

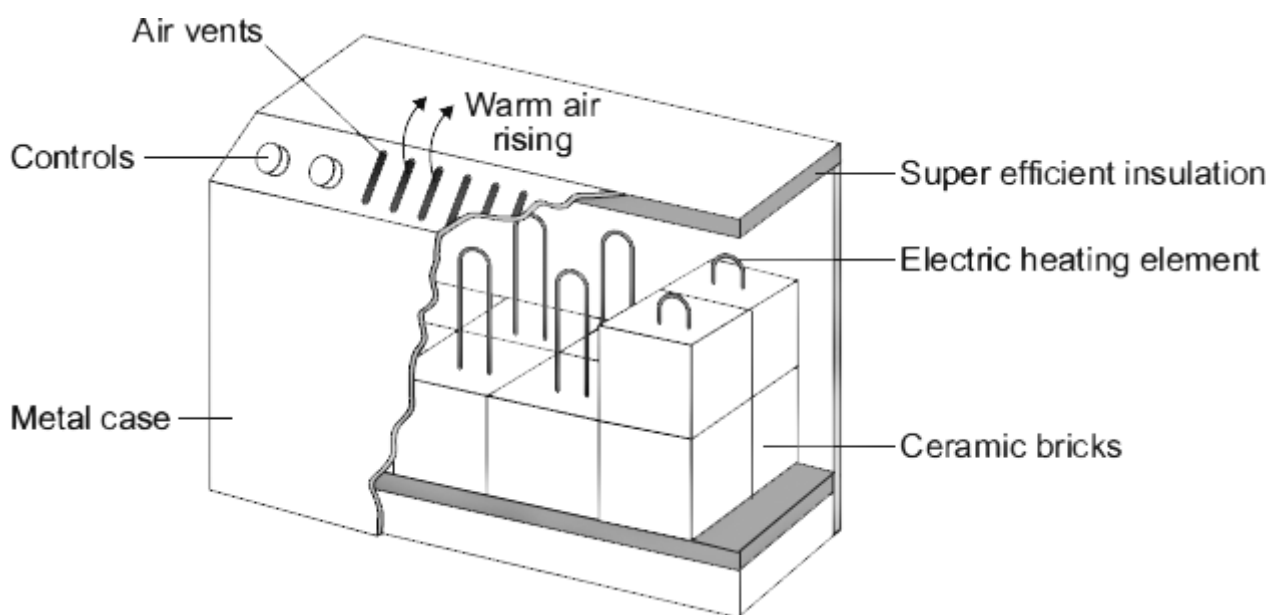
Name of the Student: _____

Max. Marks : 24 Marks

Time : 24 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.

