7 This question is about specific heat capacity.

(a) State what is meant by the term **specific heat capacity**.

(2)

....

....

(b) A student uses this method to measure the specific heat capacity of water.

- place an aluminium block of known mass in an oven at a temperature of 220 °C

- place water of known mass in a container at a temperature of 20 °C

- leave the aluminium block in the oven for 10 minutes

- remove the aluminium block from the oven and place the block in the water

- measure the maximum temperature of the water after it has been heated by the aluminium block

The student uses their data to calculate the specific heat capacity of water.

Give two ways that they could improve their method to increase the accuracy of their value of specific heat capacity.

(2)

1 ....

....

....

2 ....

....

....

PMT

(c) The box shows the student's data.

> Mass of aluminium block = 1.6 kg
>
> Mass of water = 2.3 kg
>
> Initial temperature of water = 20 °C
>
> Maximum temperature of water = 38 °C

(i) When the water reaches its maximum temperature, the water and aluminium block are in thermal equilibrium.

State the temperature of the aluminium block as it reaches thermal equilibrium with the water.

(1)

temperature of aluminium = ... °C

(ii) Calculate the temperature change of the water when it has been heated to its maximum temperature.

(1)

temperature change of water = ... °C

(iii) The water gains 190 000 J of energy in its thermal store as it is heated to its maximum temperature.

Calculate the specific heat capacity of water.

(3)

specific heat capacity of water = ... J / kg °C

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(d) After finishing the experiment, the student removes the aluminium block and places the container of water into a freezer.

The water loses energy at a constant rate and cools from 38 °C to −20 °C.
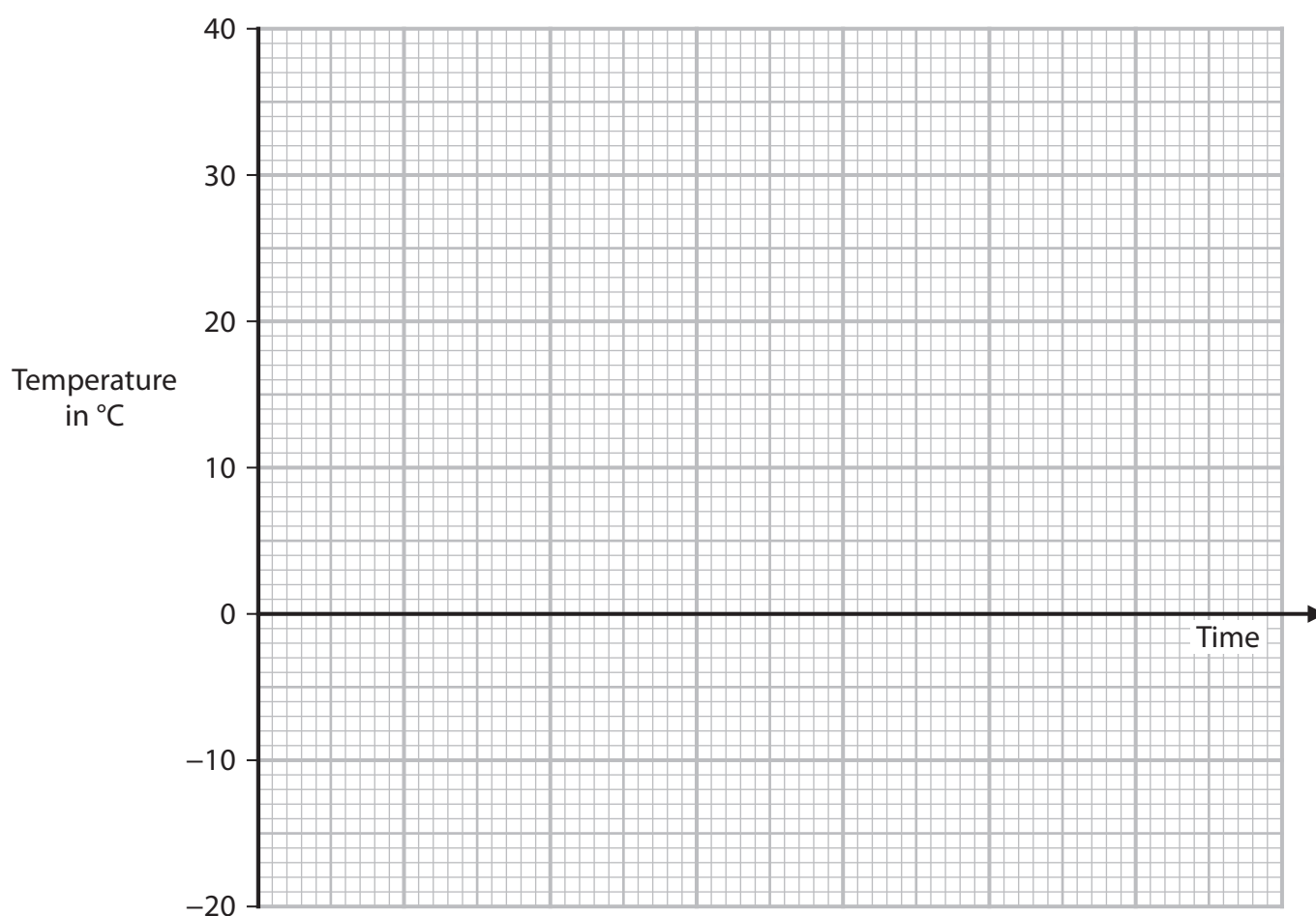
The water freezes and turns into ice at 0 °C.

Ice has a lower specific heat capacity than water.

Use the axes to sketch a temperature-time graph from when the water is placed in the freezer until it reaches its lowest temperature.

No calculations are required.

(4)

(Total for Question 7 = 13 marks)

TOTAL FOR PAPER = 70 MARKS