SECTION–I : (i) Only One option correct Type

This section contains **06 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct. **3(–1)**

1. Choose the correct option in which all compounds are having same electron geometry of their central atom :-

(I) XeO_2F_2 (II) BrF_3 (III) SiF_2Cl_2 (IV) XeO_3F_2

(A) I and II only (B) II and III only (C) I, II and III only (D) I, II and IV only

2. Which of the following complex is inner orbital as well as diamagnetic in nature.

(A) $[Cr(NH_3)_6]^{3+}$ (B) MnO_4^{2-} (C) $[Fe(EDTA)]^-$ (D) $[Co(H_2O)_6]^{3+}$

3. Identify the correct statement

(A) The ppt of $BaCO_3$ is insoluble in dil HCl

(B) $Hg(NO_3)_2 + Na_2S \rightarrow$ white ppt of HgS

(C) $Na_2SO_4 + Hg(NO_3)_2 \rightarrow$ yellow ppt of $HgSO_4.2HgO$

(D) H_2S turns lime water milky

4. Identify the metal chloride salt **(P)** which give colourless clear solution with excess of NaOH and excess of NH_4OH. When metal chloride salt **(P)** treated with ammonium sulphide then white ppt is formed :

(A) $ZnCl_2$ (B) $MnCl_2$ (C) $FeCl_2$ (D) $SnCl_2$

5. Which of the following compound is/are used for oxygenating the submarine or spaceshuttle

(1) Na_2O_2 (2) KO_2 (3) KO_3 (4) All of these

6. Which of the following statement is correct -

(A) Froth floatation method can only be used for sulphide ore

(B) Tin stone is consisting of wolframite as non-magnetic impurity

(C) In cyanide process for the extraction of silver, Zn used as leaching agent

(D) Bessemerization process is used in the extraction of copper from copper pyrite

(ii) One or more options correct Type

This section contains **04 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** are correct. **4(–1)**

7. A sample of bauxite ore is made up of $Al_2O_3 + SiO_2 + TiO_2 + Fe_2O_3$. This ore is treated with conc. NaOH solution at 500 K and 35 bar pressure for few hours and filtered the species present in filtrate is / are :

(A) $Na[Al(OH)_4]$ (B) $Na_2[Ti(OH)_6]$ (C) Na_2SiO_3 (D) $Na[Fe(OH)_4]$

8. Choose the **CORRECT** statement from following :

(A) On hydrolysis of SOF_4 both products are acidic in nature

(B) The state of hybridisation of S-atom remains same in the hydrolysis product as in SOF_4

(C) The general formula for cyclic silicate and pyroxene chain silicate is same

(D) The number of planes containing maximum number of atoms in IF_5 is 3

9. The electronic configuration of four element are-

(i) $[Xe],6s^2$ (ii) $[Xe], 4f^{14}, , 5d^1, 6s^2$

(iii) [Ne], $3s^2$, $3p^5$ (iv) [Ar] , $3d^7$, $4s^2$

which of the following statements about these elements are true ?

(A) (i) is a strong reducing agent

(B) (ii) is a d-block element

(C) (iii) has more EA than fluorine (F).

(D) (iv) to get its dipositive ion two electrons are removed from 4s orbital

10. Choose the **CORRECT** statement from the following :

(A) Bond angle $\angle$ BFB increases due to back bonding in BF_3

(B) Bond angles are affected in PF_3 due to back bonding

(C) Bond angles are not affected in $B(OMe)_3$ due to back bonding

(D) B – F bond length decreases in BF_3 due to back bonding

(iii) Paragraph Type

This section contains **02 paragraphs** each describing theory, experiment, data etc. **Four questions** relate to two paragraphs with two questions on each paragraph. Each question of a paragraph has **only one correct answer** among the four choices (A), (B), (C) and (D).

Paragraph for Question 11 to 13

The crystal field theory is now much more widely accepted than the valence bond theory. It assumes that the attraction between the central metal atom and the ligands in a complex is purely electrostatic.

