrow 2\operatorname{CrO}_2^{4-} + 8\operatorname{H}_2\operatorname{O} \\ \operatorname{(B)} \\ \operatorname{yellow} \operatorname{solution}$$

$$2\operatorname{CrO}_4^{2-} + 2\operatorname{H}^+ & \longrightarrow \operatorname{Cr}_2\operatorname{O}_2^- & + \operatorname{H}_2\operatorname{O} \\ \operatorname{Orange} \operatorname{solution} \\ \operatorname{(C)} \\ \operatorname{Cr}_2\operatorname{O}_7^2 + 2\operatorname{NH}_4\operatorname{Cl} & \longrightarrow (\operatorname{NH}_4)_2\operatorname{Cr}_2\operatorname{O}_7 + 2\operatorname{Cl}^- \\ \operatorname{(D)} & \operatorname{(NH}_4)_2\operatorname{Cr}_2\operatorname{O}_7 & \stackrel{\Delta}{\to} \operatorname{Cr}_2\operatorname{O}_3 + \operatorname{N}_2(g) + 4\operatorname{H}_2\operatorname{O}(g) \\ \operatorname{(B)} & \operatorname{(H)} \\ \operatorname{(B)} & \operatorname{(J)} & \stackrel{\Box}{\to} \operatorname{CusO_4(aq)} \\ \operatorname{(G)} & \operatorname{(I)} & \stackrel{\Box}{\to} \operatorname{(J)} \\ \operatorname{solid} & \operatorname{conc.} & \operatorname{(E)} \\ \operatorname{solid} & \operatorname{conc.} & \operatorname{(E)} \\ \operatorname{red} \operatorname{vapours} \\ \operatorname{CrO}_2\operatorname{Cl}_2\uparrow + 2\operatorname{OH}^- & \longrightarrow \operatorname{CrO}_4^{2-} + 2\operatorname{Hcl} \\ \operatorname{(B)} \\ \operatorname{CrO}_4^{2-} + \operatorname{Pb}^{2+} & \stackrel{\Delta{\operatorname{COH}}}{\to} \operatorname{PbCrO}_4 \downarrow \\ \operatorname{yellow} (F) \\ \end{array}$$

- HgCl₂ does not give chromyl chloride test. - In case of Br⁻, Reddish brown/Red vapours of Br₂ are evolved on heating it with K₂Cr₂O₇ and conc. H₂SO₄.

Passage-14

Mixture contains NaOH + ZnSO₄

$$NaOH + ZnSO_4 \longrightarrow Na_2ZnO_2 + Na_2SO_4 + 2H_2O_4$$

soluble

$$Na_2ZnO_2 + 2HCl \longrightarrow 2NaCl + Zn(OH)_2 \downarrow$$

 $Zn(OH)_2 + 2HCl \longrightarrow ZnCl_2 + 2H_2O$
soluble

1. (a)
$$Cu(NO_3)_2 + 2NaOH \longrightarrow Cu(OH)_2 \downarrow + 2NaNO_3 \downarrow \Delta$$

$$CuO \downarrow + H_2O$$
black ppt.

2. (b)
$$4Zn + NaNO_3 + 7NaOH \longrightarrow 4Na_2ZnO_2 + 2H_2O + NH_3 \uparrow$$
 pungent smell

3. (b)
$$CuO + H_2SO_4 \longrightarrow CuSO_4 + H_2S$$

 $2CuSO_4 + K_4[Fe(CN)_6] \longrightarrow Cu_2[Fe(CN)_6] \downarrow + 2K_2SO_4$
chocolate ppt.

Passage-17

The formation of D indicates NH₄.

Heating X with $K_2Cr_2O_7$ and concentrated H_2SO_4 , resulting in the formation of A, which in subsequent reactions gives B and C are the different steps of the chromyl chloride test. Thus, X is NH_4Cl .

$$NH_{4}Cl + H_{2}SO_{4} \longrightarrow NH_{4}HSO_{4} + HCl$$

$$X$$

$$K_{2}Cr_{2}O_{7} + 2H_{2}SO_{4} \longrightarrow 2KHSO_{4} + 2CrO_{3} + H_{2}O$$

$$CrO_{2}Cl_{2} + 2HCl \longrightarrow CrO_{2}Cl_{2} + H_{2}O$$

$$chromyl chloride$$

$$CrO_{2}Cl_{2} + 4OH^{-} \longrightarrow CrO_{4}^{2-} + 2H_{2}O + 2Cl^{-}$$

$$chromate ion (yellow) B$$

$$CrO_{4}^{2-} + Pb^{2+} \longrightarrow PbCrO_{4} \downarrow$$

$$lead chromate (yellow) C$$

$$NH_{4}^{+} + OH^{-} \longrightarrow NH_{3} \uparrow + H_{2}$$

$$NH_{3} + 2[HgI_{4}]^{2-} + 3OH^{-} \longrightarrow \begin{bmatrix} O & Hg \\ Hg & NH_{2} \end{bmatrix} I \downarrow + 7I^{-} + 2H_{2}O$$

2. (a) Cl⁻ would have given rise to CrO₂Cl₂ which would turn an NaOH solution yellow. Br⁻ would have given rise to formation of colourless compounds (a mixture of NaBr and NaBrO/NaBrO₃). NO₃ and NO₂ would have given rise to NO₂ which reacts with an NaOH solution to produce a mixture of colourless compounds NaNO₃ and NaNO₂.

Passage-18

One of the three colourless gases— CO_2 , SO_2 and H_2S —is generally produced by the action of dilute H_2SO_4 on a salt. As the gas turns acidified dichromate solution green along with the formation of a slightly coloured precipitate (may be S), the gas seems to be H_2S and so the substance A seems to be a sulphide. Again, the action of NH_3 or an NaOH solution on the solution of the substance in dilute

H₂SO₄ suggests that the substance is a zinc salt. Thus, A is most likely ZnS. Let us go through the reactions now.

