

AQA – Transition metal – A2 Chemistry P1 & P3

1. No.3

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This question is about aqueous ions of the metal iron.

When an aqueous $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ ion reacts with ethanedioate ions, an iron(III) complex ion **X** is formed.

The only ligands in **X** are ethanedioate ions.

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Draw the structure of **X**.

Include the charge.

[2 marks]

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The formation of **X** is an example of the chelate effect.

Explain the meaning of the chelate effect.

[2 marks]

In your answer you should include

- [6 marks]**

[illegible]

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A student adds dilute ammonia solution to a solution containing $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ ions.

Give the formula of the precipitate that forms.

[1 mark]

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The student adds sodium carbonate solution to a solution containing $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ ions.

State **one** observation the student would make.

Give an equation for the reaction.

[2 marks]

Observation _____

Equation _____

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A solution containing $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ ions changes to a yellow-brown colour after several hours in contact with air.

The student adds sodium carbonate to the yellow-brown solution.

Give an equation for the reaction with sodium carbonate.

[1 mark]

1

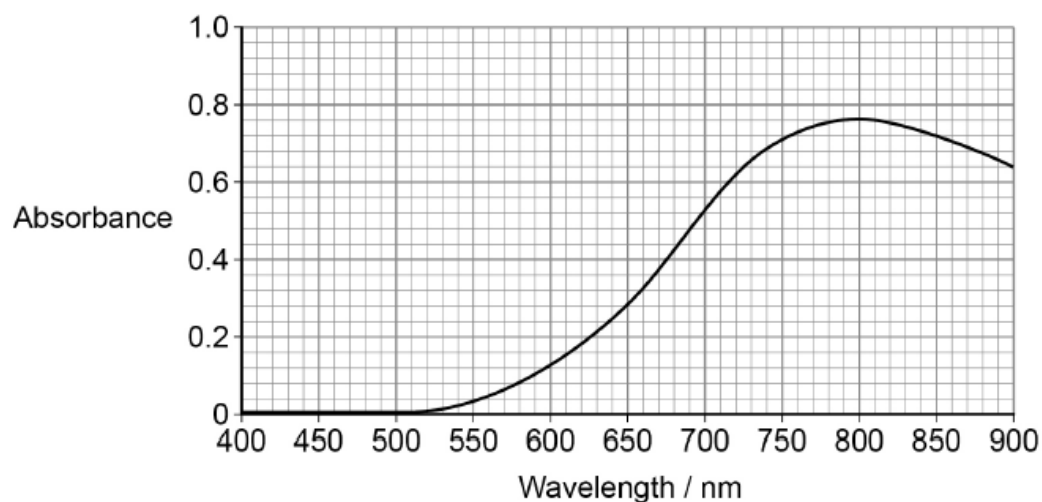
- Explain why some complexes containing transition metal ions are coloured.
- List the factors that affect the colour.
- Describe how colorimetry can be used to determine the concentration of a coloured complex.

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Figure 5 shows the visible spectrum of $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$

Figure 5



Use the wavelength at the peak of the curve in **Figure 5** to calculate the change in energy, in J, of an electron when it absorbs radiation with this wavelength.

the Planck constant, $h = 6.63 \times 10^{-34} \text{ J s}$

speed of light, $c = 3.00 \times 10^8 \text{ m s}^{-1}$

[3 marks]

Change in energy _____ J