Resonance
Educating for better tomorrow

TARGET : JEE (ADVANCED) 2015

INORGANIC CHEMISTRY
DPP
DAILY PRACTICE PROBLEMS
NO. 08

Course : VIJETA & VIJAY (ADP & ADR) Date : 01-05-2015

TEST INFORMATION

DATE : 03.05.2015 AII INDIA OPEN TEST (AIOT) - 02

Syllabus : Full Syllabus

DPP No. # 08 (JEE-ADVANCED)

Total Marks : 169 **Max. Time : 137 min.**

Single choice Objective (–1 negative marking) Q.1 to Q.15	(3 marks 2½ min.)	[45, 37½]
Multiple choice objective (–1 negative marking) Q.16 to Q.20	(4 marks, 3 min.)	[20, 15]
Assertion and Reason ('–1' negative marking) Q.21 to Q.23	(3 marks 2½ min.)	[09, 7½]
Comprehension (–1 negative marking) Q.24 to Q.32	(3 marks 2½ min.)	[27, 22½]
Single Digit Subjective Questions (no negative marking) Q.33 to Q.41	(4 marks 2½ min.)	[36, 22½]
Match the column (4 vs 4) (no negative marking) Q.42 to Q.43	(8 marks, 8 min.)	[16, 16]
Match the column (4 vs 5) (no negative marking) Q.44 to Q.45	(8 marks, 8 min.)	[16, 16]

1. Which of the following statements is false ?
(A) In 3d series, there is a regular increase in the first ionisation enthalpy of transition elements from left to right.
(B) In 3d series, the negative value of standard electrode potential (E^0) for M^{2+}/M decreases in the order Ti > Mn > Cr > Fe.
(C) The decrease in metallic radius coupled with increase in atomic mass results in a general increase in the density of transition elements from Ti to Cu.
(D) The higher oxidation state are favoured by the heavier elements (i.e. heavier members) in the groups of d-block.

2. Extraction of zinc from zinc blende is done industrially by :
(A) electrolytic reduction (B) roasting followed by reduction with carbon
(C) roasting followed by reduction with another metal (D) roasting followed by self-reduction

3. Which of the nitrates on strong heating leaves the metal as the residue ?
(A) $AgNO_3$ (B) $Pb(NO_3)_2$ (C) $Cu(NO_3)_2$ (D) $Al(NO_3)_3$

4. Manganous salt in presence of catalyst zinc sulphate or zinc oxide is oxidised by potassium permanganate in neutral or faintly alkaline medium to :
(A) MnO_2 (B) Mn_2O_7 (C) Mn_2O_3 (D) Can not be oxidised

5. V_2O_5 reacts with alkalies to give :
(A) VO_4^{3-} (B) VO_4^{+} (C) VO^{2+} (D) VO_2^{2+}

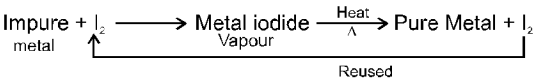
6. A white crystalline substance dissolves in water. On passing H_2S gas in this solution, a black precipitate is obtained. The black precipitate dissolves completely in hot HNO_3. On adding a few drops of conc. H_2SO_4, a white precipitate is obtained. This precipitate is that of :
(A) $BaSO_4$ (B) $SrSO_4$ (C) $PbSO_4$ (D) $CdSO_4$

7. Salt mixture $\xrightarrow{\text{dil. HCl}}$ white ppt. $\xrightarrow[\text{and filtered under hot condition}]{\text{Heated}}$ Filtrate $\xrightarrow{\text{Cooled}}$ white needle like crystal
Residue $\xrightarrow{NH_3 \text{ Sol.}}$ Clear solution

Salt is consisting of cations :
(A) Pb^{2+} and Hg^{2+} (B) Ag^{+} and Hg_2^{2+} (C) Pb^{2+} and Ag^{+} (D) None of these

