Energy Changes in Systems

Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.1 Energy
Sub-Topic	Energy Changes in Systems
Difficulty Level	Bronze Level
Booklet	Question Paper

Time Allowed: **31 minutes**

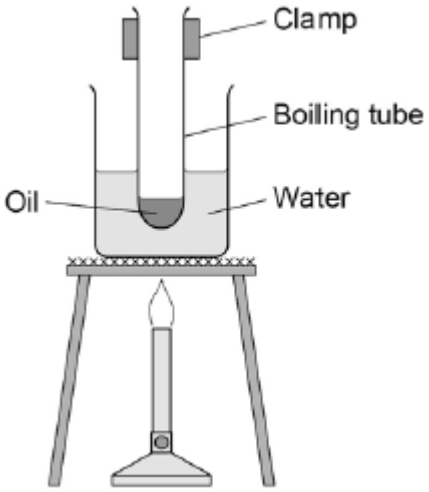
Score: **/29**

Percentage: **/100**

Grade Boundaries:

Q1. A student investigated the change in temperature when oils of different specific heat capacities were heated.

She set up the apparatus shown in the figure below.



This is the method used.

1. Put 25 g of oil into a boiling tube.
2. Pour 100 ml of water into a beaker and heat it with a Bunsen burner.
3. When the water is boiling, put the boiling tube into the beaker.
4. When the temperature of the oil reaches 30 °C, heat for a further 30 seconds and record the rise in temperature.
5. Repeat with different oils.
6. Repeat the whole investigation.

(a) Name **two** pieces of apparatus the student used that are **not** shown in the figure above.

1 .....

2 .....

(2)

(b) What are the independent and dependent variables in the student's investigation?

Independent .....

.....

Dependent .....

.....

(2)

(c) Give **two** safety precautions the student should have taken.

1 .....

.....

2 .....

.....

(2)

(d) Suggest **one** improvement to the student's method.

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(2)

(e) The table below shows the student's results.

	Temperature rise in °C			
Type of oil	**1**	**2**	**3**	**Mean**
Castor oil	20	19	21	20
Linseed oil	19	18	19	19
Mineral oil	21	21	21	21
Olive oil	17	17	18	
Sesame oil	23	23	20	22

Calculate the mean temperature rise for olive oil.

Give your answer to two significant figures.

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Mean temperature rise = ... °C

(2)

(f) The mean change in temperature of the castor oil is 20 °C

The specific heat capacity of castor oil is 1 800 J / kg °C

The mass of oil used is 0.025 kg

Calculate the change in thermal energy of the castor oil the student used.

Use the correct equation from the Physics Equations Sheet.

Select the correct unit from the box.

joule	**newton**	**volt**

.....

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Change in thermal energy = ... °C

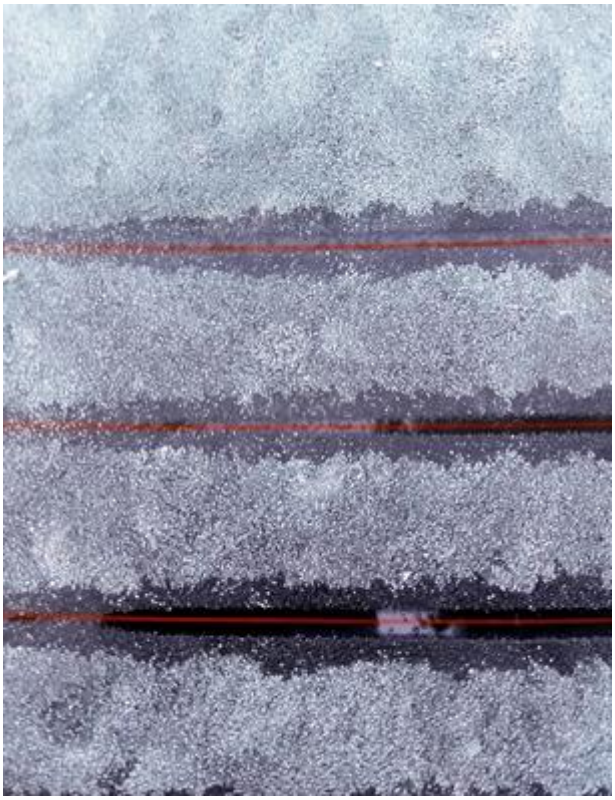
Unit = ... °C

(3)

(Total 13 marks)

Q2.Figure 1 shows solid ice on a car's rear window.

