A complex with the coordination number 6 will have an octahedral shape, with bond angles of either 90° or 120°

Explain the terms bidentate, and polydentate as applied to ligands, and outline the systematic nomenclature of ligand naming

The number of dative covalent bonds a ligand can form with a central metal ion is dependent on the number of lone electron pairs it possess. For each lone electron pair, one bond can be+ formed – it then follows that the naming of a ligand matches this:

Monodentate – one	e.g. H_2O, Cl^-, NH_3, CN^-, OH^-
Bi dentate – two	e.g. ethanedioate ion $(COO^-)_2$
Polydentate – multiple (more than two)	e.g. $edta^{4-}$

$Edta^{4-}$ is a **chelation**, as it can wrap itself around the central metal ion to form multiple coordinate bonds.

Naming ligand complexes:

1. The number of **each type** of ligand bonded to the central metal ion, e.g. di (2), tetra (4), hexa (6)
2. The name of each ligand in **alphabetical order** e.g. aqua, cyano, chloro, ammine
3. The name of the central metal ion – if the **overall charge** of the **ion is negative** then the **Latin name** is used, if the **overall charge** is **positive** then the **English name** is used
4. The charge on the central metal ion in brackets e.g. (II) for Fe^{2+}

An example would be $[Cu(NH_3)_4(H_2O)_2]^{2+}$

1. 4 amine/2 water molecules are bonded to each copper atom – making it tetra and di
2. Amine = ammine, water = aqua
3. Copper (has a positive charge so is written in regular English)
4. Copper has a charge of 2+, therefore is II

Tetraamminediaquacopper (II)

Transition metals are able to form complexes because the partially filled 3D subshells can accept the electrons donated by the ligands.

Recall that ions of transition metals in solution are often coloured, and explain that this is because they absorb in specific of the visible spectrum and transmit the complementary frequencies

- The 5 3D subshells can split into 2 at a higher energy level and 3 at a lower energy level
- The frequency of visible light of a photon which is proportional the energy gap between the two levels (ΔE, as ΔE = hv) will be absorbed by an electron in the lower 3D subshells