8. An aqueous solution of a substance (X) gives a black precipitate on treatment with H_2S gas in presence of NH_4OH and NH_4Cl which dissolves in aqua regia on heating. The ammoniacal solution of substance (X) gives red precipitate with dimethylglyoxime. The substance (X) is :
(A) Cu^{2+} salt (B) Fe^{3+} salt (C) Ni^{2+} salt (D) Pb^{2+} salt

9. Consider the following metallurgical processes :
(i) Heating impure metal with CO and distilling the resulting volatile carbonyl (boiling point 43ºC) and finally decomposing at 150ºC to 200ºC to get the pure metal.
(ii) Heating the sulphide ore in air until a part is converted to oxide and then further heating in the absence of air to let the oxide react with unchanged sulphide.
(iii) Electrolysing the molten electrolyte containing approximately equal amounts of the metal chloride and $CaCl_2$ to obtain the metal.
The process used for obtaining sodium, nickel and copper are, respectively,
(A) (i), (ii) and (iii) (B) (ii), (iii) and (i) (C) (iii), (i) and (ii) (D) (ii), (i) and (iii)

10. 

The above method of purification is :
(A) Van – arkel process for Zr, Hg etc (B) Distillation for Zn, Cd, Hg etc
(C) Electro refining for W, Ag, Au, etc (D) Zone refining of germanium, gallium, silicon etc.

11. Which of the following is desirable as a slag in extraction of copper but not during the extraction of iron ?
(A) $CuFeS_2$ (B) $FeSiO_3$ (C) $CaSiO_3$ (D) $CuSiO_3$

12. Which of the following is not correctly matched with respect to the processes involved in the extractive metallurgy of the respective metal ?
(A) $Al_2O_3.2H_2O \rightarrow Al$: Leaching, precipitation, calcination and electrolytic reduction (molten state).
(B) $Ag_2S \rightarrow Ag$: Leaching and displacement method.
(C) $PbS \rightarrow Pb$: Froth flotation process, roasting and self reduction.
(D) $KCl.MgCl_2.6H_2O \rightarrow Mg$: Dehydration by simple heating and electrolytic reduction (molten state).

13. Which of the following will not give positive chromyl chloride test :
(A) Copper chloride, $CuCl_2$ (B) Mercuric chloride, $HgCl_2$
(C) Zinc chloride, $ZnCl_2$ (D) Aniline hydro chloride $C_6H_5NH_2.HCl$

14. Which of the following statements is correct for matte which is formed during extraction of copper ?
(A) Matte is a molten mixture of mostly cuprous sulphide and a little iron sulphide
(B) Matte is a solid mass consisting of CuO and FeO.
(C) Matte is a molten mixture largely consisiting of CuS and FeS_2. (D) None of these

15. H_2S and SO_2 can be distinguished by :
(A) Litmus paper (B) MnO_4^- (C) $(CH_3COO)_2Pb$ (D) None of these

16.* Which of the following statements is/are true about Mohr's salt ?
(A) It decolourises $KMnO_4$ (B) It gives NH_3 on heating with KOH.
(C) It is a double salt (D) Oxidation state of iron is +3 in this salt

17.* Suppose Cu^{2+} and Pb^{2+} both are present in a mixture, then they can be separated by :
(A) adding KI solution (B) adding NH_3 solution
(C) adding NaOH solution (D) adding dilute HCl (2M)

18.* In electrolysis of Al_2O_3 by Hall-Heroult process :
(A) cryolite $Na_3[AlF_6]$ lowers the melting point of Al_2O_3 and increases its electrical conductivity.
(B) Al is obtained at cathode and probably CO_2 at anode
(C) electrolysis is carried out in aqueous medium (D) anode consist of graphite

19.* Heating which of the following salts in a dry test tube may cause a change in their colour ?
(A) $ZnCO_3$ (white) (B) $Co(NO_3)_2.6H_2O$ (red) (C) $FeSO_4.6H_2O$ (green) (D) $MnSO_4$ (faint pink)

20.* Complexes formed in the cyanide process are :
(A) $[Au(CN)_2]^-$ (B) $[Ag(CN)_2]^-$ (C) $[Cu(CN)_4]^{2-}$ (D) $[Zn(CN)_4]^{2-}$

21. **Statement-1 :** MgO bricks are used for inner lining of the zone of combustion of blast furnace in extraction of iron.
Statement-2 : MgO fails to react with SiO_2 under the furnace condition where it is used as inner lining.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
(C) Statement-1 is True, Statement-2 is False. (D) Statement-1 is False, Statement-2 is True.

