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

F

J249/01 Paper 1 (Foundation Tier)

Sample Question Paper

Date – Morning/Afternoon

Time allowed: 1 hour 45 minutes

You must have:
- the Data Sheet

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

SPECIMEN

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 **24** pages.

SECTION A

Answer **all** the questions.

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

1 Which of these pairs of objects will attract each other?

A
copper bar

B

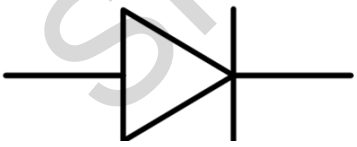
C

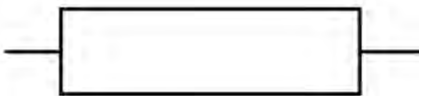
D
aluminium bar

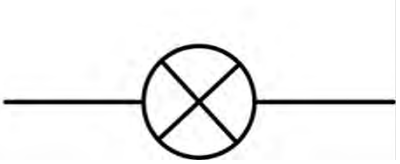
Your answer ☐

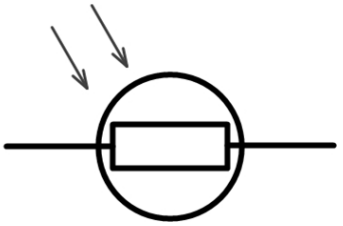
[1]

2 Which of these symbols is used to show an LDR?

A 

B 

C 

D 

Your answer ☐

[1]

SPECIMEN

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

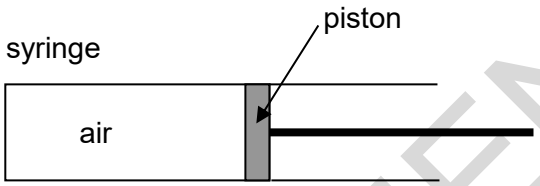
C 22.2 km/h

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?

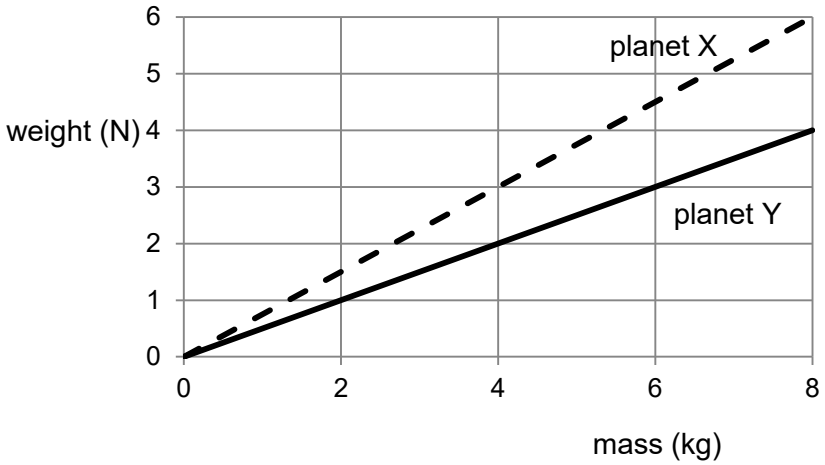
	Pressure	Volume
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

Your answer ☐

[1]

SPECIMEN

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



The weight of an object on planet **X** is 3 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 The strength of the magnetic effect of a solenoid can be changed.

Which of the following rows correctly describes what happens to the strength when the current and number of turns are increased?

	Increased current	**Increased number of turns**
A	increases	decreases
B	increases	increases
C	decreases	increases
D	decreases	decreases

Your answer ☐

[1]

SPECIMEN

7 Why is an unmagnetised iron object attracted to a magnet?

A The iron has magnetism induced by the magnet.

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

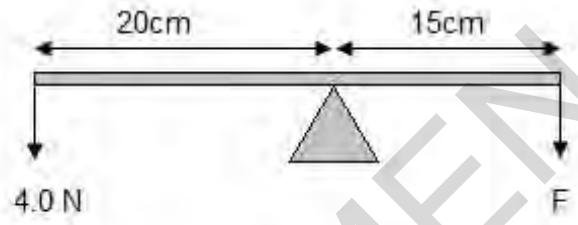
C The iron has charged particles which attract the electrons in the magnet.

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

Your answer ☐

[1]

8 A see-saw is in equilibrium.



What force is needed for the see-saw to be in equilibrium?

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]

SPECIMEN

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 Their average distance apart increases.

B They expand.

