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**CHEMISTRY COACHING CIRCLE**

S.C.O. 208 (TF) Sector 24-D, Chandigarh. Ph. No. 0172-2713289 (O).

**INORGANIC CHEMISTRY TEST - 1**

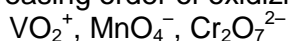
**READ INSTRUCTIONS CAREFULLY**

- The test is of **1 hour** duration.
- The maximum marks are **150**.
- This test consists of **50 questions. (Negative Marking)**
- For each question you will be **awarded 3 marks** if you have darkened only the bubble corresponding to the correct answer and **zero mark** if no bubbles are darkened. **Minus one (-1) mark** will be awarded for wrong answer

1. Among the following, the species that is both paramagnetic and coloured is:

- a.  $[\text{MnO}_4]^{2-}$                       b.  $[\text{TiCl}_6]^{2-}$                       c.  $[\text{VO}_4]^{3-}$                       d.  $\text{CrO}_2\text{Cl}_2$

2. Which of the following increasing order of oxidizing power is correct for the following specie?

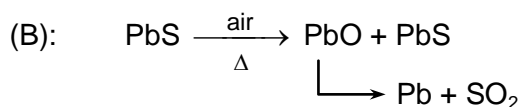
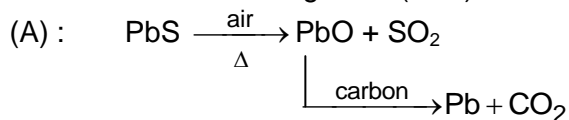


- a.  $\text{VO}_2^+ < \text{Cr}_2\text{O}_7^{2-} < \text{MnO}_4^-$                       b.  $\text{VO}_2^+ < \text{MnO}_4^- < \text{Cr}_2\text{O}_7^{2-}$   
c.  $\text{Cr}_2\text{O}_7^{2-} < \text{VO}_2^+ < \text{MnO}_4^-$                       d.  $\text{Cr}_2\text{O}_7^{2-} < \text{MnO}_4^- < \text{VO}_2^+$

3. Select the correct statement.

- In the decomposition of an oxide into oxygen and gaseous metal, entropy increases.
- Decomposition of an oxide is an endothermic change.
- To make  $\Delta G^\circ$  negative, temperature should be high enough so that  $T\Delta S^\circ > \Delta H^\circ$ .
- All are correct statements.

4. Main source of lead is galena (PbS). It is converted to Pb by:



Self – reduction process is:

- a. A                      b. B                      c. Both                      d. none

5. Which of the following statements is incorrect?

- Cassiterite ore of tin contains the impurities of Wol-framite which are separated by electromagnetic separator.
- Tin metal is obtained by the carbon reduction of black tindioxide
- In the extraction of lead from galena, the roasting and self-reduction are carried out in the same furnance at different temperature.
- Reduction agent of haematite in blast-furnace is coke in upper part and CO in lower part of furnance.