22. **Statement-1 :** Adding KCN to $CuSO_4$ produces a white ppt which dissolves in excess KCN.
Statement-2 : With excess KCN, $CuSO_4$ forms $K_2[Cu(CN)_4]$ complex.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
(C) Statement-1 is True, Statement-2 is False. (D) Statement-1 is False, Statement-2 is True.

23. **Statement-1 :** NH_4Cl is added while analysing the IIIrd group basic radicals to suppress the ionisation of NH_4OH.
Statement-2 : With high concentration of OH^- ions, basic radicals of other groups also get precipitated with III group cations.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.
(C) Statement-1 is True, Statement-2 is False. (D) Statement-1 is False, Statement-2 is True.

Comprehension # 1

When 16.8 g of white solid (X) was heated 4.4 g of acid gas (A) that turned lime water milky was driven off together with 1.8 g of a gas (B) which condensed to a colorless liquid. The solid that remained (Y) dissolved in water to given an alkaline solution, which with excess of $BaCl_2$, solution gave a white precipitate (Z). The precipitate effloresces with acid giving off CO_2 gas.

24. Compounds A and B are respectively :
(A) CO_2 and H_2O (B) SO_2 and H_2O (C) CO_2 and N_2O_4 (D) SO_2 and N_2O_4

25. Compounds X and Y are respectively :
(A) $Na_2CO_3 . 10H_2O$ and Na_2O (B) $KHCO_3$ and CO_2
(C) $NaHCO_3$ and Na_2CO_3 (D) $Na_2CO_3.NaHCO_3.1.5H_2O$ and Na_2CO_3

26. Compound Z is :
(A) $BaSO_3$ (B) $BaSO_4$ (C) $Ba(HCO_3)_2$ (D) $BaCO_3$

Comprehension # 2

A mixture (M) of two salts was treated as follows :
(i) The mixture was heated with MnO_2 and concentrated H_2SO_4, when yellowish green gas (P) was liberated.
(ii) The mixture on heating with NaOH solution gave a gas (Q) that turned red litmus blue.
(iii) Its solution in water gave blue precipitate (R) with potassium ferricyanide and red cololration (S) with ammonium thiocyanate.
(iv) The mixture was boiled with KOH and the liberated gas was bubbled through on alkaline solution of K_2HgI_4 to give brown precipitate (T).

27. Gas P and Q are respectively.
(A) ClO_2 and NH_3 (B) $SOCl_2$ and SO_3 (C) NH_3 and Cl_2 (D) Cl_2 and NH_3

28. Compounds R and S confirm the presence of :
(A) Fe^{2+} and Fe^{3+} respectively (B) Fe^{3+} and Fe^{2+} respectively
(C) Fe^{3+} ions only (D) Fe^{2+} ions only

Comprehension # 3

$X + \text{dil } H_2SO_4 \longrightarrow$ brown colored vapours turning wet starch iodide paper blue

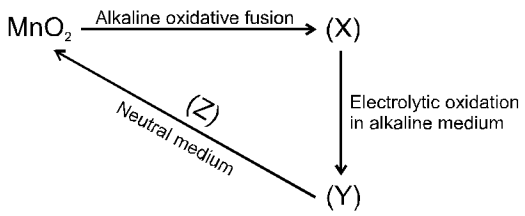
$X + NaOH \xrightarrow{\Delta} NH_3$ gas

$X \xrightarrow{\Delta} Y(g) + Z(g)$ but liquid at room temperature.

