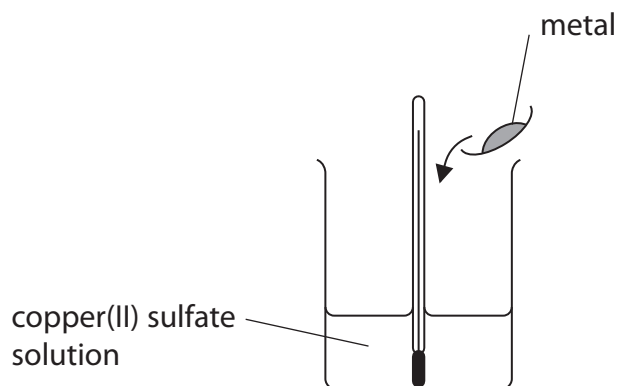


- 6 A student uses this apparatus to investigate the temperature changes that occur when metals are added to copper(II) sulfate solution.



This is the student's method.

- add a sample of aluminium to a beaker containing 25 cm^3 of copper(II) sulfate solution
- stir the mixture and record the highest temperature reached

The student repeats the experiment four times, using the same amount of a different metal each time.

(a) The table shows the thermometer readings for each metal.

	Aluminium	Iron	Magnesium	Silver	Zinc
Thermometer reading					
Highest temperature reached in $^{\circ}\text{C}$				25.0	

Complete the table by recording the highest temperature reached for each metal, giving all temperatures to the nearest 0.5°C .

(2)



(b) The initial temperature of the copper(II) sulfate solution in each experiment is 25.0 °C.

(i) Suggest why magnesium produces the largest temperature rise.

(1)

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(ii) Explain why there is no temperature change with silver.

(2)

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(c) In the experiment with magnesium, using 25 cm³ of solution means that the copper(II) sulfate is in excess.

In another experiment, the student uses the same amount of magnesium but adds it to 50 cm³ of copper(II) sulfate solution.

Explain how the change in volume affects the temperature rise.

(2)

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(d) In another experiment, the student adds a metal to 45 cm³ of copper(II) sulfate solution and obtains a temperature rise of 15.0 °C.

The mass of 1.0 cm³ of the solution is 1.0 g.

The specific heat capacity, c , of the solution is 4.2 J/g/°C.

Calculate the heat energy, Q , in kilojoules (kJ), released in this reaction.

(4)

$Q =$ kJ

(Total for Question 6 = 11 marks)