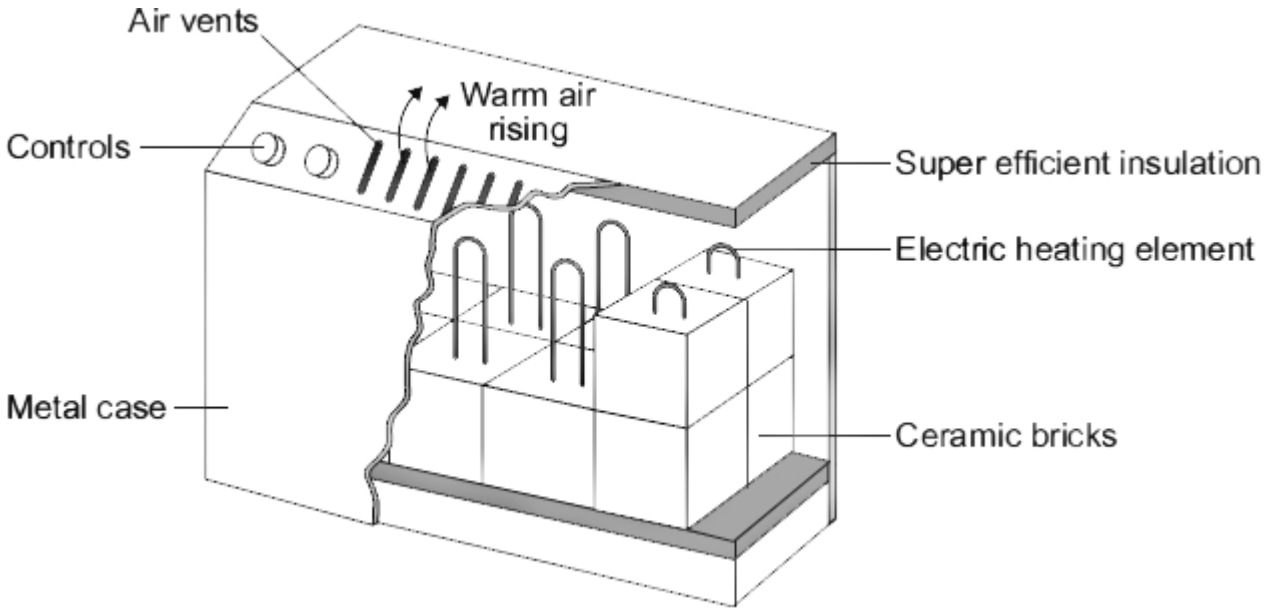
Energy transferred = _____ J

(2)

(Total 8 marks)

Q2.

The diagram shows 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.

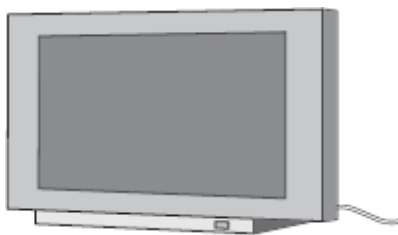
Mass = _____ kg

(2)

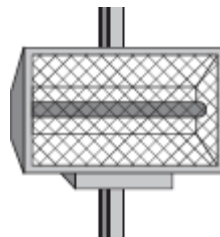
(Total 8 marks)

Q3.

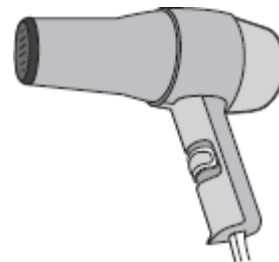
The data included in the diagrams gives the power of the electrical appliances.



TV
160 W



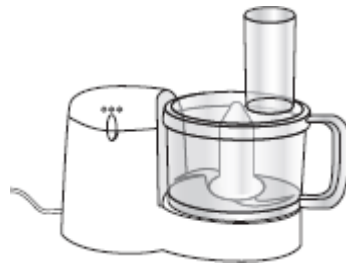
Radiant heater
1.0 kW



Hairdryer
1100 W



Sandwich toaster
1.1 kW



Food processor
0.4 kW



Table lamp
40 W

- (a) (i) Which of the appliances are designed to transform electrical energy to kinetic energy?

(1)

- (ii) Which of the appliances waste energy as heat?

(1)

- (b) Leaving the radiant heater switched on is likely to lead to more carbon dioxide being emitted into the atmosphere than leaving the table lamp on for the same length of time.

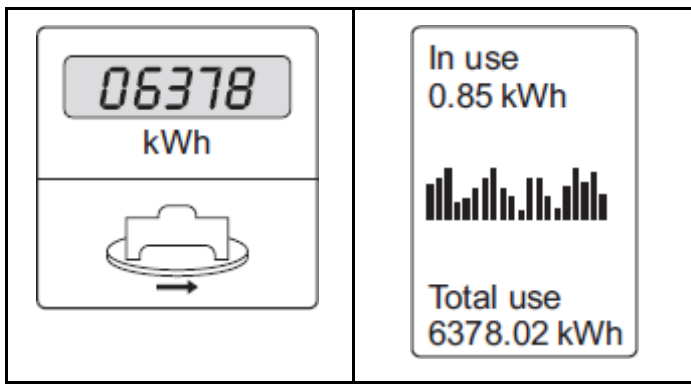
Explain why.

(2)

- (c) A homeowner decides to monitor the amount of electrical energy used in his home. He can do this by using the home's electricity meter or by using a separate electronic device.

The table gives some information about each method.

| Electricity meter | Electronic device |
|---|---|
| Records to the nearest kilowatt-hour | Records to the nearest 1/100th kilowatt-hour |
| Homeowner takes readings at regular intervals | Energy use recorded continuously and stored for one year |
| | Displays a graph showing energy use over a period of time |



(i) Complete the following sentence.

The reading given by the electronic device is more _____ than the reading given by the electricity meter.

(1)

(ii) Suggest how data collected and displayed by the electronic device could be useful to the homeowner.

(3)

(Total 8 marks)