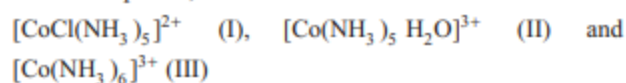


Three complexes,

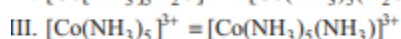
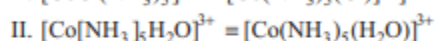
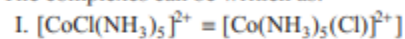


absorb light in the visible region. The correct order of the wavelength of light absorbed by them is (2019 Main, 10 April I)

- (a) $\text{II} > \text{I} > \text{III}$ (b) $\text{I} > \text{II} > \text{III}$
(c) $\text{III} > \text{I} > \text{II}$ (d) $\text{III} > \text{II} > \text{I}$

Key Idea The wavelength (λ) of light absorbed by the complexes is inversely proportional to its Δ_0 CFSE (magnitude). $\Delta_0(\text{CFSE}) \propto 1/\lambda$

The complexes can be written as:



So, the differentiating ligands in the octahedral complexes of Co (III) in I, II and III are Cl^- , H_2O and NH_3 respectively. In the spectrochemical series, the order of this power for crystal field splitting is $\text{Cl}^- < \text{H}_2\text{O} < \text{NH}_3$.

So, the crystal field splitting energy (magnitude) order will be

$$\Delta_0^{\text{CFSE}}(\text{I}) < \Delta_0^{\text{CFSE}}(\text{II}) < \Delta_0^{\text{CFSE}}(\text{III})$$

and the order of wavelength (λ) of light absorbed by the complexes will be

$$\lambda(\text{I}) > \lambda(\text{II}) > \lambda(\text{III}) \quad \left[\because \text{Energy } (\Delta_0^{\text{CFSE}}) \propto \frac{1}{\lambda} \right]$$