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Wednesday 22 May 2019 – Afternoon

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

J250/05 Paper 5 (Foundation Tier)

Time allowed: 1 hour 10 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

* J 2 5 0 0 5 *

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 **60**.
- 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 **20** pages.

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SECTION A

You should spend a maximum of 20 minutes on this section.

Answer **all** the questions.

Write your answer to each question in the box provided.

1 This question is about magnetic forces.

Which of the following would cause repulsion?

A



B



C



D



Your answer ☐ **[1]**

2 How many amperes are there in 1 microampere (1 μA)?

A 1×10^{-6}

B 0.001

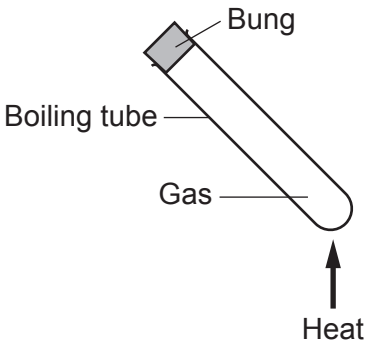
C 1000

D 1×10^{6}

Your answer ☐ **[1]**

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3 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]**

4 Which row of the table is correct?

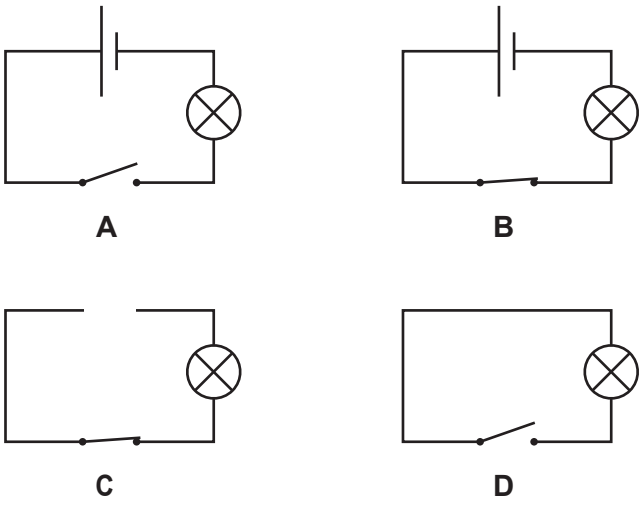
Use the equation: charge flow = current × time

	Current (A)	**Time (s)**	**Charge flow (C)**
A	1.0	2.0	0.5
B	1.0	2.0	2.0
C	3.0	1.5	2.0
D	3.0	2.0	0.6

Your answer ☐ **[1]**

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5 Which circuit gives a flow of charge?



Your answer ☐ **[1]**

6 Which row of the table gives a power of 300 W?

Use the equation: power = work done ÷ time

	Work done (J)	**Time taken (s)**
A	600	1.5
B	900	3.0
C	1000	5.0
D	1500	300

Your answer ☐ **[1]**

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7 A car changes velocity from 5 m/s to 15 m/s in 10 s.

What is the acceleration of the car?

