

6 (a) Nickel forms complexes.

- (i) Give the formula and charge of the tetrahedral complex formed by Ni atoms with carbon monoxide molecules. Carbon monoxide is a monodentate ligand. This is complex **E**.

E = [1]

- (ii) Give the formula and charge of the octahedral complex formed by Ni^{2+} ions with ethanedioate ions. This is complex **F**.

F = [2]

- (iii) Identify which complex, **E** or **F**, exists as a mixture of two stereoisomers and the type of stereoisomerism involved.

The complex which exists as a mixture of two stereoisomers is

The type of stereoisomerism involved is

[1]

- (b) Cadmium forms complexes with methylamine, CH_3NH_2 , and 1,2-diaminoethane, *en*. The values of the stability constants, K_{stab} , of these complex ions are given in Table 6.1.

Table 6.1

complex	K_{stab}
$[\text{Cd}(\text{CH}_3\text{NH}_2)_4]^{2+}$	3.5×10^6
$[\text{Cd}(\text{en})_2]^{2+}$	4.0×10^{10}

- (i) Explain, by reference to its structure, why CH_3NH_2 acts as a monodentate ligand.

..... [1]

- (ii) Some $\text{Cd}^{2+}(\text{aq})$ is added to a solution containing equal concentrations of CH_3NH_2 and *en*.

Predict which of the two complexes in Table 6.1 forms at the higher concentration.

Explain your answer.

complex that forms at the higher concentration

explanation

..... [1]

- (iii) Complete the expression for the K_{stab} of $[\text{Cd}(\text{CH}_3\text{NH}_2)_4]^{2+}$.

$K_{\text{stab}} =$