Unit Practice Test

for Board Examination

Time allowed : 2 Hrs. *Maximum Marks : 35*

1. Explain why Cu^+ ion is not stable in aqueous solution. (1)
2. Why is europium (II) more stable than cerium (II) ? (1)
3. Which trivalent ion has maximum size in lanthanoid series ? (1)
4. Write the general electronic configuration of lanthanoids. (1)
5. Why does Mn (II) ion show maximum paramagnetic character amongst the bivalent ions of first transition series ? (1)
6. How would you account for the irregular variation of ionisation enthalpies (first and second) in the first transition series ? (2)
7. Indicate the steps in the preparation of $K_2Cr_2O_7$ from chromite ore. (2)
8. What is meant by disproportionation ? Give example of disproportionation reaction in aqueous solution (2)
9. Compare the chemistry of actinoids and lanthanoids with reference to
   (*i*) atomic and ionic sizes
   (*ii*) oxidation states. (2)
10. The 5*d* series of transition metals have more frequent metal-metal bonding in their compounds than do the 3*d* and 4*d* metals. Explain. (2)
11. What is lanthanoid contraction ? What are the main consequences of lanthanoid contraction ? (3)
12. Complete the following reaction equations:
    (*i*) $MnO_4^- + Fe^{2+} + H^+ \longrightarrow$
    (*ii*) $MnO_4^- + I^- + H_2O \longrightarrow$
    (*iii*) $S_2O_3^{2-} + Cr_2O_7^{2-} + H^+ \longrightarrow$ (3)
13. How would you account for the following :
    (*a*) The transition elements exhibit high enthalpy of atomization.
    (*b*) Of the d^4 species, Cr^{2+} is strongly reducing while Mn(III) is strongly oxidising.
    (*c*) Co (II) is stable in aqueous solution but in the presence of complexing reagents, it is easily oxidised. (3)
14. Explain the following :
    (*a*) Europium (II) is more stable than cerium (II)
    (*b*) Zr and Hf exhibit similar properties.
    (c) Scandium forms no coloured ions, yet it is regarded as a transition metal. (3)
15. Draw the structures of chromate and dichromate ions. Write the action of heat on potassium dichromate and potassium permanganate. (3)
16. *(a)* Why do transition metals and their compounds are found to be good catalysts and form alloys ?
    (b) The paramagnetic character of first transition series increases upto manganese and then decreases. Explain.
    (c) Why do transition metals form complexes and coloured ions? (5)

▶ To check your performance, see HINTS AND SOLUTIONS TO SOME QUESTIONS at the end of Part I of the book.

3. La^{3+}

4. $(n-2)\,f^{1-14}\ 5d^{0-1}\ 6s^2$

5. Mn(II) has the electronic configuration; $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5$. There are five unpaired electrons and d-subshell can have maximum of 5 unpaired electrons. Thus, Mn(II) has maximum paramagnetic character.

8. The disproportionation reactions are those in which the same substance gets oxidised as well as reduced. For example,

   (*i*) $3Cr^{V}O_4^{3-} + 8H^+ \longrightarrow 2Cr^{VI}O_4^{2-} + {}^{III}Cr^{3+} + 4H_2O$

   (*ii*) $Mn^{VI}O_4^{2-} + 4H^+ \longrightarrow Mn^{VII}O_4^- + Mn^{IV}O_2 + 2H_2O$

10. In the third transition series, the size of the atoms is larger than those of the corresponding elements of first and second transition series. As a result, the valence electrons are less tightly held and hence can form metal-metal bonds more frequently.

12. (*i*) $2\,MnO_4^- + 10\,Fe^{2+} + 16\,H^+ \longrightarrow 2Mn^{2+} + 10Fe^{3+} + 8\,H_2O$

    (*ii*) $2\,MnO_4^- + I^- + H_2O \longrightarrow 2MnO_2 + IO_3^- + 2\,OH^-$

    (*iii*) $3\,S_2O_3^{2-} + Cr_2O_7^{2-} + 8H^+ \longrightarrow 2Cr^{3+} + 3SO_4^{2-} + 3S + 4H_2O$