Use the equation: acceleration = change in velocity ÷ time

A 0.5 m/s^2

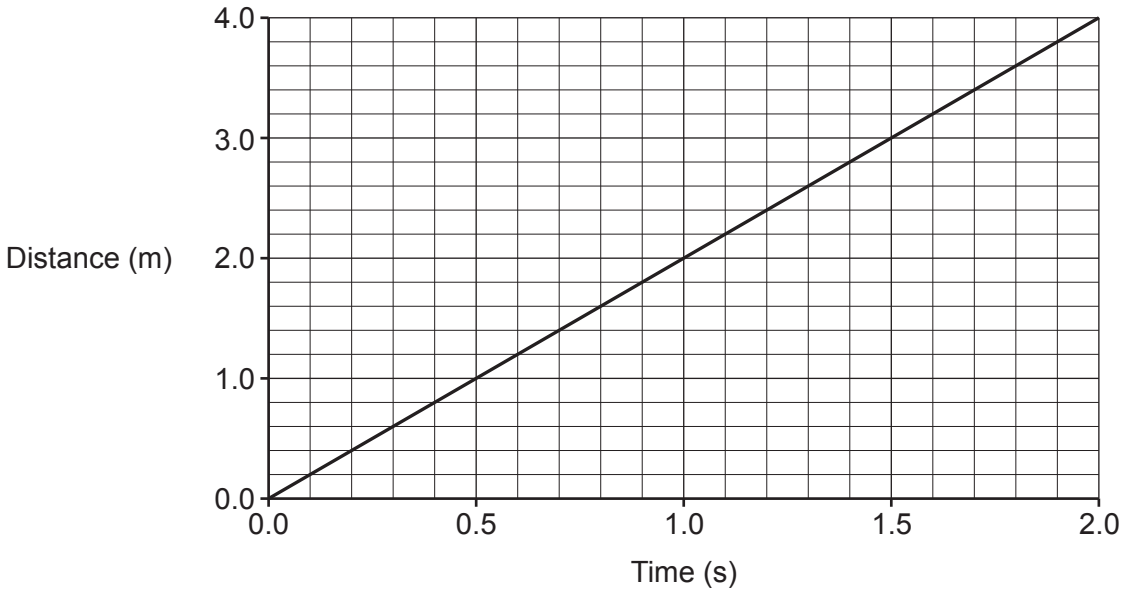
B 1.0 m/s^2

C 1.5 m/s^2

D 2.0 m/s^2

Your answer ☐ **[1]**

8 Look at the graph of distance against time for an object.



What is the speed of the object?

A 0.5 m/s

B 2.0 m/s

C 4.0 m/s

D 8.0 m/s

Your answer ☐ **[1]**

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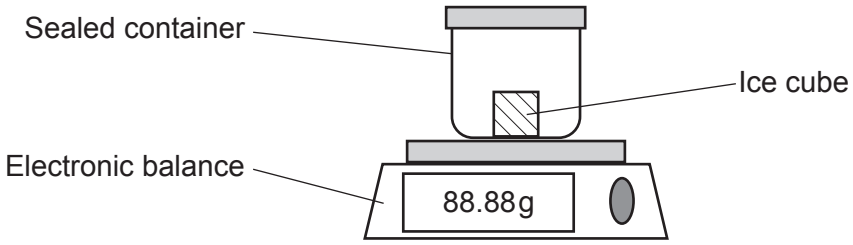
9 Some quantities are vectors and some are scalars.

Which row of the table is correct?

	Vector	**Scalar**
A	Speed	Displacement
B	Speed	Distance
C	Velocity	Displacement
D	Velocity	Distance

Your answer ☐ **[1]**

10 An ice cube and container are placed on an electronic balance on a hot day. The container is sealed.



Which row of the table correctly describes what happens?

	Reading on balance	**Type of change**	**Name of change**
A	Decreases	Chemical	Evaporating
B	Decreases	Physical	Evaporating
C	Stays the same	Chemical	Melting
D	Stays the same	Physical	Melting

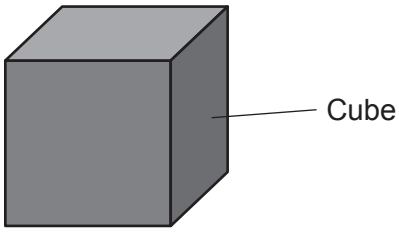
Your answer ☐ **[1]**

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SECTION B

Answer **all** the questions.

11 **(a)** A student is given a **solid** metal cube.



(i) Explain how the student can use a ruler to calculate the volume of the metal cube.

.....

.....

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

(ii) The metal cube has a volume of 125 cm^3 and a mass of 850 g.

Calculate the density of the metal cube.

Use the equation: density = mass ÷ volume

Density = ... g/cm^3 **[2]**

(b) The student wants to calculate the density of a stone. The stone has an irregular shape.

(i) Suggest **one** piece of apparatus that she can use to measure the **mass** of the stone.

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

(ii) Suggest **one** piece of apparatus that she can use to **measure** the **volume** of the stone.

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

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12 A teacher shows her class some magnets.

