

Chapter 1.3

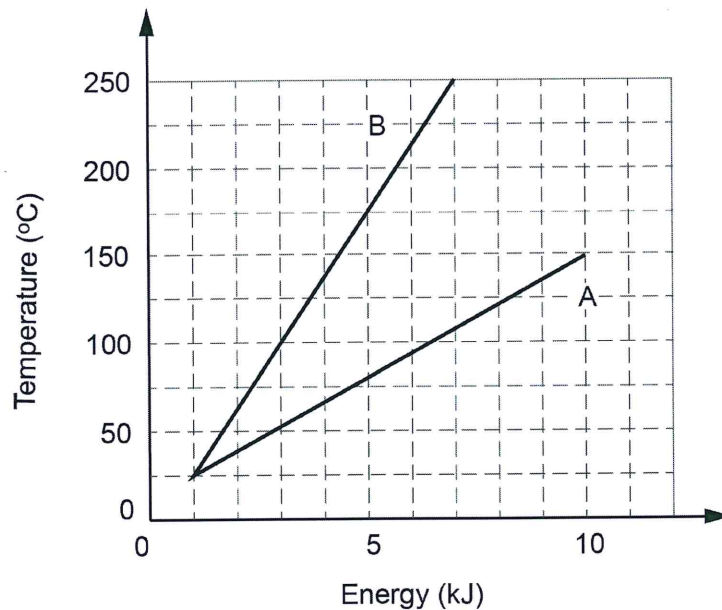
Question 1

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(6 marks)

Two objects, A and B, have the same sizes but different masses. The specific heat capacity of each is $234 \text{ J kg}^{-1} \text{ K}^{-1}$. A and B each receive the same amount of energy from an external source. The graph shows the result.



- (a) Which object has the larger mass? Using the correct mathematical formula, explain your reasoning for this choice. (3 marks)
- (b) From the data in the graph, determine the mass of object A. (3 marks)

Question 2

(4 marks)

A jeweller is making a gold bar by melting small pieces of pure gold. The gold pieces have a total mass of $4.00 \times 10^{-2} \text{ kg}$ and are initially at 20.3°C . The energy required to bring the gold up to its melting point is $5.24 \times 10^3 \text{ J}$. If the specific heat capacity of gold is $126 \text{ J kg}^{-1} \text{ K}^{-1}$, determine the melting point of gold.

Question 3

(5 marks)

The heating element of an electric kettle connected to the 240 V mains supply is used to heat 0.500 kg of water from 20.0°C to the boiling point (100°C). Knowing that heat energy is equivalent to electrical work, determine the amount of charge that passed through the heating element during this time. Include the correct unit for charge.

Question 4

(12 marks)

In a dishwasher, the water combines with detergent and then the mixture is heated and sprayed against the dishes to clean them. The dirty water is pumped out and then fresh water, with a rinsing agent, rinses the dishes. Finally, the hot rinse water is pumped out and the hot dishes dry in the machine. The dishwasher in this question is connected to the 240 V electricity supply and draws a total current of 12.0 A.

- (a) The heater in the dishwasher draws half the total current to heat the water during the washing cycle. Determine the power rating of the heater, including the correct unit. Show **all** workings. (3 marks)
- (b) During the washing cycle, the dishwasher heats 6.50 kg of water from 15.0 °C to 90.0 °C. Using your answer from Part (a) above, calculate the time taken to heat the water. If you were unable to calculate a value for the power in Part (a), use a value of 1.50×10^3 . Show **all** workings. (4 marks)
- (c) In reality, the time taken to heat the water is longer than the time calculated in Part (b). Suggest **two** reasons why this is so. (2 marks)

Another electrical device used in the kitchen is a toaster.

- (d) Occasionally a piece of toast will get caught in the toaster. Explain why it is dangerous to use a metal knife to remove this toast without first turning off the toaster. (3 marks)