OCR
Oxford Cambridge and RSA

Accredited

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

F

J249/01 Paper 1 (Foundation Tier)

Sample Question Paper

Date – Morning/Afternoon

Version 2

Time allowed: 1 hour 45 minutes

You must have:
- the Data Sheet

You may use:
- a scientific or graphical calculator
- a ruler

First name									
Last name									
Centre number						Candidate number				

INSTRUCTIONS
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

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 questions marked with an asterisk (*).
- This document consists of **28** pages.

SECTION A

Answer **all** the questions.

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

1 Which pair of objects attract each other?

A

B

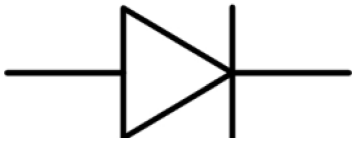
C

D

Your answer ☐ **[1]**

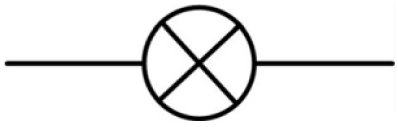
2 Which symbol is used to show an LDR?

A

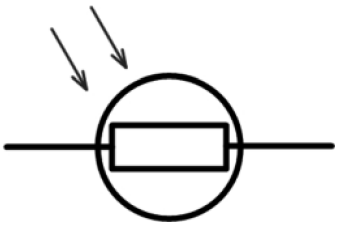


B

C



D



Your answer ☐ **[1]**

3 A bus takes 1.8 hours to travel 24 km.

What is the average speed of the bus?

A 43.2 km/h

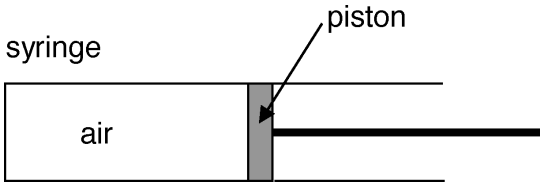
B 25.8 km/h

C 22.2 km/h

D 13.3 km/h

Your answer ☐ **[1]**

4 A syringe contains air.



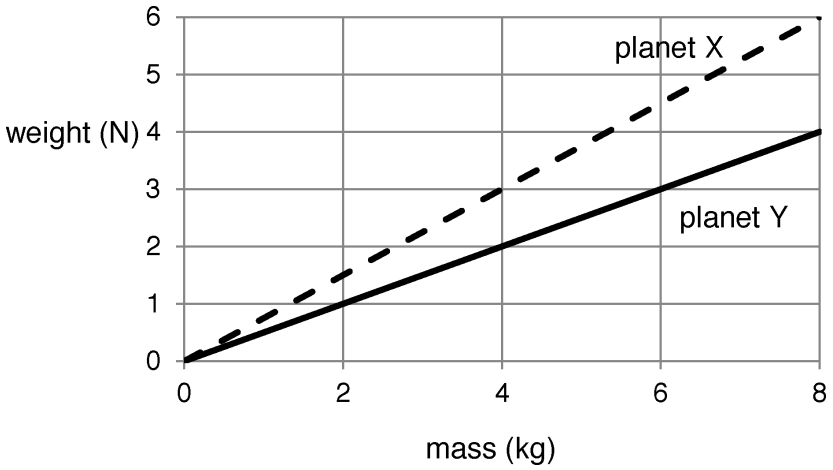
The piston is pushed inwards.

How do the pressure and volume of the air in the syringe change?

	Pressure	**Volume**
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

Your answer ☐ **[1]**

5 The graph shows the relationship between mass and weight on two different planets.



The weight of an object on planet **X** is 3.0 N.

What is the weight of the same object on planet **Y**?

A 1.5 N

B 2.0 N

C 4.0 N

D 6.0 N

Your answer ☐ **[1]**

6 In a solenoid, a magnetic field is generated when an electric current passes through a coiled wire.

Which row shows how increasing the current or increasing the number of turns in the coiled wire affects the strength of the magnetic field?

		Increased current	**Increased number of turns**
A	Effect on magnetic field strength	stronger	weaker
B		stronger	stronger
C		weaker	stronger
D		weaker	weaker

Your answer ☐ **[1]**

7 Why is an unmagnetised piece of iron attracted to a magnet?

A The iron has charged particles which attract the electrons in the magnet.

