

Chapter-4 d and f block elements

- 1 The reaction of acidified KMnO_4 and H_2O_2 gives
(a) Mn^{4+} and O_2 (b) Mn^{2+} and O_2
(c) Mn^{2+} and O_3 (d) Mn^{4+} and MnO_2 1
- 2 Magnetic moment of 2.83 BM is given by which of the following ion?
(a) Ti^{3+} (b) Ni^{2+}
(c) Cr^{3+} (d) Mn^{2+} 1
- 3 The colour of KMnO_4 is due to
(a) $\text{L} \rightarrow \text{M}$ charge transfer transition
(b) $\sigma \rightarrow \sigma^*$ transition
(c) $\text{M} \rightarrow \text{L}$ charge transfer transition
(d) $d \rightarrow d$ transition. 1
- 4 KMnO_4 is not acidified by HCl instead of H_2SO_4 because
(a) H_2SO_4 is stronger acid than HCl
(b) HCl is oxidised to Cl_2 by KMnO_4
(c) H_2SO_4 is dibasic acid
(d) rate is faster in presence of H_2SO_4 1
- 5 Out of Mn_2O_7 , V_2O_3 , V_2O_5 , CrO , Cr_2O_3 , the basic oxides are
(a) Mn_2O_7 , V_2O_3 (b) V_2O_3 , V_2O_5
(c) V_2O_5 , CrO (d) V_2O_3 and CrO 1

- 6 The oxidation state of Cr in final product formed by reaction of KI and acidified dichromate solution is
(a) +4 (b) +6
(c) +2 (d) +3

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- 7 KMnO_4 gets reduced to
(a) K_2MnO_4 in neutral medium
(b) MnO_2 in acidic medium
(c) Mn^{2+} in alkaline medium
(d) MnO_2 in neutral medium

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- 8 The electronic configuration of Cu(II) is $3d^9$ whereas that of Cu(I) is $3d^{10}$. Which of the following is correct? [NCERT Exemplar Problem]
(a) Cu(II) is more stable
(b) Cu(II) is less stable
(c) Cu(I) and Cu(II) are equally stable
(d) Stability of Cu(I) and Cu(II) depends on nature of copper salts

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- 9 Metallic radii of some transition elements are given below. Which of these elements will have highest density? [NCERT Exemplar Problem]

Element	Fe	Co	Ni	Cu
Metallic radii/pm	126	125	125	128

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- (a) Fe (b) Ni
(c) Co (d) Cu

- 10 Generally transition elements form coloured salts due to the presence of unpaired electrons. Which of the following compounds will be coloured in solid state?

- (a) Ag_2SO_4 (b) CuF_2
(c) ZnF_2 (d) Cu_2Cl_2

- 11 There is hardly any increase in atomic size with increasing atomic numbers in a series of transition metals. Give reason. 1
- 12 On what ground can you say that scandium ($Z = 21$) is a transition element but zinc ($Z = 30$) is not? 1
- 13 Why do transition metals show variable oxidation states? 1
- 14 Lanthanoids form primarily +3 ions, while the actinoids usually have higher oxidation states in their compounds, +4 or even +6 being typical. Give reason. 1
- 15 Among lanthanoids, Ln(III) compounds are predominant. However, occasionally in solutions or in solid compounds, +2 and +4 ions are also obtained. Give reason. 1
- 16 Explain the following observations giving an appropriate reason for each. 2
- (i) There occurs much more frequent metal-metal bonding in compounds of heavy transition metals (i.e. 3rd series).
 - (ii) Mn^{2+} is much more resistant than Fe^{2+} towards oxidation.
- 17 State reasons for the following: 2
- (i) Actinoids exhibit greater range of oxidation states than lanthanoids.
 - (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.

18 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 3d series of transition elements.

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19 Explain the following observations:

- (i) Generally there is an increase in density of elements from titanium (Z = 22) to copper (Z = 29) in the first series of transition elements.
- (ii) Transition elements and their compounds are generally found to be good catalysts in chemical reactions.

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20 Explain the following observations:

- (i) Transition elements generally form coloured compounds.
- (ii) Zinc is not regarded as a transition element.

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Complete the following equations: $(ii) 2\text{CrO}_4^{2-} + 2\text{H}^+ \longrightarrow$

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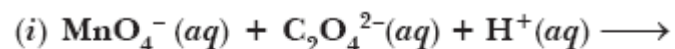
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Complete the following equations: $(ii) \text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \longrightarrow$

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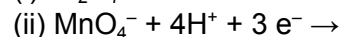
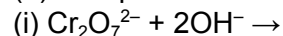


Complete the following chemical equations: $(ii) \text{Cr}_2\text{O}_7^{2-}(aq) + \text{Fe}^{2+}(aq) + \text{H}^+(aq) \longrightarrow$

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- 24 State reasons for the following observations:
- (i) The enthalpies of atomisation of transition elements are quite high. 2
 - (ii) There is a greater horizontal similarity in the properties of the transition elements than of the main group elements.
- 25 Assign suitable reasons for the following:
- (a) The Mn^{2+} compounds are more stable than Fe^{2+} towards oxidation to their +3 state. 3
 - (b) In the 3d series from Sc ($Z = 21$) to Zn ($Z = 30$), the enthalpy of atomization of Zn is the lowest.
 - (c) Sc^{3+} is colourless in aqueous solution, whereas Ti^{3+} is coloured.
- 26 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. 3
 - (ii) The E° value for the $\text{Mn}^{3+}/\text{Mn}^{2+}$ couple is much more positive than that for $\text{Cr}^{3+}/\text{Cr}^{2+}$ couple or $\text{Fe}^{3+}/\text{Fe}^{2+}$ couple.
 - (iii) The highest oxidation state of a metal is exhibited in its oxide or fluoride.
- 27 Give reasons for each of the following:
- (i) Size of trivalent lanthanoid cations decreases with increase in the atomic number. 3
 - (ii) Transition metal fluorides are ionic in nature, whereas bromides and chlorides are usually covalent in nature.
 - (iii) Chemistry of all the lanthanoids is quite similar.
- 28 A solution of KMnO_4 on reduction yields either a colourless solution or a brown precipitate or a green solution depending on pH of the solution. 3
- What different stages of the reduction do these represent and how are they carried out?

29 (a) Complete the following equations:



(b) Account for the following:

(i) Zn is not considered a transition element.

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

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

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30 (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.

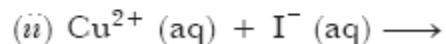
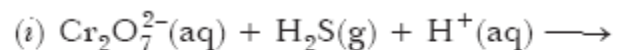
(iii) Complete the following equation:



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

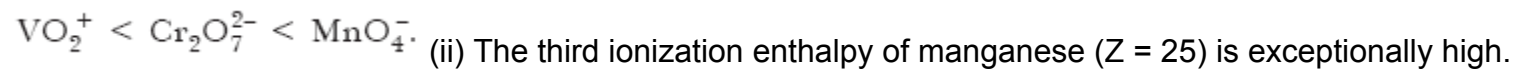
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31 (a) Complete the following chemical equations:



(b) How would you account for the following?

(i) The oxidising power of oxoanions are in the order



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

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