

Name of the Student: _____

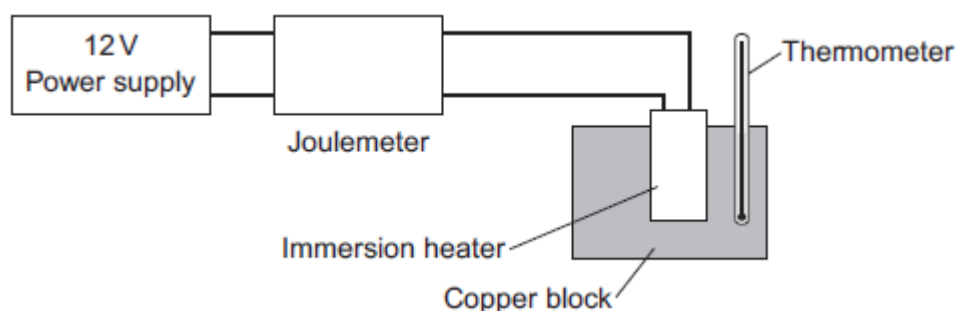
Max. Marks : 23 Marks

Time : 23 Minutes

Q1.

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.

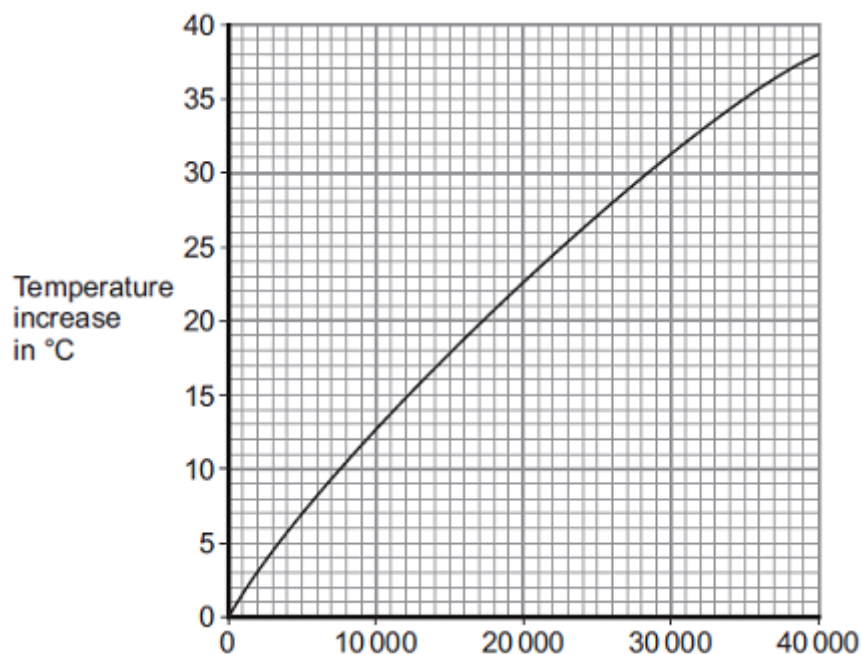
The energy transferred by the heater to the block was measured using the joulemeter.

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.

Specific heat capacity = _____

(3)

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

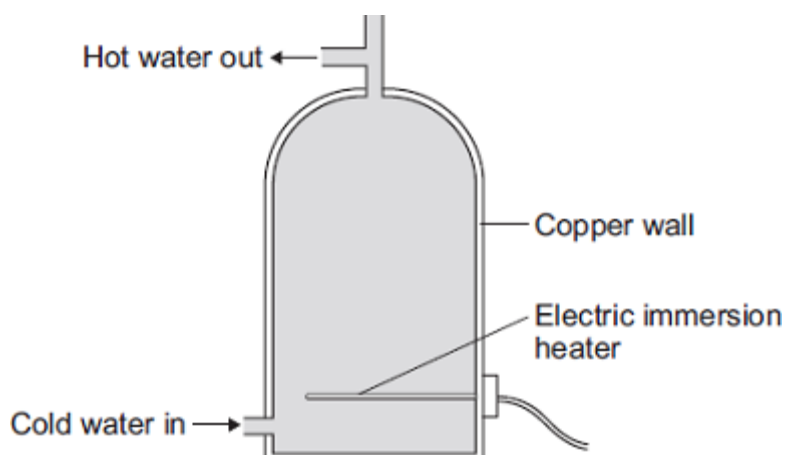
Suggest **one** reason why.

