CHAPTER 8

The *d*- and *f*-Block Elements

TRY YOURSELF ANSWERS

1. This is because Ag ($Z = 47$) can show +2 oxidation state in which silver will have partially filled *d* orbitals.

2. The five *d*-orbitals when combined make a complete sphere. Thus, if the *d*-subshell is half-filled or completely filled, the distribution of electron density will be symmetrical as compared to an assymmetrical distribution of electron density for a partially filled *d*-orbital. This symmetrical distribution of electrons make the half-filled or completely filled *d*-subshell more stable (lower energy) as compared to partially filled *d*-subshell (more energy).

3. No unpaired electron is present in *d*-orbital of Hg, this no possibility of *d*-*d* transition. Here, weak metallic bond is present between atoms.

4. Enthalpy of atomisation reaches maximum upto middle, due to increased number of unpaired electrons at middle in the series. Greater is the *d*-*d* transition, stronger is metallic bond but after middle decrease in the number of unpaired electrons occurs that leads to weak metallic bonds. As a result, enthalpy of atomisation decreases.

5. Since standard reduction potential of Co^{3+} is larger than that of Co^{2+}, it suggests that Co^{3+} can be more easily reduced. Therefore, it is better oxidising agent than Co^{2+}.

6. Magnetic properties of a substance is determined by the number of unpaired electrons in the ion. In Cu(II) ion the outermost orbital configuration is $3d^9$. Thus, there is one unpaired electron. Hence, it is paramagnetic. In Cu(I), the outermost orbital configuration is $3d^{10}$. There is no unpaired electron and therefore, Cu (I) is diamagnetic.

7. In the solution, the following equilibria exists :

$Cr_2O_7^{2-} + H_2O \rightleftharpoons 2CrO_4^{2-} + 2H^+$

On adding an alkali, the concentration of H^+ ions decreases, this equilibrium shifts in the forward direction. According to Le-chatelier principle on adding acid, an increase in the H^+ ions occurs causing the equilibrium to shift in backward direction.

8. (i) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \xrightarrow{\Delta} 2Cr^{3+} + 6Fe^{3+} + 7H_2O$

(ii) $Cr_2O_7^{2-} + 3H_2S + 8H^+ \xrightarrow{\Delta} 2Cr^{3+} + 3S + 7H_2O$

(iii) $2KMnO_4 \xrightarrow{\Delta} K_2MnO_4 + MnO_2 + O_2$

(iv) $MnO_4^- + 5Fe^{2+} + 8H^+ \longrightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$

9. The decreasing order of reducing strength is $Sm^{2+} > Eu^{2+} > Yb^{2+}$.

10. Due to lanthanoid contraction, Hf and Zr have almost similar size and therefore, their properties are similar.

11. 5*f* electrons of actinoids are less effectively shielded which results in quenching of orbital contribution. Therefore, magnetic moments of actinoid ions are less than the theoretically predicted values.

12. Chemistry of actinoids is more complicated than lanthanoids because

(i) actinoids show greater number of oxidation states due to the comparable energies of 5*f*, 6*d* and 7*s*-orbitals.

(ii) most of the actinoids are radioactive and the study of their chemistry in the laboratory is difficult.

13. MnO_2

14. V_2O_5

15. $TiCl_4$ and $Al(CH_3)_3$ (Zieglar Natta) are useful in the polymerisation of alkene.

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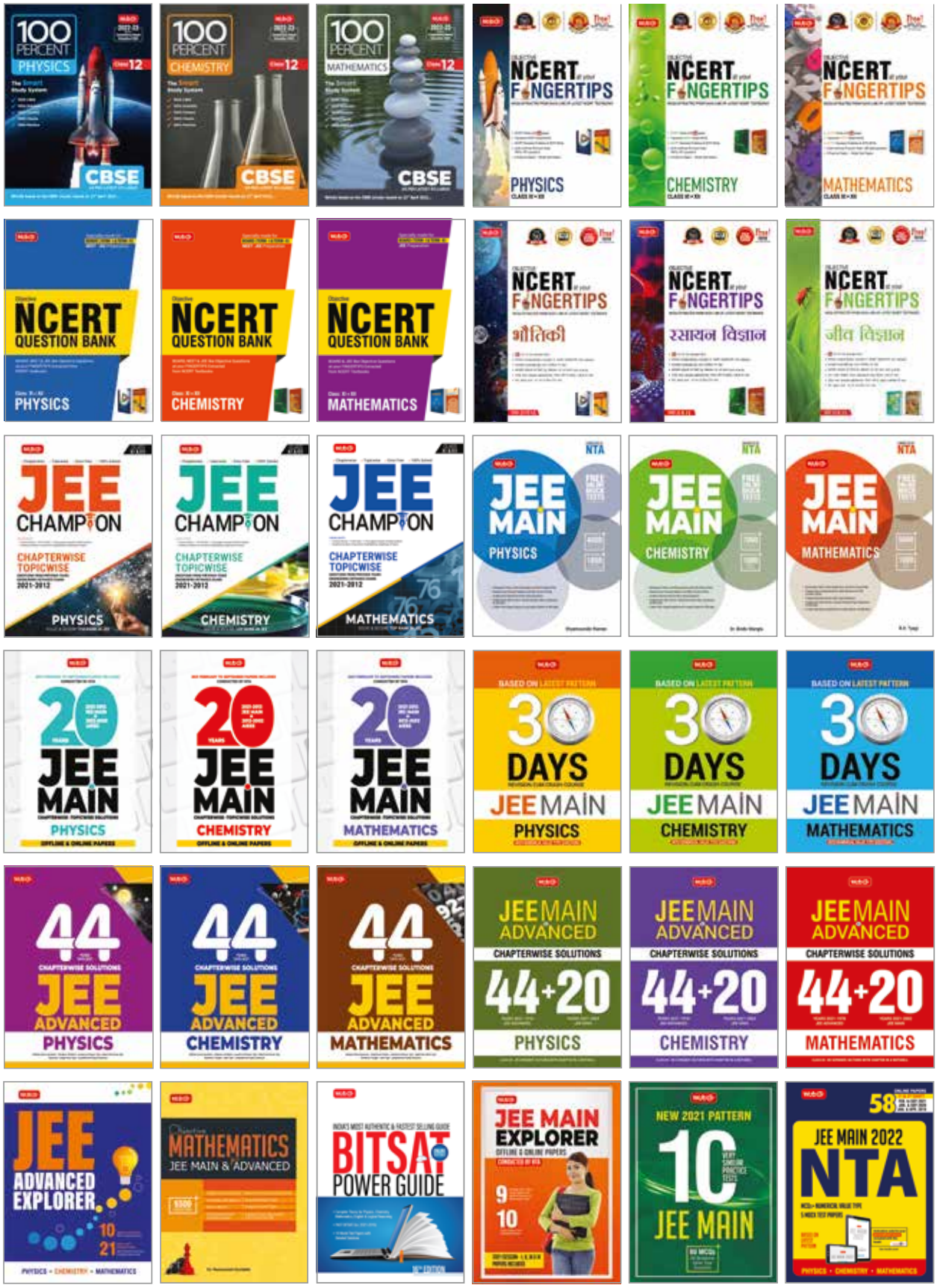

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