6. All the following complexes show decrease in their weights when placed in a magnetic balance then the group of complexes having tetrahedral geometry is:  
(i)  $\text{Ni}(\text{CO})_4$                       (ii)  $\text{K}[\text{AgF}_2]$                       (iii)  $\text{Na}_2[\text{Zn}(\text{CN})_4]$                       (iv)  $\text{K}_2[\text{PtCl}_4]$                       (v)  $[\text{RhCl}(\text{PPh}_3)_3]$   
a. (ii), (iii), (v)                      b. (i), (ii), (iii)                      c. (i), (iii), (iv)                      d. (i), (iii)
7. Which of the following ions is not identified by  $\text{AgNO}_3$  solution?  
a.  $\text{F}^-$                       b.  $\text{Cl}^-$                       c.  $\text{Br}^-$                       d.  $\text{I}^-$
8. What would you observe if you add with shaking excess of dilute  $\text{NaOH}$  solution to an aqueous solution of  $\text{AlCl}_3$ ?  
a. A permanent white ppt. is formed  
b. No change at first, but a white ppt. is formed on standing  
c. A white ppt. is formed which later dissolves  
d. A green ppt. which turns red on standing in air
9. Which of the following reactions does not produce ammonia?  
a.  $\text{NH}_4\text{NO}_3 + \text{KOH}(\text{aq.}) \longrightarrow$                       b.  $\text{NaNO}_3 + \text{KOH} \xrightarrow{\text{Zn dust}}$   
c.  $\text{AlN} + \text{dil. HCl} \longrightarrow$                       d.  $\text{NH}_4\text{NO}_2(\text{s}) \xrightarrow{\Delta}$
10. Which of the following products are formed when potassium bromide reacts with potassium permanganate in alkaline pH?  
a.  $\text{BrO}_3^-$ ,  $\text{MnO}_2$                       b.  $\text{BrO}_4^-$ ,  $\text{Mn}^{2+}$                       c.  $\text{Br}_2$ ,  $\text{MnO}_2$                       d.  $\text{BrO}^-$ ,  $\text{MnO}_4^{2-}$
11. Which of the following product is formed by the reaction of manganese (II) ions salt with peroxodisulphate ( $\text{S}_2\text{O}_8^{2-}$ ) ?  
a.  $\text{Mn}_2\text{O}_7$                       b.  $\text{Mn}_3\text{O}_4$                       c.  $\text{MnO}_4^{2-}$                       d.  $\text{MnO}_4^-$
12. The yellow colour solution of  $\text{Na}_2\text{CrO}_4$  changes to orange red on passing  $\text{CO}_2$  gas due to the formation of  
a.  $\text{CrO}_5$                       b.  $\text{CrO}_3$                       c.  $\text{Na}_2\text{Cr}_2\text{O}_7$                       d.  $\text{Cr}_2\text{O}_3$
13. Which of the following statements is incorrect?  
a. The  $\text{Ni}^{2+}$  (aq) cation is coloured because  $\text{Ni}^{2+}$  ion can absorb light, which promotes electrons from the filled d-orbitals to the higher energy half-filled d-orbitals.  
b. The  $\text{Zn}^{2+}$  (aq) cation is colourless because the d-orbitals are completely filled and no electrons can be promoted, so no light is absorbed.  
c. A complex which has just one absorption band at 455 nm (Blue), must be red coloured  
d. none
14. Which of the following complexes are diamagnetic?  
 $[\text{Pt}(\text{NH}_3)_4]^{2+}$                        $[\text{Co}(\text{SCN})_4]^{2-}$                        $[\text{Cu}(\text{en})_2]^{2+}$                        $[\text{HgI}_4]^{2-}$   
square planar                      tetrahedral                      square planar                      tetrahedral  
(i)                      (ii)                      (iii)                      (iv)  
a. (i) and (ii)                      b. (ii) and (iii)                      c. (i) and (iv)                      d. (iii) and (iv)
15. The increase in bond length in CO as compared to carbon monoxide is due to:  
a. the donation of lone pair of electrons on the carbon into a vacant orbital of the metal atom  
b. the donation of a pair of electrons from a filled d-orbital of metal into the vacant antibonding  $\pi^*$  orbital of carbon monoxide.  
c. (A) and (B) both  
d. None

16. **S<sub>1</sub>**:  $[\text{MnCl}_6]^{3-}$ ,  $[\text{FeF}_6]^{3-}$  and  $[\text{CoF}_6]^{3-}$  are paramagnetic having four, five and four unpaired electrons respectively.

**S<sub>2</sub>**: Valence bond theory gives an explanation of colour of coordination compounds.

**S<sub>3</sub>**: The crystal field splitting  $\Delta_0$ , depends upon the field produced by the ligand and charge on the metal ion.

- a. T T T                                      b. T F T                                      c. F T F                                      d. T F F

17. Which amongst the following metal carbonyls are inner orbital complexes with diamagnetic property?

(I)  $\text{Ni}(\text{CO})_4$ ;                                      (II)  $\text{Fe}(\text{CO})_5$ ;                                      (III)  $\text{V}(\text{CO})_6$                                       (IV)  $\text{Cr}(\text{CO})_6$

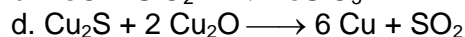
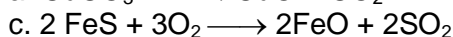
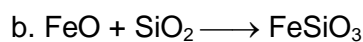
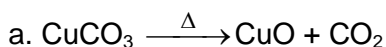
Select the correct answer from the codes gives below:

- a. I and II only                                      b. II, III and IV only                                      c. II and IV only                                      d. I, II and IV only

18. Which one of the following metal carbonyls involves the  $d^2sp^3$  hybridisation for the formation of metal-carbon  $\sigma$  bond and is paramagnetic.

- a.  $[\text{Cr}(\text{CO})_6]$                                       b.  $[\text{V}(\text{CO})_6]$                                       c.  $[\text{Mo}(\text{CO})_6]$                                       d.  $[\text{W}(\text{CO})_6]$

19. Which of the following reactions does not occur in Bessemer converter in the extraction of copper from chalcopyrites.