(1)

(Total 6 marks)

Q2.

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.

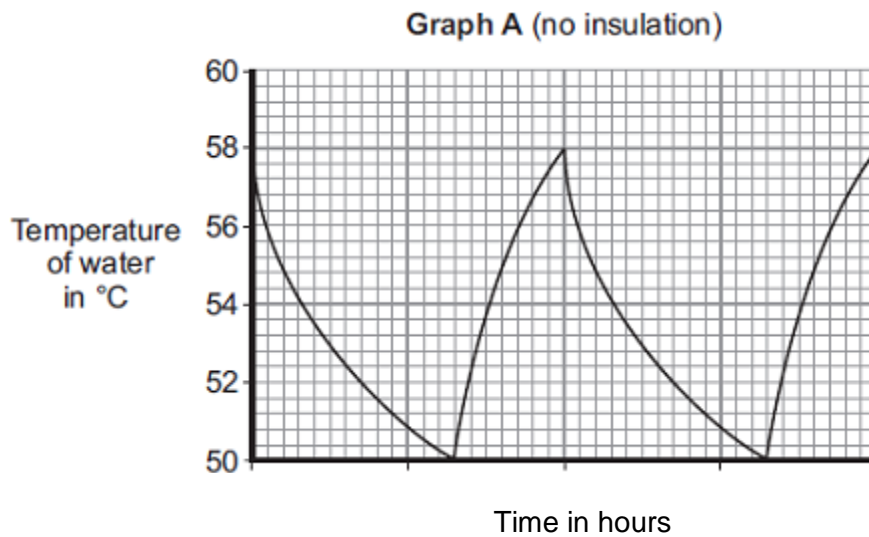
The main way the energy is transferred through the copper wall of the water tank is by the process of _____ .

(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.

(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.

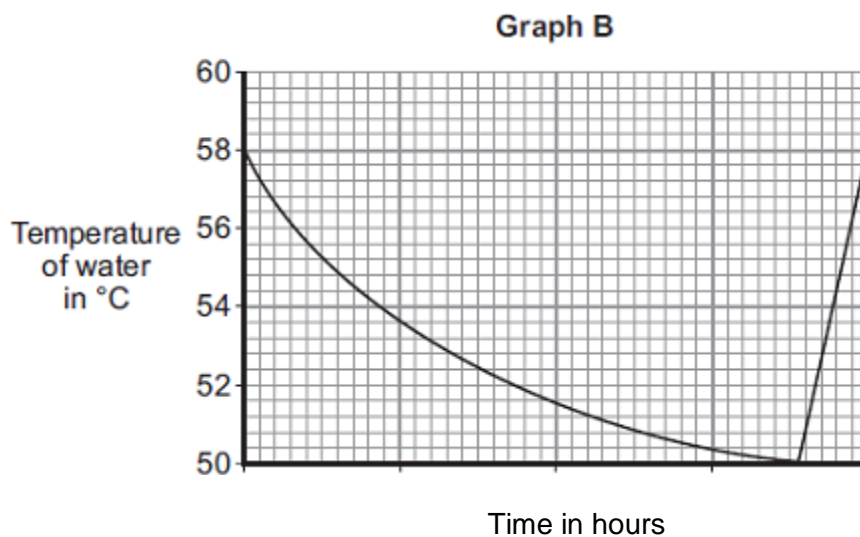
Specific heat capacity of water = 4200 J/kg°C

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.

(3)

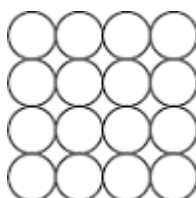
(Total 9 marks)

Q3.

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



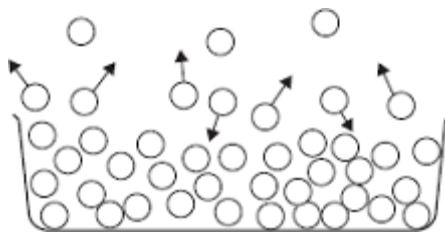
- (a) One kilogram of a gas has a much larger volume than one kilogram of a solid.

Use kinetic theory to explain why.

(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?

(1)

- (ii) The temperature of the liquid in the container decreases as the liquid evaporates.
Use kinetic theory to explain why.

(3)

(Total 8 marks)