

d-Block Elements

Date Planned : __ / __ / __	CBSE Pattern	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level-0	Exact Duration : _____

Very Short Answer Type

(1 Mark)

- Name the oxo-metal anions of the first series of the transition metals in which the metal exhibits the oxidation state equal to its group number.
- In what way is the electronic configuration of the transition elements different from that of the non transition elements ?
- What are the different oxidation states exhibited by the lanthanides ?
- What are interstitial compounds? Why are such compounds well known for transition metals ?
- How is the variability in oxidation states of transition metals different from that of the non transition metals? Illustrate with examples.
- Which is the last element in the series of the actinides? Write the electronic configuration of this element. Comment on the possible oxidation state of this element.

Short Answer Type-I

(2 Marks)

- Write down the electronic configuration of:

(i) Cr^{3+}	(iii) Cu^+	(v) Co^{2+}	(vii) Mn^{2+}
(ii) Pm^{3+}	(iv) Ce^{4+}	(vi) Lu^{2+}	(viii) Th^{4+}
- Why are Mn^{2+} compounds more stable than Fe^{2+} towards oxidation to their +3 state ?
- What are alloys? Name an important alloy which contains some of the lanthanides metals. Mention its uses.
- What is lanthanides contraction? What are the consequences of lanthanides contraction ?
- What are the characteristics of the transition elements and why are they called transition elements? Which of the d-block elements may not be regarded as the transition elements ?
- Explain giving reasons :
 - Transition metals and many of their compounds show paramagnetic behaviour.
 - The enthalpies of atomization of the transition metals are high.
 - The transition metals generally form coloured compounds.
 - Transition metals and their many compounds act as good catalyst.
- What are inner transition elements? Decide which of the following atomic numbers are the atomic numbers of the inner transition elements: 29, 59, 74, 95, 102, 104.

Short Answer Type-II

(3 Marks)

- What may be the stable oxidation state of the transition element with the following d-electron configurations in the ground state of their atoms : $3d^3$, $3d^5$, $3d^8$ and $3d^{10}$?

15. Describe the preparation of potassium dichromate from iron chromite ore.
What is the effect of increasing pH on a solution of potassium dichromate ?
16. Predict which of the following will be coloured in aqueous solution? Ti^{3+} , V^{3+} , Cu^+ , Sc^{3+} , Mn^{2+} , Fe^{3+} and Co^{2+} . Give reasons for each.
17. The chemistry of the actinide elements is not so smooth as that of the lanthanides. Justify this statement by giving some examples from the oxidation state of these elements.
18. Use Hund's rule to drive the electronic configuration of Ce^{3+} ion, and calculate its magnetic moment on the basis of 'spin-only' formula.
19. Write the electronic configurations of the elements with the atomic numbers 61, 91, 101 and 109.

Long Answer Type

(5 Mark)

20. Write down the number of 3d-electrons in each of the following ions : Ti^{2+} , V^{2+} , Cr^{3+} , Mn^{2+} , Fe^{2+} , Fe^{3+} , Co^{2+} , Ni^{2+} and Cr^{2+} . Indicate how would you expect the five 3d-orbitals to be occupied for these hydrated ions (octahedral).
21. Describe the oxidising action of potassium dichromate and write the ionic equation for its reaction with :
(i) iodide (ii) iron(II) solution and (iii) H_2S
22. Describe the preparation of potassium permanganate. How does the acidified permanganate solution react with (i) iron(II) ions (ii) SO_2 and (iii) oxalic acid? Write the ionic equations for the reactions.
23. How would you account for the following :
(i) Out of the d^4 species, Cr^{2+} is strongly reducing while manganese (III) is strongly oxidising.
(ii) Cobalt (II) is stable in aqueous solution but in the presence of complexing reagents it is easily oxidised.
(iii) The d^1 configuration is very unstable in ions.
24. What is meant by 'disproportionation'? Give two examples of disproportionation reaction in aqueous solution.
25. What can be inferred from the magnetic moment values of the following complex species ?

Example	Magnetic Moment (BM)
$\text{K}_4[\text{Mn}(\text{CN})_6]$	2.2
$[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$	5.3
$\text{K}_2[\text{MnCl}_4]$	5.9