(a) **Fig. 12.1** shows the magnetic field around a bar magnet.

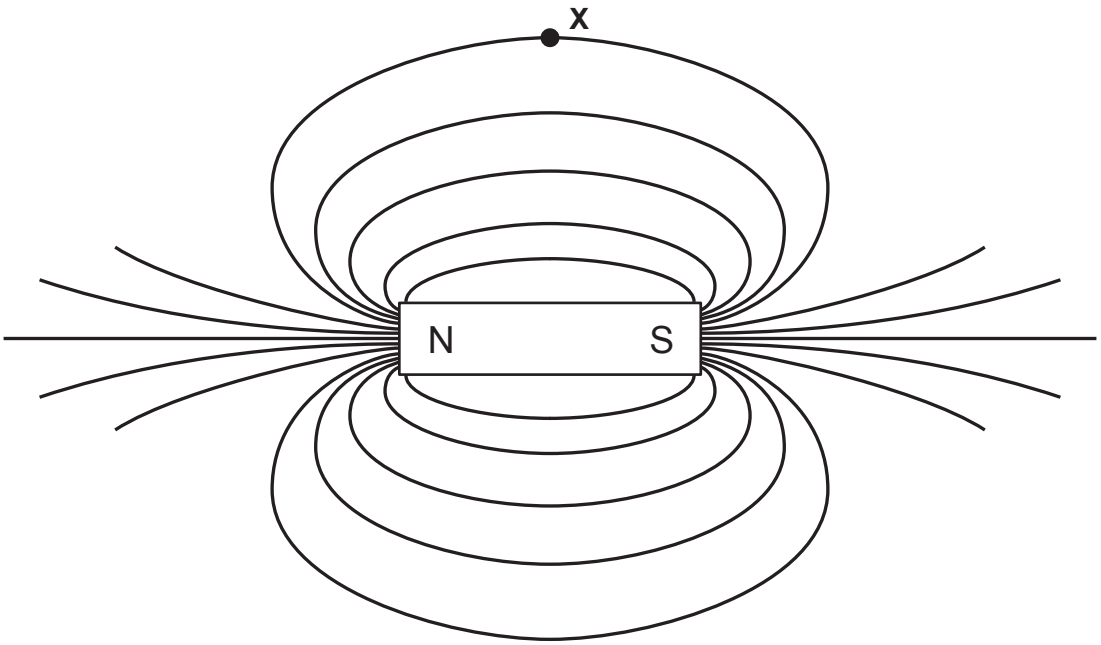


Fig. 12.1

(i) What is the direction of the magnetic field at **X**?

Draw an arrow **on the diagram** in **Fig. 12.1** to show your answer. **[1]**

(ii) Where is the magnetic field **strongest** around the bar magnet?

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

(b) A compass points towards 'magnetic north'.

What does this tell us about the Earth?

.....

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

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(c) The teacher wraps a coil of insulated wire around a soft iron core as shown in **Fig. 12.2**.

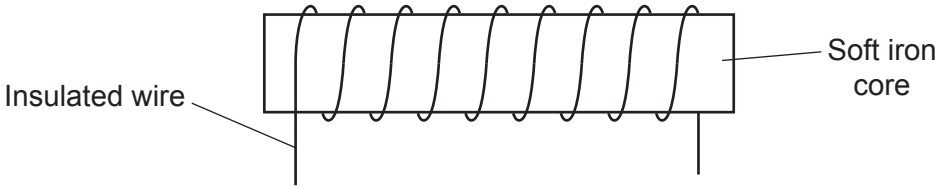


Fig. 12.2

(i) Describe what the student needs to do to create a magnetic field.

.....

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

(ii) The student changes the number of turns in the coil. He records the number of steel pins that the magnetic field can pick up.

Number of turns in coil	Number of steel pins picked up
5	0
10	1
15	2
20	2

The student concludes 'The more turns, the stronger the magnetic field'.

Explain if his conclusion is true. Use the results in the table in your answer.

.....

.....

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

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13 A student hangs a mass from the end of a spring as shown in **Fig. 13.1**.

