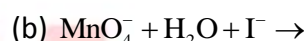


## Chapter 08

## D And F Block Elements

Very Short Answer Type Questions

01. Why do the transition elements have a high enthalpy of hydration?
02. Name the tripositive metal ion represented by the configuration :  $1s^2 2s^2 2p^6 3s^2 3p^6$
03. Name one ore each of manganese and chromium.
04. What is that an orange solution of  $K_2Cr_2O_7$  turns yellow on adding NaOH to it?
05. Why do Zr and Hf exhibit similar properties?
06. Why are all salts of scandium white?
07. Complete the balance following chemical equations.



08. Scandium ( $Z = 21$ ) does not exhibit variable oxidation states and yet it is regarded as a transition element
09. What is meant by 'lanthanoid contraction'?
10. Complete the equation:  $KMnO_4 \xrightarrow{\text{heated}}$

Short Answer Type Questions

11. Write one similarity and one difference between the chemistry of lanthanoids and actinoids.
12. Decide giving reason which one of the following pairs has the property indicated:
- (i) Fe or Cu has a higher melting point. (ii)  $Co^{2+}$  or  $Ni^{2+}$  has a lower magnetic moment.  
(At. Nos. : Fe = 26, Co = 27, Ni = 28, Cu = 29).
13. Decide giving reason which one of the following pairs exhibits the property indicated:
- (i)  $Sc^{3+}$  or  $Cr^{3+}$  exhibits paramagnetism.  
(ii) V or Mn exhibits more number of oxidation states.  
(At. No. Sc = 21, Cr = 24, V = 23, Mn = 25)
14. Give reasons.
- (i)  $E^0$  value  $Mn^{3+} / Mn^{2+}$  for the couple is much more positive than that for  $Fe^{3+} / Fe^{2+}$ .
- (ii) Iron has a higher enthalpy of atomization than that of copper.
- (iii)  $Sc^{3+}$  is colorless in an aqueous solution where  $Ti^{3+}$  is colored.
15. (a) Account for the following.
- (i)  $Cu^+$  is unstable in an aqueous solution.

(ii) Transition metals form complex compounds.

(b) Complete the following equation.  $\text{Cr}_2\text{O}_7^{2-} + 8\text{H}^+ + 3\text{NO}_2^- \rightarrow$

16. Why is the third ionization enthalpy of manganese exceptionally high?

17. (a) Describe with an example each the oxidizing action of permanganate ion in alkaline and acidic medium. What acid and alkali are usually used?

(b) Write two uses of potassium permanganate in the laboratory.

18. Assign reason for each of the following statements:

(i) The largest number of oxidation states are exhibited by the elements in the middle of the first-row transition elements.

(ii) The atomic radii decrease in size with the increasing atomic number in the lanthanoid series.

19. Assign reasons for the following observations.

(i)  $\text{Mn}^{2+}$  compounds are more stable than  $\text{Fe}^{2+}$  compounds toward oxidation to their +3 state.

(ii) An aqueous solution of potassium chromate is yellow but changes its color on decreasing the pH of the solution.

20. How would you account for the following:

(i) Many of the transition elements and their compounds can act as good catalysts.

(ii) The metallic radii of the third (5d) series of transition elements are virtually the same as those of the corresponding members of the second series.

(iii) There is a greater horizontal similarity in the properties of the transition elements than that of the main group elements.

**Long Answer Type Questions:**

21. (a) Describe how potassium dichromate is made from chromite ore and give the equations for the chemical reactions involved.

(b) Write a balanced ionic equation for reacting ions to represent the action of acidified potassium dichromate on:

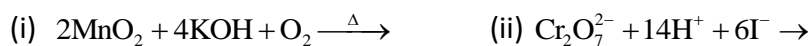
(i) Potassium iodide solution (ii) Acidified ferrous sulphate solution. (iii) Hydrogen sulphide gas.

22. (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)  $\text{Cr}^{2+}$  is a strong reducing agent. (iii)  $\text{Cu}^{2+}$  salts are colored while  $\text{Zn}^{2+}$  salts are white.

(b) Complete the following equations.



23. (a) Complete the following chemical equations for reactions:



(b) Explain each of the following observations:

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

(ii) The greater number of oxidation states are exhibited by members in the middle of a transition series.

(iii) With the same orbital configuration  $d^4$ ,  $\text{Cr}^{2+}$  ion is reducing while  $\text{Mn}^{3+}$  ion is oxidizing.

24. (a) Complete the following chemical reactions equations:



(b) Account for the following.

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

(ii) Transition metals form a large no. of complexes

(iii) The  $E^0$  value for the  $\text{Mn}^{3+} / \text{Mn}^{2+}$  couple is much more positive than that for  $\text{Cr}^{3+} / \text{Cr}^{2+}$ .

25. The elements of the 3rd transition series are given as Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu & Zn.

Answer the following.

(i) Write the element which shows the maximum no. of oxidation states. Give reason.

(ii) Which element has the highest m.p. (iii) Which element shows only +3 oxidation state.

(iv) Which element is a strong oxidizing agent in the +3 oxidation state and why?

26. (i) Concerning structural variability and chemical reactivity, write the difference between lanthanoids and actinoids.

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

(iii) Complete the following equation :  $\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightarrow$

(iv) Out of  $\text{Mn}^{3+}$  &  $\text{Cr}^{3+}$  which is more paramagnetic and why?

27. (a) What is meant by the term lanthanoid contraction? What is it due to and what consequences does it have on the chemistry of elements following lanthanoids in the periodic table?

(b) Explain the following observations:

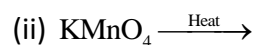
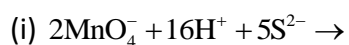
(i) Although  $\text{Co}^{2+}$  ion appears to be stable, it is easily oxidized to  $\text{Co}^{3+}$  ion in the presence of a strong ligand.

(ii) The  $E_{M^{2+}/M}^0$  value for manganese is much more than expected from the trend for other elements in the series.

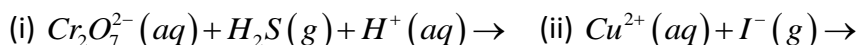
28. (a) Account for the following.

(i) Transition metals show a variable oxidation state.      (ii) Zn, Cd, and Hg are soft metals.

(b) Complete the following equations.



29. (a) Complete the following chemical equations:



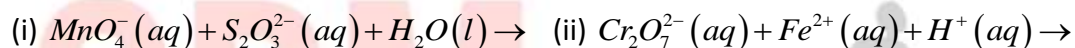
(b) How would you account for the following:

(i) The oxidizing power of oxoanions is in the order.  $\text{VO}_2^+ < \text{Cr}_2\text{O}_7^{2-} < \text{MnO}_4^-$

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

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

30. (a) Complete the following chemical equations:



(b) Explain the following observations:

(i)  $\text{La}^{3+}$  (Z = 57) and  $\text{Lu}^{3+}$  (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)  $\text{Cu}^+$  ion is not known in aqueous solutions.

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