$$\begin{array}{c} \operatorname{ZnS}_{(\text{white})} + 2\operatorname{H}^{+} \longrightarrow \operatorname{Zn}^{2+}_{(\text{colourless})} + \operatorname{H}_{2}\operatorname{S}^{\uparrow}_{(\text{colourless})} \\ \operatorname{Cr}_{2}\operatorname{O}_{7}^{2-} + 14\operatorname{H}^{+} + 3\operatorname{S}^{2-}_{(\operatorname{H}_{2}\operatorname{S})} \longrightarrow 2\operatorname{Cr}^{3+}_{3+} + 7\operatorname{H}_{2}\operatorname{O} + 3\operatorname{S}_{(\text{yellowish white})} \\ \operatorname{S}_{B} + \operatorname{O}_{2} \longrightarrow \operatorname{SO}_{2}^{\uparrow}_{E} \\ 2\operatorname{H}_{2}\operatorname{S} + \operatorname{SO}_{2} \longrightarrow 3\operatorname{S} + 2\operatorname{H}_{2}\operatorname{O}_{(\text{colourless liquid})} \xrightarrow{\operatorname{cusO}_{4}} \operatorname{white} \xrightarrow{\operatorname{cusO}_{4} \cdot x\operatorname{H}_{2}\operatorname{O}_{\text{hydrated copper(II)}} \\ \operatorname{Sulphate (blue)} \\ \end{array}$$

$$\begin{array}{c} \operatorname{Zn}^{2+} + 2\operatorname{OH}^{-}_{C} \longrightarrow \operatorname{Zn}(\operatorname{OH})_{2} \\ \operatorname{CNH}_{4}\operatorname{OH}_{C} \longrightarrow \operatorname{NaOH} \end{array} \xrightarrow{\operatorname{excess}_{\operatorname{NaOH}}} \operatorname{IZn}(\operatorname{OH}_{3})_{4} \right]^{2+} + 2\operatorname{OH}^{-}_{C} \times \operatorname{CusO}_{4} \longrightarrow \operatorname{IZn}(\operatorname{OH}_{2})_{4} \xrightarrow{\operatorname{excess}_{\operatorname{NaOH}}} \operatorname{IZn}(\operatorname{OH}_{3})_{4} \xrightarrow{\operatorname{excess}_{\operatorname{In}}} \operatorname{IZn}(\operatorname{OH}_{3})_{4} \xrightarrow{\operatorname{excess}_{\operatorname{In}}} \operatorname{CusO}_{4} \xrightarrow{\operatorname{IZ}} \xrightarrow{\operatorname{IZ}} \operatorname{CusO}_{4} \xrightarrow{\operatorname{IZ}} \operatorname{CusO}_{4} \xrightarrow{\operatorname{IZ}} \operatorname{CusO}_{4} \xrightarrow{\operatorname{IZ}} \operatorname{Cus$$

Passage-19

The reactions at step (ii) suggest the presence of Fe3+.

$$[Fe(H_2O)_6]^{3+} + xSCN^- \longrightarrow [Fe(SCN)_x(H_2O)_{6-x}]^{+3-x} + xH_2O$$
or
$$Fe^{3+} + 3SCN^- \longrightarrow Fe(SCN)_3$$

$$(red) B$$

$$4Fe^{3+} + 3 [Fe(CN)_6]^{4-} \longrightarrow Fe_4[Fe(CN)_6]_3$$

$$(Prussian blue) C$$

The reactions in steps (iii) and (iv) indicate the presence of Cl (chromyl chloride test).

Thus, A is FeCl_3 , B is $[\text{Fe(SCN)}_x(\text{H}_2\text{O})_{6-x}]^{+3-x}$ or Fe(SCN)_3 , C is $\text{Fe}_4[\text{Fe(CN)}_6]_3$, D is CrO_2Cl_2 and E is PbCrO_4 .

Anhydrous $FeCl_3$ is a covalent compound, subliming at about 300°C, but the hydrated salt $(FeCl_3 \cdot 6H_2O)$ or an aqueous solution of it contains Fe^{3+} and Cl^- ions. An aqueous solution of $FeCl_3$ is acidic to litmus because of the hydrolysis of the salt.

The yellow precipitate of a sulphite could be CdS (group IIA) or As₂S₃/As₂S₃/SnS₂ (group IIB), but as it is insoluble in yellow ammonium polysulphide, it should be CdS. Thus, the cation appears to be Cd2+ which is confirmed by reactions (ii) to (v). Reaction (vi) indicates SO_4^{2-} . Hence, the compound B is

(i)
$$Cd^{2+} \atop (CdSO_4)$$
 + $S^{2-} \atop (H_2S)$ $\longrightarrow CdS \downarrow \atop (yellow)$

(ii)
$$CdS \downarrow + 2H^2 \longrightarrow Cd^{2+} + H_2S \uparrow CdS \xrightarrow{(NH_4)_2S_x} No action$$

(iii)
$$Cd^{2+} + 2OH^{-} \longrightarrow Cd(OH)_2 \downarrow \xrightarrow{4NH_3} Cd(NH_3)_4]^{2+} + 2OH^{-}$$
(cdSO₄) (NH₄OH) (white) $Cd^{2+} \longrightarrow Cd(NH_3)_4$ (white) tetramminecadmium(II) ion (soluble) $Cd^{2+} \longrightarrow Cd(NH_3)_4$

(iv)
$$Cd^{2+}$$
 $+ 2 CN^{-}$ \longrightarrow $Cd(CN)_2 \downarrow$ $\xrightarrow{(KCN)}$ $\xrightarrow{(KCN)}$ $\xrightarrow{(KCN)}$ $\xrightarrow{(KCN)}$ $\xrightarrow{(ETacyanocadmiate(II) ion (soluble) D}$

The tetracyanocadmiate(II) ion, formed in (iv), has a low stability constant value and, furnishes Cd^{2+} ions in sufficient concentration to give a precipitate of CdS(A).

$$[Cd(CN)_{4}]^{2-} \iff Cd^{2+} + 4CN^{-}$$

$$\downarrow S^{2-}$$

$$\downarrow (H_{2}S)$$

$$CdS \downarrow$$

$$(Vi) Ba^{2+} + SO_{4}^{2-} \longrightarrow BaSO_{4} \downarrow$$

$$(white)$$

$$insoluble in HCl$$

$$or HNO_{2}$$

Thus, A is CdS, B is CdSO₄, C is $[Cd(NH_3)_4]^{2+}$, D is $[Cd(CN)_4]^{2-}$.

