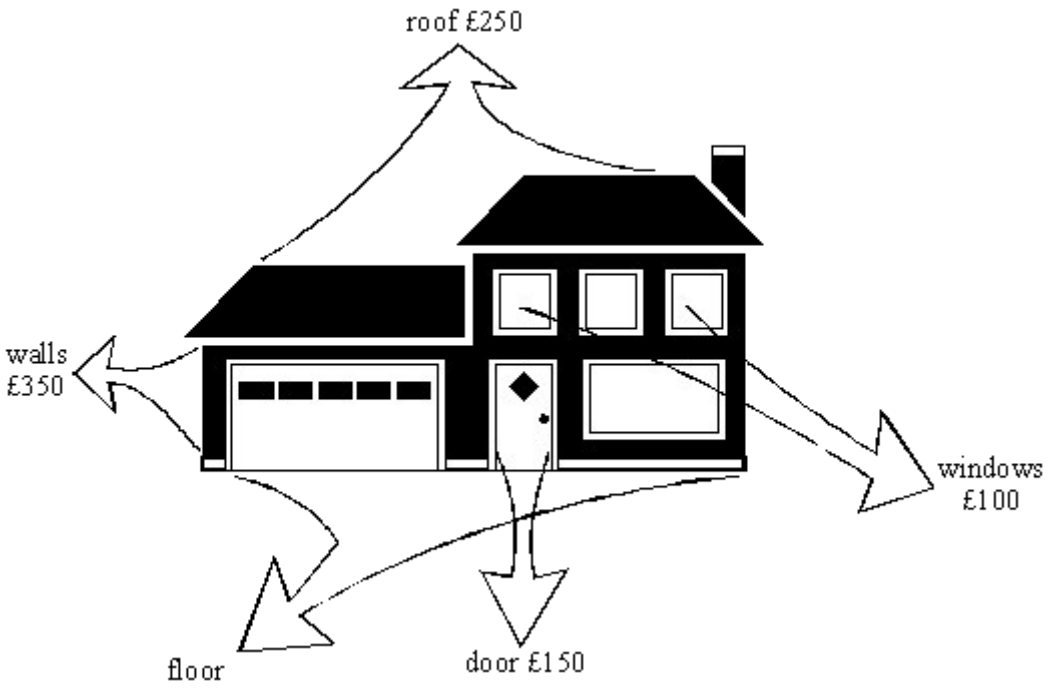
Q1. The diagram below shows a house which has **not** been insulated. The cost of the energy lost from different parts of the house during one year is shown on the diagram.



(a) The total cost of the energy lost during one year is £1000.

(i) What is the cost of the energy lost through the floor?

.....

(2)

(ii) Suggest one way of reducing this loss.

.....

(1)

(b) The table below shows how some parts of the house may be insulated to reduce energy losses. The cost of each method of insulation is also given.

WHERE LOST	COST OF ENERGY LOST PER YEAR (£)	METOD OF INSULATION	COST OF INSULATION (£)

roof	250	fibre-glass in loft	300
walls	350	foam filled cavity	800
windows	100	double glazing	4500
doors	150	draught proofing	5

(i) Which method of insulation would you install first? Explain why.

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(3)

(ii) Which method of insulation would you install last? Explain why.

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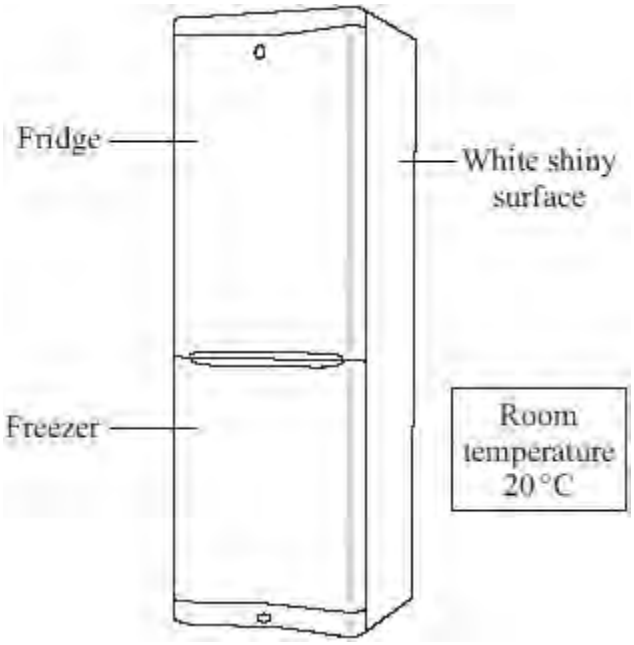
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(3)

(Total 9 marks)

Q2. The diagram shows a fridge-freezer.



