

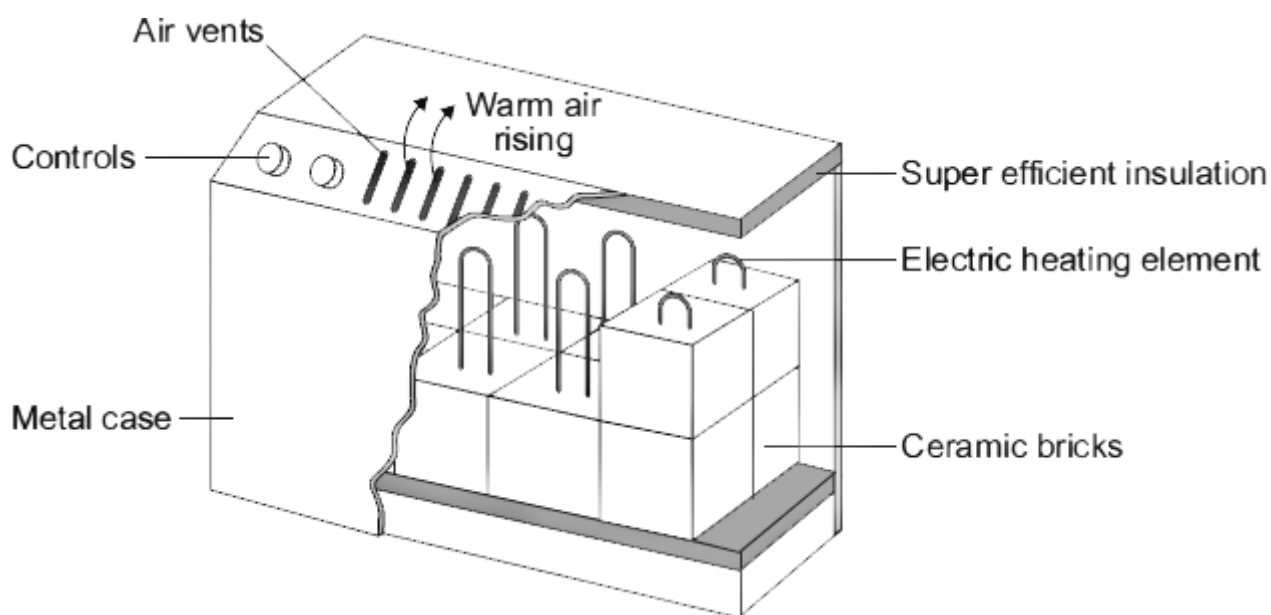
Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

Q1.

The diagram shows how one type of electric storage heater is constructed. The heater has ceramic bricks inside. The electric elements heat the ceramic bricks during the night. Later, during the daytime, the ceramic bricks transfer the stored energy to the room.



- (a) (i) Complete the following sentences using words from the box.

conduction**convection****evaporation**

Energy is transferred through the metal casing by _____

The warm air rising from the heater transfers energy to the room by _____

(2)

- (ii) The inside of the metal case is insulated.

Which **one** of the following gives the reason why?

Tick (✓) **one** box.

To transfer energy from the ceramic bricks to the room faster

☐

To stop energy from the room transferring into the heater

To keep the ceramic bricks hot for a longer time

(1)

- (b) In winter, the electricity supply to a 2.6 kW storage heater is switched on for seven hours each day.

- (i) Calculate the energy transferred, in kilowatt-hours, from the electricity supply to the heater in seven hours.

Show clearly how you work out your answer.

Energy transferred = _____ kWh

(2)

- (ii) The electricity supply to the heater is always switched on between midnight and 7 am. Between these hours, electricity costs 5 p per kilowatt-hour.

Calculate how much it costs to have the heater switched on between midnight and 7 am.

Cost = _____ p

(1)

- (c) Between 7 am and 8 am, after the electricity supply is switched off, the temperature of the ceramic bricks falls by 25 °C.

Calculate the energy transferred from the ceramic bricks between 7 am and 8 am.

Total mass of ceramic bricks = 120 kg.

Specific heat capacity of the ceramic bricks = 750 J/kg °C.

Show clearly how you work out your answer.

