

CHEMISTRY STUDY MATERIALS FOR CLASS 12
(Questions – Answers of Chapter -08)
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d – block and f -block elements

1. Write the spin-only formula used to calculate the magnetic moment of metal ions.

Ans. The magnetic moment is determined by using the spin only formula,

$$\mu = \sqrt{n(n+2)} \quad \text{where } n \text{ is the number of unpaired electrons and } \mu \text{ is the magnetic moment in units of Bohr magneton (BM).}$$

2. Why is Sc³⁺ (or Zn²⁺) diamagnetic?

Ans. Sc³⁺(Z=21) 3d⁰ no unpaired electron, n=0, $\mu=0$.

(or Zn²⁺(Z=30) 3d¹⁰ no unpaired electron, n=0, $\mu=0$)

3. What is the most common oxidation state of lanthanoids and actinoids?

Ans. The most common oxidation state of lanthanoids and actinoids is +3.

4. What is actinoid contraction?

Ans. There is a gradual decrease in the size of atoms or M³⁺ ions across the series. This is known as the actinoid contraction.

5. Actinoid contraction is more than lanthanoid contraction. Give reason.

Ans. The Actinoid contraction is, more than lanthanoid contraction due to poor shielding by 5f electrons from nuclear charge.

6. Actinoids show larger number of oxidation states than lanthanoids. Why?

Ans. In actinoids 5f, 6d and 7s levels are of comparable energies, hence electrons from these orbitals are available to lose or share.

7. Give one use of Mischmetall

Ans. Mischmetall is used in Mg-based alloy to produce bullets, shell and lighter flint.

8. Why transition metals forms alloys readily?

Ans. Transition metals readily form alloys with other transition metals because of their similar radii

9. Give one use of transition metal alloy.

Ans. Ferrous alloys containing chromium, vanadium, tungsten, molybdenum and manganese are used for the production of a variety of steels.

II. Each question carries TWO marks.

34. Name two characteristic properties exhibited by d – block elements

due to their partly filled d orbitals.

Ans. The characteristic properties exhibited by d – block elements due to their partly filled d orbitals are variable; (i) Oxidation states

(ii) Formation of coloured ions.

35. Name two typical metallic properties displayed by transition elements.

Ans. High tensile strength, ductility, malleability, high thermal and electrical conductivity and metallic luster etc.

36. What are interstitial compounds? Give example.

Ans. Interstitial compounds are those which are formed when small atoms like H, C or N are trapped inside the crystal lattices of transition metals.

Example; TiC, Mn₄N, Fe₃H, VH_{0.56} and TiH_{1.7}, etc.

37. Give any two physical characteristics of interstitial compounds.

Ans. Two physical characteristics of interstitial compounds are:

(i) They have high melting points, higher than those of pure metals.

(ii) They are very hard and they retain metallic conductivity.

38. Calculate the 'spin only' magnetic moment of M²⁺ (aq) ion (Z = 27).

Ans. M (z= 27, 3d⁷ 4s²) , M²⁺ (3d⁷ 4s⁰) hence it has 3 unpaired electrons

$$n = 3 \quad \mu = \sqrt{n(n+2)} = \sqrt{3(3+2)} = 3.87 \text{ BM}$$

39. The second ionisation enthalpy is high for Cr and Cu , why?

Ans: The second ionisation enthalpy is unusually high values for Cr and Cu because when M^+ ion ionize to M^{+2} ion , the d^5 and d^{10} confi.ⁿs of the M^+ ions (i.e Cr^+ or Cu^+) are disrupted, with considerable loss of exchange energy .

40. Give two characteristics of transition metal alloys.

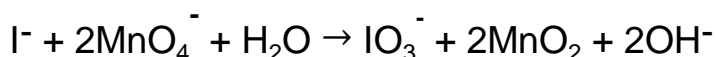
. The alloys are hard and have high melting points.

41. What is the action of heat on potassium permanganate? Give eq.ⁿ.

Ans. It decomposes at 513K to potassium manganate, manganese dioxide and oxygen. $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

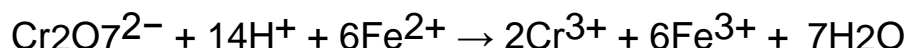
42. What is the action of neutral or faintly alkaline permanganate solution on iodide? Give equation.

Ans. Alkaline permanganate solution oxidizes iodide to iodate.



43. Explain the oxidising action of acidified potassium dichromate on Fe^{+2} ions and write the ionic equations for the reaction.

Ans. Acidified potassium dichromate oxidises iron(II) salts to iron(III).



44. The transition metals generally form coloured compounds, why?

Ans. The compounds of transition elements shows colour due to presence of unpaired electron & ability to undergo d-d transition.

When an electron from a lower energy d orbital is excited to a higher energy d orbital, the energy of excitation corresponds to the frequency of light absorbed. This frequency generally lies in the visible region.

45. Give reason “transition metals and their many compounds act as good catalysts”.

Ans. Transition metals and their many compounds acts as good catalysts, it is due to (i) partially filled (n-1) d orbital (ii) variable oxidation state and provide a suitable surface for the reaction to take place.
