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F

Wednesday 22 May 2019 – Afternoon

GCSE (9–1) Physics A (Gateway Science)

J249/01 Paper 1 (Foundation Tier)

Time allowed: 1 hour 45 minutes

You must have:
- a ruler (cm/mm)
- the Data Sheet (for GCSE Physics A (inserted))

You may use:
- a scientific or graphical calculator
- an HB pencil

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- The Data Sheet will be found inside this document.
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Answer **all** the questions.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. If additional space is required, use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.

INFORMATION
- The total mark for this paper is **90**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended responses will be assessed in the questions marked with an asterisk (*).
- This document consists of **28** pages.

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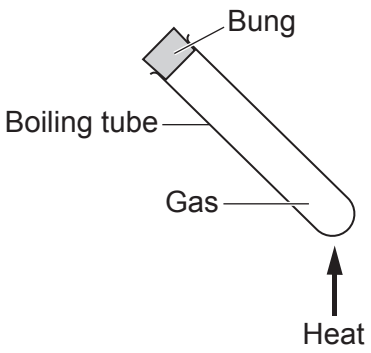
SECTION A

Answer **all** the questions.

You should spend a maximum of 30 minutes on this section.

Write your answer to each question in the box provided.

1 A sealed boiling tube contains gas.



The boiling tube is heated.

What happens?

A The particles in the gas evaporate.

B The particles in the gas expand.

C The particles in the gas move faster.

D The particles in the gas move slower.

Your answer ☐ **[1]**

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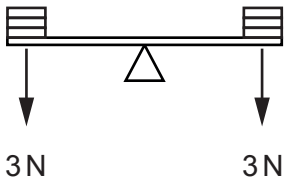
2 A student puts different weights on four balances.

A



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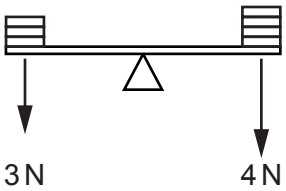
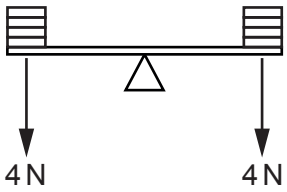


C



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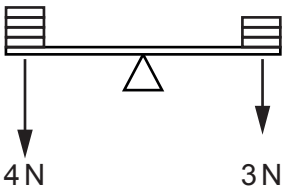

Which balance will give a **clockwise** moment?

Your answer ☐ **[1]**

3 Static electricity can be produced when two materials are rubbed together.

Which two types of material could cause static electricity to be produced?

A Two insulators

B Two conductors

C One insulator and one conductor

D A metal and a non-metal

Your answer ☐ **[1]**

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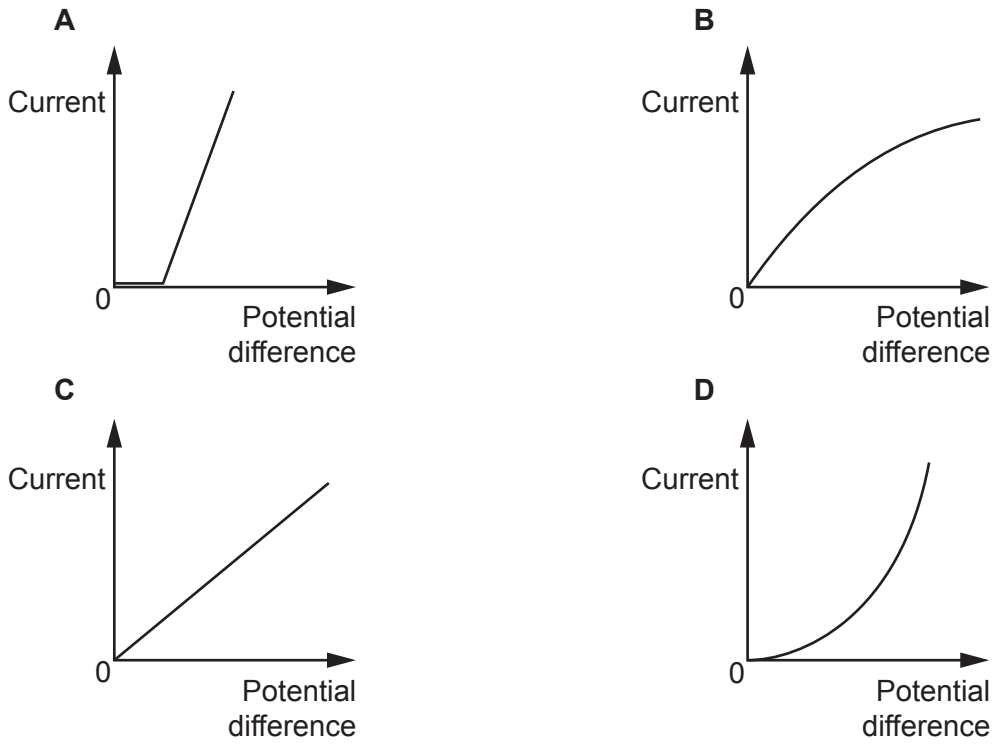
4 A student investigates how current and potential difference vary in different components.