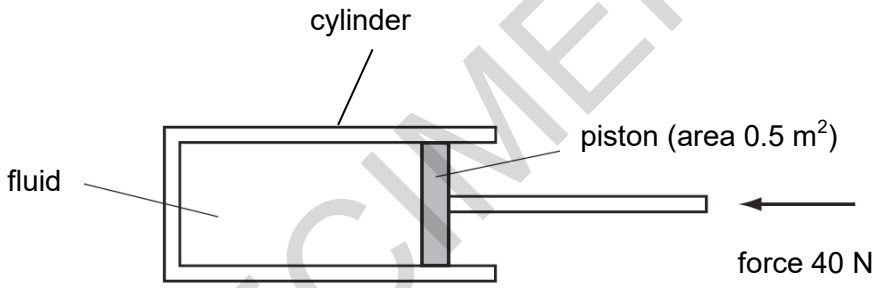
C They hit each other more frequently.

D They hit the can more frequently.

Your answer ☐

[1]

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



If **pressure = force ÷ area**, what is the pressure exerted on the fluid?

A 20 Pa

B 80 Pa

C 160 Pa

D 200 Pa

Your answer ☐

[1]

SPECIMEN

12 A firework rocket has a resultant force of 2 N acting on it.

It has a mass of 0.1 kg.

What is the acceleration of the firework 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 that are required to compress a spring?

A 1

B 2

C 3

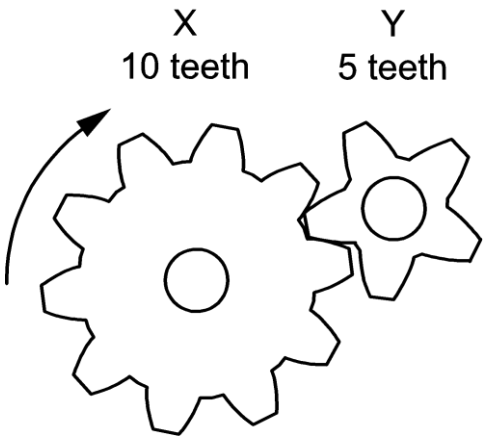
D 4

Your answer ☐

[1]

SPECIMEN

14 The diagram shows 2 gears.



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

Which row is the correct description of the movement of gear **Y**?

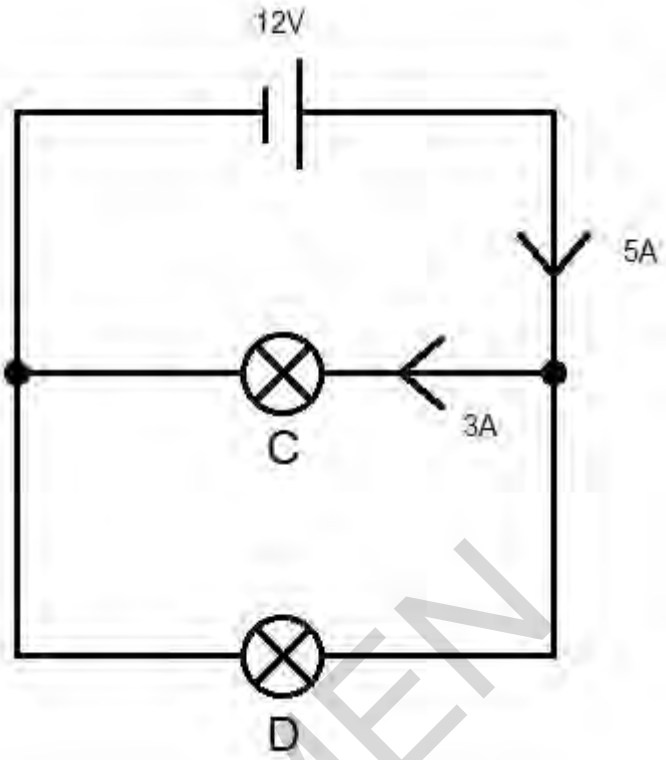
	direction of rotation	rotations per second
A	anticlockwise	0.5
B	anticlockwise	2.0
C	clockwise	0.5
D	clockwise	2.0

Your answer ☐

[1]

SPECIMEN

15 Look at the circuit diagram.



Use the formula **resistance = potential difference ÷ current** to calculate the resistance of bulb **D**.

A 2 Ω

B 4 Ω

C 6 Ω

D 8 Ω

Your answer ☐

[1]

SPECIMEN

SECTION B

Answer **all** the questions.

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

They need distance and time measurements to calculate speed.