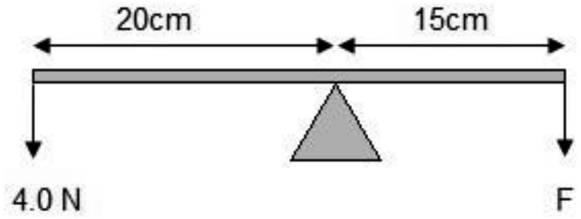
B The iron has charged particles which attract the protons in the magnet.

C The iron has magnetism induced by the magnet.

D The iron is attracted by the Earth's magnetic field.

Your answer ☐ **[1]**

8 A see-saw is in equilibrium.



What is the value of force F?

A 3.0 N

B 3.5 N

C 5.0 N

D 5.3 N

Your answer ☐ **[1]**

9 Which sentence is the definition of the power of a machine?

A The amount of work done by the machine.

B The efficiency of the machine.

C The number of joules of energy the machine requires to work.

D The rate at which energy is transferred by the machine.

Your answer ☐ **[1]**

10 A sealed can contains gas.

The can is heated and the pressure of the gas increases.

How do the gas particles cause this increase in pressure?

A The average distance between the particles increases.

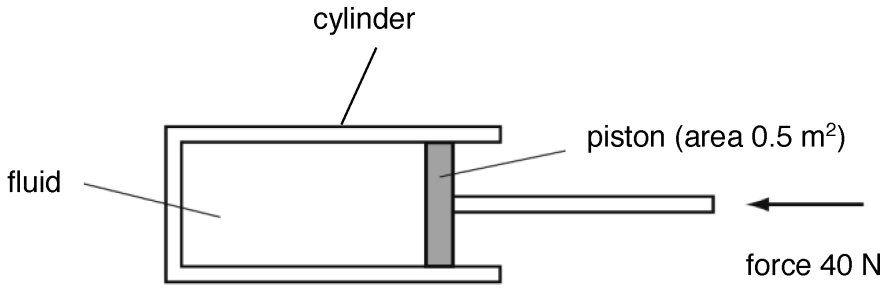
B The particles expand.

C The particles hit each other more frequently.

D The particles hit the can more frequently.

Your answer ☐ **[1]**

11 A piston is pushed in a cylinder containing a fluid.



pressure = force ÷ area.

What is the pressure on the fluid?

A 20 Pa

B 80 Pa

C 160 Pa

D 200 Pa

Your answer ☐ **[1]**

12 A firework rocket has a mass of 0.1 kg.

A resultant force of 2 N acts on the rocket.

What is the acceleration of the rocket?