Look at the graphs of her results.



Which graph shows a filament lamp?

Your answer ☐ **[1]**

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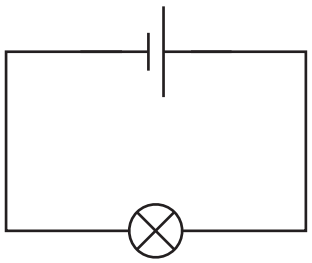
5 A student sets up four different circuits. He uses identical lamps and the same cell.

Look at the diagrams of his circuits.

A



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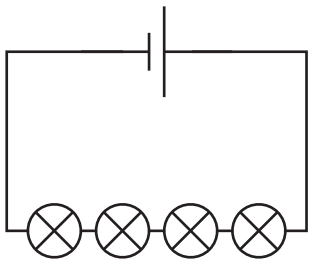

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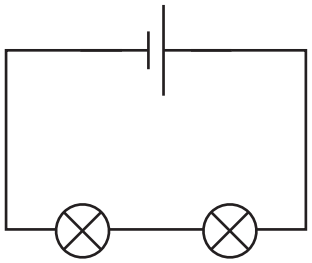

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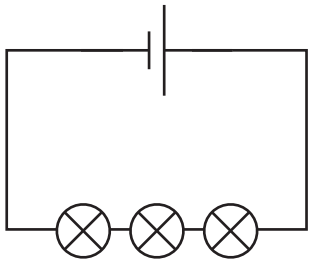

Which circuit has the brightest lamp(s)?

Your answer ☐ **[1]**

6 Different states of matter have different densities.

Which of the following shows the states of matter in density order, starting with the lowest density?

A Solid – liquid – gas

B Solid – gas – liquid

C Gas – liquid – solid

D Liquid – gas – solid

Your answer ☐ **[1]**

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7 What conditions are needed for charge to flow?

A A source of potential difference and two lamps.

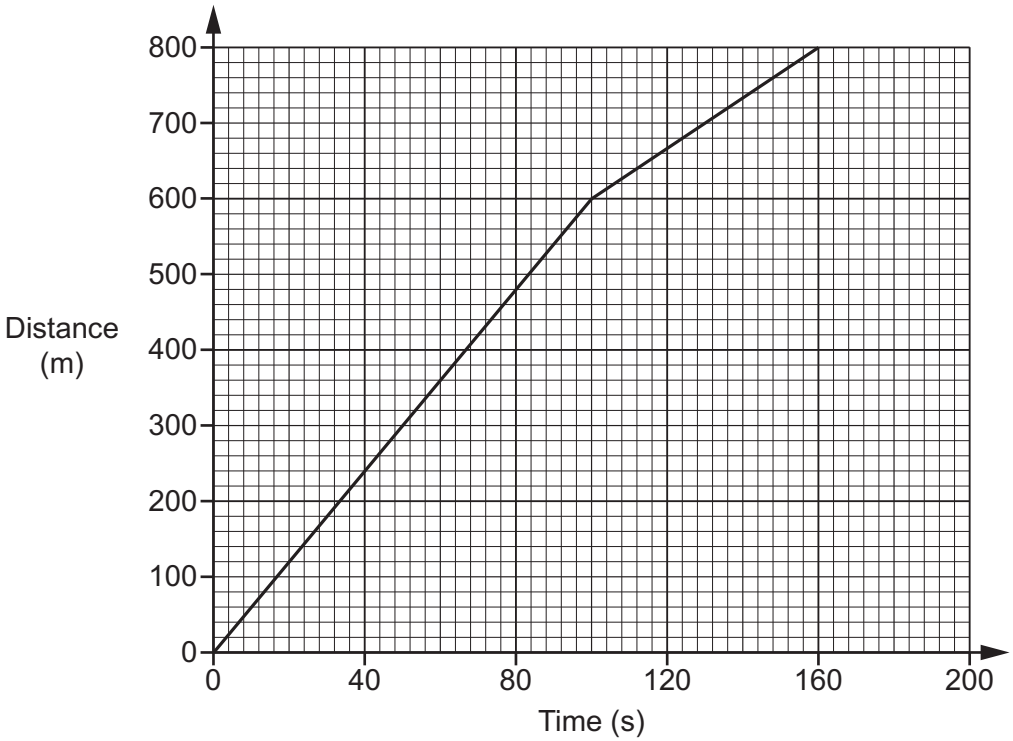
B A complete circuit and two lamps.

