CAMBRIDGE
OCR

Tuesday 2 June 2026 – Morning

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

J249/01 (Foundation Tier)

Time allowed: 1 hour 45 minutes

You must have:
- a ruler (cm/mm)
- the Equation Sheet for GCSE (9–1) Physics A (inside this document)

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

F

* J 2 4 9 0 1 *

* 2 6 9 2 7 4 5 0 6 1 *

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

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

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **90**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*****).
- This document has **32** pages.

ADVICE
- Read each question carefully before you start your answer.

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Section A

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

Write your answer to each question in the box provided.

1 Which of the following has a **negative charge**?

A Electron

B Neutron

C Nucleus

D Proton

Your answer ☐ **[1]**

2 A car travels at a constant speed.

The car travels 50 km in 2 hours.

How far does the car travel in 8 hours?

A 25 km

B 100 km

C 200 km

D 800 km

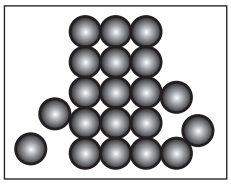
Your answer ☐ **[1]**

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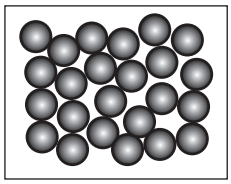
3 A teacher models how atoms are arranged in a box.

Which box shows the **lowest density**?

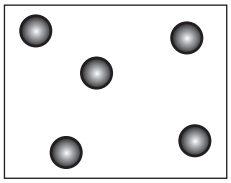
A



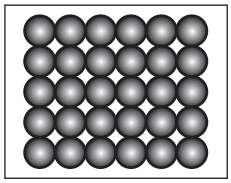
B



C



D



Your answer ☐ **[1]**

4 Water is heated from 20 °C to 50 °C.

Which row describes what happens to the energy stored in the water and what happens to the temperature of the water?

	Energy stored	**Temperature**
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

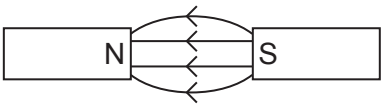
Your answer ☐ **[1]**

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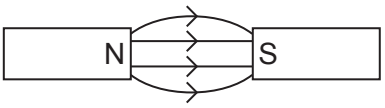
5 Two bar magnets are placed close together.

Which diagram shows the magnetic field pattern between the two bar magnets?

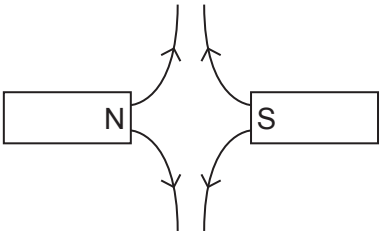
A



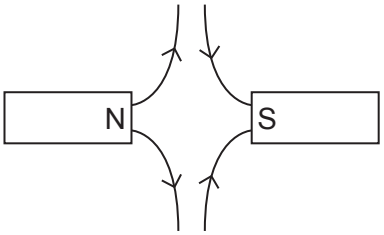
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C

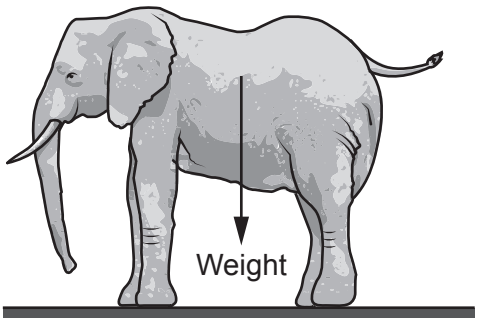


D



Your answer ☐ **[1]**

6 The diagram shows an elephant standing on the ground.



The weight of the elephant acts downwards.

An upwards force from the ground acts on each of the feet of the elephant.

What is the name of this upwards force?

A Friction

B Normal contact force

C Tension

D Upthrust

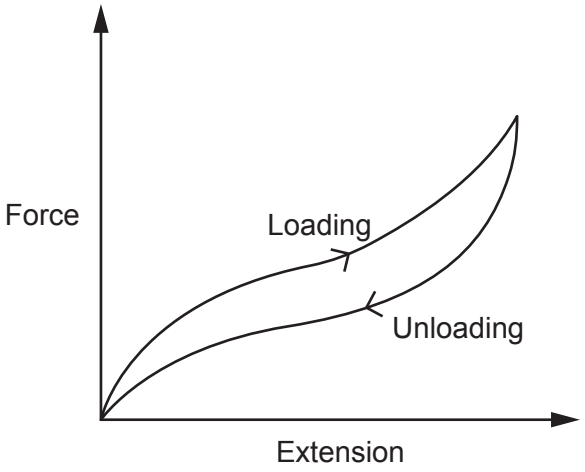
Your answer ☐ **[1]**

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7 A student hangs masses, one at a time, from a rubber band and measures the extension of the rubber band each time a mass is added.

