

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 Ni²⁺ 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, CH₃NH₂, 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}
[Cd(CH ₃ NH ₂) ₄] ²⁺	3.5×10^6
[Cd(<i>en</i>) ₂] ²⁺	4.0×10^{10}

- (i) Explain, by reference to its structure, why CH₃NH₂ acts as a monodentate ligand.

..... [1]

- (ii) Some Cd²⁺(aq) is added to a solution containing equal concentrations of CH₃NH₂ 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 [Cd(CH₃NH₂)₄]²⁺.

$K_{stab} =$

[1]