(a) By which method is heat transferred through the walls of the fridge-freezer?

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(1)

(b) The inside of the fridge is at 4 °C. The inside of the freezer is at –18 °C.

Into which part of the fridge-freezer will the rate of heat transfer be greater?

Draw a ring around your answer.

the fridge **the freezer**

Give a reason for your answer.

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(1)

(c) The outside surface of the fridge-freezer is white and shiny.

Give **two** reasons why this type of surface is suitable for a fridge-freezer.

1 .....

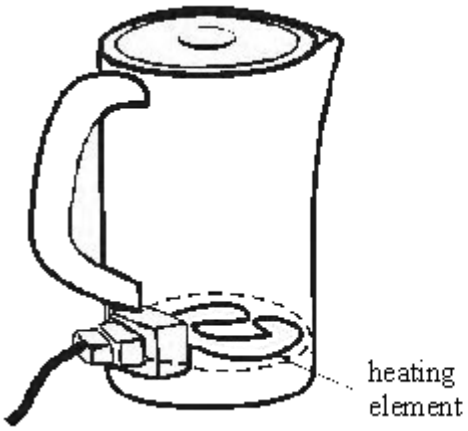
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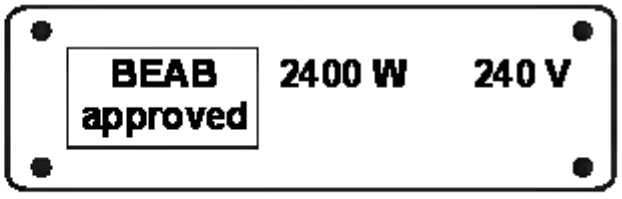
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(2)
(Total 4 marks)

Q3. The diagram below shows an electric kettle and the label on the bottom of the kettle.





The water at the bottom of the kettle will heat up first.
This is because the heating element is near the bottom of the kettle.
Convection currents will then cause the rest of the water in the kettle to be heated.

(i) What are convection currents?

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(1)

(ii) Explain how convection currents are produced.
(Your answer should refer to **density** and **temperature**.)

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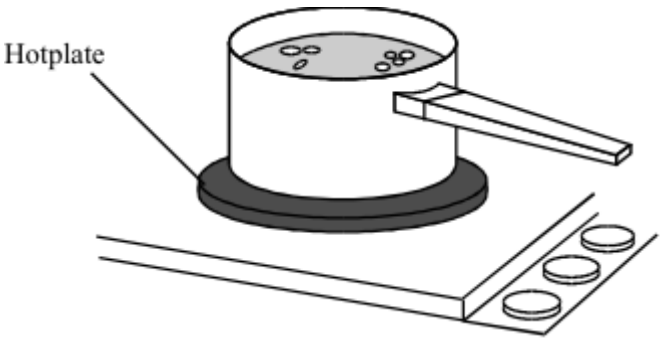
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(4)
(Total 5 marks)

Q4. The drawing shows water being heated in a metal saucepan.



(a) Explain, in terms of the particles in the metal, how heat energy is transferred through the base of the saucepan.

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(2)

(b) Energy is transferred through the water by convection currents. Explain what happens to cause a convection current in the water. The answer has been started for you.

As heat energy is transferred through the saucepan, the water particles at the bottom

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(3)

(c) Some energy is transferred from the hotplate to the air by *thermal radiation*. What is meant by *thermal radiation*?

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(1)

(Total 6 marks)

Q5. According to kinetic theory, all matter is made up of small particles. The particles are constantly moving.

Diagram 1 shows how the particles may be arranged in a solid.

Diagram 1



(a) One kilogram of a gas has a much larger volume than one kilogram of a solid.

Use kinetic theory to explain why.

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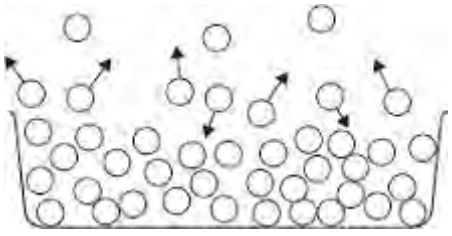
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(4)

(b) **Diagram 2** shows the particles in a liquid. The liquid is evaporating.

Diagram 2



(i) How can you tell from **Diagram 2** that the liquid is evaporating?