Passage-21

The fact that the mixture is insoluble in water but soluble in dilute HCl and that the solution does not give a precipitate with H₂S suggest that groups I and II are absent. The evolution of a gas (during the dissolution of the mixture of dilute HCl) turning lime water milky but not acting on an acidified dichromate solution suggests the presence of CO₃²⁻ in the mixture. The formation of a white precipitate by the action of AgNO₃ on the soda extract, acidified with HNO₃, suggests the presence of Cl⁻. The formation of a brown precipitate when an alkaline solution of K2[HgI4], i.e., Nessler's reagent, is treated with the gas formed by boiling the mixture with an NaOH solution indicates the presence of NH⁺. Step (4) suggests the absence of group IIIA cations and step (5) that of group IIB cations. Step (6) suggests the presence of group IV cation(s). Steps (7) and (8) suggest the absence of Ba²⁺ and Sr²⁺ respectively, and (9) suggests the presence of Ca²⁺.

$$(Ca^{2+} + C_2O_4^{2-} \longrightarrow CaC_2O_4\downarrow)$$
(white)

$$(Ca^{2^{+}} + C_{2}O_{4}^{2^{-}} \longrightarrow CaC_{2}O_{4}\downarrow)$$
(white)

Thus, the mixture contains the cations NH₄⁺ and Ca²⁺ and the anions Cl⁻ and CO₃²⁻.

1. (c) Ag⁺ + Cl⁻ \longrightarrow AgCl \downarrow $\xrightarrow{2NH_{4}OH}$ [Ag(NH₃)₂]²⁺ + Cl⁻ + 2H₂O (AgNO₃)

As there is an excess of NH₄OH, some NH₄ and OH ions will also be present.

3. (a) The precipitate is CaC₂O₄, which dissolves in minerals acids to set oxalic acid free, which decolorises a solution of KMnO₄.

$$\begin{array}{ccc} \text{Ca}^{2+} & + & \text{C}_2\text{O}_4^{2-} & \longrightarrow & \text{CaC}_2\text{O}_4\downarrow & \xrightarrow{\text{H}_2\text{SO}_4} & \text{Ca}^{2+} + \text{SO}_4^{2-} + & \text{H}_2\text{C}_2\text{O}_4 \\ \text{(calcium acetate)} & \text{(ammonium oxalate)} & \text{oxalic acid} \\ \end{array}$$

$$\frac{[\text{MnO}_{4}^{-} + 8\text{H}^{+} + 5e \longrightarrow \text{Mn}^{2+} + 4\text{H}_{2}\text{O}] \times 2}{[\text{H}_{2}\text{C}_{2}\text{O}_{4} \longrightarrow 2\text{CO}_{2} + 2\text{H}^{+} + 2e] \times 5}{2\text{MnO}_{4}^{-} + 6\text{H}^{+} + 5\text{H}_{2}\text{C}_{2}\text{O}_{4} \longrightarrow 2\text{Mn}^{2+} + 8\text{H}_{2}\text{O} + 10\text{CO}_{2}}$$

(Oxalic acid is a weak acid, and is therefore represented as H2C2O4. It could also be represented as $C_2O_4^{2-}$ along with $2H^+$).

One or More Answers is/are Correct

1. (a, b, d)

Only metal cations having unpaired electron(s) produce colour beads of metaborates.

2. (a, d)

AgCl and AgBr dissolve in excess of conc. ammonia solution.

AgI does not dissolve in excess conc. NH₃ solution.

3. (a)
$$I_2 + 2S_2O_3^{2-} \longrightarrow 2I^- + S_4O_6^{2-}$$

$$3K^+ + Na_3[Co(NO_2)_6] \longrightarrow K_3[Co(NO_2)_6 \downarrow + 3Na^+]$$

Na+ and Mg2+ do not give test.

Pb²⁺ and Ba²⁺ both form yellow ppt. with CrO_4^{2-} ion which is not soluble in CH_3COOH . Flame test Ba²⁺ — Apple green Pb²⁺ — Blue

O3, Cl2 water and conc. HNO3 being strong oxidants will oxidise sulphur into H2SO4.

10. (b, d)

$$SO_2 \uparrow + H_2O \longrightarrow H_2SO_3$$

 $3H_2SO_3 \xrightarrow{150^{\circ}C \text{closed vessle}} S + 2H_2SO_4 + H_2O \downarrow$
 $BaCl_2$
 $BaSO_4 \downarrow$ (white ppt.)

$$MgCl_2 + 2NaNO_3 \longrightarrow 2Na^+ + Mg^{2+} + 2Cl^- + 2NO_3^-$$
 (No reaction)

BaSO₄ + HCl → No reaction (remains insoluble)

$$ZnSO_4 + BaS \longrightarrow ZnS \downarrow + BaSO_4 \downarrow$$

(white) (white)

$$BaCO_3 \downarrow + 2CH_3COOH \longrightarrow Ba^{2+} + 2CH_3COO^- + CO_2 \uparrow + H_2O$$
 (white)

19. (c, d)

$$SO_2/CO_2 + Lime Water \longrightarrow milky soln.$$

$$SO_2/CO_2 + BaCl_2 \longrightarrow BaSO / BaCO_3 \downarrow$$
 (soluble in dil. HCl) white ppt.

H₂O₂ oxidises SO₂ to H₂SO₄, which reacts with a BaCl₂ solution to give a white precipitate of BaSO₄, insoluble in HCl. CO2 does not react with H2O2, but reacts with a BaCl2 solution forming a white precipitate of BaCO₃ soluble in HCl.

Acidified dichromate turns green with SO₂ but not with CO₂.

21. (b, d)

NH₃ solution cannot be used because both of these cations form soluble complexes with NH₃.

22. (a, b, d)

- (i) Cations of the same group cannot be separated by the group reagent, and
- (ii) A cation, not treated with its own group reagent, is generally precipitated by the reagent of a later group.

 H_2S in an acid medium is the reagent for group II. So the cations mentioned in (a) and (b) cannot be separated as they all belong to group II. Those mentioned in (c) can be separated because Pb^{2+} (group II) is precipitated as PbS and Al³⁺ (group III) is not. The cations mentioned in (d) Remain unaffected by the reagent.

38. (a)

 $HgCl_2$ reacts with H_2S , in the presence of moisture, to leave a black residue of HgS, whereas NH_4Cl does not. Other reagents do not react with $HgCl_2$ and NH_4Cl .

