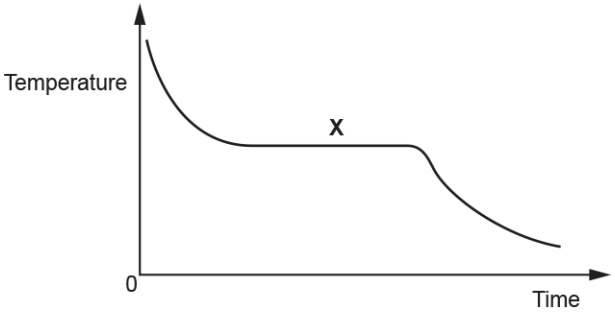
Changes in State (F)

1. A student studies how the temperature falls when a liquid cools.



What is happening at point **X** on the graph?

A Boiling
B Freezing
C Melting
D Subliming

Your answer ☐ **[1]**

2. A wooden block has a mass of 2 kg and a specific heat capacity of 2000 J/kg °C.

Calculate the energy needed to raise its temperature by 6 °C.

Use the equation:

Change in thermal energy = Mass × Specific Heat Capacity × Change in Temperature

A 1 200 J
B 2 400 J
C 12 000 J
D 24 000 J

Your answer ☐ **[1]**

3. Energy is needed to change ice into water.

Calculate the energy needed to change 5 kg of ice into water.

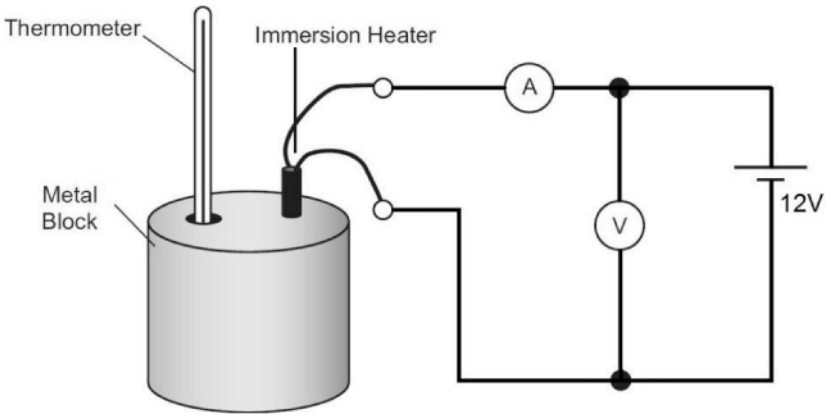
Use an equation from the data sheet to help you.

Specific latent heat of melting = 3.34×10^5 J / kg.

A 16.7 J
B 1670 J
C 1 670 000 J
D 1 670 000 000 J

Your answer ☐ **[1]**

4 (a). A student completes an experiment to find the specific heat capacity of a metal.



i. The student takes voltage and current measurements.

Suggest **three** other measurements they need to take?

--- **[3]**

ii. Describe how these measurements could be used to determine the specific heat capacity of the metal.

--- **[2]**

(b). The value obtained from the experiment is much higher than expected.

Suggest **two** reasons how this could have occurred and suggest **two** improvements to the experimental procedure.

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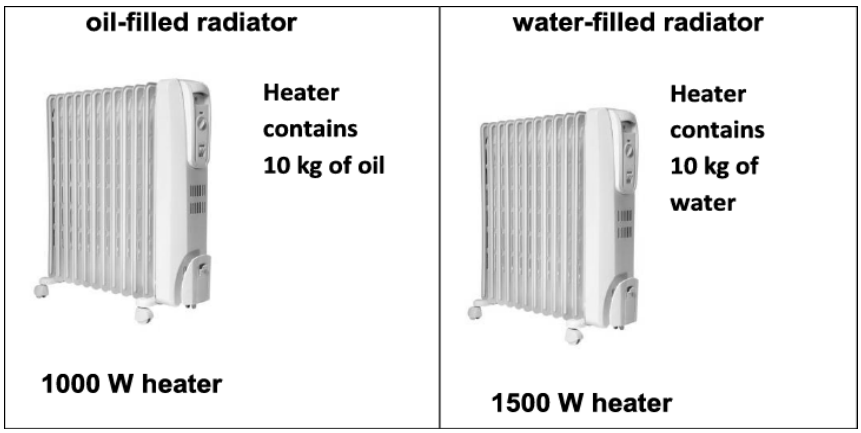
[4]

5 (a). Alex has two radiators in her home. They are filled with 10 kg of different liquids.



The table below shows information about oil and water.

Material	Specific heat capacity (J/kg°C)	Freezing point (°C)	Boiling point (°C)
Oil	1 700	−24	250
Water	4 200	0	100

Alex's conservatory can be very cold.