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(1)

(ii) The temperature of the liquid in the container decreases as the liquid evaporates.

Use kinetic theory to explain why.

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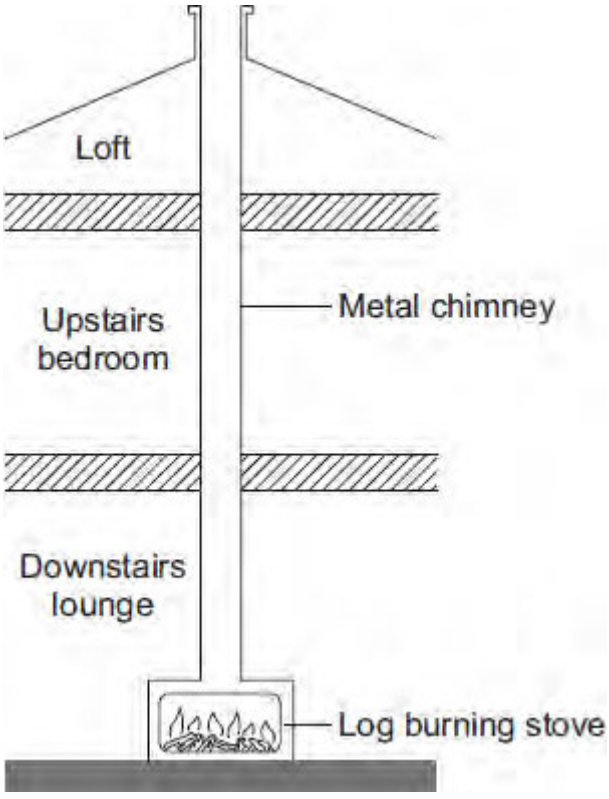
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(3)
(Total 8 marks)

Q6. The diagram shows how the metal chimney from a log-burning stove passes through the inside of a house.



(a) Explain how heat is transferred by the process of convection from the inside of the stove to the top of the chimney.

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(2)

(b) Although the outside of the chimney becomes very hot, there is no insulating material around the chimney.

(i) Explain, in terms of the particles in a metal, how heat is transferred by conduction from the inside to the outside of the metal chimney.

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(2)

(ii) Suggest **one** advantage of having no insulation around the chimney.

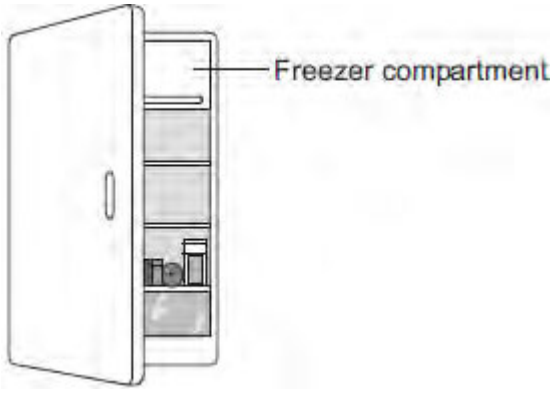
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(1)
(Total 5 marks)

Q7.(a) The figure below shows a fridge with a freezer compartment.

The temperature of the air inside the freezer compartment is –5 °C.



The air inside the fridge forms a convection current when the fridge door is closed.

Explain why.

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(4)

(b) The table below shows information about four fridges.

Fridge	Volume in litres	Energy used in one year in kWh
A	250	300
B	375	480
C	500	630
D	750	750

A householder concludes that the energy used in one year is directly proportional to the volume of the fridge.

Explain why her conclusion is **not** correct.

Use data from the table in your answer.

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(2)

(c) New fridges are more efficient than fridges made twenty years ago.

Give **one** advantage and **one** disadvantage of replacing an old fridge with a new fridge.

Ignore the cost of buying a new fridge.

Advantage .....

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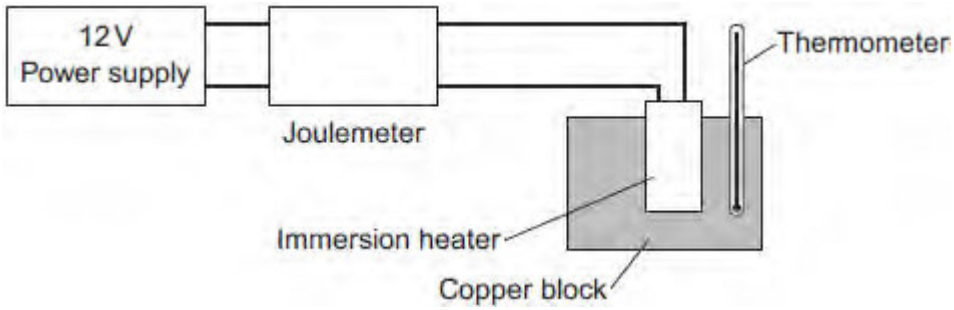
Disadvantage .....