C A complete circuit and a source of potential difference.

D A complete circuit and a source of resistance.

Your answer ☐ **[1]**

8 Look at the distance-time graph for a journey to school.



What is the average speed for the journey?

Use the equation: average speed = distance travelled ÷ time

A 0.2 m/s

B 5.0 m/s

C 6.0 m/s

D 50 m/s

Your answer ☐ **[1]**

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9 Which of the following is Newton's Third Law?

A For every action there is an equal and opposite reaction.

B What goes up must come down.

C The acceleration that a resultant force produces depends on the size of the force and mass of the object.

D An object will continue to stay at rest or move with uniform speed unless a force acts on it.

Your answer ☐ **[1]**

10 On Mars the gravitational field strength is 4.0 N / kg.

How much would a 60 kg person weigh on Mars?

Use the equation: weight = mass × gravitational field strength

A 15 N

B 64 N

C 240 N

D 600 N

Your answer ☐ **[1]**

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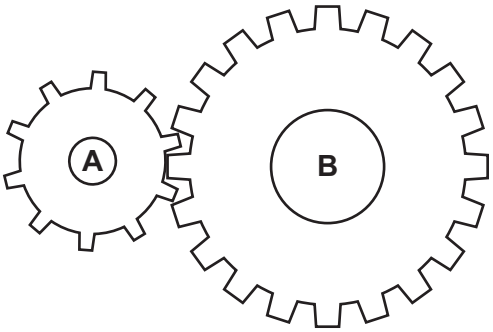
11 A student sets up two cogs.

Cog **A** has 10 teeth and cog **B** has 20 teeth.



Cog **A** is turned **2** times.

How many times does cog **B** turn?

A 0.5 times

B 1 time

C 2 times

D 20 times

Your answer ☐ **[1]**

12 A car travels at 72 km / h.

How fast is this in metres per second (m / s)?

A 1.2 m / s

B 20 m / s

C 120 m / s

D 1200 m / s

Your answer ☐ **[1]**

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13 A cylinder contains a gas.

The volume of the gas is halved and the temperature remains the same.

What happens to the pressure of the gas?

A It remains the same.

B It halves.

C It doubles.

D It quadruples.

Your answer ☐ **[1]**

14 An object has a volume of $1.5\,m^3$ and a mass of $3.0\,kg$.

What is the density of the object?