29. Compound X is
(A) $(NH_4)_2SO_4$ (B) NH_4NO_2 (C) $(NH_4)_2CO_3$ (D) none of these

30. Compound Y and Z are respectively
(A) N_2 , H_2O (B) CO_2, H_2O (C) NO_2 , H_2O (D) SO_2, H_2O

Comprehension # 4



31. What is (Z) ?
(A) It is a salt of Fe^{3+} (B) It is a salt of Sn^{4+} (C) It is a salt of Mn^{2+} (D) It is a salt of Cr^{6+}

32. What happens when X is kept in acidic medium ?
(A) neutralisation reaction. (B) disproportionation reaction.
(C) double decomposition reaction (D) pyrolytic reaction

33. $Mn^{2+} + S_2O_8^{2-} + H_2O \longrightarrow [X] + SO_4^{2-} + H^+$ The magnetic moment (spin only) of [X] is :

34. Amongst the following the total number of ions which produce colour in the solutions (in water) is.
$_{22}Ti^{3+}$, $_{23}V^{4+}$, $_{24}Cr^{3+}$, $_{82}Pb^{2+}$, $_{26}Fe^{2+}$, $_{30}Zn^{2+}$, $_{28}Ni^{2+}$, $_{21}Sc^{3+}$, $_{80}Hg^{2+}$

35. Which of the following will produce an insoluble precipitate with NH_3(aq.)/H_2S.
$BaCl_2$, $NiSO_4$, Mohr's salt, $AlCl_3$, $Bi(NO_3)_3$, $Hg(CH_3COO)_2$, $AgNO_3$, $SnCl_2$, $CoSO_4$.

36. NaCl + Solid $K_2Cr_2O_7$ + Conc. $H_2SO_4 \longrightarrow$ "X" (reddish brown fumes) How many axial-d-orbital are involved in hybridization of "X" ?

37. What is the oxidation number of Cr in the product of the reaction of $K_2Cr_2O_7$ with H_2O_2 / H^+, followed by boiling, followed by treatment with excess KOH.

38. How many of the following contain at least one iron atom in +2 oxidation state?
(a) FeS_2 (b) Haematite (c) Magnetite (d) Brown ring complex
(e) $Na_2[Fe(CN)_5(NO)]$ (f) $Fe[Fe(CN)_6]$ (g) $K_2Fe[Fe(CN)_6]$ (h) Ferrocene ($[Fe(C_5H_5)_2]$)
(i) $FeWO_4$

39. Amongst the following, the total number of compounds whose aqueous solution gives white precipitate with Pb^{2+} ions is : KI, NH_3, Na_2CO_3, K_2CrO_4, NaCl, Na_2SO_3, Na_2S, KNO_3, $NaClO_4$

40. How many of the following metallurgies involve leaching ?
$Al_2O_3 \longrightarrow Al$, ; $Ag_2S \longrightarrow Ag$; $Au \longrightarrow Au$; $CuFeS_2 \longrightarrow Cu$; $PbS \longrightarrow Pb$
$MgCl_2 \longrightarrow Mg$; $FeCO_3 \longrightarrow Fe$; Low grade copper ore $\longrightarrow Cu$; $HgS \longrightarrow Hg$

41. The number of reducing agents involved in the extraction of iron (as pig iron) using blast furnace from ore haematite is(are).

42. Match the compound in column (I) with the properties of products obtained on heating it in column (II).

Column - I	**Column - II**
(A) $FeSO_4$	(p) One of the product is basic oxide
(B) NH_4NO_3	(q) One of the product is acidic oxide
(C) $Ba(N_3)_2$	(r) One of the product is unreactive towards O_2 at room temperature.
(D) $MgCl_2 . 6H_2O$	(s) At least one of the product is neutral oxide.