20. Silver is extracted from its native ore by:

- a. formation of soluble complex by dilute solution of NaCN in presence of air followed by the reduction with zinc.  
b. formation of soluble complex by dilute solution of NaCN in absence of air followed by the reduction with zinc.  
c. roasting followed by the self reduction.  
d. roasting followed by the electrolytic reduction.

21. Which of the following is not correctly matched?

- a. Red bauxite                                      —                                      Purification by Serpeck's method.  
b. Iron from haematite                                      —                                      Carbon monoxide reduction.  
c. Calamine                                      —                                      Carbonate ore.  
d.  $\text{FeSiO}_3$                                       —                                      Slag obtained in the extraction of copper

22. Which of the following pair of compounds is expected to exhibit same colour in aqueous solution?

- a.  $\text{FeCl}_2$ ,  $\text{CuCl}_2$                                       b.  $\text{VOCl}_2$ ,  $\text{CuCl}_2$                                       c.  $\text{VOCl}_2$ ,  $\text{FeCl}_2$                                       d.  $\text{FeCl}_2$ ,  $\text{MnCl}_2$

23. Titanium shows magnetic moment of 1.73 BM in its compound. What is the oxidation state of titanium in the compound?

- a. +2                                      b. +1                                      c. +3                                      d. +4

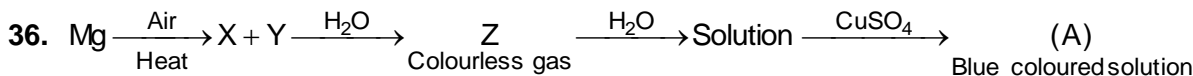
24. Identify the incorrect statement.

- a.  $\text{Mn}^{2+}$  has the highest paramagnetism amongst the bivalent cations of the 1st transition series.  
b. The coloured ions or compounds of transition elements are due to d-d transition, polarization of anion and charge transfer spectrum.  
c. In 3d series the paramagnetic character first increase to maximum & then starts decreasing.  
d. Higher oxidation states are more known for Lanthanide than actinoid.

25. The IUPAC name of  $[\text{Pt}(\text{NH}_3)_4\text{NO}_2\text{Cl}]\text{SO}_4$  is
- a. tetraaminechloridonitro-N-platinum(IV) sulphate      b. tetraaminerchlorionitro-O-platinum(IV) sulphate  
c. chloridonitrotetraamineplatinum(IV) sulphate      d. platinum(IV) tetraaminenitrochlorido sulphate
26. Which of the following statements is incorrect?
- a. All halogens form oxyacids.  
b. All halogens show -1, +1, +3, +5 and +7 oxidation state  
c. Hydrofluoric acid forms  $\text{KHF}_2$ ,  $\text{K}_2\text{F}_2$  and attacks glass.  
d. Oxidising power of halogens follows the order  $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$
27. Copper sulphate solution decolourises on addition of potassium cyanide due to the formation of
- a.  $[\text{Cu}(\text{CN})_4]^{2-}$       b.  $[\text{Cu}(\text{CN})_4]^{3-}$       c.  $\text{Cu}(\text{CN})_2$       d.  $\text{CuCN}$
28. When rain is accompanied by a thunderstorm, the collected rainwater will have a pH value
- a. slightly lower than that of rainwater without thunderstorm  
b. slightly higher than that when the thunderstorm is not there  
c. uninfluenced by the occurrence of thunderstorm  
d. depends upon the amount of dust in air.
29. Two compounds pentaamminesulphatocobalt(III) bromide and pentaamminesulphatocobalt(III) chloride represent
- a. linkage isomerism      b. ionisation isomerism  
c. coordination isomerism      d. no isomerism
30. Which of the following molecules has planar structure?
- a.  $\text{N}_2\text{F}_3^+$       b.  $\text{NH}_2\text{OH}$       c.  $\text{PSCl}_3$       d.  $\text{PF}_3\text{Cl}_2$
31. In which of the following coordination entities the magnitude of  $\Delta_0$  (CFSE in octahedral field) will be maximum? (At. no. of Co = 27)
- a.  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$       b.  $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$       c.  $[\text{Co}(\text{NH}_3)_6]^{3+}$       d.  $[\text{Co}(\text{CN})_6]^{3-}$
32. The colour of  $\text{CuCr}_2\text{O}_7$  solution in water is green because
- a.  $\text{Cr}_2\text{O}_7^{2-}$  ions are green      b.  $\text{Cu}^{2+}$  ions are green  
c. both  $\text{Cr}_2\text{O}_7^{2-}$  and  $\text{Cu}^{2+}$  ions are green      d.  $\text{Cu}^{2+}$  ions are blue and  $\text{Cr}_2\text{O}_7^{2-}$  ions are yellow.
33. Hydrolysis of  $\text{PI}_3$  yields
- a. a monobasic acid and a salt      b. a monobasic acid and a dibasic acid  
c. a dibasic acid and a tribasic acid      d. a monobasic acid and a tribasic acid.
34. Metals of group -12 are softer than other transition metals because:
- a. group - 12 metals have a cage -like structure  
b. group - 12 metals have high ionization energies  
c. s as well as d-electrons take part in metallic bonding  
d. d-electrons do not take part in metallic bonding