(a) Write down an instrument they could use to measure:

(i) distance: …….. **[1]**

(ii) time: …… **[1]**

(b) The toy train travels for 45 seconds at 2 m/s.

Calculate the distance it travels.

Show your working.

…….....

…….....

…….....

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?

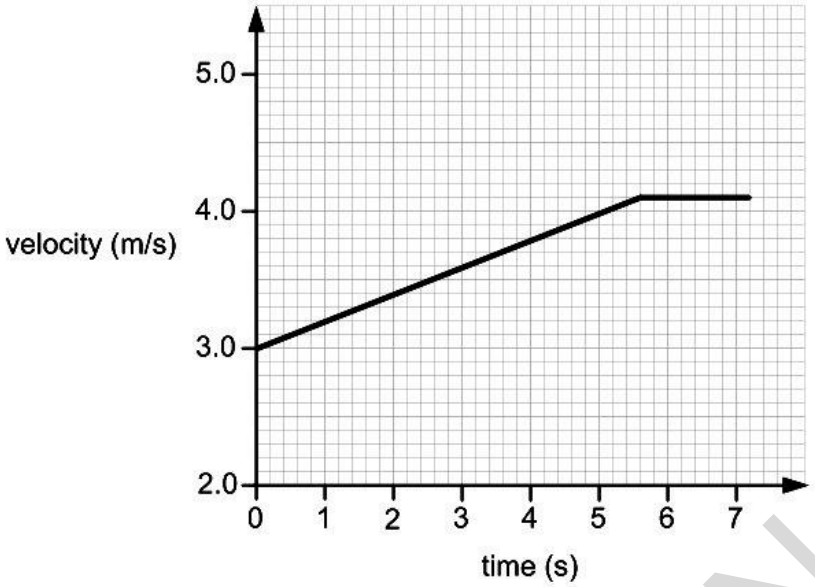
……... **[1]**

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

……... **[1]**

SPECIMEN

(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]**

SPECIMEN

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

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

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

.....

.....

.....

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

SPECIMEN

(ii) Student **B** uses iron filings to show a magnetic field pattern.

Describe how student **B** uses 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 students to use the method proposed by student **A.**

Suggest **one** reason why.

……

…… **[1]**

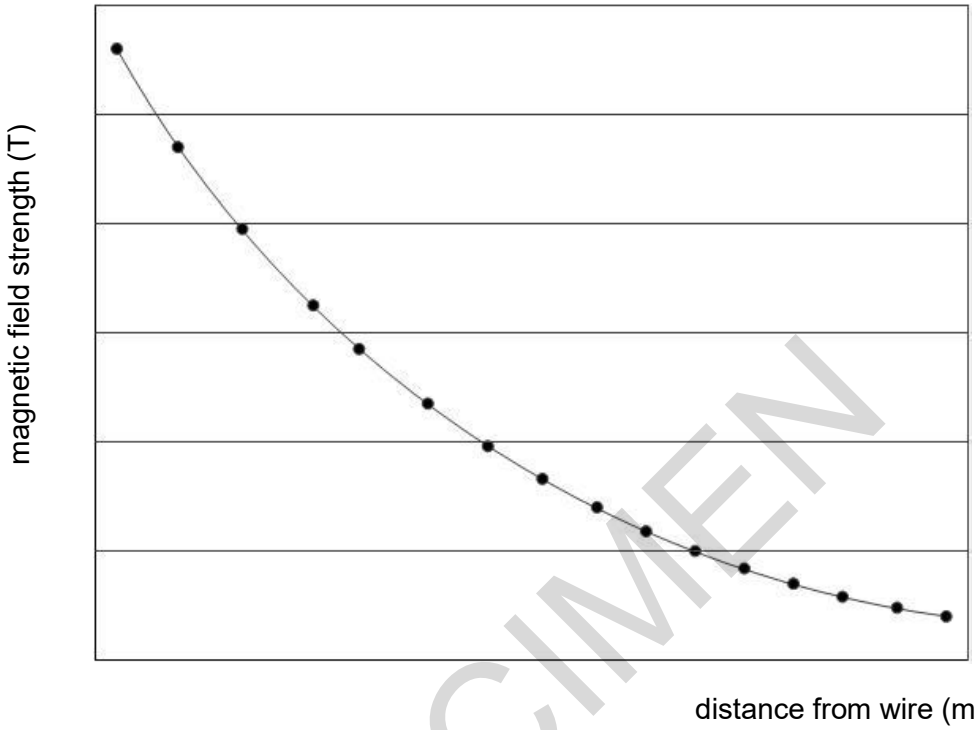
(c) Sketch the field pattern the students found around a bar magnet.