The student then removes the masses, one at a time, and measures the extension of the rubber band each time a mass is removed.

The graph shows the student's results.



Which row describes the relationship between force and extension, and the type of deformation, for the rubber band?

	Relationship between force and extension	Type of deformation
A	linear	elastic
B	linear	plastic
C	non-linear	elastic
D	non-linear	plastic

Your answer ☐ **[1]**

8 A student says 'an object will remain at rest or move with uniform velocity unless a force acts on it'.

Which law is the student describing?

A Hooke's law

B Newton's first law

C Newton's second law

D Newton's third law

Your answer ☐ **[1]**

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9 How much energy is transferred when a charge of 600 mC moves through a potential difference of 30 V?

Use the equation: energy transferred = charge × potential difference

A 18 J

B 20 J

C 50 J

D 18 000 J

Your answer ☐ **[1]**

10 The atomic model has changed as new evidence has been discovered by scientists.

Bohr discovered that electrons orbit in shells.

Thomson suggested the Plum Pudding model.

Rutherford discovered a tiny positively charged nucleus at the centre of an atom.

Which list shows the scientists in order of their work from earliest to most recent?

A Rutherford → Bohr → Thomson

B Rutherford → Thomson → Bohr

C Thomson → Bohr → Rutherford

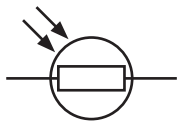
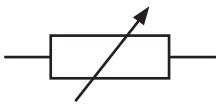
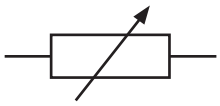
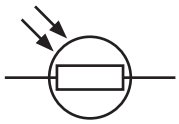
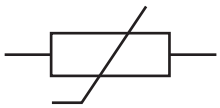
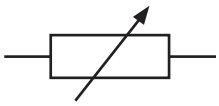
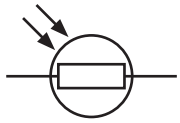
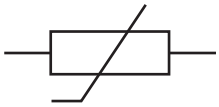
D Thomson → Rutherford → Bohr

Your answer ☐ **[1]**

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11 The resistance of some components depends on light intensity or on temperature.

Which row shows the correct circuit symbols for each component?

	Resistance depends on light intensity	Resistance depends on temperature
A		
B		
C		
D		

Your answer ☐ **[1]**

12 An engineer has two concrete blocks **P** and **Q**.

They determine the pressure exerted on the ground by block **P**.

Block **Q** has twice the weight of block **P**. Block **Q** also has twice the area in contact with the ground as block **P**.

How does the pressure exerted on the ground by block **Q** compare with the pressure exerted on the ground by block **P**?

Use the equation: $\text{pressure} = \dfrac{\text{force normal to a surface}}{\text{area of that surface}}$

A It is half the pressure exerted by block **P**.

B It is the same as the pressure exerted by block **P**.

C It is twice the pressure exerted by block **P**.

D It is four times the pressure exerted by block **P**.

Your answer ☐ **[1]**

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13 A lion runs at a speed of 20 m / s. The lion has a mass of 180 kg.

What is the kinetic energy of the lion?