35. Phosphine is not evolved when

- a. white phosphorus is boiled with a strong solution of Ba(OH)<sub>2</sub>
- b. phosphorous acid is heated
- c. calcium hypophosphite is heated
- d. metaphosphoric acid is heated



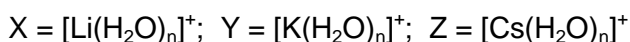
Substances, X, Y, Z and A are respectively:

- a. Mg<sub>3</sub>N<sub>2</sub>, MgO, NH<sub>3</sub>, CuSO<sub>4</sub> · 5H<sub>2</sub>O
- b. Mg(NO<sub>3</sub>)<sub>2</sub>, MgO, H<sub>2</sub>, CuSO<sub>4</sub> · 5H<sub>2</sub>O
- c. MgO, Mg<sub>3</sub>N<sub>2</sub>, NH<sub>3</sub>, [Cu(NH<sub>3</sub>)<sub>4</sub>]SO<sub>4</sub>
- d. Mg(NO<sub>3</sub>)<sub>2</sub>, MgO<sub>2</sub>, H<sub>2</sub>O<sub>2</sub>, CuSO<sub>4</sub> · 5H<sub>2</sub>O

37. The alkali metal which can emit its outermost electron under the influence of even candle light is:

- a. Na
- b. Rb
- c. K
- d. Cs

38. Consider the following abbreviations for hydrated alkali metal ions:



Which is the correct order of size of these hydrated alkali metal ions?

- a. X > Y > Z
- b. Z > Y > X
- c. X = Y = Z
- d. Z > X > Y

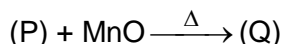
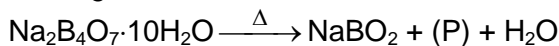
39. Which of the following cannot be used for the preparation of H<sub>2</sub>?

- a. Zn + HCl (dil.) →
- b. NaH + H<sub>2</sub>O →
- c. Zn + HNO<sub>3</sub>(dil.) →
- d. Fe + H<sub>2</sub>O  $\xrightarrow{\text{steam}}$

40. Which of the following on thermal decomposition yields a basic as well as an acidic oxide?

- a. KClO<sub>3</sub>
- b. Na<sub>2</sub>CO<sub>3</sub>
- c. NaNO<sub>3</sub>
- d. CaCO<sub>3</sub>

41. In the given reactions,



(P) and (Q) are respectively

- a. Na<sub>3</sub>BO<sub>3</sub>, Mn<sub>3</sub>(BO<sub>3</sub>)<sub>2</sub>
- b. Na<sub>2</sub>(BO<sub>2</sub>)<sub>2</sub>, Mn(BO<sub>2</sub>)<sub>2</sub>
- c. B<sub>2</sub>O<sub>3</sub>, Mn(BO<sub>2</sub>)<sub>2</sub>
- d. None of the above

42. Phosphine, acetylene and ammonia can be formed by treating water with

- a. Mg<sub>3</sub>P<sub>2</sub>, Al<sub>4</sub>C<sub>3</sub>, Li<sub>3</sub>N
- b. Ca<sub>3</sub>P<sub>2</sub>, CaC<sub>2</sub>, Mg(NO<sub>3</sub>)<sub>2</sub>
- c. Ca<sub>3</sub>P<sub>2</sub>, CaC<sub>2</sub>, CaNCN
- d. Ca<sub>3</sub>P<sub>2</sub>, MgC<sub>2</sub>, NH<sub>4</sub>NO<sub>3</sub>

43. A Metal M readily forms water soluble sulphate MSO<sub>4</sub>, water insoluble hydroxide M(OH)<sub>2</sub> and oxide MO which becomes inert on heating. The hydroxide is soluble in NaOH. The metal M is

- a. Be
- b. Mg
- c. Ca
- d. Sr

44. Hydride of boron occurs as  $B_2H_6$  but  $B_2Cl_2$  does not exist. This is because

- $p\pi-d\pi$  back bonding is possible in  $B_2H_6$  but not in  $B_2Cl_6$
- boron and hydrogen have almost equal values of electronegativity
- boron and chlorine have almost equal atomic sizes
- small hydrogen atoms can easily fit in between boron atoms but large chlorine atoms do not.