A 0.2 m/s^2

B 0.5 m/s^2

C 20 m/s^2

D 200 m/s^2

Your answer ☐ **[1]**

13 What is the **minimum** number of forces needed to compress a spring?

A 1

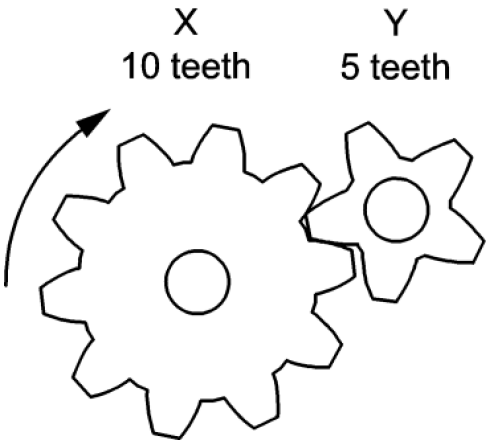
B 2

C 3

D 4

Your answer ☐ **[1]**

14 The diagram shows 2 gears.



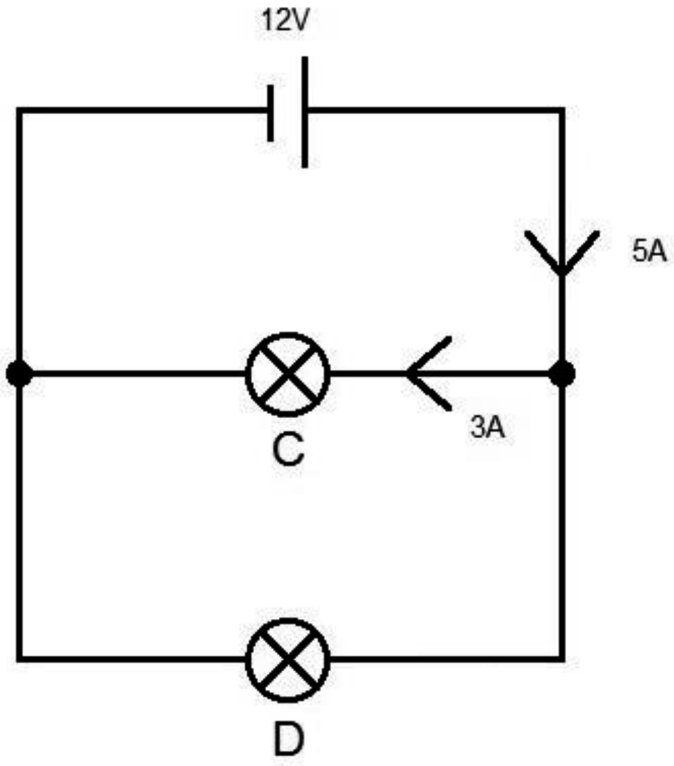
Gear **X** is rotated clockwise at 1.0 rotation per second.

Which row describes the movement of gear **Y**?

	direction of rotation	rotations per second
A	anticlockwise	0.5
B	anticlockwise	2.0
C	clockwise	0.5
D	clockwise	2.0

Your answer ☐ **[1]**

15 Look at the circuit diagram.



resistance = potential difference ÷ current

Calculate the resistance of bulb **D**.

A 2 Ω

B 4 Ω

C 6 Ω

D 8 Ω

Your answer ☐ **[1]**

SECTION B

Answer **all** the questions.

16 Two students study the motion of a model train on a track.

They need distance and time measurements to calculate speed.

(a) Write down an instrument they could use to measure the following.

(i) Distance:..... **[1]**

(ii) Time:..... **[1]**

(b) The train travels for 45 seconds with a speed of 2 m/s.

Calculate the distance travelled by the train.

Show your working.

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Answer: ..... m **[4]**

(c) The maximum speed of the train is 5 m/s. Its maximum velocity is also 5 m/s.

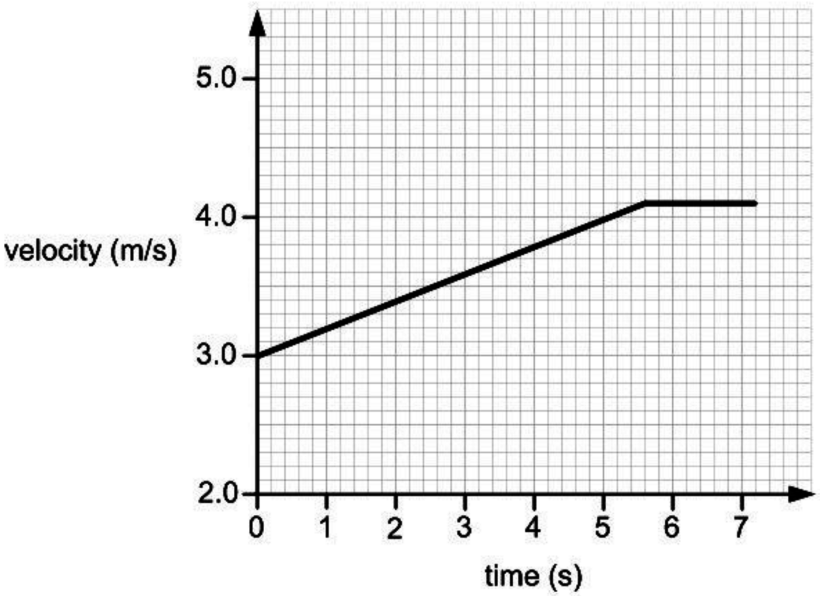
(i) What is the same about the maximum speed and velocity?

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

(ii) What may be different about the maximum speed and velocity?

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

(d) The train accelerates and its journey is shown in the graph below.



Use data from the graph to calculate the acceleration.

Show your working.

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

17 Two students, **A** and **B**, use different methods to see magnetic field patterns.

(a) (i) Describe how student **A** could use a compass to plot a magnetic field pattern.

You may draw a diagram to help you answer this question.

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

(ii) Describe how student **B** could use iron filings to show a magnetic field pattern.

You may draw a diagram to help you answer this question.

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

(b) Their teacher prefers the method used by student **A**.

Suggest **one** reason why.

