8 (a) Explain the meaning of the terms *ligand* and *bidentate* as applied to transition metal complexes.

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(2 marks)

8 (b) Aqueous cobalt(II) ions react separately with an excess of chloride ions and with an excess of ammonia.

For each reaction, draw a diagram to illustrate the structure of, the shape of and the charge on the complex ion formed.

In each case, name the shape and indicate, on the diagram, a value for the ligand–metal–ligand bond angle.

(6 marks)

8 (c) The complex ion formed in aqueous solution between cobalt(II) ions and chloride ions is a different colour from the $[Co(H_2O)_6]^{2+}$ ion.

Explain why these complex ions have different colours.

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(3 marks)

8 (d) In aqueous ammonia, cobalt(II) ions are oxidised to cobalt(III) ions by hydrogen peroxide. The H_2O_2 is reduced to hydroxide ions.

Calculate the minimum volume of $5.00\,mol\,dm^{-3}$ H_2O_2 solution required to oxidise the Co^{2+} ions in 9.87 g of $CoSO_4.7H_2O$

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(5 marks)

END OF QUESTIONS

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