1. What shapes are the following ions? In each case, name the shape, and draw a diagram showing the shape. Make clear what sort of bonding is involved.

   a) \[[\text{AlF}_6]\]^{3-}

   b) \[[\text{CuCl}_4]\]^{2-}

   c) \[[\text{Cu(NH}_3)_4(\text{H}_2\text{O})_2]\]^{2+}

   d) \[[\text{Co(NH}_3)_6]\]^{2+}

2. a) Cisplatin is an anticancer drug with the formula Pt(NH\text{\textsubscript{3}})_2\text{Cl}_2. Draw the structure for cisplatin and name its shape.

   b) Cisplatin has a geometric isomer. Draw the structure of that as well and name its shape.

3. Octahedral complexes involving bidentate ligands such as 1,2-diaminoethane or ethanedioate (oxalate) ions have optical isomers. A simplified diagram of one such complex of a metal M (omitting the charge on the ion and concentrating on the important bits of the ligands - the lone pairs) looks like this:

   a) Redraw this structure, and then draw its optical isomer.

   b) Why do these structures have optical isomers?