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

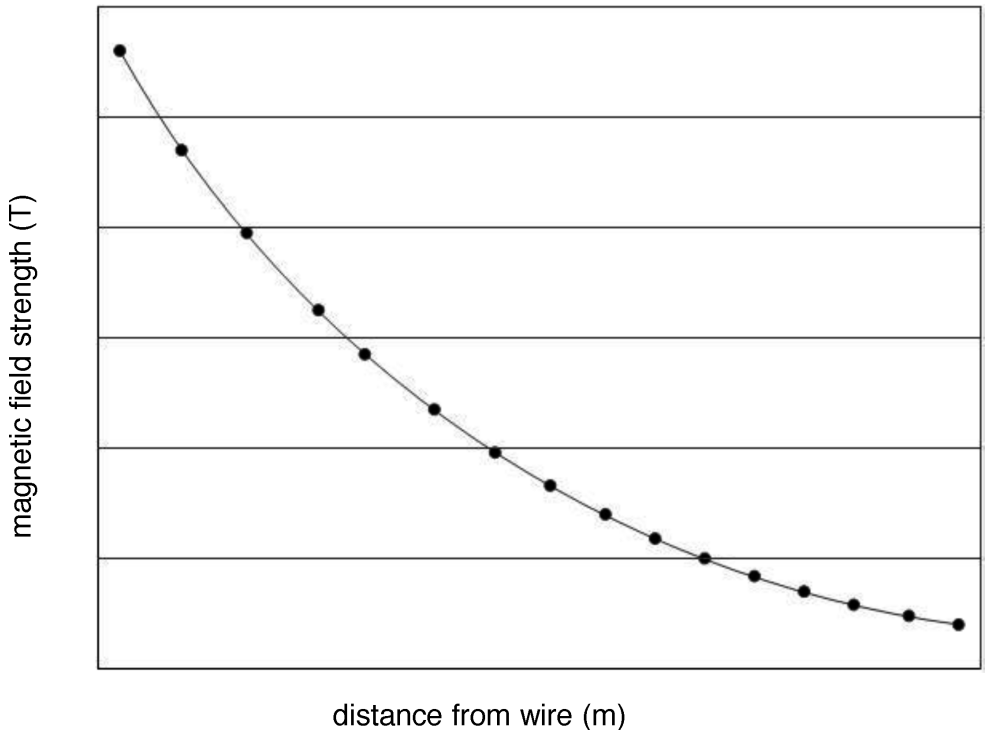
(c) Sketch the field pattern the students would find around a bar magnet.

Your sketch should show the direction of the field pattern.

[2]

(d) The two students investigate the magnetic effect of a current-carrying wire.

Look at the graph of their results.



What trend is shown by the graph?

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

18 Four students investigate the work done in moving a trolley.

work done = force × distance

Each student moves a trolley by a different distance using a different force.

Their results are shown in the table.

Student	Force (N)	Distance moved (m)
A	100	5
B	50	10
C	120	12
D	40	4

(a) Which student does the most work?

Show your working.

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

(b) Which **two** students do the same amount of work?

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

(c) State **two** reasons why it is important to repeat measurements in any experiment.

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

(d) Student **C** pushes the trolley for 0.5 minutes.

What is the power, in W, used by student **C**?

Show your working.

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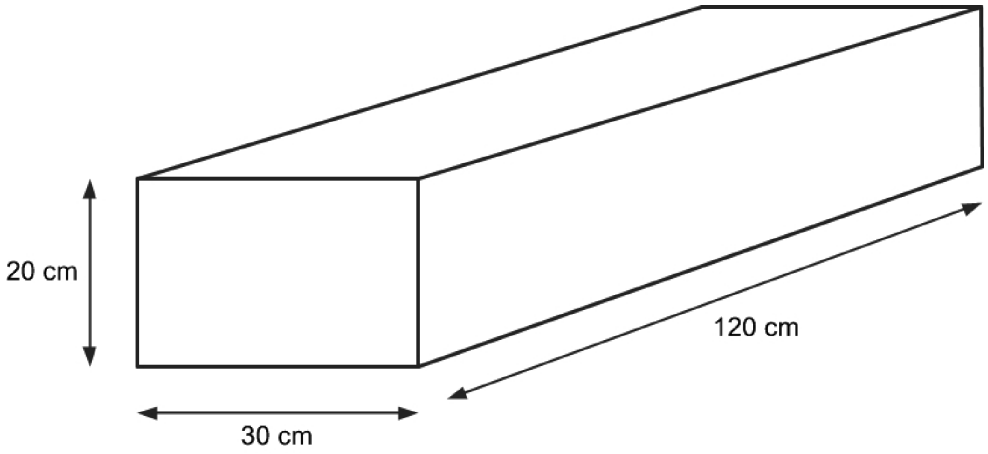
Answer: ..... W **[4]**

19 A piece of wood, shown below, has a density of 180 kg/m^3.



Calculate the mass of this piece of wood.

