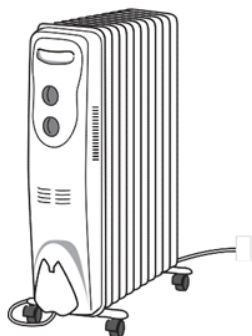


**GCSE Physics B (Twenty First Century Science)**  
**J259/01** Breadth in Physics (Foundation Tier)

**Question Set 14**

1

The diagram shows a common type of electric heater. It contains oil which is heated by an electrical element.



The table shows some information about the heater.

Electrical power	1500 W
Voltage rating	230 V
Specific heat capacity of oil	1600 J/kg °C
Mass of oil	4.5 kg

- (a) Show that more than 700 000 J of energy is needed to heat the oil from 20 °C to 120 °C.

Use the equation:

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

[2]

$$E = mc\Delta T = 4.5 \times 1600 \times (120 - 20) = 720\,000 \text{ J}$$

- (b) (i) Use your answer to (a) to calculate the minimum time for the oil to reach a temperature of 120 °C, starting at 20 °C.

$$E = Pt \text{ so } t = \frac{E}{P} = \frac{720\,000}{1500} = 480 \text{ seconds}$$

Minimum time = ..... 480 ..... s [3]

- (ii) In practice, it will take longer than this for the heater to reach 120 °C.

State the reason for this.

Energy is lost to the surroundings as heat. [1]

**Total Marks for Question Set 14: 6**

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