Saitechinfo NEET JEE Academy

43, Haridoss Main Rd, CH-99. Ph:9444929163

D AND F BLOCK ELEMENTS

Class 12 - Chemistry

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 45**

1. When MnO_2 is fused with KOH in air, it gives: **[1]**

   a) Mn_2O_3 b) $KMnO_4$

   c) Mn_2O_7 d) K_2MnO_4

2. $KMnO_4$ is the oxo salt of **[1]**

   a) Mn_2O_3 b) MnO_3

   c) Mn_2O_7 d) MnO_2

3. $KMnO_4$ acts as an oxidising agent in acidic medium. The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphide ions in acidic solution is: **[1]**

   a) $\frac{4}{5}$ b) $\frac{3}{5}$

   c) $\frac{2}{5}$ d) $\frac{1}{5}$

4. Haemoglobin and chlorophyll contain: **[1]**

   a) Fe and Mg b) Fe and Mn

   c) Fe and Co d) Mg and Fe

5. The yellow colour of the chromate changes to orange on acidification due to the formation of: **[1]**

   a) $Cr_2O_7^{2-}$ b) Cr_2O_3

   c) CrO_2 d) CrO_4^{2-}

6. Ag^+ ion is isoelectronic with: **[1]**

   a) Pd^{2+} b) Cd^{2+}

   c) Cu^+ d) Zn^{2+}

7. In a neutral solution, how many moles of $KMnO_4$ is required for the oxidation of 10 moles of ferric oxalate? **[1]**

   a) 6 b) 5

   c) 2 d) 4.5

8. There are 14 elements in the actinoid series. Which of the following elements does not belong to this series? **[1]**

   a) U b) Tm

   c) Np d) Fm

9. Which set of ions exhibit specific colours? (Atomic number of Sc = 21, Ti = 22, V = 23, Mn = 25, Fe = 26, Ni = **[1]**

28, Cu = 29 and Zn = 30)

a) Sc^{3+}, Zn^{2+}, Ni^{2+}

b) Ti^{3+}, Ti^{4+}, Ni^{2+}

c) Sc^{3+}, Ti^{4+}, Mn^{3+}

d) V^{3+}, V^{2+}, Fe^{3+}

10. The most common and stable oxidation state of a Lanthanoid is: **[1]**

a) +3

b) +4

c) +6

d) +2

11. Give reasons for the following: **[3]**

a. Transition metals form complex compounds.

b. E^o values for (Zn^{2+}/Zn) and (Mn^{2+}/Mn) are more negative than expected.

c. Actinoids show wide range of oxidation states.

12. i. Silver atom has completely filled d-orbitals in its ground state, it is still considered to be a transition element. Justify the statement. **[3]**

ii. Why are $E^{\ominus}_{M^{2+}/M}$ values of Mn and Zn more negative than expected?

iii. Why do transition metals form alloys?

13. Describe the preparation of potassium permanganate. How does the acidified potassium permanganate solution react with (i) NO_2^- solution (ii) SO_2 and (iii) oxalic acid? Write the equations for the reaction. **[3]**

14. Give reasons for the following: **[3]**

i. Transition metals form alloys.

ii. Zinc has lowest enthalpy of atomization.

iii. Manganese shows higher oxidation state of +4 with Fluorine but shows +7 with Oxygen.

15. Give reason for the following: **[3]**

a. Transition metals have high enthalpies of atomization.

b. Among the lanthanoids Ce (III) is easily oxidized to Ce (IV)

c. Fe^{3+} / Fe^{2+} redox couple has less positive electrode potential than Mn^{3+} / Mn^{2+} couple.

d. Copper (I) has d^{10} configuration while copper (II) has d^9 configuration. Still copper (II) is more stable in aqueous solution than copper (I).

e. The second and third transition series elements have almost similar atomic radii.

16. a. What happens when **[5]**

i. Manganate ions (MnO_4^{2-}) undergoes disproportionation reaction in acidic medium?

ii. Lanthanum is heated with sulphur?

b. Explain the following trends in the properties of the members of the first series of transition elements:

i. $E^0(M^{2+}/M)$ value for copper is positive (+0.34 V) in contrast to the other members of the series.

ii. Cr^{2+} is reducing while Mn^{3+} is oxidising, though both have d^4 configuration.

iii. The oxidising power in the series increases in the order $VO^+_2 < Cr_2O^{2-}_7 < MnO_4^-$.

17. How do you account for the following: **[5]**

i. All scandium salts are white? (At. No. of Sc = 21)

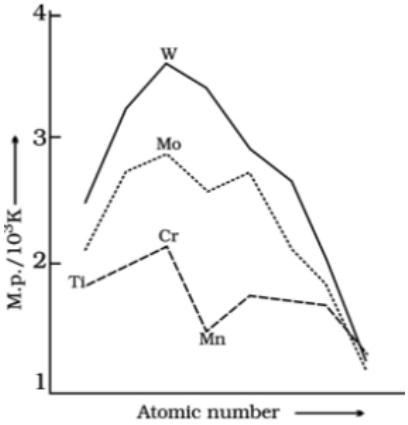
ii. The first ionization energies of the 5d transition elements are higher than those of the 3d and 4d transition elements in respective groups?

18. a. Why is chemistry of actinoids complicated as compared to lanthanoids? **[5]**

b. Complete the following reaction and justify that it is a disproportionation reaction:

$3MnO_4^{2-} + 4H^+ \rightarrow$ _____ + _____ + 2 H_2O.

c. The given graph shows the trends in melting points of transition metals:



Explain the reason why Cr has highest melting point and manganese (Mn) a lower melting point.

19. Compare the general characteristics of the first series of the transition metals with those of the second and third series metals in the respective vertical columns. Give special emphasis on the following points: **[5]**

i. Electronic configurations

ii. Oxidation states

iii. Ionisation enthalpies and

iv. Atomic sizes.