Show your working and give the units.

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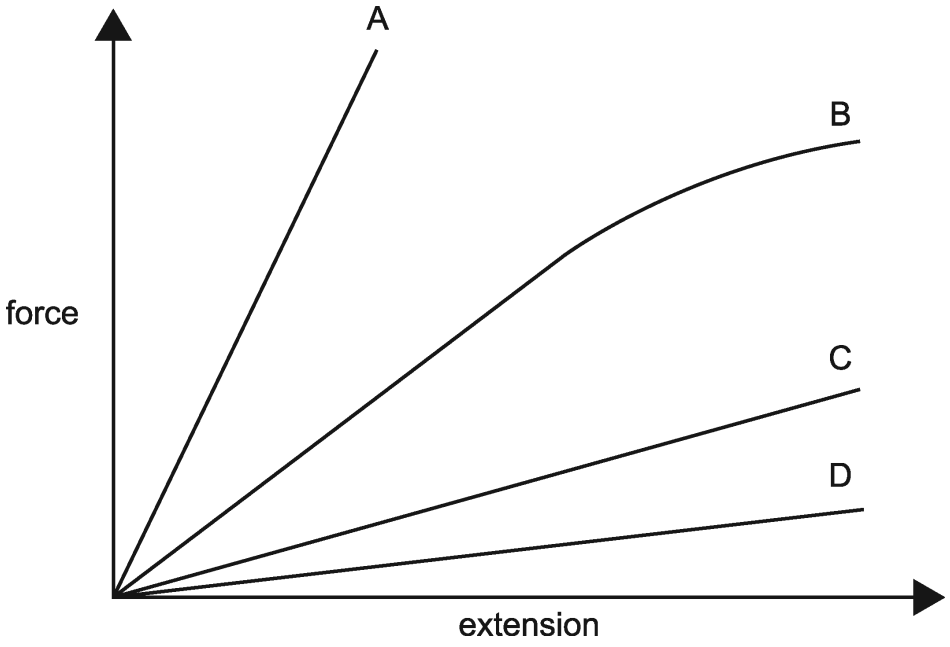
Answer: ..... Units ..... **[6]**

20 The force–extension graphs for four different springs (**A**, **B**, **C** and **D**) are shown below.



(a) Explain which of the springs (**A**, **B**, **C** or **D**) has the largest spring constant?

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

(b) Explain why the line for spring **B** has a different shape from the other lines.

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

(c) **(i)** A spring has a spring constant of 27 N/m.

The spring is stretched to an extension of 25 cm.

The energy transferred can be calculated using the formula:

energy transferred = 0.5 × spring constant × extension^2.

Calculate the energy transferred in stretching.

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Answer ..... J **[2]**

(ii) A student set up the apparatus shown in **Fig. 20.1**.