43. Match the reactions given in column - I with the nature of the reaction/products given in column - II

Column - I	**Column - II**
(A) $S_2O_3^{2-}(aq) + H^+(aq) \longrightarrow$	(p) Show disproportionation
(B) $Cu^{2+}(aq) + I^-(aq) \longrightarrow$	(q) Redox reaction
(C) $CrO_4^{2-}(aq) + H^+(aq) \longrightarrow$	(r) At least one of the products is diamagnetic
(D) $Mg(NH_4)VO_4 \xrightarrow{\Delta}$	(s) One of the products has metal-oxygen-metal bond/ linkage.

44. In column-I there are certain reactions which are given by different basic radicals with the reagents given in column-II in qualitative analysis. Now match the entries given in column-I with entries given in column-II.

Column-I	**Column-II**
(A) Pb^{2+} ions form yellow precipitate with	(p) K_2CrO_4 solution
(B) Zn^{2+} ions form first white precipitate and then dissolves in excess with	(q) NaOH solution
(C) Ni^{2+} ions form green precipitate with	(r) KI solution
(D) Cu^{2+} ions form blue precipitate with	(s) NH_3 solution
	(t) KCN solution

45.

Column - I	**Column - II**
(A) White or buff colored	(p) $Mn(OH)_2$
(B) Oxidisable by air	(q) $Zn(OH)_2$
(C) Amphoteric	(r) $Fe(OH)_2$
(D) Green	(s) $Cr(OH)_3$
	(t) $Ni(OH)_2$

CHEMISTRY

1. (A) There is irregular trend in the first ionisation enthalpy of the 3d metals.

	Se	Ti	V	Cr	Mn	F	Co	Ni	Cu	Zn
In kJ/mol :	631	656	650	653	717	762	758	736	745	906

3. $AgNO_3 \longrightarrow Ag + NO_2 + \frac{1}{2}O_2$; $Cu(NO_3)_2 \longrightarrow CuO + 2NO_2 + \frac{1}{2}O_2$

$Pb(NO_3)_2 \longrightarrow PbO + 2NO_2 + \frac{1}{2}O_2$; $2Al(NO_3)_2 \longrightarrow Al_2O_3 + 6NO_2 + \frac{3}{2}O_2$

4. $2MnO_4^- + 3Mn^{2+} + 2H_2O \longrightarrow 5MnO_2 + 4H^+$

5. $V_2O_5 + NaOH \longrightarrow 2Na_3VO_4 + 3H_2O$

6. $Pb^{2+} + S^{2-} \longrightarrow PbS \downarrow$ (black)

$PbS + HNO_3 \longrightarrow Pb(NO_3)_2 + H_2S \uparrow$

$SO_4^{2-} + Pb(NO_3)_2 \longrightarrow PbSO_4 \downarrow$ (white precipitate)

7. Pb^{2+} and Ag^+ → $PbCl_2$ dissolves in hot water $\xrightarrow{\text{Cooled}}$ $PbCl_2$ white ppt.

Pb^{2+} and Ag^+ → AgCl does not dissolve in hot water $\xrightarrow{NH_3\ \text{Sol.}}$ $[Ag(NH_3)_2]Cl$ (soluble) Clear solution

8. $Ni^{2+} + S^{2-} \longrightarrow NiS \downarrow$ (black)

$NiS + HNO_3 + 3HCl \longrightarrow Ni^{2+} + S \downarrow + NOCl \uparrow + 2Cl^- + 2H_2O$

$$Ni^{2+} + 2\ \begin{matrix} CH_3 - C = N - OH \\ | \\ CH_3 - C = N - OH \end{matrix} \xrightarrow{NH_4OH} [Ni(dmg)_2] \downarrow \text{(red)} + 2H^+$$

9. Carbon monoxide is better reducing agent than carbon below 983 K.

10. (a) → van – Arkel method for Zr – Hg
→ Based on volatile nature of halides of methods.