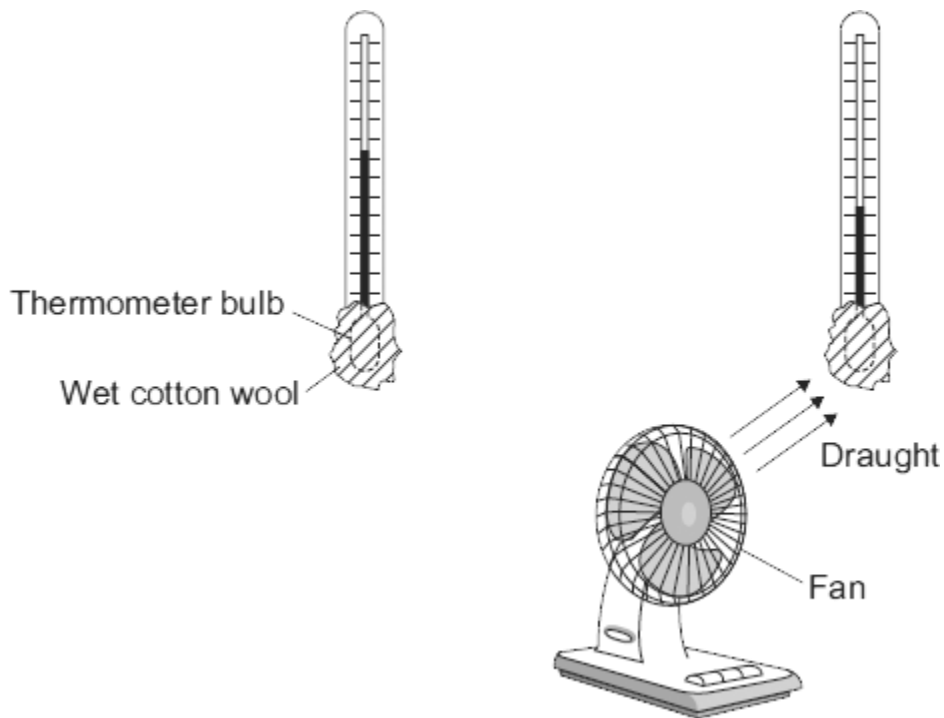
Energy transferred = _____ J

(2)

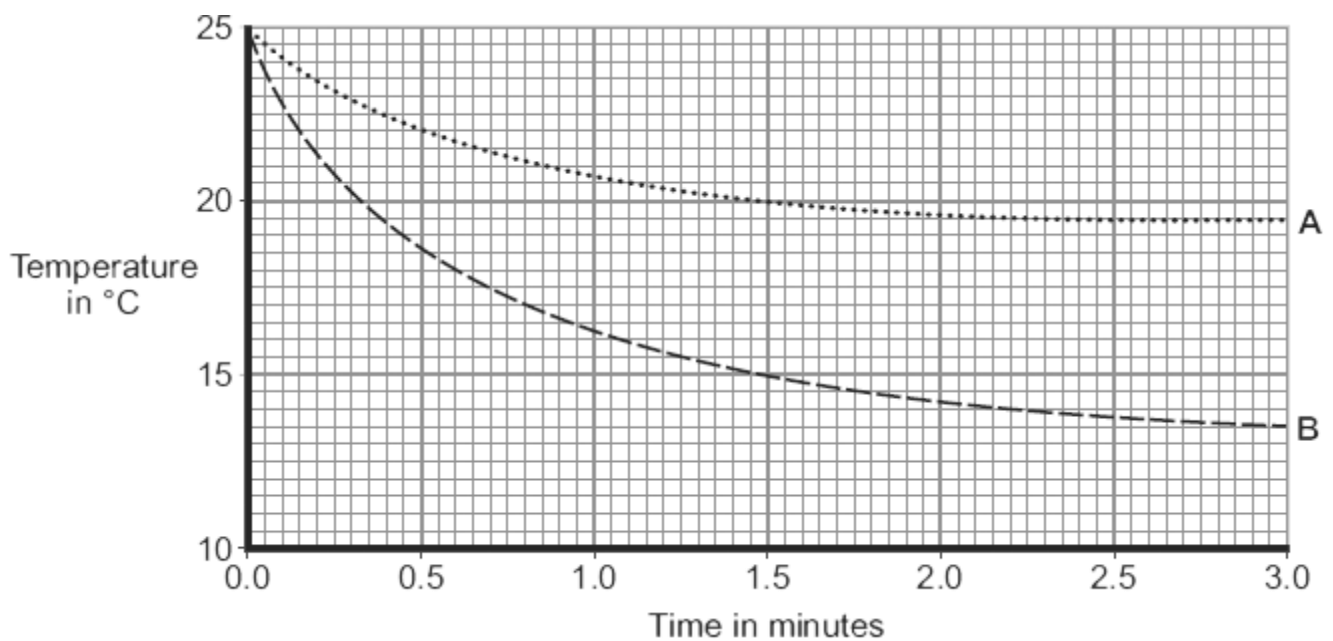
(Total 8 marks)

Q2.