41. (a, b, d)

When a solid mixture of NaCl, K, Cr, O, and conc. H, SO, is heated, the products obtained are:

$$4KCl + K_{2}Cr_{2}O_{7} + 6H_{2}SO_{4} \longrightarrow 2CrO_{2}Cl_{2} + 6KHSO_{4} + 3H_{2}O$$

$$red$$

$$vapours$$

$$CrO_{2}Cl_{2} + 4NaOH \longrightarrow Na_{2}CrO_{4} + 2NaCl + 2H_{2}O$$

$$yellow$$

$$solution$$

42. (a, d)

Ba²⁺ ions produce yellow ppt. with CrO₄²⁻, which is not soluble in CH₃COOH

 $BaCO_3$ dissolves in CH_3COOH and produces Ba^{2+} ion which gives yellow ppt. with CrO_4^{2-} which is insoluble in CH_3COOH

SrCO₃ is soluble in CH₃COOH and produces Sr²⁺ ion which does not give yellow ppt. of SrCrO₄ in CH₃COOH.

43. (a, c)

(a)
$$Cd^{2+} + 2NaOH \rightarrow Cd(OH)_2$$
 white ppt.

Excess $NaOH$ Not soluble

$$Excess NH_4OH \rightarrow [Cd(NH_3)_4]^{2+} \text{ soluble}$$

(b) $Cr^{3+} + 3NaOH \rightarrow Cr(OH)_3$ green ppt.

$$Excess NaOH \rightarrow Na[Cr(OH)_4] \text{ soluble}$$

$$Excess NH_4OH \rightarrow [Cr(NH_3)_6]^{3+} \text{ soluble}$$

: Cr(OH)3 soluble in both NaOH (excess) and NH4OH (excess)

(c)
$$Sn^{2+} + 2NaOH \rightarrow Sn(OH)_2$$
 white ppt. Excess $NaOH \rightarrow Na_2[Sn(OH)_4]$ soluble

522 INORGANIC CHEMISTRY

(d)
$$Bi^{3+} + 3NaOH \rightarrow Bi(OH)_3 \downarrow$$

white ppt.

Excess NaOH

Insoluble

Excess NH₄OH

Insoluble

44. (a, b, c, d)
$$Al_{2}(SO_{4})_{3} + 6NH_{4}OH \longrightarrow 2Al(OH)_{3} \downarrow + 3(NH_{4})_{2}SO_{4}$$
white gelatinous pot.

⇒ ppt. of Al(OH)₃ is insoluble in NH₃ sol. but soluble in NaOH
Al(OH)₃ \downarrow + OH \rightleftharpoons [Al(OH)₄]

 \Rightarrow Al(OH)₃ can be used as antacid.

45. (a, b, c, d)

A chloride will give CrO₂Cl₂, bromide will give Br₂, and nitrate and nitrite will give NO₂. All these gases are red-brown.

Match the Column

$$Pb(NO_2)_2 \rightarrow PbCl_2 \downarrow + HNO_3 + NO \uparrow$$

$$(NH_4)_2S \rightarrow H_2S \uparrow + NH_4^+ + Cl^-$$

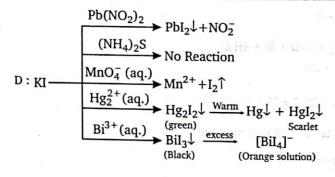
$$MnO_4^- (aq) \rightarrow Mn^{2+} (aq) + Cl_2 \uparrow$$

$$Hg_2^{2+} (aq) \rightarrow Hg_2Cl_2 \downarrow$$

$$Bi^{3+} (aq) \rightarrow BiCl_3 \rightleftharpoons Bi^{3+} + 3Cl^-$$
i.e., No Reaction

$$C: NaOH(excess) \xrightarrow{Pb(NO_2)_2} (Pb(OH)_4]_2^- + NO_2^- \\ & \xrightarrow{(NH_4)_2S} NH_3 \uparrow + 2Na^+ + S^{2-} \\ & \xrightarrow{MnO_4^- (aq.)} MnO_4^{2-} + O_2 \uparrow \\ & \xrightarrow{Hg_2^{2+} (aq.)} Hg + HgO \\ & \xrightarrow{(glack)} Bi(OH)_3 \downarrow \\ & \xrightarrow{(white)}$$

Assertion-Reason Type Questions



2. (A)
$$H_2SO_4$$
 $S_2O_3^{2-}$ $SO_2\uparrow + S\downarrow$ S^{2-} $H_2S\uparrow$ $NO_2\uparrow$ $NO_2\uparrow$ CH_3COO^+ $CH_3COOH\uparrow$

⇒ SO₂, H₂S, CH₃COOH: Colourless ⇒ NO₂: Brown

$$S_2O_3^{2-} \longrightarrow Ag_2S_2O_3\downarrow \text{ (white)}$$

$$S_2^{2-} \longrightarrow Ag_2S\downarrow \text{ (black)}$$

$$NO_2^{-} \longrightarrow AgNO_2\downarrow \text{ (white)}$$

$$CH_3COO^{-} \longrightarrow CH_3COOAg\downarrow \text{ (white)}$$

(C)
$$HgCl_2$$

$$S_2O_3^{2-} \longrightarrow Ag S_2O_3 \downarrow \text{(white)}$$

$$S^{2-} \longrightarrow HgS \text{ (black)}$$

$$NO_2^{-} \longrightarrow No \text{ ppt.}$$

$$CH_3COO^{-} \longrightarrow No \text{ ppt.}$$

(D) Ag₂S is insoluble in NH₃ soluble.

3. (A) (P)
$$Fe^{2+} + 2KCN \longrightarrow Fe(CN)_2 \downarrow \xrightarrow{4KCN} K_4[Fe(CN)_6]$$

brown ppt. \xrightarrow{excess} pale yellow colouration
(S) $Ag^+ + KCN \longrightarrow AgCN \downarrow \xrightarrow{KCN} K[Ag(CN)_2]$
white ppt. $\xrightarrow{soluble}$

- (B) (P) Fe(OH)2 is not soluble in both excess NaOH and excess NH4OH solution
 - (Q) HgO not soluble in excess NaOH and excess NH₄OH solution
- (C) (Q) $Hg^{2+} + 2KI \longrightarrow HgI_2 \downarrow$ (scarlet red)

$$\begin{array}{ccc} \text{HgI}_2 & \xrightarrow{2\text{KI}} & \text{K}_2[\text{HgI}_4] \\ \text{scarlet red ppt} & & \text{soluble} \end{array}$$

$$(R) \text{Pb}^{2+} + 2\text{KI} & \longrightarrow & \text{PbI}_2 \downarrow + 2\text{K}^+ \\ \text{PbI}_2 \downarrow & + & 2\text{KI} & \longrightarrow & \text{K}_2[\text{PbI}_4] \\ \text{Yellow ppt.} & & \text{soluble} \end{array}$$

(D) (R)
$$Pb^{2+} + H_2S \longrightarrow PbS \downarrow black ppt.$$
 + $2H^+$
 $3PbS + 8HNO_3 \longrightarrow 3Pb(NO_3)_2 + 2NO + 3S + 4H_2O$
(S) $2Ag^+ + H_2S \longrightarrow Ag_2S \downarrow + 2H^+$
 $black ppt.$
 $3Ag_2S \downarrow + 8HNO_3 \longrightarrow AgNO_3 + 2NO + 3S + 4H_2O$

4. (A) Due to high K_{sp} of ZnS, it is precipitated in alkaline medium.