12. **(A)** $Al_2O_3(s) + 3H_2O(\ell) + 2NaOH(aq) \xrightarrow{\text{Leaching}} 2Na[Al(OH)_4](aq)$

$2Na[Al(OH)_4](aq) + CO_2(g) \longrightarrow Al_2O_3 . xH_2O(s) + 2NaHCO_3(aq)$

$Al_2O_3 . xH_2O(s) \xrightarrow[\text{Calcination}]{1470\,K} Al_2O_3(s) + xH_2O(g)$

Electrolytic reduction of molten pure Al_2O_3 mixed with Na_3AlF_6 or CaF_2
Method is known as Hall-Heroult process

Cathode : Al^{3+} (melt) $+ 3e^- \longrightarrow Al(l)$

Anode : $C(s) + O^{2-}$ (melt) $\longrightarrow CO(g) + 2e^-$

$C(s) + 2O^{2-}$ (melt) $\longrightarrow CO_2(g) + 4e^-$

(B) Leaching :

$Ag_2S + 4NaCN \rightleftharpoons 2Na[Ag(CN)_2] + Na_2S$

$Na_2S + 2O_2 \longrightarrow Na_2SO_4$

Displacement by zinc in aqueous solution :

$2Na[Ag(CN)_2] + Zn \longrightarrow Na_2[Zn(CN)_4] + 2Ag\downarrow$

(C) Roasting :

$2PbS + 3O_2 \xrightarrow{\Delta} 2PbO + 2SO_2$

Self reduction :

$2PbO + PbS \longrightarrow 3Pb + SO_2$

(D) Calcination :

$MgCl_2.6H_2O \xrightarrow[\text{Dry HCl(g)}]{\Delta\text{(calcination)}} MgCl_2 + 6H_2O$

It is not made anhydrous by simple heating because it gets hydrolysed

$MgCl_2.6H_2O \xrightarrow{\Delta} MgO + 5H_2O + 2HCl$

Electrolytic reduction :

Electrolytic reduction of molten anhydrous carnallite.

$MgCl_2 \rightleftharpoons Mg^{2+} + 2Cl^-$

At cathode : $Mg^{2+} + 2e^- \longrightarrow Mg$(99% pure) ;

At anode : $2Cl^- \longrightarrow Cl_2 + 2e^-$

13. $HgCl_2$ due to covalent characters, sufficient chloride ions are not obtained.

16.* (D) Oxidation state of iron in Mohr's salt, $FeSO_4.(NH_4)_2SO_4.6H_2O$ is +2

17.* (A) $2Cu^{2+} + 5I^- \longrightarrow Cu_2I_2$ (white) $+ I_3^-$; $Pb^{2+} + 2I^- \longrightarrow PbI_2\downarrow$ (yellow)

(B) $Cu^{2+} + 4NH_3 \longrightarrow [Cu(NH_3)_4]^{2+}$ (deep blue solution)

$Pb^{2+} + 2NH_3 + 2H_2O \longrightarrow Pb(OH)_2\downarrow$ (white) $+ 2NH_4^+$ (Pb^{2+} does not form soluble complex)

(C) $Cu^{2+} + 2OH^- \longrightarrow Cu(OH)_2\downarrow$ (blue) ; $Pb^{2+} + 2OH^- \longrightarrow Pb(OH)_2\downarrow$ (white)

$Pb(OH)_2\downarrow + 2OH^- \longrightarrow [Pb(OH)_4]$ soluble complex.

(D) $Pb^{2+} + 2Cl^- \longrightarrow PbCl_2\downarrow$ (white) ; $Cu^{2+} + 2Cl^- \longrightarrow CuCl_2$ (green solution).

18.* $Na_3[AlF_6] \longrightarrow 3NaF + AlF_3$

NaF and AlF_3 both are ionic compounds and so ionise to give ions. This increases the electrical conductivity and lowers the melting point of Al_2O_3.

At cathode : Al^{3+} (melt) $+ 3e^- \longrightarrow Al$.

At anode : $C(s) + O^{2-}$ (melt) $\longrightarrow CO(g) + 2e^-$; $C(s) + 2O^{2-}$ (melt) $\longrightarrow CO_2(g) + 4e^-$.