45. For one of the element various successive ionisation energies (in  $\text{kJ mol}^{-1}$ ) are given below:

Ionisation energy	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>
	577.5	1810	2750	11580	14820

The element is

- magnesium
- aluminium
- silicon
- phosphorus

46. Match the list I with List II and select the correct answer using the code given below the lists:

List – I		List – II	
P.	Clark's method	1.	$Na_6P_6O_{18}$
Q.	Calgon's method	2.	$NaAlSiO_4$
R.	Ion – exchange method	3.	$RSO_3H$
S.	Synthetic resins method	4.	$Ca(OH)_2$

- |                |                |                |                |
|----------------|----------------|----------------|----------------|
| <b>P Q R S</b> | <b>P Q R S</b> | <b>P Q R S</b> | <b>P Q R S</b> |
| a. 3 4 1 2     | b. 2 1 4 3     | c. 4 1 2 3     | d. 4 3 2 1     |

47. Match List I with List II and select the correct answer using the code given below the lists:

List I	List II
1. Heavy water	(a) Bicarbonates of Mg of and Ca in water
2. Temporary hard water	(b) No foreign ions in water
3. Soft water	(c) $D_2O$
4. Permanent hard water	(d) Sulphates and chlorides of Mg and Ca in water

**Codes:**

- |                               |                               |
|-------------------------------|-------------------------------|
| a. 1 – c, 2 – d, 3 – b, 4 – a | b. 1 – b, 2 – a, 3 – c, 4 – d |
| c. 1 – b, 2 – d, 3 – c, 4 – a | d. 1 – c, 2 – a, 3 – b, 4 – d |

48. In which of the following arrangements the order is not according to the property indicated against it?

- $Al^{3+} < Mg^{2+} < Na^+ < F^-$  - increasing ionic size
- $B < C < N < O$  – increasing first ionisation energy
- $I < Br < F < Cl$  – increasing electron gain enthalpy (with negative sign)
- $Li < Na < K < Rb$  – increasing metallic radius

49. An alkali metal hydride (NaH) reacts with diborane in Y to give a tetrahedral compound Z which is extensively used as reducing agent in organic synthesis. The Y and Z respectively are

- $C_2H_6, C_2H_5Na$
- $(C_2H_5)_2O, NaBH_4$
- $NH_3, B_3N_3H_6$
- $C_3H_8, C_3H_7Na$

50. Which one of the following statements about the zeolites is false?

- They are used as cation exchangers.
- They have open structure which enables them to take up small molecules
- Zeolites are aluminosilicates having three dimensional network.
- Some of the  $SiO_4^{4-}$  units are replaced by  $AlO_4^{5-}$  and  $AlO_6^{9-}$  ions in zeolites

**+2 Inorganic Chemistry Test – 1 (Answers)**

1. A

**Sol.**  $[\text{MnO}_4]^{2-}$ ; Mn is in +6 oxidation state. Electronic configuration is  $[\text{Ar}]^{18}3d^14s^0$ . As it contains one unpaired electron it is paramagnetic and green coloured because of d-d transition in visible region.

2. A

**Sol.** This is due to the increasing stability of the lower species to which they are reduced.

3. D

**Sol.** (a), (b) and (c) statements are correct

4. B

**Sol.** PbS reduces PbO to Pb and  $\text{SO}_2$  is liberated. This is called as self-reduction.

5. D

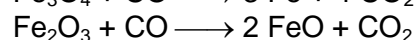
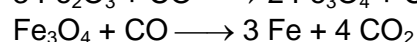
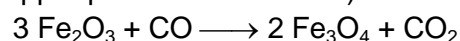
**Sol.** (A) Cassiterite contains iron & manganese tungstate, called as Wolframite. They have magnetic properties.

(B) Purified ore that contains 70%  $\text{SnO}_2$  is called black tin.