(B)
$$2 \text{ Cu}^{2+} + 5\text{ I}^- \longrightarrow \underbrace{\begin{array}{c} \text{Cu}_2\text{I}_2 \downarrow + \text{I}_3^- \\ \text{white ppt. Brown} \end{array}}_{\text{brown ppt.}}$$
(C) $\text{Pb}_3\text{O}_4 + \text{HNO}_3 \longrightarrow 2\text{Pb}(\text{NO}_3)_2 + \text{PbO}_2 \downarrow + 2\text{H}_2\text{O}_{\text{Brown}}$

$$(D)2FeCl_3 + H_2S \longrightarrow 2Fe^{2+} + S \downarrow + 2H^+ + 6Cl^-$$
pale green solution

Oxalate—on heating with conc. H₂SO₄ gives a mixture of CO and CO₂ gases

Acetate—on heating with conc. H₂SO₄, a vinegar smell of acetic acid is produced and with FeCl₃ (neutral), gives a red ppt.

Sulphide—with dil. H₂SO₄ producing SO₂ gas which turns lead acetate paper black and sodium nitroprusside produces violet colour of Na₄[Fe(CN)₅(NOS)].

Thiosulphate—with dil. H₂SO₄ producing SO₂ gas and colloidal sulphur.

Assertion-Reason Type Questions

- (C) HNO₃ oxidises Zn metal into ZnO which is further neutralized by HNO₃ and salt of Zn(NO₃)₂ is formed with liberation of water.
- 4. (B) On mild heating (temp. should not be greater than 40°C) ammonium molybdate with phosphate radical in presence of conc. HNO₃, yellow ppt. is obtained.

5. (A)
$$2\text{HgCl}_2 + \text{SnCl}_2 \longrightarrow \text{Hg}_2\text{Cl}_2\downarrow + \text{SnCl}_4$$
 white

$$Hg_2Cl_2 + SnCl_2 \longrightarrow 2Hg \downarrow + SnCl_4$$
grey

6. (D) The white ppt. is due to the formation of the BiOCl or SbOCl

$$BiCl_3 + H_2O \implies BiOCl + 2HCl$$

 $SbCl_3 + H_2O \implies SbOCl + 2HCl$
 $Pb^{2+} + 2Cl^- \longrightarrow PbCl_2 \downarrow$

(D) Group reagent for V group is (NH₄)₂CO₃ in presence of NH₄Cl and because of NH₄OH, pH of solution is maintained.

Subjective Problems

1.
$$B = \text{Na}_{4}[\text{Fe}(\text{CN})_{6}(\text{NOS})]$$

 $\text{Fe}^{2+}(d^{6}) \Rightarrow \text{t}_{2g}^{6}e_{g}^{*}$
 $|6^{2}-0^{2}| \Rightarrow "36"$

2. Soluble in excess NH₃ soln. Cd²⁺(aq.), Ni²⁺(aq.), Zn²⁺(aq.), Ag⁺(aq.) 3. $X \Rightarrow (NH_4)_3 PO_4 \cdot 12MoO_3$

15th group and
$$sp^3$$
 hybridized atoms in $X = 4$, (3, N-atoms +1 P-atom)

5.
$$\Rightarrow \text{FeS}(s) \xrightarrow{\text{dil .HCl}} \text{H}_2S \uparrow \xrightarrow{\text{Na}_2[\text{Fe}(\text{CN})_5(\text{NO})]} \text{Na}_4[\text{Fe}(\text{CN}_5)(\text{NO})]$$
Purple solution

(a)
$$2\text{FeCl}_3 + 2\text{H}_2\text{S} \uparrow \xrightarrow{\text{Acidic/}} 2\text{Fe}^{2+} + \text{S} \downarrow + 4\text{H}^+ + 6\text{Cl}^-$$

(b)
$$CuSO_4 + H_2S \uparrow \xrightarrow{Acidic/} CuS \downarrow + 2H^+ + SO_4^{2-}$$

(c)
$$BaCl_2 + H_2S \uparrow \xrightarrow{Acidic} Ba^{2+} + 2Cl^- + 2H^+ + S^{2-}$$

Neutral \rightarrow $Ba^{2+} + 2Cl^- + 2H^+ + S^{2-}$

(d)
$$SO_2 \uparrow + 2H_2S \uparrow \longrightarrow 2S \downarrow + H_2O$$
 or $SO_2 \uparrow + H_2O \longrightarrow H_2SO_3 \xrightarrow{H_2S} S \downarrow + H_2O$

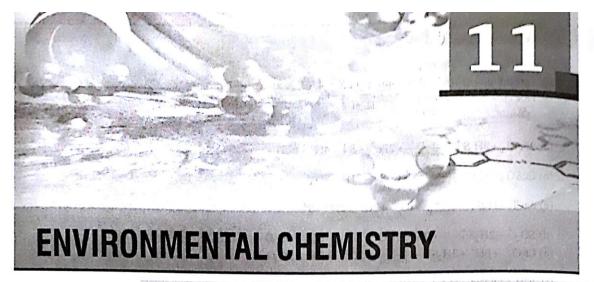
(e)
$$\text{Cr}_2\text{O}_7^{2-} + 8\text{H}^+ + 3\text{H}_2\text{S} \uparrow \xrightarrow{\text{Acidic}/} 2\text{Cr}^{3+} + \text{S} \downarrow + 7\text{H}_2\text{O}$$

(f)
$$2CH_3COONa + H_2S \uparrow \xrightarrow{Acidic/} 2CH_3COOH + 2Na^+ + S^{2-}$$