Use the equation: density = mass ÷ volume

A $0.5\,kg/m^3$

B $2.0\,kg/m^3$

C $4.5\,kg/m^3$

D $6.0\,kg/m^3$

Your answer ☐ **[1]**

15 Which one of the following uses of forces causes a rotation?

A Lowering a book vertically from a shelf

B Opening a door

C Lifting a book vertically onto a shelf

D Sitting in the centre of a see-saw

Your answer ☐ **[1]**

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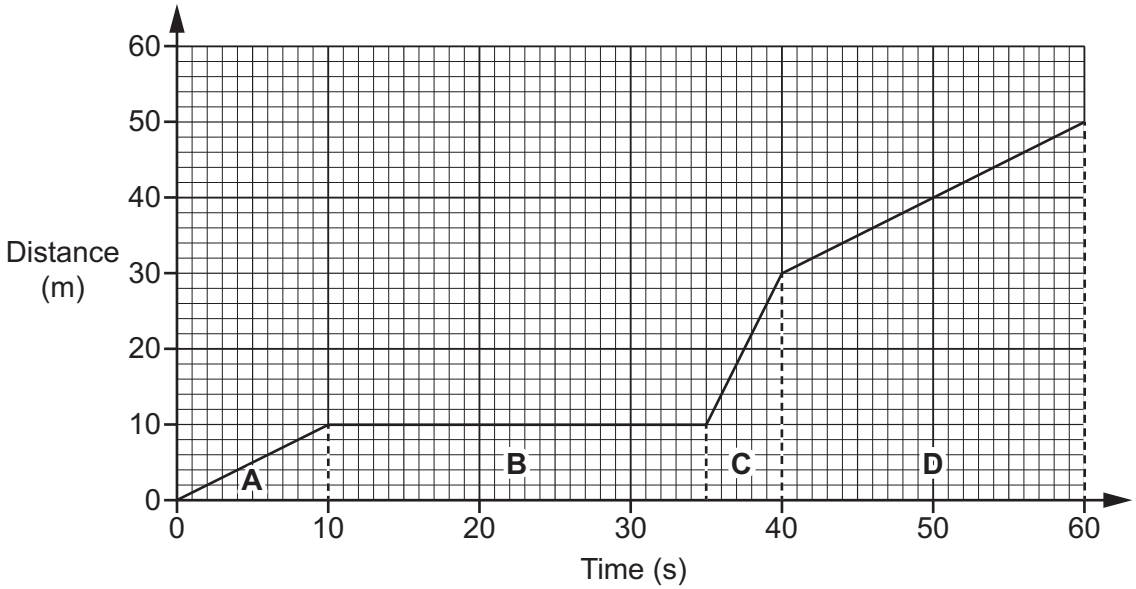
SECTION B

Answer **all** the questions.

16 A student investigates motion graphs.

(a) Look at a distance-time graph for the movement of a dog in a park.



(i) How far did the dog move in the park?

Distance = ... m **[1]**

(ii) How long was the dog in the park?

Time = ... s **[1]**

(iii) Name a piece of apparatus the student could use to accurately measure the distance the dog moved.

..... **[1]**

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(b) The distance-time graph has four sections: **A**, **B**, **C** and **D**.

(i) Which section of the graph shows the **greatest** speed?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

D ☐

Explain your answer.

.....

.....

..... **[2]**

(ii) Which section of the graph shows **zero** speed?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

D ☐

Explain your answer.

.....

.....

..... **[2]**

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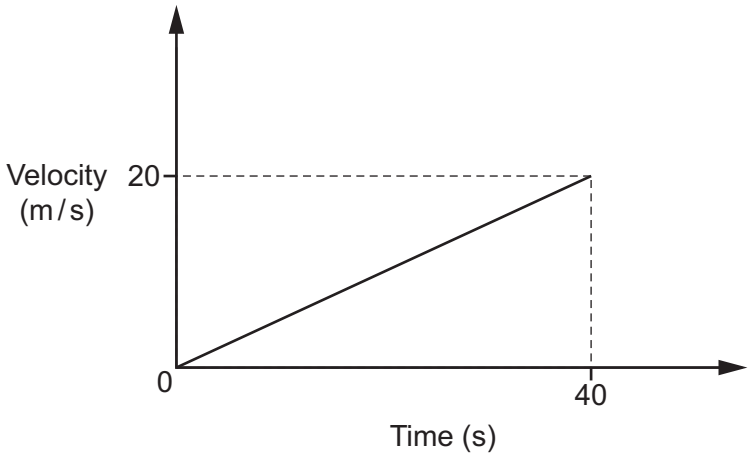
(c) The student draws a velocity-time graph for a boat accelerating.



Acceleration is the gradient of a velocity-time graph.

Calculate the acceleration of the boat.