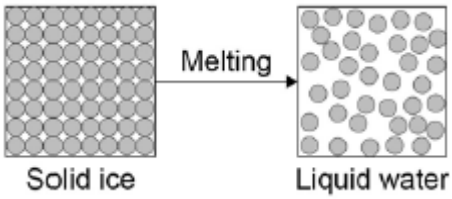
Figure 1



The glass window contains an electrical heating element.

(a) Use the particle model in **Figure 2** to describe how the heating element causes the arrangement of the ice particles to change as the ice melts.

Figure 2



You should include a description of how the particles are arranged in the solid ice and in the water.

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(6)

(b) A car manufacturer tests different heating elements by measuring how long it takes ice to melt.

During the test some variables must be controlled.

Identify **two** control variables in the car manufacturer's test.

Tick **two** boxes.

- The colour of the car ☐
- The current in the heating element ☐
- The mass of ice ☐
- The size of the car ☐
- The time taken for the ice to melt ☐

(2)

(c) Some of the energy supplied by the heater causes the ice to melt without the temperature of the ice increasing.

What is the name given to this energy supplied by the heater?

Tick **one** box.

- Latent heat of freezing ☐
- Latent heat of fusion ☐

Latent heat of vaporisation ☐

(1)

(d) When the heater is supplied with 120 J of energy each second, the internal energy of the ice increases by 45 J each second.

Use the following equation to calculate the efficiency of the heater.

$$\text{Efficiency} = \frac{\text{Output energy transfer}}{\text{input energy transfer}}$$

Give your answer to two decimal places.

.....

.....

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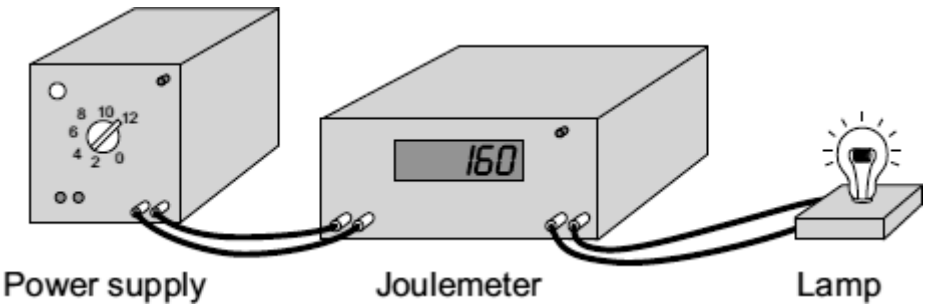
Efficiency = ...

(2)
(Total 11 marks)

Q3. A student used a joulemeter to measure the energy transformed by a lamp.



The student set the joulemeter to zero, and then switched on the power supply.

After 120 seconds (2 minutes), the reading on the joulemeter had increased to 2880.

(a) In the space below, draw the circuit symbol used to represent a lamp.

(1)

(b) (i) Use the equation in the box to calculate the power of the lamp.

$$\text{power} = \frac{\text{energy transformed}}{\text{time}}$$

Show clearly how you work out your answer.

.....

.....

Power = ...

(2)

(ii) Which **one** of the following is the unit of power?

Draw a ring around your answer.

joule **newton** **watt**

(1)

(c) Complete the following sentence using one of the phrases from the box.

larger than	the same as	smaller than

If the lamp was left switched on for 10 minutes, the amount of energy transformed would

be ..... the amount of energy transformed in

2 minutes.

(1)
(Total 5 marks)