No observable change

(g)
$$Hg^{2+} + H_2S \xrightarrow{\text{Acidic}/} HgS \downarrow + 2H^+$$

$$\therefore$$
 $P=3$; $Q=2$; $R=2$
Hence value of $(P+Q-R)=3+2-2=3$



Level

- 1. The term biosphere is used for the zone of the earth where life exists:
 - (a) On the lithosphere
 - (b) In the hydrosphere
 - (c) In the lithosphere and hydrosphere
 - (d) In the lithosphere, hydrosphere and atmosphere
- 2. Biosphere is:
 - (a) In which individual interact to each other
 - (b) By which life originated
 - (c) The name of a bird
 - (d) Organic compound by which life diminishes
- 3. Which is not a renewable source?
 - (a) Forest
- (b) Coal
- (c) Water
- (d) Forest organism

- 4. Noosphere is synonyms of:
 - (a) Environment

(b) Atmosphere

(c) Hydrosphere

- (d) Stratosphere
- 5. The living organisms on or around the earth constitute:
 - (a) Biome

(b) Biosphere

(c) Community

(d) Biocoenosis

- 6. Biosphere refers to:
 - (a) Plants of the world

- (b) Special plants
- (c) Area occupied by living beings
- (d) Plants of a particular area
- 7. What is the correct sequence of atmospheric layers starting from earth?
 - (a) Stratosphere troposphere, mesosphere, thermosphere
 - (b) Troposphere, stratosphere, mesosphere, thermosphere
 - (c) Mesosphere, troposphere, stratosphere, thermosphere
 - (d) Thermosphere, mesosphere, stratosphere, troposphere

ENVIRONMENTAL CHEMISTRY

8.	8. On earth all living organisms constitute:	
	(a) Community (b) Biome	
	(c) Association (d) Biospho	ere
9.	9. A biosphere is composed of:	
	(a) Living organisms	
	(b) Living organisms + lithosphere	distriction of
	(c) Living organisms + lithosphere + lithosphere	
	(d) Living organisms + lithosphere + atmosphere hydro-	sphere
10.	10. Pollution can be controlled by:	· · · · · · · · · · · · · · · · · · ·
	(a) Sewage treatment	w A
	(b) Checking atomic blasts	
	(c) Manufacturing electrically operated vehicles	
	(d) All the above	
11.	11. If water pollution continues at its present rate, if will eve	ntually:
	(a) Stop water cycle can be a seen as a seen a	4.0
	(b) Prevent precipitation	
	(c) Make oxygen molecules unavailable to water plants	
	(d) Make nitrate molecules unavailable to water plants	
12.	12. Recent reports of acid rains industrial cities are due to the e	ffect of atmospheric pollution by:
	(a) Excessive release of NO ₂ and SO ₂ by burning of foss	
	(b) Excessive release of CO ₂ by burning of fuel like wood	and charcoal, cutting of forests and
	increased animal population	
	(c) Excessive release of NH ₃ by industrial plants and coa	
	(d) Excessive release of CO in atmosphere by incomplete	combustion of cock, charcoal and
10	other carbonaceous fuels in pancity of oxygen	Charles and the contract of th
13.	13. Pollution is a change in physical, chemical or biological change be:	aracters of our land and water that
		e and useful to human
		able and useful to human
14	14. Which is the greatest air pollution these days?	and drong the s
14.	(a) Factories (b) Moto ve	hicles
	(c) Domestic appliances (d) Animals	
15.	15. Removal of the soil by the action of wind and water is kr	
	(a) Erosion (b) Fossiliza	
	(c) Leaching (d) Calcification	
16.	16. Acid rain occur due to atmospheric pollution of:	
	(a) SO_2 (b) NH_3 (c) CO_2	(d) N ₂ O
17.	17. An increase in CO ₂ concentration in the atmosphere will	result in:
	(a) Adverse effects of natural vegetation	
	(b) Global warming	
	(c) Temperature decrease in global atmosphere	
	(d) Genetic disorders in plants and animals	

18.	Planting more and more trees helps to:		
	(a) reduce CO ₂ in the air	(b) increase CO ₂ in th	ie air
	(c) reduce O ₂ in the air	(d) reduce CO ₂ and ir	icrease O_2 in the air
19.	The basic component of smog is:		
	(a) PAN (b) PBN	(c) NO ₂	(d) All of these
20.	Which of the following protects life on earth fr	om harmful effects of UV	V radiations from sun?
	(a) N_2 (b) CO_2	(c) O ₂	(d) O_3
21.	The ozone layer forms natural by:		W
	(a) the interaction of CFC with oxygen		
	(b) the interaction of UV radiation with oxyg	gen	
	(c) the interaction of IR radiation with oxyge	en	
	(d) the interaction of oxygen and water vapo	our	
22.	Fish die in water bodies polluted by sewage	due to:	
	(a) pathogens	(b) reduction in oxyge	en
	(c) foul smell	(d) none of these	
2 3.	Main pollutant from automobile exhaust is:	11/12 "	
		(c) NO	(d) hydrocarbons
24.	Ultraviolet radiation is absorbed by:		
	(a) exosphere		
	(c) mesosphere		
25 .	Global warming may result in:		
	(a) flood	(b) cyclone	
		(d) all of the above	
26.	BHC and DDT act as:		
	(a) carcinogens	(b) allergens	
	(c) asthmatic agents	(d) all of these	
27.	Which of the following statement is wrong?		
	(a) Polar stratospheric clouds (PSCs) are clo		
	(b) Acid rain dissolves heavy metals such as (iu, Pb, Hg and Al from so	oil, rocks and sediments.
	(c) H ₂ SO ₄ is major contributor to acid rain, I	INO ₃ ranks second and 1	HCl third in this respect
	(d) Fishes grow as well in warm as in cold		
28.	Ozone depletion in the stratosphere is main		
	(a) SO ₂		
	(c) NO	(d) chlorofluorocarbo	
29.	Persons working in cement plants and lime		
	(a) asthma (b) cancer	(c) silicosis	(d) pneumoconiosis