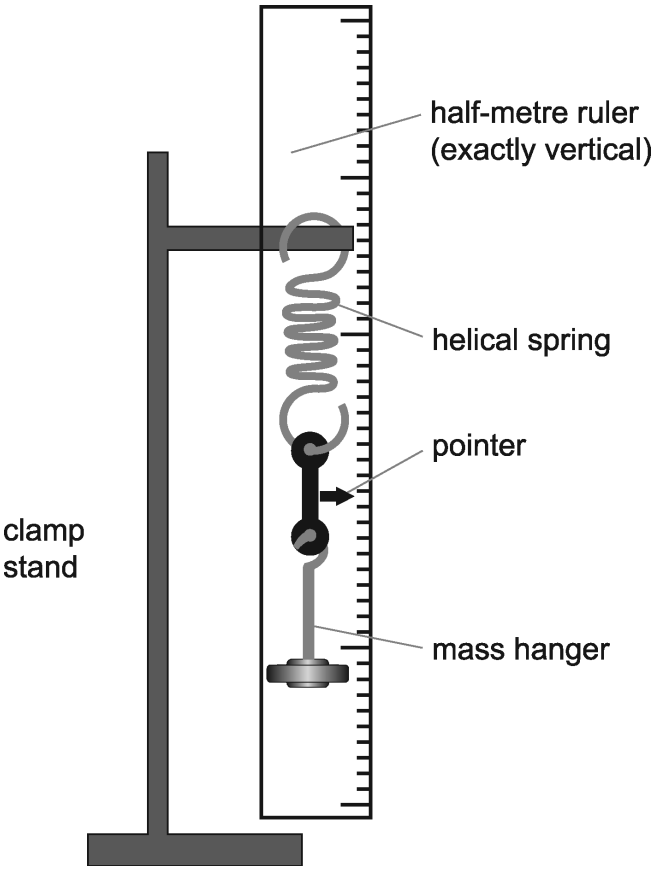

Fig. 20.1

The students want to plot a force–extension graph for this spring.

Describe how they could use this apparatus to collect data so that the graph could be plotted.

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..... **[4]**

(iii) The spring in **Fig. 20.1** has a spring constant of 30 N/m.
This is replaced by a spring with a spring constant of 10 N/m.

What changes should the student make to this method to investigate this spring?

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

21 A student finds a resistor which has no markings on it.

The student uses a voltmeter, an ammeter and a cell to find the resistance of the resistor.

(a) Draw a circuit diagram to show how the student could set up this apparatus to find the resistance of the resistor.

[3]

(b) In the experiment the current is 0.15 A and the potential difference is 2.0 V.

potential difference = current × resistance

Calculate the resistance of the unknown resistor.

Show your working.

Record your answer to **3** significant figures.

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Answer = ... Ω **[3]**

(c) The student repeats the experiment with different potential differences and currents.

Look at the results.

Potential difference (V)	Current (A) (Attempt 1)	Current (A) (Attempt 2)	Current (A) (Attempt 3)	Mean current (A)
2.0	0.15	0.14	0.16	0.15
4.0	0.31	0.31	0.31	0.31
6.0	0.44	0.44	0.38	0.44
8.0	0.60	0.62	0.58	0.60
10.0	0.74	0.75	0.73	0.74

There is an anomaly in the results.

(i) Write down the anomaly from the table.

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

(ii) How did the student deal with the anomaly.

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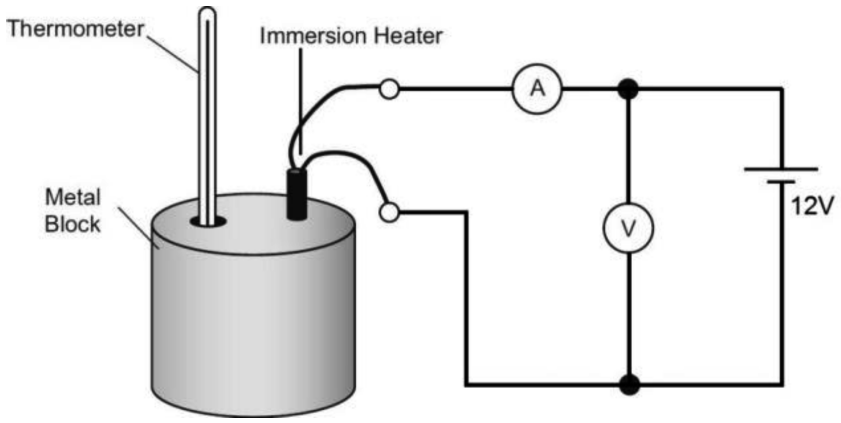
..... **[1]**

22 A student completes an experiment to find the specific heat capacity of a metal block.



(a) (i) The student measures voltage and current.

Suggest **three** other measurements he needs to take?

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

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

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

(b) The specific heat capacity obtained from the experiment is much larger than expected.

- Suggest **two** reasons for this difference.
- Suggest **two** improvements to the method that might give a more accurate value for the specific heat capacity.

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..... **[4]**

23 A student rubs a balloon against a scarf.

(a)* Describe how the balloon becomes charged.

Suggest how you could show that the balloon is charged.

What would you expect to see and why?

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

(b) Current is the rate of flow of electrical charge in a circuit.

A current of 40 mA transfers a charge of 3.6 C.

Calculate the time to transfer this charge.

Show your working.

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Answer = ... seconds **[3]**

END OF QUESTION PAPER