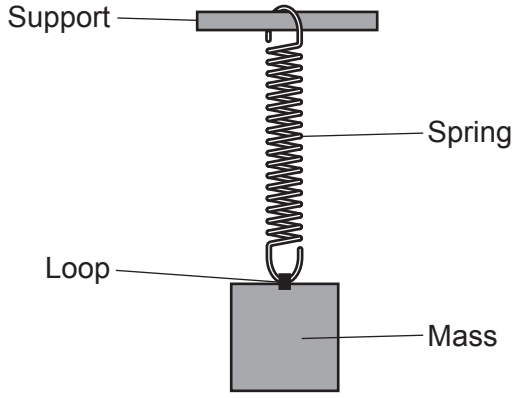


Fig. 13.1

(a) The spring in **Fig. 13.1** extends by 0.06 m. The spring constant is 25 N / m.

Calculate the force on the spring.

Use the equation: force = extension × spring constant

Force = ... N **[2]**

(b) **Fig. 13.2** shows the forces acting **on the mass**.

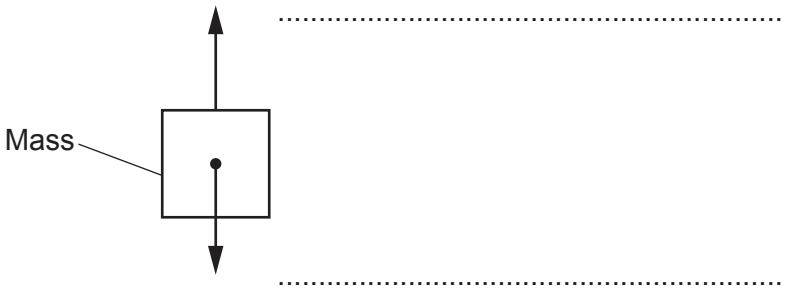


Fig. 13.2

(i) Label the forces **on the diagram** in **Fig. 13.2**. **[2]**

(ii) The loop at the end of the spring breaks and the mass falls.

Explain why the mass falls and describe its motion as it falls.

.....

.....

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

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(c) The mass is placed on a bench, as shown in **Fig. 13.3**.

This is a diagram showing the force of the bench on the mass.

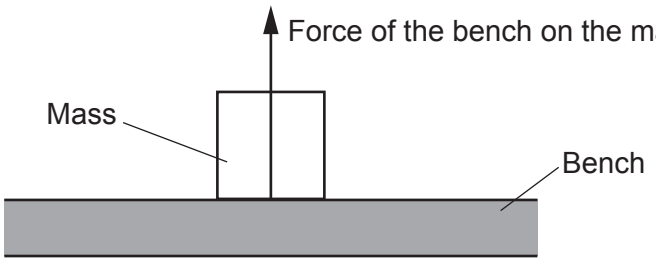


Fig. 13.3

Newton's third law is about how forces come in pairs.

Complete the table to describe the other force in this pair.

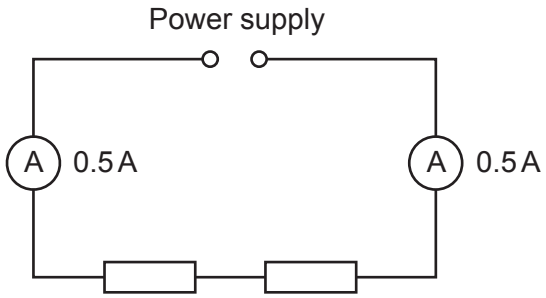
	Force in diagram	**Other force in this pair**
Name	Force of the bench on the mass	....
Type of force	Contact force	....

[2]

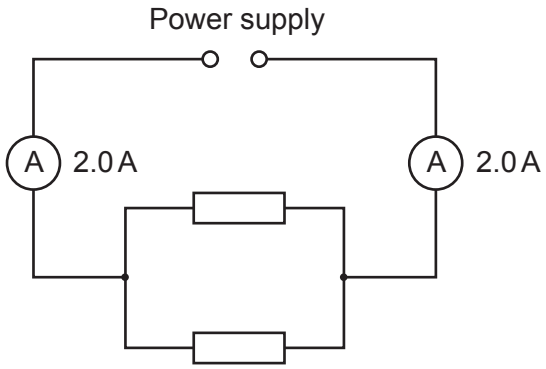
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14* A student has a fixed voltage power supply and two identical resistors.

