1. Give the full electron configuration of the following atoms and ions.
   a. Co atom: \(1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7\)  
   b. Co\(^{2+}\) ion: \(1s^2 2s^2 2p^6 3s^2 3p^6 3d^7\)

2. The complex \([\text{Pt(NH}_3\text{)}_2\text{Cl}_2]\) exists as two stereoisomers.
   a. What are stereoisomers?
      same structural formula but different arrangement of atoms in space
   b. Draw the cis stereoisomer, name its shape, ligand-Pt-ligand bond angles, give its co-ordination number and oxidation state of the platinum.
      Name of shape = square planar
      ligand-Pt-ligand bond angles = \(90^\circ\)
      Co-ordination number = 4
      Oxidation state of Pt = +2

3. A complex absorbs visible light at 582 nm. Calculate the energy gap between the d orbitals in J. [Planck’s constant is \(6.63 \times 10^{-34}\) Js and the velocity of light is \(3.00 \times 10^8\) m s\(^{-1}\)]
   \[
   \Delta E = hf = \frac{hc}{\lambda} = \frac{6.63 \times 10^{-34} \times 3.00 \times 10^8}{582 \times 10^{-9}} = 3.42 \times 10^{-19} \text{ J}
   \]
   b. Calculate the energy gap between the d orbitals in kJ mol\(^{-1}\). [the Avogadro constant \((L)\) is \(6.022 \times 10^{23}\) mol\(^{-1}\)]
   \[
   \Delta E = 3.42 \times 10^{-19} \times 6.022 \times 10^{23} = 2.06 \times 10^5 \text{ J mol}^{-1} = 206 \text{ kJ mol}^{-1}
   \]