

GCSE Physics B (Twenty First Century Science)
J259/01 Breadth in Physics (Foundation Tier)

Question Set 23

1

Ali uses a hot water bottle to keep warm.



- (a) He uses a kettle to heat 1.1 kg of water from 20°C to 90°C. Ali then pours the hot water into the hot water bottle.

The specific heat capacity of water is 4200 J/kg/°C.

Calculate the change in internal energy in heating the water.

Use the equation:

change in internal energy = mass × specific heat capacity × change in temperature

Give your answer to 2 significant figures.

$$\begin{aligned} E &= mc\Delta T = 1.1 \times 4200 \times (90 - 20) \\ &= 323400 \text{ J} \\ &= 320,000 \text{ J (2 sf)} \end{aligned}$$

Change in internal energy = 320,000 J [3]

- (b) The kettle transfers energy electrically.

The resistance of the kettle is 20 Ω.

The electric current in the kettle is 11 A.

Calculate the power of the kettle.

$$P = I^2 R = 11^2 \times 20 = 2420 \text{ W}$$

Power = 2420 W [3]

(c) Ali decides to use a heat pack instead of a hot water bottle.

A heat pack is a bag containing seeds, such as rice or wheat. It is heated in a microwave oven.



heat pack

Ali has two heat packs, one containing rice, and one containing wheat. He wants to investigate which heat pack will stay warm for longer.

(i) Suggest **two** pieces of measuring apparatus he will need to use in his investigation.

Thermometer, stop watch

[2]

(ii) Suggest **one** control variable for Ali's investigation.

Mass of heat pack.

[1]

Total Marks for Question Set 23: 9

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