

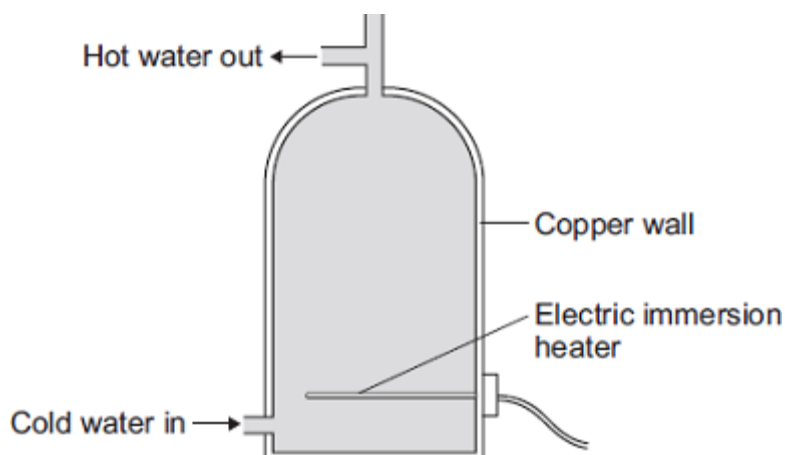
Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Q1.

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.

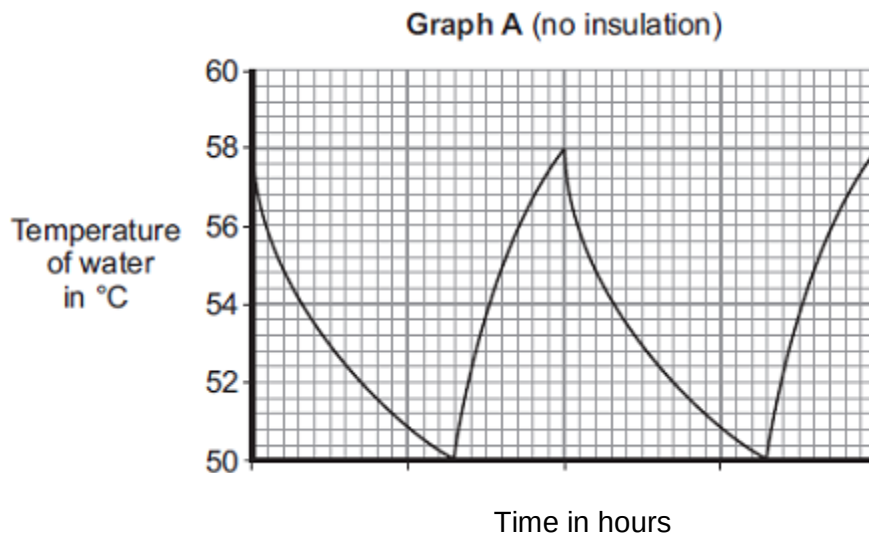
The main way the energy is transferred through the copper wall of the water tank is by the process of _____ .

(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.

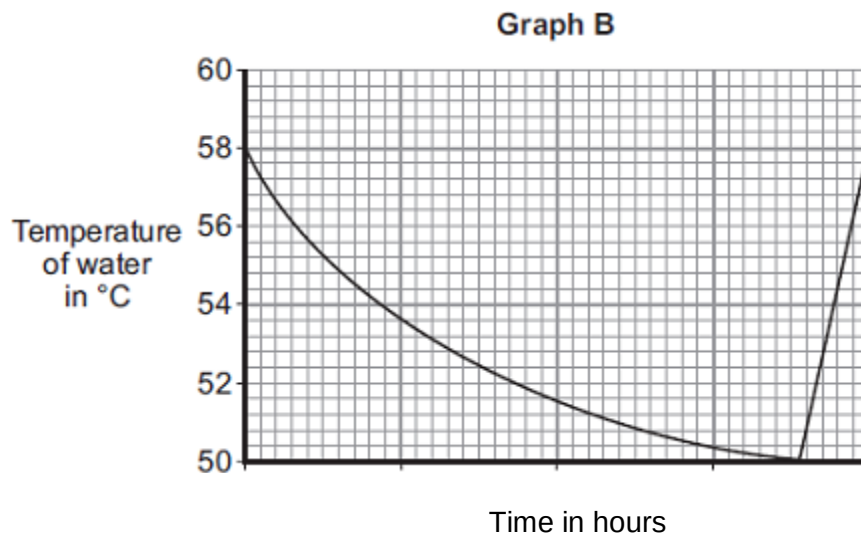
Specific heat capacity of water = 4200 J/kg°C

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)

Q2.

(a) In the UK, over 70% of the electricity is generated in power stations that burn fossil fuels.

(i) Explain **one** effect that burning fossil fuels has on the environment.

(2)

(ii) Give **one** way the effect on the environment described in part (a)(i) could be reduced.

Assume the amount of fossil fuels burnt stays the same.

(1)

- (b) Electricity can also be generated in a pumped storage hydroelectric power station.

An advantage of pumped storage hydroelectric power stations is the short start-up time they have.

- (i) What is the importance of the short start-up time?

(1)

- (ii) Give **one** other advantage of a pumped storage hydroelectric power station.

(1)

- (c) Read the extract below from a newspaper article.

In the future it may not be possible to have constant electricity. Families will have to get used to using power when it is available.

- (i) In the UK, the proportion of electricity generated using wind turbines is due to increase a lot. Some opponents of wind turbines think this increase will cause big fluctuations in the electricity supply.

Suggest **one** reason why this may be true.

(1)

- (ii) Between 2002 and 2008 the amount of electricity used for lighting in homes in the UK decreased.

Suggest **one** reason why.

(1)

(Total 7 marks)

Q3.

About half of the UK's electricity is generated in coal-burning power stations and nuclear power stations.

- (a) Coal-burning power stations and nuclear power stations provide a reliable way of generating electricity.

What is meant by a *reliable way of generating electricity*?

(1)

- (b) Over the next few years, most of the older nuclear power stations in the UK will be closed down, and the process of decommissioning will start.

What does it mean to *decommission* a nuclear power station?

(1)

- (c) Climate change has been strongly linked to the emission of carbon dioxide. Many governments around the world are committed to reducing carbon dioxide emissions.

Generating electricity can increase carbon dioxide emissions.

The companies generating electricity could reduce carbon dioxide emissions.

Give **two** ways the companies could do this.

1. _____

2. _____

(2)

- (d) Electricity is distributed from power stations to consumers along the National Grid.

The voltage across the overhead cables of the National Grid needs to be much higher than the output voltage from the power station generators.

Explain why.

(3)

(Total 7 marks)