The diagram shows two thermometers. The bulb of each thermometer is covered with a piece of wet cotton wool. One of the thermometers is placed in the draught from a fan.



The graph shows how the temperature of each thermometer changes with time.



- (a) Which of the graph lines, **A** or **B**, shows the temperature of the thermometer placed in the draught?

Write the correct answer in the box.

Explain, in terms of evaporation, the reason for your answer.

(3)

- (b) A wet towel spread out and hung outside on a day without wind dries faster than an identical wet towel left rolled up in a plastic bag.

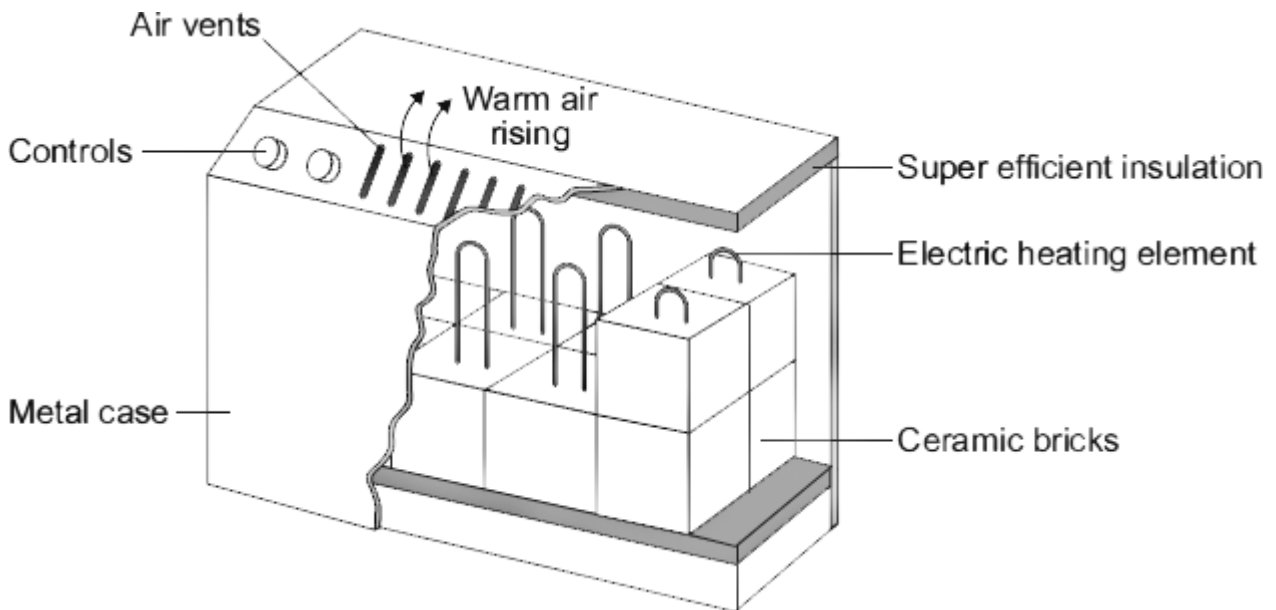
Explain why.

(2)

(Total 5 marks)

Q3.

The diagram shows how one type of electric storage heater is constructed. The heater has ceramic bricks inside. The electric elements heat the ceramic bricks during the night. Later, during the daytime, the ceramic bricks transfer the stored energy to the room.



- (a) In winter, the electricity supply to a 2.6 kW storage heater is switched on each day between midnight and 7 am. Between these hours, electricity costs 5 p per kilowatt-hour.

Calculate the daily cost of using the storage heater.

Show clearly how you work out your answer.

Cost = _____ p

(3)

- (b) Homes with electric storage heaters have a separate meter to measure the electricity supplied between midnight and 7 am. Another meter measures the electricity supplied at other times. This electricity supplied at other times costs 15 p per kilowatt-hour.

Electricity companies encourage people to use electricity between midnight and 7 am by selling the electricity at a lower cost.

Suggest why.

(1)

- (c) By 7 am, the temperature at the centre of the ceramic bricks is about 800 °C. The temperature of the outside metal casing is about 80 °C.

The ceramic bricks are surrounded by 'super-efficient' insulation.

Explain why.

(2)

- (d) At 7 am, the electricity supply switches off and the temperature of the ceramic bricks starts to fall. The temperature of the bricks falls by 100 °C over the next four hours. During this time, 9 000 000 J of energy are transferred from the bricks.

Calculate the total mass of ceramic bricks inside the heater.

Specific heat capacity of the ceramic bricks = 750 J/kg °C.

Show clearly how you work out your answer.

Mass = _____ kg

(2)

(Total 8 marks)