Use the equation: kinetic energy = $\frac{1}{2}$ × mass × (speed)^2

A 1800 J

B 3600 J

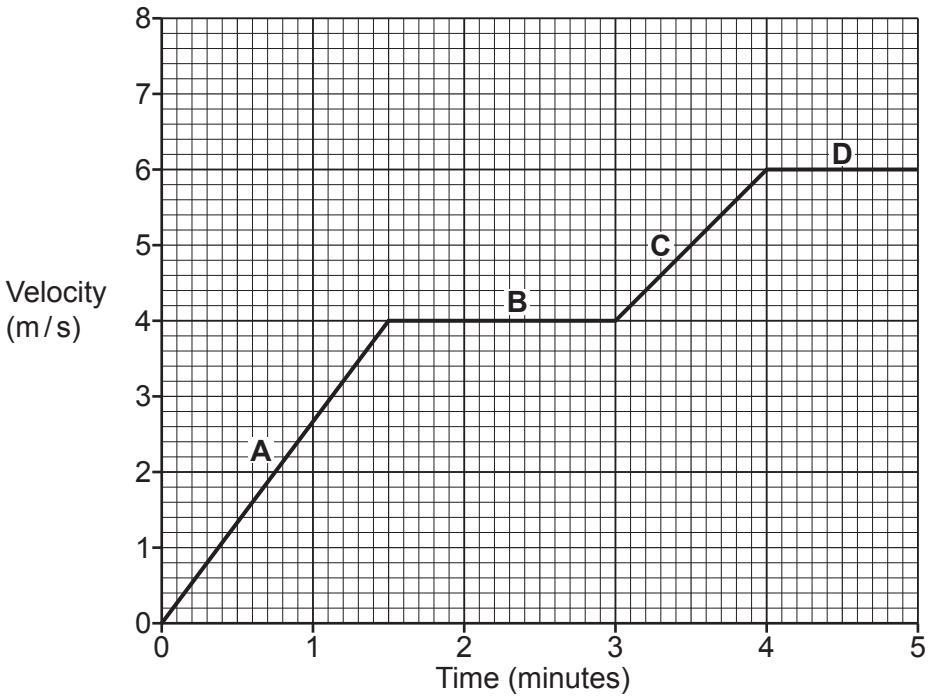
C 36 000 J

D 72 000 J

Your answer ☐ **[1]**

14 This is a velocity-time graph for a cyclist.

At which section, **A**, **B**, **C** or **D**, on the graph is the acceleration of the cyclist the **greatest**?



Your answer ☐ **[1]**

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15 A mug contains hot chocolate.

The hot chocolate has a mass of 0.50 kg and cools from 50 °C to 35 °C.

How much energy is released as the hot chocolate cools?

The specific heat capacity of the hot chocolate is 3600 J / kg °C.

Use the equation:
change in thermal energy = mass × specific heat capacity × change in temperature

A 27 000 J

B 54 000 J

C 63 000 J

D 90 000 J

Your answer ☐ **[1]**

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Section B

16 This question is about simple electrical circuits.

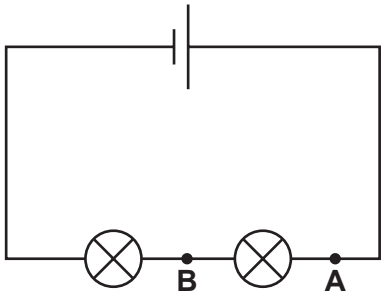
(a) Which of the following are required for charge to flow in a circuit?

Tick (✓) **two** boxes.

Closed circuit	☐
Filament lamp	☐
Open circuit	☐
Potential difference	☐
Resistor	☐

[2]

(b) A student connects a circuit using two identical lamps in series with a cell.



(i) How does the current at point **B** compare to the current at point **A**?

Put a (ring) around the correct answer.

it is higher **it is lower** **it is the same** **[1]**

(ii) The student connects a second identical cell in series with the first cell in the circuit.

Complete the sentences to describe the effects of adding the second cell.

The brightness of the lamps ..... .

The current at point **B** ..... .

The potential difference across each lamp ..... .

[3]

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(c) Calculate the time it takes a charge of 72 C to flow past a point in the circuit when the current is 0.2 A.

Use the equation: charge flow = current × time

Give your answer in **minutes**.

Time = ... minutes **[4]**

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17 An astronaut investigates gravitational field strength.

(a) A spacecraft of mass 300 kg has a weight of 480 N on the Moon.

Calculate the gravitational field strength on the Moon.

Use the equation: gravitational force = mass × gravitational field strength

Gravitational field strength = ... N / kg **[3]**

(b) The astronaut uses a force of 80 N to pull a small trolley across the surface of the Moon. The trolley moves a distance of 150 cm in the direction of the force.

Calculate the work done by the astronaut.

Use the equation: work done = force × distance

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

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(c) A Mars rover is a remote-controlled motor vehicle designed to travel on the surface of Mars.

On Mars the gravitational field strength is 3.7 N / kg.

The Mars rover has a mechanical arm which lifts a rock of mass 3.0 kg from the surface of Mars to a height of 0.40 m.

Calculate the gravitational potential energy gained by the rock.

Use the equation: gravitational potential energy = mass × gravitational field strength × height

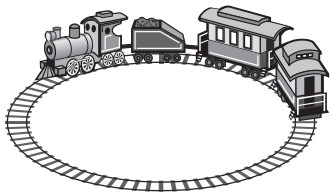
Give your answer to **2** significant figures.

