

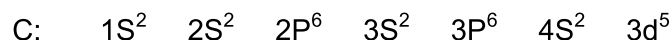
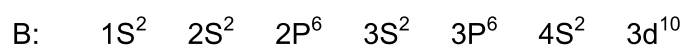
UNIT - 8
THE d- and f- BLOCK ELEMENTS

1 Mark Questions

1. Ce^{4+} has a noble gas electronic configuration, but it is used as an oxidizing agent in volumetric analysis. Give reason.
2. State why Fluorine stabilizes higher oxidation states?
3. CrO_4^{2-} is a strong oxidizing agent while MnO_4^{2-} is not. Why?
4. Why is Cu_2Cl_2 colourless and CuCl_2 coloured?
5. Which is stronger base $\text{La}(\text{OH})_3$ or $\text{Lu}(\text{OH})_3$? Why?
6. It is found that Ce^{4+} is a good oxidizing agent whereas Sm^{2+} is a good reducing agent. State the reason for this difference.
7. Actinoid contraction is greater from element to element than lanthanoid contraction. Why?
8. Mn^{2+} is more stable than Mn^{3+} . Give the reason?
9. Observe the following equation and identify the phenomenon takes place:
$$3\text{MnO}_4^{2-} + 4\text{H}^+ \longrightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$$
10. $\text{Cr}_2\text{O}_7^{2-} \rightleftharpoons 2\text{CrO}_4^{2-}$
How does this equilibrium can be shifted to right?

2 Marks Questions

11. An yellow translucent solution is obtained on passing H_2S gas through an acidified solution of KMnO_4 . Identify the solution and write the balanced chemical equation.
12. Electronic configuration of Cu(I) is $[\text{Xe}]3d^{10}$ and that of Cu(II) is $[\text{Xe}]3d^9$. Which is more stable in aqueous solution? Why?
13. Electronic configuration of four metals A, B and C are give below:



Identify the transition metals among them.

14. Zr (4d series) and Hf (5d series) have similar radi and have similar physical and chemical properties. Explain why?

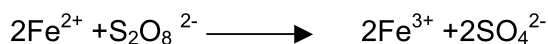
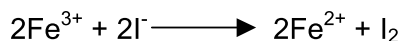
15. In a given series the difference in the ionization enthalpies between any two successive d block elements is very much less than that in case of s and p block elements. Give the explanation.

16. Cu^+ is unstable in aqueous solution and disproportionate as



Why does Cu^+ disproportionate in aqueous solution?

17. Observe the following reaction:



(i) Identify the role of Fe^{3+} in this reaction

(ii) Which property of Fe is used up here.

18. Among the oxides of Chromium CrO_3 is acidic, Cr_2O_3 is amphoteric and CrO is basic. State reasons for these observations.

19. For the first row of transition metals the E^\ominus values are

Elements	V	Cr	Mn	Fe	Co	Ni	Cu
$E^\ominus(\text{M}^{2+}/\text{M})$ in volts	-1.18	-0.91	-1.18	-0.44	-0.28	-0.25	+0.34

Observe the values and write the reasons for irregularities.

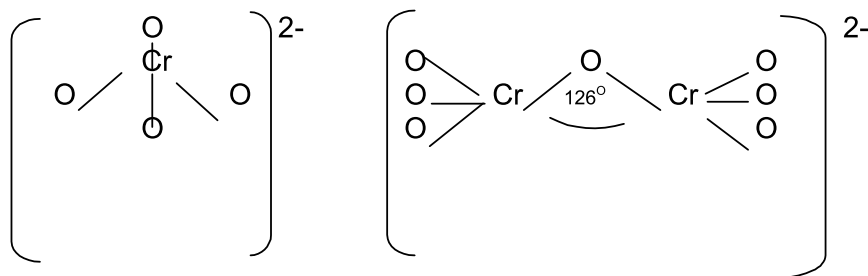
20. Give reasons for the following:

(i) Mn^{2+} is more stable than Mn^{3+}

(ii) The colour of CuCr_2O_7 in water is green.