Use the equation: acceleration = change in velocity ÷ time

Acceleration = ... m/s^2 **[2]**

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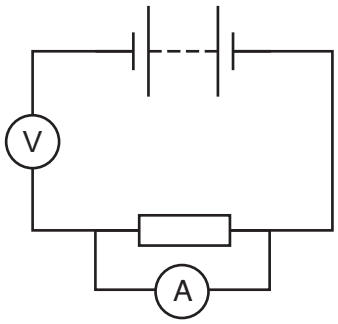
17 A student sets up a circuit to find out the resistance of an unknown resistor. The student makes **three** mistakes in their circuit.

Look at the circuit diagram of their experiment.



(a) **(i)** Write down the **three** mistakes the student makes.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(ii) For **one** of the mistakes identified in **(a)(i)** describe how the student can fix the error.

.....

..... **[1]**

(b) The student finds that the current is 20 mA when the potential difference is 4.0 V.

Calculate the **resistance** of the unknown resistor.

Include the **unit** for resistance in your answer.

Use the equation: resistance = potential difference ÷ current.

Resistance = ... Unit = ... **[4]**

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(c) Calculate the **charge** that flows when a current of 2.5 A flows for 30 seconds.

Charge = ... C **[3]**

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18 A student has a spring, a ruler and a 2.0 N weight.

(a) Describe how the student can use this equipment to determine the **spring constant** of the spring.

.....

.....

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.....

.....

..... **[3]**

(b) The 2.0 N weight has a surface area of 0.005 m^2.

Calculate the **pressure** when it is placed on a surface.

Use the equation: pressure = force normal to a surface ÷ area of that surface

Pressure = ... Pa **[2]**

(c) Describe how to change the shape of an object.

Use the idea of forces in your answer.

.....

.....

.....

..... **[2]**

(d) Describe the differences between elastic and plastic deformation.

.....

.....

.....

..... **[2]**

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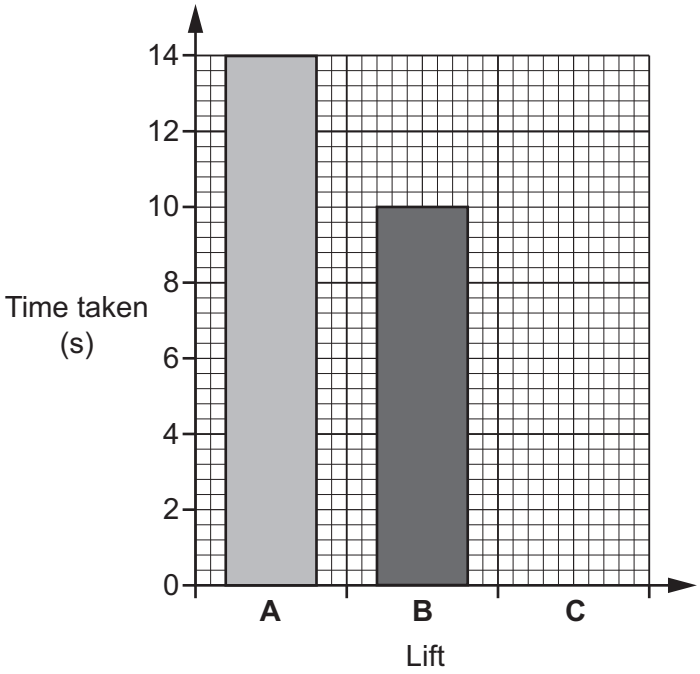
19 A tall building needs a lift to move people from one floor to another.

The builder has a choice of three different lifts.

Each lift takes a different amount of time to move between the two floors.

Look at a bar chart of the time taken for each lift.



(a) **(i)** Lift **C** takes 12 s to move between the two floors.

Draw a bar for lift **C** on the bar chart. **[1]**

(ii) Calculate the **mean** time of the three lift journeys.

Mean = ... s **[2]**

(iii) Explain which lift uses the most power.

.....

.....

..... **[2]**

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(b) **(i)** One lift uses 50 000 J for a 12 s journey.

Calculate the power of the lift.

Give your answer to **1** decimal place.

Power = ... W **[4]**

(ii) When the lift is broken the stairs are used.

