d -and f -Block Elements

Q.No.1:
Explain the following observations:
(i) Transition elements generally form coloured compounds.
(ii) Zinc is not regarded as a transition element.

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Q.No.2:
How would you account for the following?
(i) The atomic radii of the metals of the third (5d) series of transition elements are virtually the same as those of the corresponding members of the second (4d) series.
(ii) The E° Value for the Mn^{3+}/Mn^{2+} couple is much more positive than that for Cr^{3+}/Cr^{2+} couple or Fe^{3+}/Fe^{2+} couple.
(iii) The highest oxidation state of a metal is exhibited in its oxide or fluoride.

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Q.No.3:
Complete the following chemical equations:
(i) $Cr_2O_7^{2-} + H^+ + I^- \rightarrow$
(ii) $MnO_4^- + NO_2^- + H^+ \rightarrow$

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Q.No.4:
Explain the following observations giving as appropriate reason for each.
(i) The enthalpies of atomization of transition elements are quite high.
(ii) There occurs much more frequent metal-metal bonding in compounds of heavy transition metals (i.e 3^{rd} series).
(iii) Mn^{2+} is much more resistant than Fe^{2+} towards oxidation.

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Q.No.5:

Complete the following chemical equations:

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

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

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

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Q.No.6:

Assign reasons for each of the following:

(i) Transition metals generally form coloured compounds.

(ii) Manganese exhibits the highest oxidation state of +7 among the 3*d* series of transition elements.

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Q.No.7:

(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)

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Q.No.8:

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) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow$

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

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

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Q.No.9:

Explain the following giving an appropriate reason in each case.

(i) O_2 and F_2 both stabilize higher oxidation states of metals but O_2 exceeds F_2 in doing so.

(ii) Structures of Xenon fluorides cannot be explained by Valence Bond approach.

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Q.No.10: (a) How do you prepare:
(i) K_2MnO_4 from MnO_2?
(ii) $Na_2Cr_2O_7$ from Na_2CrO_4?
(b) Account for the following:
(i) Mn^{2+} is more stable than Fe^{2+} towards oxidation to +3 state.
(ii) The enthalpy of atomisation is lowest for Zn in 3d series of the transition elements.
(iii) Actinoid elements show wide range of oxidation states.

OR

(i) Name the elements of 3d transition series that show maximum number of oxidation states. Why does this happen?
(ii) Which transition metal of 3d series has positive E° (M^{2+}/M) value and why?
(iii) Out of Cr^{3+} and Mn^{3+}, which is a stronger oxidising agent and why?
(iv) Name a member of the lanthanoid series that is well-known to exhibit +2 oxidation state.
(v) Complete the following equation:

$MnO_4^- + 8H^+ + 5e^- \rightarrow$ **CBSE Board Paper 2014**

Q.No.11: What are the transition elements? Write two characteristics of the transition elements. **CBSE Board Paper 2015**

Q.No.12: (a) How would you account for the following :
(i) Actinoid contraction is greater than lanthanoid contraction.
(ii) Transition metals form coloured compounds
(b) Complete the following equation :

$2\,MnO_4^- + 6H^+ + 5\,NO_2^- \rightarrow$ **CBSE Board Paper 2015**