19.* $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2\uparrow$. ZnO is yellow when hot.
(white)

$Co(NO_3)_2.6H_2O \xrightarrow{\Delta} CoO$ (black) $+ 2NO_2\uparrow + \frac{1}{2}O_2\uparrow + 6H_2O\uparrow$

$2FeSO_4.6H_2O \xrightarrow{\Delta} Fe_2O_3$ (brown) $+ SO_2\uparrow + SO_3\uparrow + 6H_2O\uparrow$

$3MnSO_4 \xrightarrow{\Delta} Mn_3O_4 + 2SO_2\uparrow + SO_3\uparrow$

(faint pink) (black)

20.*– Cyanide process used for Au and Ag comlexes formed in this, are : $Na[Au(CN)_2]$, $Na[Ag(CN)_2]$, $Na_2[Zn(CN)_4]$.

23. Due to common ion effect the concentrations of OH^- ions is just sufficient to precipitate the cations of III group as their hydroxides. (As they have low K_{sp} values).

30. $NH_4NO_2 \xrightarrow{\Delta} N_2 + 2H_2O$
NO_2^- gives brown vapours of NO_2 with dil H_2SO_4

31. $2MnO_4^-$ (Y) + $3Mn^{2+}$ (Z) + $2H_2O \longrightarrow 5MnO_2 + 4H^+$
This reaction is Vohhard method for estimation of manganese carried out in presence of $ZnSO_4$ or suspended ZnO which catalyses the oxidation.

32. $3\overset{+6}{Mn}O_4^{2-} + H^+ \longrightarrow 2\overset{+7}{Mn}O_4^- + \overset{+4}{Mn}O_2 + 2H_2O$

33. $2Mn^{2+} + 5S_2O_8^{2-} + 8H_2O \longrightarrow 2MnO_4^- + 10SO_4^{2-} + 16H^+$
Mn(VII) – $[Ar]^{18}$ $3d^0$. No unpaired electron so 'spin only' magnetic moment of compound is .

34. Ti^{3+} – $3d^1$ (purple) ; V^{4+} $3d^1$ (blue) ; Cr^{3+} — $3d^3$ (Green), Pb^{2+} – (colourless) ; Fe^{2+} – $3d^6$ (green) ; Zn^{2+} – $3d^{10}$ (colourless) ; Ni^{2+} – $3d^8$ (green) ; Sc^{3+} – $3d^0$ (colourless) ; Hg^{2+} (colourless).

35. All except $BaCl_2$ **36._** X ≡ $\overset{VI}{Cr}O_2Cl_2$ "sp^3"

37. $K_2Cr_2O_7 \xrightarrow{H_2O_2} CrO_5 \xrightarrow[H_2O]{H^+} Cr^{3+} + O_2\uparrow$

$\xrightarrow{KOH} KCrO_2$ (green)

So the answer is 3.

38. $\overset{+2}{Fe}S_2$, $\overset{+3}{Fe}_2O_3$, Fe_3O_4 ($\overset{+2}{Fe}O + Fe_2O_3$), $[\overset{+1}{Fe}(H_2O)_5(NO)]^{2+}$, $Na_2[\overset{+2}{Fe}(CN)_5(NO)]$, $\overset{+3}{Fe}[\overset{+3}{Fe}(CN)_6]$,
$K_2\overset{+2}{Fe}[\overset{+2}{Fe}(CN)_6]$, $\overset{+2}{Fe}(C_5H_5)_2$, $\overset{+2}{Fe}WO_4$

39. $2I^- + Pb^{2+} \longrightarrow PbI_2\downarrow$ (yellow) + $2K^+$
$2NH_3 + 2H_2O + Pb^{2+} \longrightarrow Pb(OH)_2\downarrow$ (white) + $2NH_4^+$
$2Pb^{2+} + 2CO_3^{2-} + H_2O \longrightarrow Pb(OH)_2\downarrow$ (white) + $PbCO_3\downarrow$ (white) + $CO_2\uparrow$
$Pb^{2+} + CrO_4^{2-} \longrightarrow PbCrO_4\downarrow$ (yellow)
$Pb^{2+} + 2Cl^- \longrightarrow PbCl_2\downarrow$ (white)
$Pb^{2+} + SO_3^{2-} \longrightarrow PbSO_3\downarrow$ (white)
$Pb^{2+} + S^{2-} \longrightarrow PbS\downarrow$ (black)
$Pb^{2+} + KNO_3 \longrightarrow$ No precipitate is formed.
$Pb(ClO_4)_2$ is water soluble.

