

Question:

On the basis of crystal field theory explain why Co(III) forms paramagnetic octahedral complex with weak field ligands whereas it forms diamagnetic octahedral complex with strong field ligands.

Ans:

With weak field ligands; $\Delta_o < p$, the electronic configuration of Co (III) will be $t_{2g}^4 e_g^2$ and it has 4 unpaired electrons and is paramagnetic. With strong field ligands, $\Delta_o > p$, the electronic configuration will be $t_{2g}^6 e_g^0$. It has no unpaired electrons and is diamagnetic.