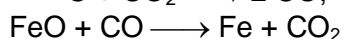
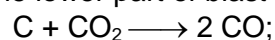


(C) Roasting is done at moderate temperature in presence of air in reverberatory furnace. Then air supply is stopped and temperature is increased to melt the mass when self-reduction takes place.

(D) At 50 – 800 K (lower temperature range in the upper part of blast furnace)



At 900 – 1500 K (higher temperature range in the lower part of blast furnace):



6. D

**Sol.**  $\text{Ni}(\text{CO})_4$  –  $sp^3$  (CO strong field ligand);  $[\text{K}[\text{AgF}_2]]$ ; sp; diamagnetic

$[\text{Zn}(\text{CN})_4]^{2-}$  –  $sp^3$  ( $3d^{10}$  electron configuration);

$[\text{PtCl}_4]^{2-}$  –  $dsp^2$  ( $5d^8$  electron configuration)

$[\text{RhCl}(\text{PPh}_3)_3]$  –  $dsp^2$  ( $4d^8$  electron configuration)

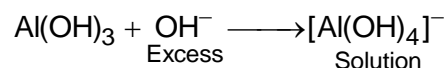
all complexes are diamagnetic in nature which show decrease in their weights in magnetic field as they are repelled by magnetic field

7. A

**Sol.** AgF = Water soluble

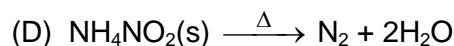
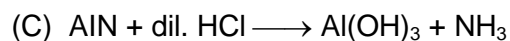
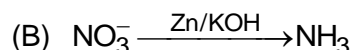
8. C

**Sol.**  $\text{Al}^{3+} + \text{NaOH} \rightarrow \text{Al}(\text{OH})_3$   
(White ppt.)



9. D

**Sol.** (A)  $\text{NH}_4^+ + \text{KOH} \rightarrow \text{K}^+ + \text{NH}_3 + \text{H}_2\text{O}$



10. A

**Sol.**  $2\text{KMnO}_4 + \text{KBr} + \text{H}_2\text{O} \rightarrow \text{KBrO}_3 + 2\text{KOH} + 2\text{MnO}_2$

11. D

**Sol.**  $2\text{Mn}^{+2} + 5\text{S}_2\text{O}_8^{2-} + 8\text{H}_2\text{O} \rightarrow 2\text{MnO}_4^- + 10\text{SO}_4^{2-} + 16\text{H}^+$

12. C

**Sol.**  $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3 \rightleftharpoons 2\text{H}^+ + \text{CO}_3^{2-}$  ;  
 $\text{CrO}_4^{2-} + 2\text{H}^+ \rightarrow \text{Cr}_2\text{O}_7^{2-}$  (orange red) +  $\text{H}_2\text{O}$

13. C

**Sol.** As it adsorbs blue colour light ( $\lambda = 455 \text{ nm}$ ), the colour of the complex must be orange.

14. C

**Sol.** (i)  $_{78}\text{Pt}(\text{II})$  has  $5d^8$  configuration, all electrons are paired; so diamagnetic.

(ii)  $_{27}\text{Co}^{2+}$  has  $3d^7$  configuration;  $\text{SCN}^-$  is weak field ligand. So the complex is paramagnetic with three unpaired electrons.

(iii)  $_{29}\text{Cu}^{2+}$  has  $3d^9$  configuration; complex is paramagnetic with one unpaired electron.

(iv)  $_{80}\text{Hg}^{2+}$  has  $5d^{10}$  configuration; all electrons are paired so diamagnetic.