He sets up two different circuits **A** and **B** and measures the currents in each circuit.



Circuit **A**



Circuit **B**

Describe and explain the **similarities** and **differences** between circuit **A** and circuit **B**.

Use ideas about current and resistance in your answer.

.....

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

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15 A student measures the acceleration of a trolley on a horizontal surface.

Fig. 15.1 is a diagram of her experiment.

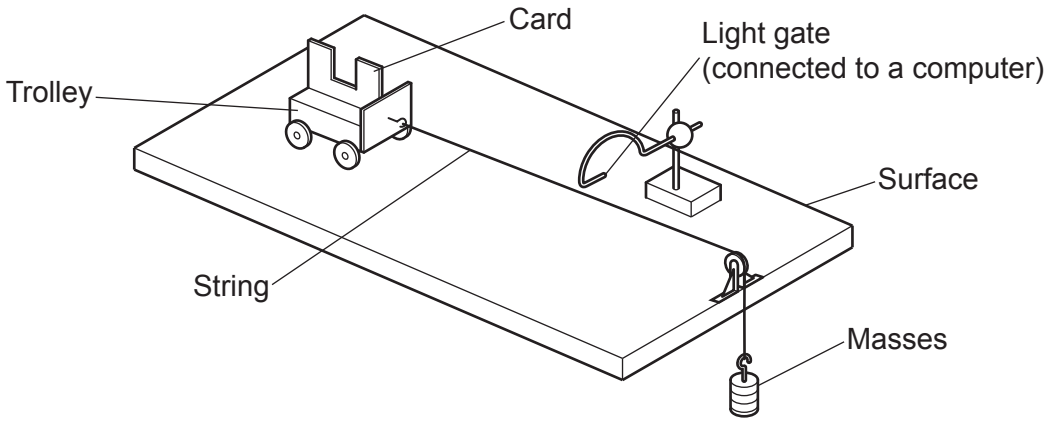


Fig. 15.1

(a) The weight of the masses accelerates the trolley.

(i) Define the term weight.

.....

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

(ii) Show that the weight of a 100 g mass is 1 N.

[3]

(b) Friction can change the results of this experiment.

Suggest **one** way friction can be reduced.

.....

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

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(c) (i) The tall parts of the card on the trolley (**U** and **V**) pass through the light gate, as shown in **Fig. 15.2**.

The velocity of **U** is 0.5 m/s.

The velocity of **V** is 1.0 m/s.

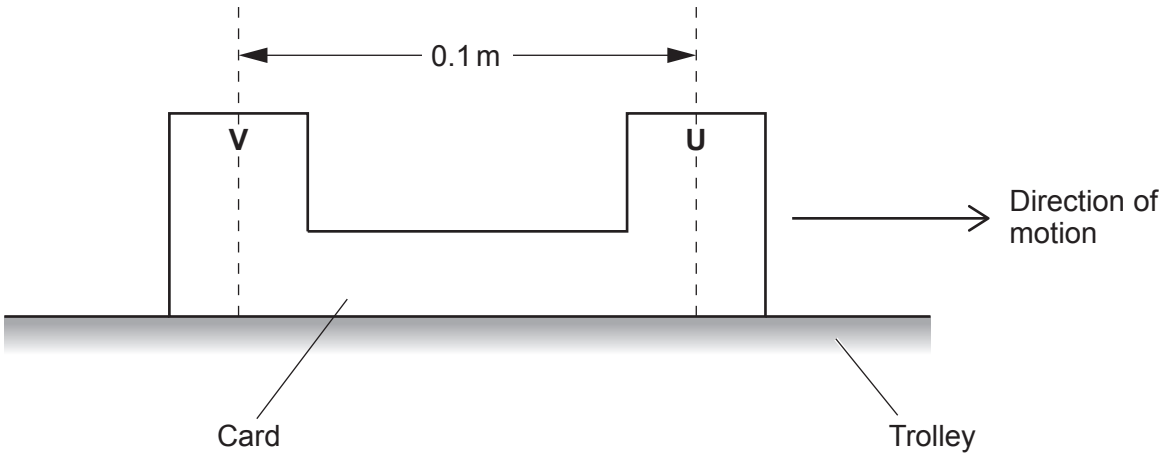


Fig. 15.2

Calculate the acceleration of the trolley.