[2]

SPECIMEN

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

Look at the graph of their results.



What trend does the graph show?

……...

……...

……... **[2]**

SPECIMEN

18 Four students investigate the idea of work done.

work done = force x distance

Look at their results.

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

(a) Use calculations to show which student does the most work.

……

…… **[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.

……

…… **[2]**

(d) Student **C** takes 0.5 minutes to push the trolley.

How much power do they use?

Show your working.

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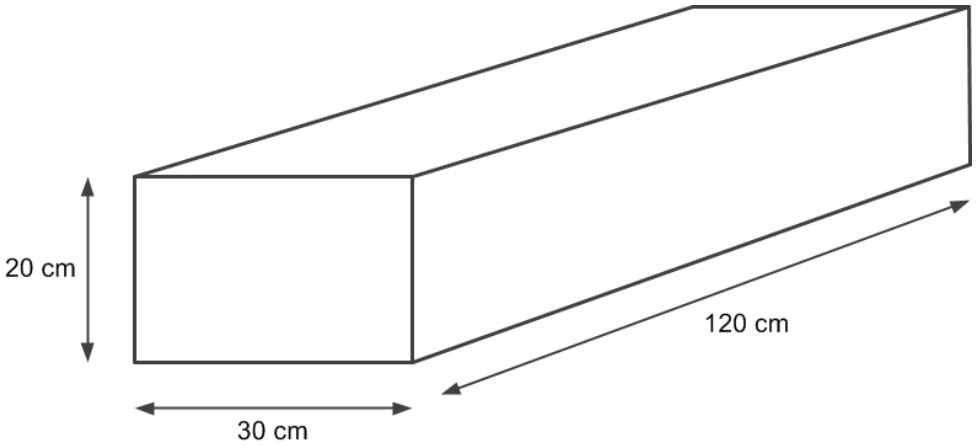
answer: .....W **[4]**

SPECIMEN

19 Wood 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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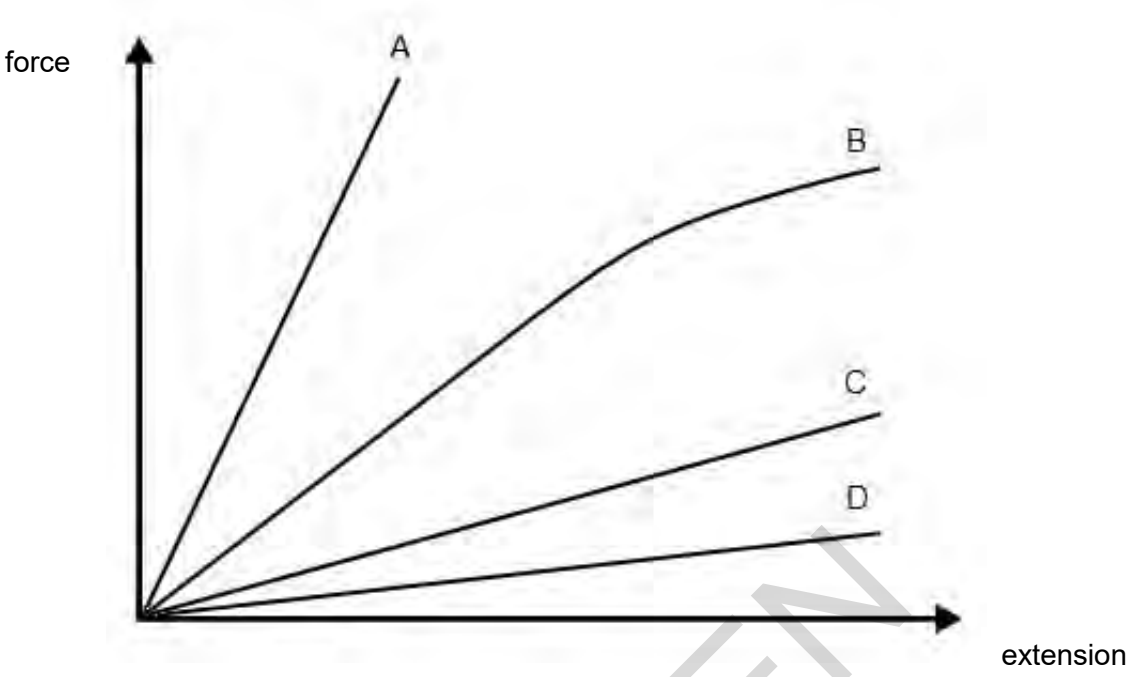
answer: …… **units:**…… **[6]**

SPECIMEN

20 The extension of four different springs is shown in the graph.



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

……

…… **[2]**

(b) Explain why the line for spring **B** has a different shape to the others.