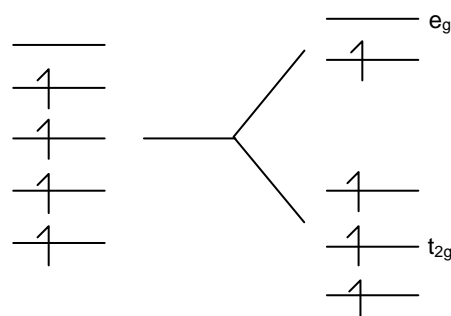
15. B

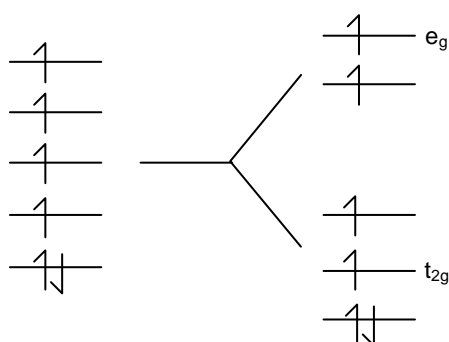
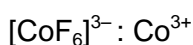
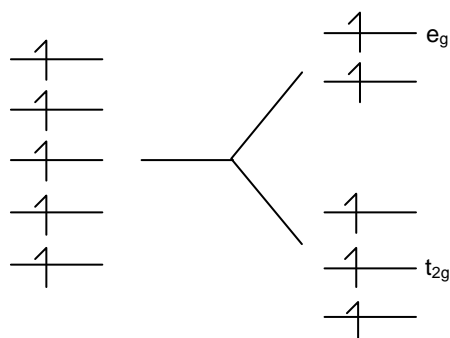
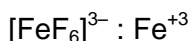
**Sol.** Donation of electrons from a filled d-orbital of metal into the vacant antibonding  $\pi^*$  bonding orbital of CO decreases the bond order three to two and half or slightly more thus increasing the bond length between C – O.

$$\text{Bond order} \propto \frac{1}{\text{Bond length}}$$

16. B

**Sol.**  $\text{S}_1$ :  $[\text{MnCl}_6]^{3-} : \text{Mn}^{+3}$



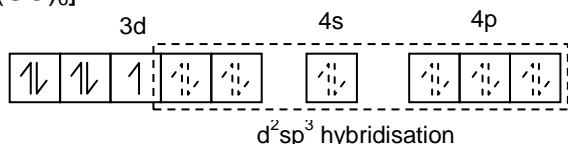
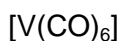
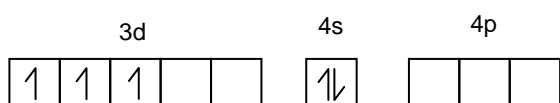


17. C

Sol. Ni(CO)<sub>4</sub> sp<sup>3</sup> diamagnetic  
 Fe(CO)<sub>5</sub> dsp<sup>3</sup> diamagnetic  
 V(CO)<sub>6</sub> d<sup>2</sup>sp<sup>3</sup> paramagnetic  
 Cr(CO)<sub>6</sub> d<sup>2</sup>sp<sup>3</sup> diamagnetic

18. B

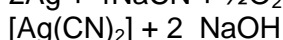
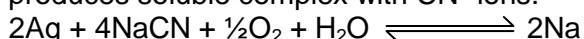
Sol. V = 23



19. A

20. A

Sol. O<sub>2</sub> oxidises silver to silver (I) ion which then produces soluble complex with CN<sup>-</sup> ions.



21. A

Sol. Red bauxite contains the impurities of iron oxides, titanium oxide and silica which are removed by Baeyer's and Hall's processes. The Serpeck's method is used when bauxite contains only the impurity of silica.

22. B

Sol. Both V<sup>4+</sup> ([Ar]<sup>18</sup>d<sup>1</sup> 4s<sup>0</sup>) and Cu<sup>2+</sup> ([Ar]<sup>18</sup> d<sup>9</sup> 4s<sup>0</sup>) have one unpaired electron in the d-orbital and thus exhibit same colour.

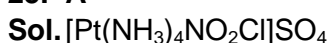
23. C

Sol.  $\mu = 1.73$  i.e. one unpaired electron, Ti (E.C.) = [Ar]<sup>18</sup> 3d<sup>2</sup>, 4s<sup>2</sup>, so it will lose three electrons to have one unpaired electron and thus the oxidation state of titanium is +3.

24. D

Sol. (A) Has five unpaired electrons in 3d-sub shell (B) is a obvious fact (C) number of unpaired electrons first increase to five and then pairing begins so number of unpaired electrons decreases.

25. A

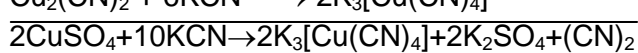
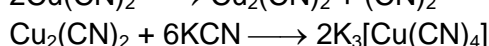
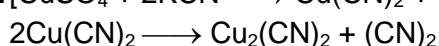
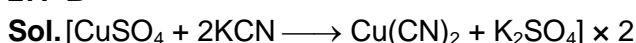


Tetraamminechloridation-N-platinum(IV) sulphate

26. B

Sol. Fluorine shows only - 1 oxidation state.

27. B

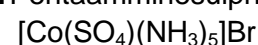


28. A

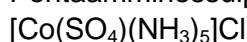
Sol. Normal rainwater has pH 5.6. Thunderstorm results in the formation of NO and HNO<sub>3</sub> which lowers the pH.