Use the equation: (final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance

Acceleration = ... m/s^2 **[3]**

(ii) When the trolley reaches the edge of the surface, it is moving at 1.2 m/s.

The mass of the trolley is 1.0 kg.

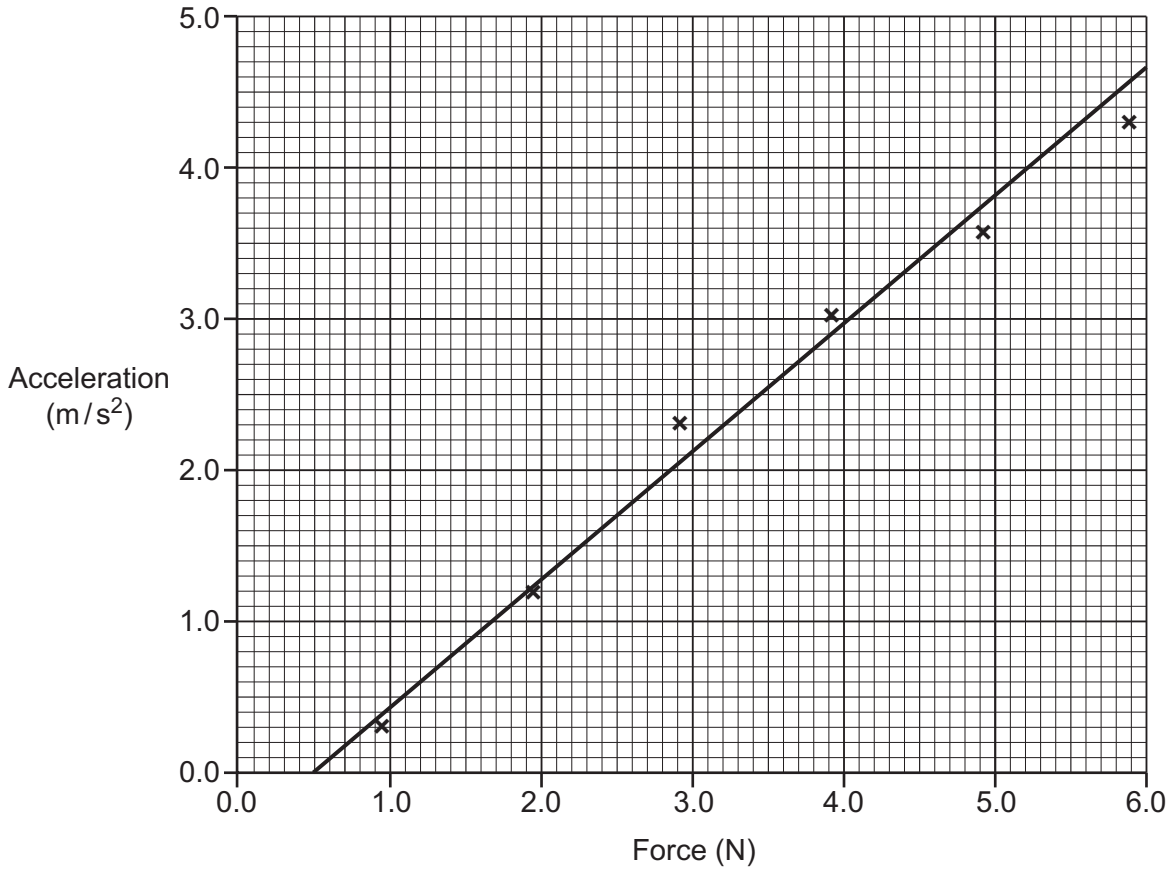
Calculate the kinetic energy of the trolley.