40. $Al_2O_3 + 2NaOH + 2H_2O \xrightarrow{\Delta} 2NaAlO_2 + 3H_2O$; $Ag_2S + 2CN^- \longrightarrow [Ag(CN)_2]^- + S^{2-}$

$Au + 2CN^- + 2H_2O + O_2 \longrightarrow [Au(CN)_2]^- + 4OH^-$; $CuFeS_2 \longrightarrow$ No leaching

$PbS \longrightarrow$ No leaching ; $MgCl_2 \longrightarrow$ No leaching ; $FeCO_3 \longrightarrow$ No leaching

$2Cu_2O$ (s) + $4H_2SO_4$ (aq) + O_2 (g) $\longrightarrow$ $4CuSO_4$ (aq) + $4H_2O$ (ℓ) ; $HgS \longrightarrow$ No leaching

41. At 500 – 800 K (lower temperature range in the blast furnace)

$$3\,Fe_2O_3 + CO \longrightarrow 2\,Fe_3O_4 + CO_2$$

$$Fe_3O_4 + CO \longrightarrow 3Fe + 4\,CO_2$$

$$Fe_2O_3 + CO \longrightarrow 2FeO + CO_2$$

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

$$C + CO_2 \longrightarrow 2\,CO\ ; \qquad FeO + CO \longrightarrow Fe + CO_2$$

42. (A) $FeSO_4 \longrightarrow Fe_2O_3 + SO_2 + SO_3$

(B) $NH_4NO_3 \longrightarrow N_2O + 2H_2O$

(C) $Ba(N_3)_2 \longrightarrow N_2 + Ba$

(D) $MgCl_2 . 6H_2O \longrightarrow MgO + 2HCl + 5H_2O$

43. (A) $S_2O_3^{2-} + H^+ \longrightarrow S + SO_2$

(B) $2Cu^{2+} + 4I^- \xrightarrow{\Delta} Cu_2I_2\downarrow + I_2$

(C) $2\,CrO_4^{2-} + 2H^+ \longrightarrow Cr_2O_7^{2-} + H_2O$

(D) $2\,Mg(NH_4)VO_4 \longrightarrow Mg_2V_2O_7 + 2NH_3\uparrow + H_2O\uparrow$

44. (A) $Pb^{2+} + CrO_4^{2-} \longrightarrow PbCrO_4\downarrow$ (yellow) ; $Pb^{2+} + 2I^- \longrightarrow PbI_2$ (yellow)

(B) $Zn^{2+} + 2OH^- \longrightarrow Zn(OH)_2\downarrow$ (White) ; $Zn(OH)_2\downarrow + 2OH^- \longrightarrow [Zn(OH)_4]^{2-}$ soluble

$Zn^{2+} + 2NH_3 + 2H_2O \longrightarrow Zn(OH)_2\downarrow$ (White) $+ 2NH_4^+$

(C) $Ni^{2+} + 2OH^- \longrightarrow Ni(OH)_2\downarrow$ (Green) ; $Ni^{2+} + 2NH_3 + 2H_2O \longrightarrow Ni(OH)_2\downarrow$ (Green) $+ 2NH_4^+$

$Ni^{2+} + 2CN^- \longrightarrow Ni(CN)_2\downarrow$ (Green)

(D) $Cu^{2+} + 2OH^- \longrightarrow Cu(OH)_2\downarrow$ (blue)

$Cu^{2+} + 2NH_3 + 2H_2O \longrightarrow Cu(OH)_2\downarrow$ (blue) $+ 2NH_4^+$