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(2)
(Total 8 marks)

Q8. A student used the apparatus in **Figure 1** to obtain the data needed to calculate the specific heat capacity of copper.

Figure 1



The initial temperature of the copper block was measured.

The power supply was switched on.

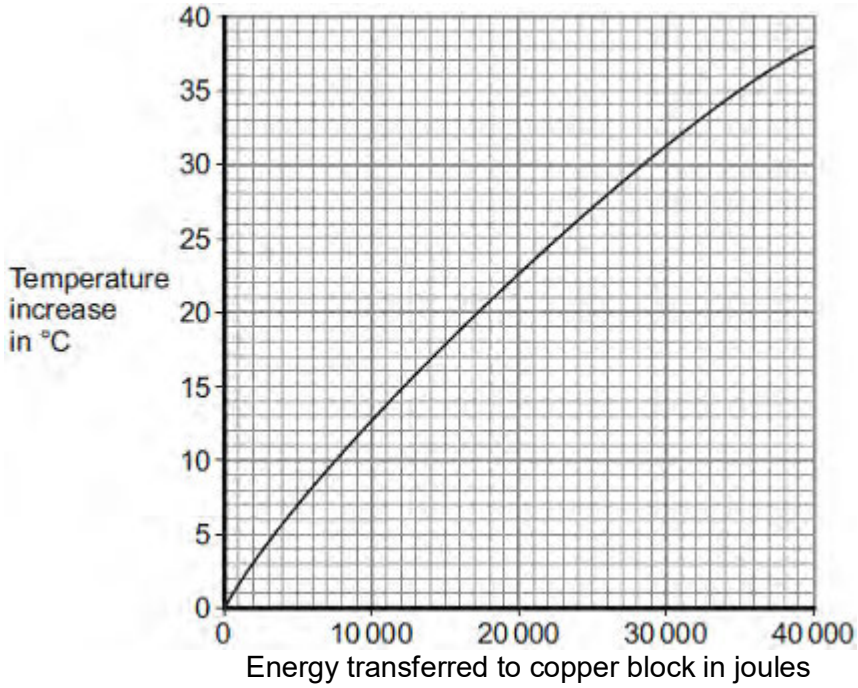
The energy transferred by the heater to the block was measured using the joulemeter.

The temperature of the block was recorded every minute.

The temperature increase was calculated.

Figure 2 shows the student's results.

Figure 2



(a) Energy is transferred through the copper block.

What is the name of the process by which the energy is transferred?

Tick (✓) **one** box.

Conduction ☐

Convection ☐

Radiation ☐

(1)

(b) Use **Figure 2** to determine how much energy was needed to increase the temperature of the copper block by 35 °C.

..... joules

(1)

(c) The copper block has a mass of 2 kg.

Use your answer to part (b) to calculate the value given by this experiment for the specific heat capacity of copper. Give the unit.

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Specific heat capacity = ...

(3)

(d) This experiment does **not** give the correct value for the specific heat of copper.

Suggest **one** reason why.

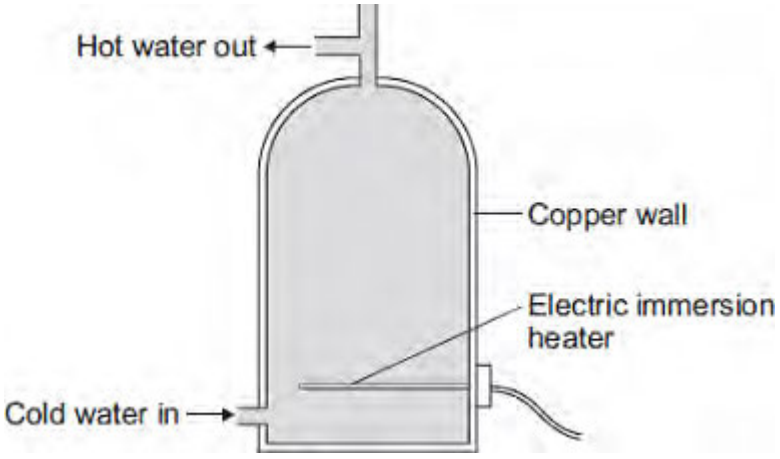
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(1)

(Total 6 marks)

Q9. An electric immersion heater is used to heat the water in a domestic hot water tank.
When the immersion heater is switched on the water at the bottom of the tank gets hot.