Haval 2

1.	Which of the following gases is not a green house gas?
	(a) CO (b) O_3 (c) CH_4 (d) H_2O vapour
2.	Photochemical smog occurs in warm, dry and sunny climate. One of the following is not amongst the components of photochemical smog, identify it.
	(a) NO_2 (b) O_3
	(c) SO ₂ (d) Unsaturated hydrocarbon
3.	Which of the following statements is not true about classical smog?
	(a) Its main components are produced by the action of sunlight on emissions of automobiles and factories
	(b) Produced in cold and humid climate
	(c) It contains compounds of reducing nature
	(d) It contains smoke, fog and sulphur dioxide
4.	Biochemical Oxygen Demand, (BOD) is a measure of organic material present in water. BOD value less than 5 ppm indicates a water sample to be
	(a) rich in dissolved oxygen (b) poor in dissolved oxygen
	(c) highly polluted (d) not suitable for aquatic life
5.	Which of the following statements is wrong?
	(a) Ozone is produced in upper stratosphere by the action of UV rays on oxygen
	(b) Ozone can oxidise sulphur dioxide present in the atmosphere to sulphur trioxide
	(c) Ozone hole is thinning of ozone layer present in stratosphere
	(d) None of these
6.	Sewage containing organic waste should not be disposed in water bodies because it causes
	major water pollution. Fishes in such a polluted water die because of:
	(a) Large number of mosquitoes (b) Increase in the amount of dissolved oxygen
	(c) Decrease in the amount of dissolved oxygen in water
	(d) Clogging of gills by mud
7	Which of the following statements about photochemical smog is wrong?
	(a) It has high concentration of oxidising agents
	(b) It has low concentration of oxidising agent
1.	(c) It can be controlled by controlling the release of NO ₂ , hydrocarbons, ozone etc.
	(d) Plantation of some plants like pinus helps in controlling photochemical smog
8.	The gaseous envelope around the earth is known as atmosphere. The lowest layer of this is
	extended upto 10 km from sea level, this layer is
	(a) Stratosphere (b) Troposphere
	(c) Mesosphere (d) Hydrosphere
9.	Dinitrogen and dioxygen are main constituents of air but these do not react with each other to form oxides of nitrogen because
	(a) the reaction is endothermic and requires very high temperature
	(b) the reaction can be initiated only in presence of a catalyst

	(c) oxides of nitrogen are unstable
	(d) N ₂ and O ₃ are unreactive
10.	The pollutants which come directly in the air from sources are called primary pollutants,
	Primary pollutants are sometimes converted into secondary pollutants. Which of the following
	belongs to secondary air pollutants?
	(a) CO (b) Hydrocarbon
	(c) Peroxyacetyl nitrate (d) NO
11.	Which of the following statements is correct?
	(a) Ozone hole is a hole formed in stratosphere from which ozone oozes out.
	(b) Ozone holes is a hole formed in the troposphere from which ozone oozes out
	(c) Ozone hole is thinning of ozone layer of stratosphere at some places
10	(d) Ozone hole means vanishing of ozone layer around the earth completely Which of the following practices will not some under green chemistry?
12.	Which of the following practices will not come under green chemistry? (a) If possible, making use of soap made of vegetable oils instead of using synthetic
	detergents
	(b) Using H ₂ O ₂ for bleaching purpose instead of using chlorine based bleaching agents
	(c) Using bicycle for travelling small distances instead of using petrol/diesel based vehicles
	(d) Using plastic cans for neatly storing substances
13.	Which of the following acts as rocket propellants? (AIEEE 2003)
	(a) Liq. H_2 + Liq. O_2 (b) Liq. N_2 + Liq. O_2
	(c) Liq. H_2 + Liq. N_2 (d) Liq. O_2 + Liq. Argon
14.	When rain is accompanied by a thunderstorm, the collected rain water will have pH?
	(AIEEE 2003)
	(a) slightly lower than that of rain water without thunderstorm
	(b) slightly higher than that of rain water without thunderstorm
	(c) uninfluenced by occurrence of thunderstorm
	(d) which depends on amount of dust in air
15.	The smog is essentially caused by the presence of: (AIREE 2004)
	(a) O_3 and N_2 (b) O_2 and O_2
0.0000	(c) Oxides of sulphur and N ₂ (d) O ₂ and O ₃
16.	
	(a) CF_2Cl_2 (b) C_7F_{16} (c) $C_6H_6Cl_6$ (d) C_6F_6
17.	Which of the following is responsible for depletion of ozone layer in upper strata of the
	atmosphere? (AIEEE 2004) (a) Polyhalogens (b) Ferrocene
	(1) 7
10	
18.	
	(a) Chlorofluorocarbons are responsible for ozone layer depletion
	(b) Green house effect is responsible for global warming
	(c) Ozone layer does not permit infrared radiation from the sun to reach the earth
	(d) Acid rain is mostly because of oxides of nitrogen and sulphur

19. Identify the incorrect statement from the following.

(AIEEE 2011)

- (a) Oxides of nitrogen in the atmosphere can cause the depletion of ozone layer
- (b) Ozone absorbs the intense ultraviolet radiation of the sun
- (c) Depletion of ozone layer is because of its chemical reactions with chlorofluoro alkanes
- (d) Ozone absorbs infra red radiations

20. What is DDT among the following?

(AIEEE 2012)

(a) Green house gas

(b) A fertilizer

(c) Biodegradable pollutant

- (d) Non-biodegradable pollutant
- 21. The gas leaked from a storage tank of the Union Carbide plant in Bhopal gas tragedy was:

[JEE (Main) 2013]

(a) Phosgene

(b) Methyl isocyanate

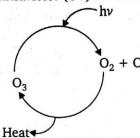
(c) Methyl amine

(d) Ammonia

Level 3

PASSAGE 1

When healthy, earth's stratosphere contains a low concentration of ozone (O₃) that absorbs potentially harmful ultraviolet (UV) radiations by the cycle shown below:



chlorofluoro carbon refrigerants, such as freon 12 (CF₂Cl₂), are stable in lower atmosphere, but in the stratosphere, they absorb high energy UV radiation to generate chlorine radicals.

$$CF_2Cl_2 \xrightarrow{h\nu} CF_2Cl+Cl^{\bullet}$$

The presence of small number of chlorine radicals appears to lower ozone concentrations dramatically. The following reactions are all known to be exothermic (except the one requiring light) and to have high rate constant.

