Section B

Answer **all** questions in the spaces provided.

7 This question is about copper chemistry.

7 (a) Aqueous copper(II) ions $[Cu(H_2O)_6]^{2+}(aq)$ are blue.

7 (a) (i) With reference to electrons, explain why aqueous copper(II) ions are blue.

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(3 marks)

(Extra space) .....

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7 (a) (ii) By reference to aqueous copper(II) ions, state the meaning of each of the **three** terms in the equation $\Delta E = h\nu$.

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(3 marks)

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7 (a) (iii) Write an equation for the reaction, in aqueous solution, between $[Cu(H_2O)_6]^{2+}$ and an excess of chloride ions.
State the shape of the complex produced and explain why the shape differs from that of the $[Cu(H_2O)_6]^{2+}$ ion.

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(3 marks)

(Extra space) .....

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7 (b) Draw the structure of the ethanedioate ion ($C_2O_4^{2-}$).
Explain how this ion is able to act as a ligand.

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(2 marks)

Question 7 continues on the next page

7 (c) When a dilute aqueous solution containing ethanedioate ions is added to a solution containing aqueous copper(II) ions, a substitution reaction occurs. In this reaction four water molecules are replaced and a new complex is formed.

7 (c) (i) Write an ionic equation for the reaction. Give the co-ordination number of the complex formed and name its shape.

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(4 marks)

7 (c) (ii) In the complex formed, the two water molecules are opposite each other.
Draw a diagram to show how the ethanedioate ions are bonded to a copper ion and give a value for one of the O—Cu—O bond angles. You are **not** required to show the water molecules.

(2 marks)

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