Sometimes it can get as low as −6 °C.

Alex thinks that the oil radiator may be better for the conservatory.

Suggest why.

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[1]

(b). Radiators in a home have a 'cut-out' which prevents them getting hotter than 60 °C.

Suggest why.

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[1]

(c). Alex does a calculation.

She knows that the oil heater produces 800 J of energy each second.

Calculate the energy produced by the oil heater in 10 minutes.

_____

_____

answer: ……J **[2]**

(d).

i. Alex wants the oil heater to heat up by 40°C.

How much energy is needed? Show your working.

_____

_____

_____

answer: ……J **[2]**

ii. She supplies enough energy to heat up the oil radiator by 40°C but it only heats up to 32°C.

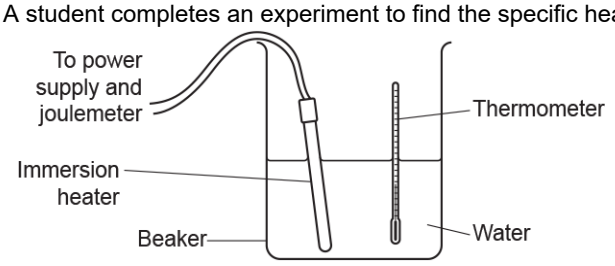
Suggest two reasons why.

_____

_____

_____ **[2]**

6 (a). A student completes an experiment to find the specific heat capacity of water.



He heats up 1 kg of water, using an immersion heater. He measures the temperature rise and calculates the specific heat capacity of the water.

Attempt	Energy supplied (J)	Temperature rise (°C)	Specific heat capacity (J/kg °C)
1	10 000	2	5000
2	21 000	4	5250
3	44 000	8	5500

i. Calculate the **mean** specific heat capacity.

Answer = ... J/kg °C **[1]**

ii. Describe the conclusions that can be drawn from the data.

---**[3]**

(b). The actual value for the specific heat capacity of water is 4200 J/kg °C.

i. Explain why the mean specific heat capacity calculated in **(a)(i)** is higher than the actual value.

---**[2]**

ii. Write down **two** problems with this experiment **and** suggest how they could be solved.

Use the diagram and results table to help you.

Problem 1 ----------

Solution ----------

Problem 2 ----------

Solution ----------

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[4]

7 (a). Describe **one** difference between a **physical change** and a **chemical change**.

---**[1]**

(b). A student puts an ice cube into a beaker. The mass of the ice cube is 40 g.

The ice cube melts.

i. Write down the mass of the water produced.

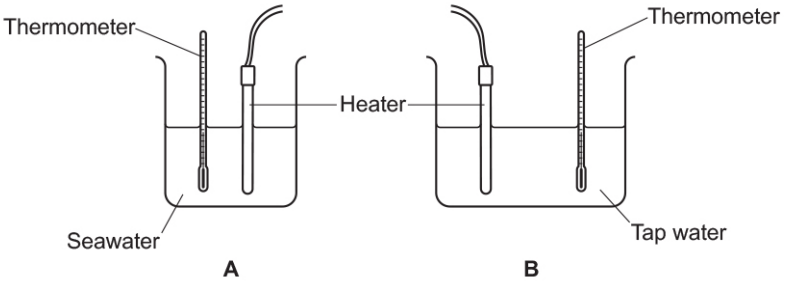
Mass = ... g **[1]**

ii. Explain your answer to **(i)**.

---**[2]**

(c). A student does an experiment to find the difference between the specific heat capacities of seawater and tap water.

The student places a heater and a thermometer into two beakers, **A** and **B**. Look at the diagram.



i. There are 5 steps to the method for this experiment.

Complete the missing steps for this method.

Step 1 – Put seawater into beaker **A** and tap water into beaker **B**.

Step 2 – _____

Step 3 – _____

Step 4 – _____

Step 5 – Calculate the temperature change of beaker **A** and beaker **B**.

[3]

ii. Suggest one mistake the student made when choosing their equipment.

_____ **[1]**

iii. Suggest **two** improvements to the method followed.

1 _____

2 _____

[2]

8. *A student does an experiment using 0.2 kg of water.

Here is some information from the experiment:

The aim is to find the energy needed to raise the temperature of the water by 20 °C. An electrical heater is used to heat the water. The temperature of the water increases by 20 °C. The **specific heat capacity** of water is 4 200 J / kg °C.

Describe how the student should carry out the experiment, including the equipment used.

In your answer calculate the change in internal energy for the water.

You may include a diagram in your answer.

_____

_____

_____

_____

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_____

_____ **[6]**

END OF QUESTION PAPER