11. The complex $K_4[Zn(CN)_4(O_2)_2]$ is oxidised to $K_2[Zn(CN)_4(O_2)_2]$, then which of the following is correct -

(A) Zn (II) is oxidised into Zn(IV)

(B) O–O bond length decreases

(C) Paramagnetic nature decreases

(D) Complex becomes diamagnetic

12. Which of the following statement is correct -

(A) With d^2sp^3 hybridisation $[FeCl(CN)_4(O_2)]^{4-}$ complex is diamagnetic

(B) $[NiCl_4]^{2-}$ complex is more stable than $[Ni(dmg)_2]$ due to higher C.F.S.E. value

(C) $[V(CO)_6]$ is not very stable and easily reduces to $[V(CO)_6]^-$

(D) Ligand such as CO in $[Ni(CO)_4]$ acts as π-electron donor due to presence of filled π-molecular orbital.

13. Which of the following complex is inner orbital as well as low spin complex -

(A) $[Cr(H_2O)_6]^{3+}$ (B) $[Fe(CN)_6]^{3-}$ (C) $[Cu(CN)_4]^{3-}$ (D) $[Mn(NH_3)_6]^{2+}$

Paragraph for Question 14 to 16

Acidic gas (A) + Yellowish green gas (B) $\xrightarrow{\Delta}$ (C) $\xrightarrow{H_2O}$ (D) + (E)

(C) $\xrightarrow{NaOH}$ (F) + (G)

(i) D and E are both acids while F and G both are salts.

(ii) F(solid) + conc. H_2SO_4 + $K_2Cr_2O_7(s)$ $\xrightarrow{\Delta}$ reddish brown vapour which is passed into NaOH solution to give yellow solution.

(iii) Solution of (G) + $CaCl_2$ $\xrightarrow{\text{Filtered}}$ White residue insoluble in dil. mineral acid

14. The gas 'B' is

(A) SO_2 (B) CO_2 (C) CO (D) Cl_2

15. The compound (C) is -

(A) $COCl_2$ (B) $SOCl_2$ (C) SO_2Cl_2 (D) $CSCl_2$

16. The hybridisation state of central atom of the compound present in reddish brown vapour is-

(A) sp^3 (B) sp^3d (C) d^3s (D) sp^2

SECTION–II : Matrix-Match Type

This Section contains **02 question**. Question has **four statements** (A, B, C and D) given in **Column I** and five statements (P, Q, R, S and T) in **Column II**. Any given statement in Column I can have correct matching with **ONE** or **MORE** statement(s) given in Column II. For example, if for a given question, statement B matches with the statements given in Q and R, then for the particular question, against statement B, darken the bubbles corresponding to Q and R in the ORS. **8(0)**

1. **Match the column :**

Column-I (Cation in solution)		**Column-I (Correct characteristics when no where excess reagent is used)**	
(A)	Ag^+ and Pb^{2+}	(P)	can be distinguished by Na_2HPO_4 solution
(B)	Ba^{2+} and Mg^{2+}	(Q)	can be distinguished by dil.HCl
(C)	Pb^{2+} and Hg_2^{2+}	(R)	can be distinguished by KI solution
(D)	Ag^+ and Fe^{3+}	(S)	can be distinguished by NaOH solution

2. Match the column

Column-I (Compound)		**Column-II (Uses)**	
(A)	H_2	(P)	As rocket fuel
(B)	H_2O	(Q)	As moderators in nuclear reactors
(C)	D_2O	(R)	Bleaching agent
(D)	H_2O_2	(S)	For drinking purpose
		(T)	Fuel cell

SECTION-IV (NUMERICAL ANSWER)

1. All the alkali and alkaline earth metals dissolved in liquid ammonia, but few of them yields the metal on evaporation of ammonia from solution. Find the total number of such metals.

Na, K , Mg, Sr, Ca , Rb , Cs

2. Find total number of conditions in which reduction of Fe^{+3} (aq) ions to iron(II) takes place

(i) On exposure to air (ii) On addition of conc. HNO_3

(iii) On reaction with $SnCl_2$ (iv) On reaction with H_2O_2 / H^+

(v) On reaction with MnO_4^-/ H^+ (vi) On reaction with KI

(vii) On reaction with $Cr_2O_7^{2-}$/ H^+ (viii) H_2S / H^+

3. Total number of elements which have less IE_1 than that of 'N'.

Be, B, C, F, P, He

4. Assuming 2s-2p mixing is not operative , the paramagnetic species among the following are

Li_2, B_2, C_2, N_2, O_2, O_2^+, NO

5. Find sum of unpaired electrons in following compounds

$Na_3[FeF_6]$; $[Ni(H_2O)_6]SO_4$; $K_4[MnF_6]$; Brown ring complex ; $K_2[NiCl_4]$; O_2 ; KO_2