Kinetic energy = ... J **[3]**

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(d) The student repeats the experiment with different masses.

This is a graph showing her results.



The student says, 'The graph shows that the acceleration of the trolley is directly proportional to the force.'

Is the student correct?

Explain your answer.

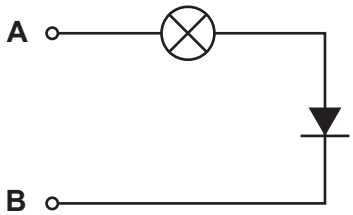
.....

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

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16 A student makes a 'component tester'. He connects a diode to a small filament lamp.

This is a diagram of the component tester.



(a) Describe how the student could use the component tester to find the positive (+) terminal of a cell.

.....

.....

.....

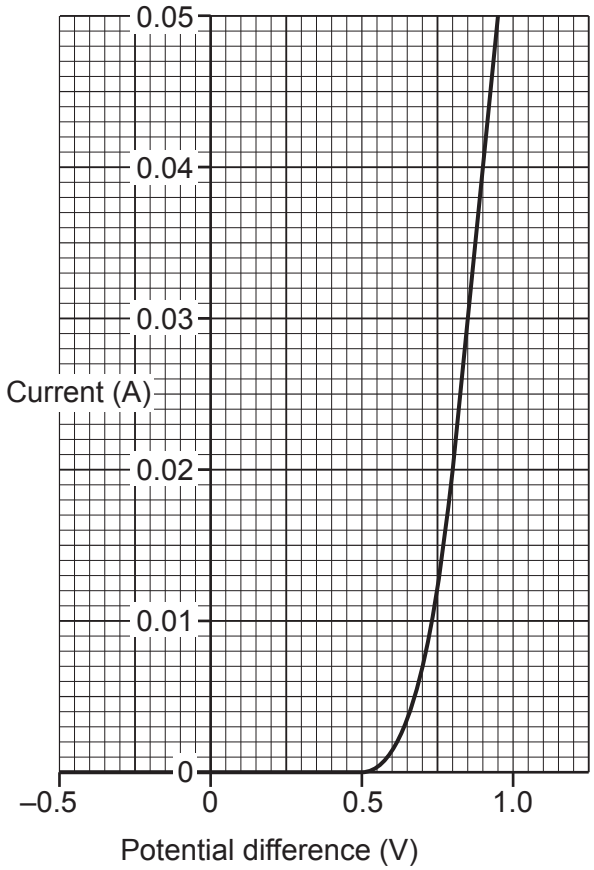
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..... **[3]**

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(b) Here is a graph of current against potential difference for a diode.



(i) The diode is **not** a fixed resistor.

Describe **two** ways the graph shows this.

1 .....

.....

2 .....

.....

[2]

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(ii) Calculate the resistance of the diode at + 0.8 V.

Use the graph **and** the equation: potential difference = current × resistance

Resistance = ... Ω **[4]**

(c) The manufacturer of the diode gives the following warning:

> The supply voltage must not exceed 1 V.

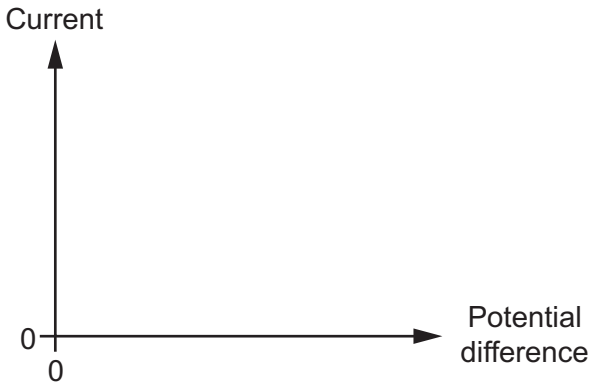
Use the graph in **16(b)** to explain why.

.....

.....

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

(d) Sketch a graph of current against potential difference for a filament lamp.
Use the axes below.



[1]

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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