……

…… **[2]**

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

For an extension of 25 cm, calculate the energy transferred in stretching.

Use the formula: **energy transferred = 0.5 x spring constant x extension^2**.

……

……

answer: ..... J **[2]**

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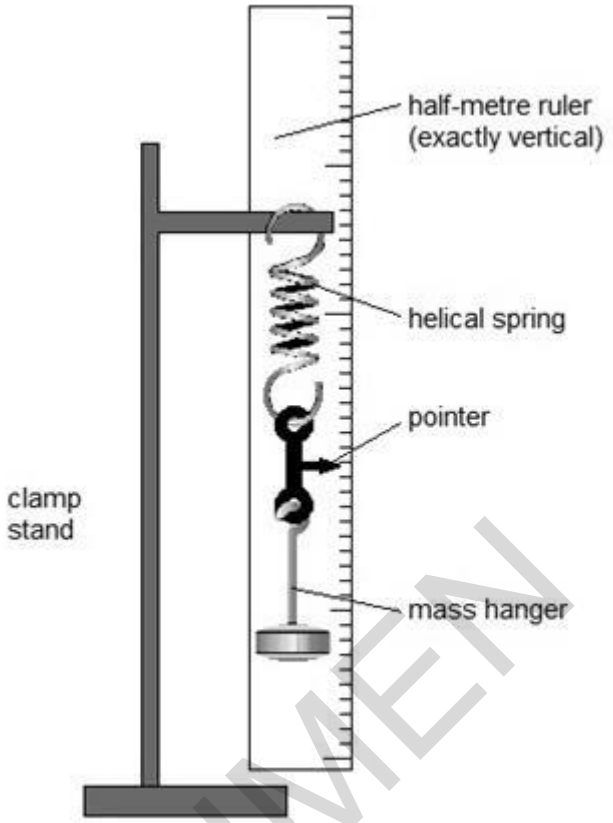
(ii) A student set up the apparatus shown in the diagram.



Describe how they could use this apparatus to collect data to draw a force/extension graph for this spring.

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…… **[4]**

(iii) The above spring has a spring constant of 30 N/m, this is replaced by a spring with a spring constant of 10 N/m.
What changes will the student have to make to this method to investigate this spring?

……

……

…… **[2]**

SPECIMEN

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 the student could use to find the resistance of the resistor.

[3]

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

Use the formula: **potential difference = current x resistance**

to calculate the resistance of the unknown resistor.

Show your working.

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

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answer: ..... Ω **[3]**

SPECIMEN

(c) The students repeat 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) State how the students dealt with the anomaly?

……

…… **[1]**

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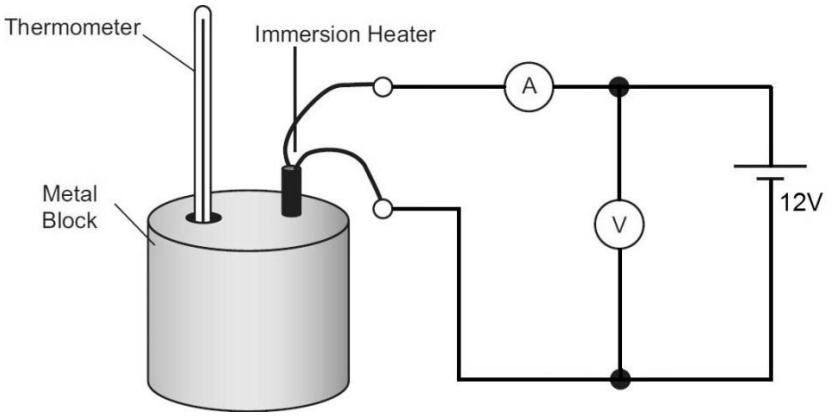
22 A student completes an experiment to find the specific heat capacity of a metal.



(a) **(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.

……

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…… **[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]**

SPECIMEN

23 A student rubs a balloon against a scarf.

(a)* Describe how the balloon has become charged.

Suggest a way to show that the balloon is charged. What would you expect to see and why?

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[6]

SPECIMEN

(b) The rate of flow of electrical charge in a circuit is a current.

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

Calculate how long this takes.

Show your working.

……

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……

answer: ..... seconds **[3]**

END OF QUESTION PAPER

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SPECIMEN

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