29. D

Sol. Pentaamminesulphatecobalt(III) bromide:



Pentaamminesulphatecobalt (III) chloride:



Two compounds have different molecular formulae hence no isomerism exists between the two

30. A

Sol. (a) Planar

(b) Pyramidal at F – N = N  $\begin{matrix} + \\ \text{F} \\ \text{F} \end{matrix}$  and bent at O

(c) Tetrahedral

(d) Trigonal bipyramidal with apical Cl atom

31. D

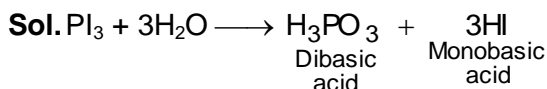
Sol. Greater the charge on central metal ion and stronger the field of ligand, greater is the  $\Delta_0$  value (CFSE). According to the spectrochemical series, the increasing order of  $\Delta_0$  is  $\text{C}_2\text{O}_4^{2-} < \text{H}_2\text{O} < \text{NH}_3 < \text{CN}^-$



32. D

Sol.  $\text{CuCr}_2\text{O}_7$  solution is green because  $\text{Cu}^{2+}$  ions are blue and  $\text{Cr}_2\text{O}_7^{2-}$  ions are yellow in aqueous medium. Both blue and yellow colours mix up to give green colour.

33. B



34. D

Sol. Metals of group-12 are softer than other transition metals due to comparatively weak metallic bond since their d-electrons do not take part in metallic bonding.

35. D

36. C

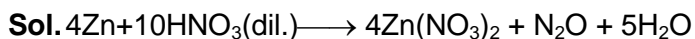
37. D

Sol. Cs because of its low IE emits electron under the influence of even candle light.

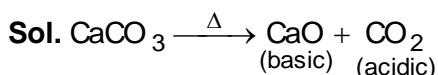
38. A

Sol. Smaller the cation, greater is the degree of hydration decreases from  $\text{Li}^+$  to  $\text{Cs}^+$ .

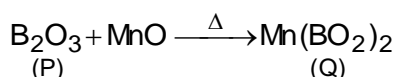
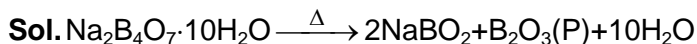
39. C



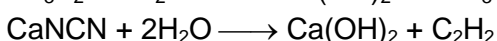
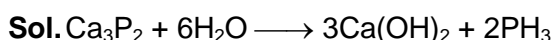
40. D



41. C

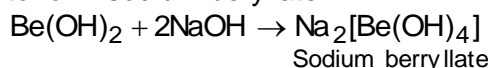


42. C



43. A

Sol. The metal M is Be. Its oxide BeO has high melting point. Its hydroxide dissolves in NaOH to form sodium beryllate.



$\text{BeSO}_4$  is highly soluble in water.  $\text{Be}(\text{OH})_2$  is insoluble in water

44. D

Sol. Trihalides of B are electron deficient compounds and do not exist as dimers.  $\text{B}_2\text{H}_6$  has different types of bonding in which two H atoms act as bridged atoms.

45. B

Sol. 3<sup>rd</sup> ionisation energy = 2750 kJ/mol

4th ionisation energy = 11580 kJ/mol

4th ionisation energy is much higher than 3rd ionisation energy, it means removal of 4th

electron is from the stable configuration  $\text{Al}^{3+}(2s^2, 2p^6)$ , hence aluminium is the element.

46. C

47. D

Sol. Heavy water –  $\text{D}_2\text{O}$

Temporary Hard water – Bicarbonates of Mg/Ca in water

Soft water – No foreign ions in water

Permanent hard water – Sulphates and chlorides of Mg/Ca in water

Soft water – No foreign ions in water

Permanent hard water – Sulphates and chlorides of Mg/Ca in water

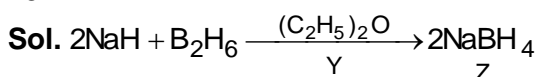
48. B

Sol. As we move from left to right across a period, ionisation enthalpy increases with increasing atomic number. So the order of increasing ionisation enthalpy should be  $\text{B} < \text{C} < \text{N} < \text{O}$ .

But  $\text{N}(1s^2 2s^2 2p^3)$  has a stable half filled electronic configuration. So, ionisation enthalpy of nitrogen is greater than oxygen.

So, the correct order of increasing first ionisation enthalpy is  $\text{B} < \text{C} < \text{O} < \text{N}$

49. B



50. D