Calculate the work done when a 750 N person climbs a distance of 4 m.

Work done = ... J **[3]**

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20 **(a)** Draw the magnetic field pattern between the North and South poles of the magnets.

Include arrows on your field lines.

[3]

(b) Describe **one difference** between a permanent magnet and an induced magnet.

.....

..... **[1]**

(c) A student investigates solenoids and writes the following:

> **Solenoids**
>
> Solenoids are coils of wire.
>
> When a voltage flows through them a magnetic field is created.
>
> The magnetic field can be increased by decreasing the number of turns or by increasing the current.

The student makes **two** mistakes.

Put a (ring) around the **two** mistakes in the above box. **[2]**

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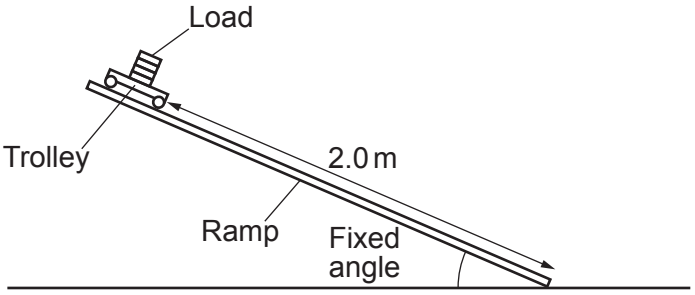
21 A student investigates the average speed at which a trolley with different loads travels down a ramp.

Look at the diagram of her experiment.



She releases the trolley from a distance of 2.0 m from the bottom of the ramp.

The student uses a stop-clock to measure the time it takes to reach the bottom of the ramp.

She calculates the average speed. Look at her results.

Load (N)	Time taken (s)	Average speed (m / s)
20	2.3	0.87
40	2.4	0.83
60	2.3	0.87
80	2.4	0.83

(a)* Describe the trend shown by the results, identify problems with the experiment and describe any improvements that you would make to the experiment.

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..... **[6]**

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(b) For one experiment the trolley starts from rest and reaches a final speed of 2 m/s.

The ramp length is 2.0 m.

Calculate the acceleration of the trolley.

Acceleration = ... m/s^2 **[4]**

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

The ice cube melts.

(a) **(i)** Write down the mass of the water produced.

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

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

.....

.....

..... **[2]**

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

.....

..... **[1]**

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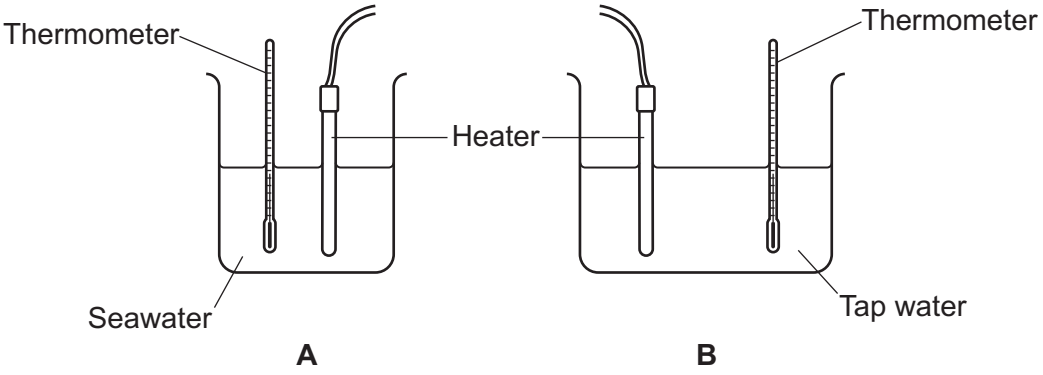
(c) A student does an experiment to find the difference between the specific heat capacities of seawater and tap water.

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]

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23 A TV has the label below on it.

OCR TV Voltage: 230 V Power: 65 W Frequency: 50 Hz

(a) Calculate the **current** in the TV when it is turned on.

Use the equation: power = potential difference × current

Give your answer to **2** significant figures.

Current = ... A **[4]**

(b) The TV is turned on for 30 minutes.

Calculate the energy transferred by the TV.

Energy used = ... J **[4]**

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

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