"CULTIVATING EXCELLENCE IN EVERY STUDENT"

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Class:-XII (Sci.) **Name of Student……**
Subject:- Chemistry

10 YEAR QUSTIONS
Chapter-8
d- & f- block elements

Explain the following

1. **(i)** XeF_2 is a linear molecule without a bend.

(ii) The electron gain enthalpy with negative sign for fluorine is less than that for chlorine, still fluorine is a stronger oxidising agent than chlorine.

(a) Complete the following chemical equations :

(i) $Cr_2O_7^{2-}$ (aq) + H_2S (g) + H^+ (aq) →

(ii) Cu^{2+} (aq) + I^- (aq) →

(b) How would you account for the following :

(i) The oxidising power of oxoanions are in the order $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$.

(ii) The third ionization enthalpy of manganese (Z = 25) is exceptionally high.

(iii) Cr^{2+} is a stronger reducing agent than Fe^{2+}.

OR

(a) Complete the following chemical equations :

(i) MnO_4^- (aq) + $S_2O_3^{2-}$ (aq) + H_2O (*l*) →

(ii) $Cr_2O_7^{2-}$ (aq) + Fe^{2+} (aq) + H^+ (aq) →

(b) Explain the following observations :

(i) La^{3+} (Z = 57) and Lu^{3+} (Z = 71) do not show any colour in solutions.

(ii) Among the divalent cations in the first series of transition elements, manganese exhibits the maximum paramagnetism.

(iii) Cu^+ ion is not known in aqueous solutions.

2. Complete the following chemical equations :

(i) $MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow$

(ii) $KMnO_4 \xrightarrow{\text{heated}}$

(iii) $Cr_2O_7^{2-} + H_2S + H^+ \longrightarrow$

3. **Complete the following chemical equations :**

(i) $MnO_4^-(aq) + S_2O_3^{2-}(aq) + H_2O(l) \rightarrow$

(ii) $Cr_2O_7^{2-}(aq) + Fe^{2+}(aq) + H^+(aq) \rightarrow$

OR

State reasons for the following :

(i) Cu (I) ion is not stable in an aqueous solution.

(ii) Unlike Cr^{3+}, Mn^{2+}, Fe^{3+} and the subsequent other M^{2+} ions of the 3d series of elements, the 4d and the 5d series metals generally do not form stable cationic species.

4. Explain (i) Transition metals show variable oxidation states. (ii) Zn, Cd and Hg are soft metals. (iii) E^O value for the Mn^{3+}/Mn^{2+} couple is highly positive (+ 1·57 V) as compared to Cr^{3+}/Cr^{2+}.

5. (a) Write one similarity and one difference between the chemistry of lanthanides and actinide elements.

(b) Following are the transition metal ions of 3d series: Ti^{4+}, V^{2+}, Mn^{3+}, Cr^{3+} (Atomic numbers : Ti = 22, V = 23, Mn = 25, Cr = 24)

Answer the following:

(i) Which ion is most stable in an aqueous solution and why?

(ii) Which ion is a strong oxidizing agent and why?

(iii) Which ion is colorless and why?

6. **How would you account for the following :**

(i) Cr^{2+} is reducing in nature while with the same d-orbital configuration (d^4) Mn^{3+} is an oxidising agent.

(ii) In a transition series of metals, the metal which exhibits the greatest number of oxidation states occurs in the middle of the series.

(iv) Among lanthanoids, Ln (III) compounds are predominant. However, occasionally in solutions or in solid compounds, +2 and +4 ions are also obtained.

(v) The $E^{\circ}_{M^{2+}/M}$ for copper is positive (0·34 V). Copper is the only metal in the first series of transition elements showing this behaviour.

(vi) The metallic radii of the third (5d) series of transition metals are nearly the same as those of the corresponding members of the second series.

7. **Account for the following :**

(i) Zn is not considered as a transition element.

(ii) Transition metals form a large number of complexes.

(iii) The E^{o} value for the Mn^{3+}/Mn^{2+} couple is much more positive than that for Cr^{3+}/Cr^{2+} couple.

OR

(i) With reference to structural variability and chemical reactivity, write the differences between lanthanoids and actinoids.