(a) Complete the following sentence.

The main way the energy is transferred through the copper wall of the water tank is by

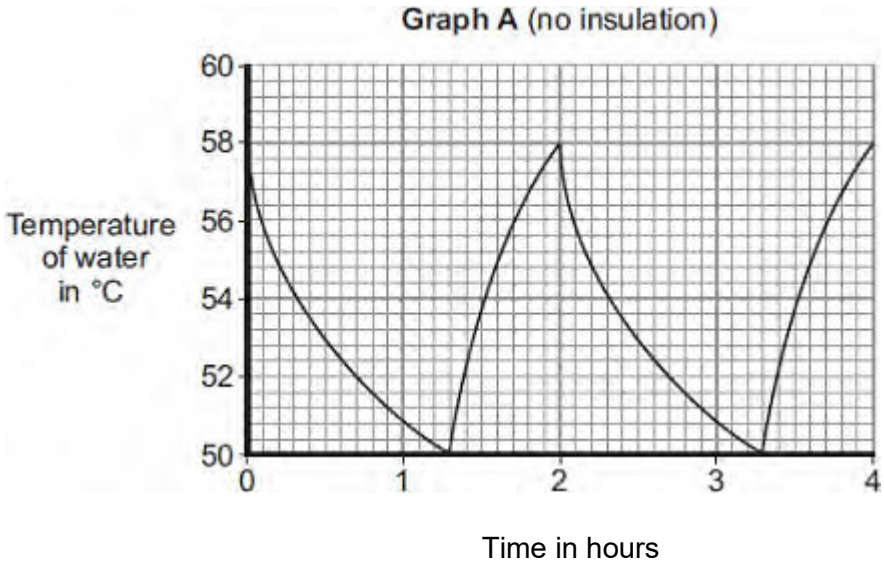
the process of ..... .

(1)

(b) The immersion heater has a thermostat to control the water temperature.

When the temperature of the water inside the tank reaches 58°C the thermostat switches the heater off. The thermostat switches the heater back on when the temperature of the water falls to 50°C.

Graph A shows how the temperature of the water inside a hot water tank changes with time. The tank is **not** insulated.



(i) The temperature of the water falls at the fastest rate just after the heater switches off.

Explain why.

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(2)

(ii) To heat the water in the tank from 50°C to 58°C the immersion heater transfers 4032 kJ of energy to the water.

Calculate the mass of water in the tank.

Specific heat capacity of water = 4200 J/kg°C

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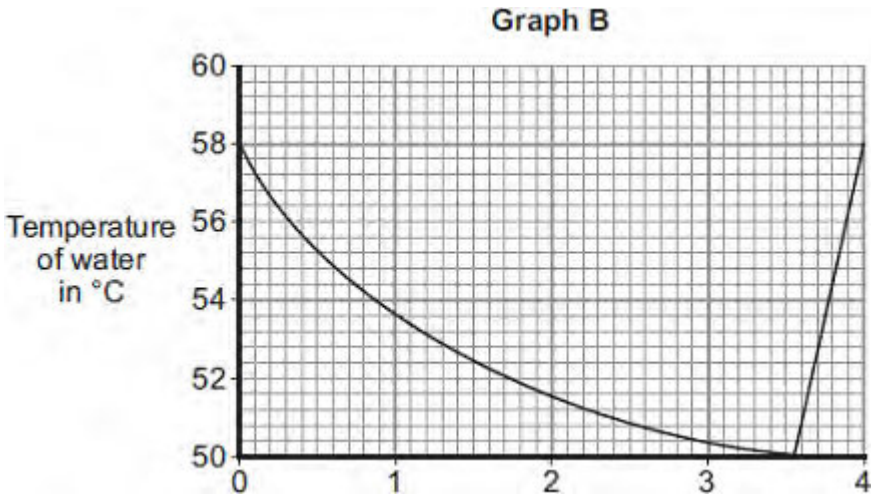
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Mass = ... kg

(3)

(iii) An insulating jacket is fitted to the hot water tank.

Graph B shows how the temperature of the water inside the insulated hot water tank changes with time.



An insulating jacket only costs £12.

By comparing **Graph A** with **Graph B**, explain why fitting an insulating jacket to a hot water tank saves money.

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(3)
(Total 9 marks)