3 Marks Questions

21. The structure of chromate ion and dichromate ion are given below;

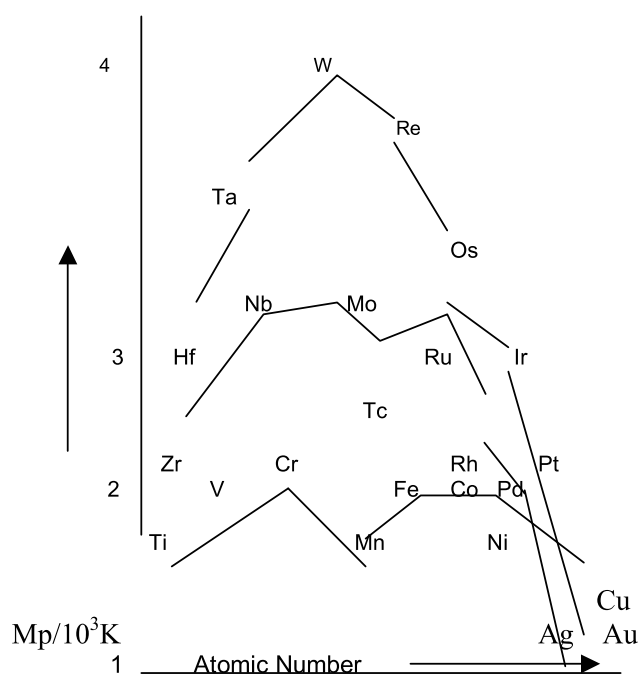


They are interconvertible in aqueous solution depending upon P^{H} of the solution. Give the possible reason for this phenomenon along with the balanced chemical equations.

22. When an orange coloured crystalline compound 'A' was heated with common salt and concentrated H_2SO_4 , an orange red coloured gas 'B' was evolved. The gas 'B' on passing through NaOH solution gave a yellow solution C

- (i) Identify A, B and C.
- (ii) Write balanced chemical equation involved in the reactions.

23. Observe the following graph and answer the questions given below:



- (i) Why melting point of transition elements generally increases towards middle in each series.
- (ii) Why Mn and Tc in 3d and 4d series respectively have low values of melting points.

(Hint: d^5 – stable electronic configuration; electrons held tightly by nucleus; delocalization is less and metallic bond is weak)

(iii) Why the last members of each series show low values of melting points?

24. Elements	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
$\Delta_i H^{\ominus II}$	1235	1309	1414	1592	1509	1561	1644	1752	1988	1734
$\Delta_i H^{\ominus III}$	2393	2657	2833	2990	3266	2962	3243	3462	3556	3829

Observe the table and give plausible reasons for the following trends:

- The second ionization enthalpy values of Cr and Cu are unusually high.
- The second ionization enthalpy of Zn is comparatively low.
- The third ionization enthalpy of Mn and Zn are unusually high.

25. Observe the following table and explain the statements given below:

Elements	Ti	V	Cr	Mn	Fe	Co
$E^{\ominus}(M^{3+}/M^{2+})$ in volts	-0.37	-0.26	-0.41	1.57	0.77	1.97

- Mn has high E^{\ominus} value.
- Comparatively low E^{\ominus} value of V.
- Comparatively low E^{\ominus} value of Fe.

26. A mixed oxide of iron and chromium $FeO \cdot Cr_2O_3$ is fused with Sodium Carbonate in presence of air to form a yellow coloured compound (A). On acidification the compound (A) forms an orange coloured compound (B) which is a strong oxidizing agent.

- Identify the compounds (A) and (B)
- Write balanced chemical equations for each step.

5 Marks Questions

27. (a) A blackish brown coloured solid (A) when fused with alkali metal hydroxides in presence of air produces a dark green compound (B), which on electrolytic oxidation in alkaline medium gives a dark purple compound (C). Identify (A), (B) and (C) and write balanced chemical equations for the reactions involved.

(b) What happens when an acidic solution of the green coloured compound (B) is allowed to stand for some time? Give the equation of the reaction involved. What is this type of reaction called?

(Hint: MnO_4^{2-} changes to MnO_4^-)

28. (A) reacts with H_2SO_4 to form purple coloured solution (B) which reacts with KI to form colourless compound (C). The colour of (B) disappears with acidic solution of $FeSO_4$. With concentrated H_2SO_4 (B) forms (D) which can decompose to give a black compound (E) and O_2 . Identify (A) to (E) and write equations for the reactions involved.