(ii) Name a member of the lanthanoid series which is well known to exhibit +4 oxidation state.

(iii) Complete the following equation :

$$MnO_4^- + 8H^+ + 5e^- \rightarrow$$

(iv) Out of Mn^{3+} and Cr^{3+}, which is more paramagnetic and why ?
(Atomic nos. : Mn = 25, Cr = 24)

8. Complete the following equations :

(i) $2\ MnO_4^- + 16\ H^+ + 5\ S^{2-} \longrightarrow$

(ii) $KMnO_4 \xrightarrow{\text{heat}}$

9. How would you account for the following: (i) Cr^{2+} is reducing in nature while with the same d-orbital configuration (d^4) Mn^{3+} is an oxidizing agent.
(ii) In a transition series of metals, the metal which exhibits the greatest number of oxidation states occurs in the middle of the series.
(iii) State reasons for the following: (a) Cu (I) ion is not stable in an aqueous solution. (b) Unlike Cr^{3+}, Mn^{2+}, Fe^{3+} and the subsequent other M^{2+} ions of the 3d series of elements, the 4d and the 5d series metals generally do not form stable Cationic species.

10.

(a) Which metal in the first transition series (3d series) exhibits +1 oxidation state most frequently and why ?

(b) Which of the following cations are coloured in aqueous solutions and why ?

Sc^{3+}, V^{3+}, Ti^{4+}, Mn^{2+}

(At. nos. Sc = 21, V = 23, Ti = 22, Mn = 25)

11. How would you account for the following ?

(i) Transition metals exhibit variable oxidation states.

(ii) Zr (Z = 40) and Hf (Z = 72) have almost identical radii.

(iii) Transition metals and their compounds act as catalyst.

OR

Complete the following chemical equations :

(i) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \longrightarrow$

(ii) $2CrO_4^{2-} + 2H^+ \longrightarrow$

(iii) $2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \longrightarrow$

12. (a) Give reasons for the following :

(i) Bond enthalpy of F_2 is lower than that of Cl_2.

(ii) PH_3 has lower boiling point than NH_3.

(b) Draw the structures of the following molecules :

(i) BrF_3

(ii) $(HPO_3)_3$

(iii) XeF_4

OR

(a) Account for the following :

(i) Helium is used in diving apparatus.

(ii) Fluorine does not exhibit positive oxidation state.

(iii) Oxygen shows catenation behaviour less than sulphur.

(b) Draw the structures of the following molecules.

(i) XeF_2

(ii) $H_2S_2O_8$

13. How would you account for the following:

(i) Actinide contraction is greater than lanthanides contraction. (ii) Transition metals form colored compounds. (iii) Why-do actinides show a Wide range of oxidation states·? Write one similarity between the chemistry of lanthanides and actinides.

14. Account for the following; (i) Zr and Hf have almost similar atomic radii. (ii) Transition metals show variable oxidation states. (iii) Cu+ ion is unstable in aqueous solution.

15.

$E^0_{(M^{2+}/M)}$	Cr	Mn	Fe	Co	Ni	Cu
	− 0·91	− 1·18	− 0·44	− 0·28	− 0·25	+ 0·34

From the given data of E^0 values, answer the following questions :

(i) Why is $E^0_{(Cu^{2+}/Cu)}$ value exceptionally positive ?

(ii) Why is $E^0_{(Mn^{2+}/Mn)}$ value highly negative as compared to other elements ?

(iii) Which is a stronger reducing agent Cr^{2+} or Fe^{2+} ? Give reason.

16. Give reasons: (i) Mn show the highest oxidation state of +7 with oxygen but with fluorine it shows the highest oxidation state of +4. (ii) Transition metals show variable oxidation states. (iii) Actinides show irregularities in their electronic configurations.

17. (a) Account for the following :

(i) Mn shows the highest oxidation state of +7 with oxygen but with fluorine it shows the highest oxidation state of +4.

(ii) Cr^{2+} is a strong reducing agent.

(iii) Cu^{2+} salts are coloured while Zn^{2+} salts are white.

(b) Complete the following equations :

(i) $2MnO_2 + 4KOH + O_2 \xrightarrow{\Delta}$

(ii) $Cr_2O_7^{2-} + 14H^+ + 6I^- \rightarrow$

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