A:
$$Cl \longrightarrow O \longrightarrow Cl \xrightarrow{hv} O_2 + 2Cl^{\bullet}$$

B:
$$Cl - O^{\bullet} + O \longrightarrow O_2 + Cl^{\bullet}$$

C:
$$Cl^{\bullet} + O_3 \longrightarrow Cl - O^{\bullet} + O_2$$

D:
$$2Cl - O^{\bullet} \longrightarrow Cl - O - O - Cl$$

- 1. Ozone has the ability to absorb:
 - (a) UV radiations

(b) electromagnetic radiations

(c) CFC

- (d) green house gases
- 2. Increased UV radiations due to hole in ozone layer:
 - (a) will cause increase in cases of skin diseases
 - (b) will cause more ice to melt
 - (c) will cause summer to be more warmer
 - (d) will cause more rain



ONE OR MORE ANSWERS IS/ARE CORRECT

- 1. Which of the following conditions shows the polluted environment?
 - (a) pH of rain water is 5.6
 - (b) amount of carbondioxide in the atmosphere is 0.03%
 - (c) biochemical oxygen demand 10 ppm.
 - (d) eutrophication
- - (a) enhanced growth of algae
 - (b) decrease in amount of dissolved oxygen in water
 - (c) deposition of calcium phosphate
 - (d) increase in fish population
- 3. The acids present in acid rain are
 - (a) Peroxyacetylnitrate

(b) H₂CO₃

(c) HNO₃

(d) H_2SO_4

- 4. The consequences of global warming may be
 - (a) increase in average temperature of the earth
 - (b) melting of Himalayan Glaciers
 - (c) increased biochemical oxygen demand
 - (d) eutrophication



MATCH THE COLUMN

Column-I and **Column-II** contains four entries each. Entries of column-I are to be matched with some entries of column-II. Each entry of column-I may have the matching with one or more than one entries of column-II.

(A) Acid rain (B) Photochemical smog (C) Combination with haemoglobin (D) Depletion of ozone layer (P) CHCl₂ — CHF₂ (Q) CO (R) CO₂ (S) SO₂ (T) Unsaturated hydrocarbons

2. Column-I

- (A) Oxides of sulphur
- (B) Nitrogen dioxide
- (C) Carbon dioxide
- (D) Nitrate in drinking water
- (E) Lead

3. Column-I (Activity)

- (A) Releasing gases to the atmosphere after burning waste material containing sulphur
- (B) Using carbamates as pesticides
- (C) Using synthetic detergents for washing clothes
- (D) Releasing gases produced by automobiles and factories in the atmosphere
- (E) Using chlorofluorocarbon compounds for cleaning computer parts

4. Column-I

- (A) Phosphate fertilizers in water
- (B) Methane in air
- (C) Synthetic detergents in water
- (D) Nitrogen oxides in air

Column-II

- (P) Global warming
- (O) Damage to kidney
- (R) 'Blue baby' syndrome
- (S) Respiratory diseases
- (T) Red haze in traffic and congested areas

Column-II (Effect)

- (P) Water pollution
- (Q) Photochemical smog, damage to plant life, corrosion to building material, induce breathing problems, water pollution
- (R) Damaging ozone layer
- (S) May cause nerve diseases in human
- (T) Classical smog, acid rain, water pollution, induce breathing problems, damage to buildings, corrosion of metals

Column-II

- (P) BOD level of water increases
- (Q) Acid ran
- (R) Global warming
- (S) Eutrophication

535



ASSERTION-REASON TYPE QUESTIONS

The questions given below consist of "Assertion" and their "Reason". Use the following key to choose the appropriate answer.

- (A) If both assertion and reason are CORRECT, and reason is the CORRECT explanation of the assertion.
- (B) If both assertion and reason are CORRECT, but reason is NOT the CORRECT explanation of the assertion.
- (C) If assertion is CORRECT but reason is INCORRECT.
- (D) If assertion is INCORRECT but reason is CORRECT.
- **1. Assertion**: Green house effect was observed in houses used to grow plants and these are made of green glass.
- Reason: Green house name has been given because glass houses are made of green glass.
- **2. Assertion :** The pH of acid rain is less than 5.6.
- **Reason** : Carbon dioxide present in the atmosphere dissolves in rain water and forms carbonic acid.
- Assertion : Photochemical smog is oxidising in nature.
 Photochemical smog contains NO₂ and O₃, which are formed during the sequence of reactions.
- 4. Assertion : Carbon dioxide is one of the important green house gases.
 Reason : It is largely produced by respiratory function of animals and plants.
- 5. Assertion : Ozone is destroyed by solar radiation in upper stratosphere.
 Eason : Thinning of the ozone layer allows excessive UV radiations to reach the surface
- of earth.

 6. Assertion: Excessive use of chlorinated synthetic pesticides causes soil and water
- pollution.

 Reason: Such pesticides are non-biodegradable.
- 7. Assertion : If BOD level of water in a reservoir is less than 5 ppm it is highly polluted.
 Reason : High biological oxygen demand means low activity of bacteria in water.

ANSWERS

Level

1. (d)	2.	(a)	3,	(b)	4.	(a)	6.	(b)	6.	(c)	7.	(b)	8.	(d)	9.	(d)	10.	(d)
11. (c)	12.	(a)	13.	(c)	14.	(b)	15.	(a)	16.	(a)	17.	(b)	18.	(d)	19.	(c)	20.	(d)
21. (b)	22.	(b)	23.	(b)	24.	(d)	25.	(d)	26.	(a)	27.	(d)	28.	(d)	29.	(c)		

Level 2

1.	(a)	2.	(c)	3.	(a)	4.	(a)	5.	(d)	6.	(c)	. 7.	(b)	8.	(b)	9.	(a)	10.	(c)
11.	(c)	12.	(d)	13.	(a)	14.	(a)	15.	(c)	16.	(a)	17.	(d)	18.	(c)	19.	(d)	20.	(d)
21.	(b)					l, ij.	YES.		(GE)				onto		3723				4

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Level

Passage-1 1. (a) 2. (a)

One or More Answers is/are correct

1. (c,d) 2. (a,b) 3. (b,c,d) 4. (a,b)

Match the Column

 $B \rightarrow T, S;$ $C \rightarrow Q$; 1. $A \rightarrow R$, S; $D \rightarrow P$ $B \rightarrow T$; $C \rightarrow P$; $D \rightarrow R$; 2. $A \rightarrow S$; $E \rightarrow O$ 3. $A \rightarrow T$; $B \rightarrow S$; $C \rightarrow P$; $D \rightarrow Q$; $E \rightarrow R$ $C \rightarrow P$; 4. $A \rightarrow P$, S; $B \rightarrow R$; $D \rightarrow Q$

Assertion-Reason Type Questions

1. (C) 2. (B) 3. (A) 4. (B) 5. (D) 6. (A) 7. (C)