Gravitational potential energy = ... J **[3]**

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18

(a) A child plays with a toy train on a circular track.



The length of the track is 2.0 m.

The train travels at a constant speed.

The time taken for the train to travel once around the track is 5.0 s.

(i) Suggest suitable equipment for measuring the time taken to travel once around the track.

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

(ii) Draw lines to connect each **quantity** with the correct **value** for this train when it has travelled exactly once around the track.

Use the Equation Sheet.

Quantity	Value
displacement	0 m
distance	0 m/s
speed	0.4 m/s
	2.0 m

[3]

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(b) A different toy train is placed on a straight horizontal track.

(i) The train takes 2.0 s to increase its velocity from 2.5 m / s to 4.0 m / s.

Calculate the acceleration of the train.

Use the equation: acceleration = $\frac{\text{change in velocity}}{\text{time}}$

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

(ii) The mass of the train is 2.4 kg.

Calculate the force acting on the train.

Use the equation: force = mass × acceleration

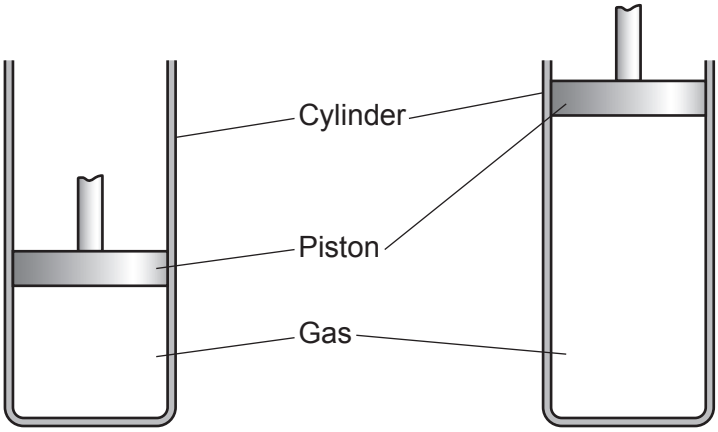
Force = ... N **[2]**

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19

(a) A scientist investigates the pressure of a fixed mass of gas in a sealed cylinder.

The scientist moves the piston slowly upwards and the volume occupied by the gas increases.



Initial position of piston **Final position of piston**

Gas particles collide with the wall of the cylinder and exert a force.

The temperature of the gas does **not** change.

Complete the sentences to explain what happens to the pressure of the gas in the cylinder from the initial position of the piston to the final position of the piston.

Use words from the list.

decreases	**increases**	**stays the same**

The number of collisions per second between the particles and

the wall of the cylinder ..... .

The force exerted by each collision with the wall ..... .

The pressure of the gas ..... .

[3]

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(b) The scientist uses a pressure gauge to investigate how atmospheric pressure varies with height above the Earth's surface.

The table shows the scientist's results.

Height above the Earth's surface (m)	Atmospheric pressure (kPa)
0	101
250	98
500	95
750	92
1000	89

(i) Describe how atmospheric pressure varies with height above the Earth's surface.

.....

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

(ii) Explain why atmospheric pressure varies with height above the Earth's surface.

.....

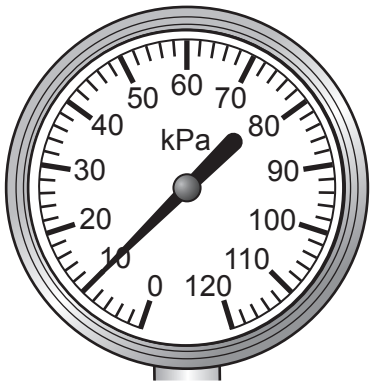
..... **[1]**

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(c) Another scientist uses a different pressure gauge to measure pressure. This pressure gauge has a zero error.

The zero error means the pressure gauge shows an incorrect reading when the true value of the pressure is zero.

The diagram shows the reading on the pressure gauge when the true value of the pressure is zero.



Explain how the zero error on this pressure gauge affects the measurements for pressure that the scientist records.

.....

.....

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

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20* A student investigates how the power of a kettle affects the time it takes to boil water.

The table shows data about the kettles.

Kettle	Potential difference (V)	Current (A)	Maximum volume of water (cm^3)	Time to boil maximum volume of water (minutes)
A	230	13	1800	3.5
B	230	10	1700	4.5
C	230	6.4	1700	7.0
D	110	11	1700	8.5
E	12	21	800	20

Compare the kettles using data from the table.

In your answer:
- include calculations of power
- identify trends in the data.

Use the Equation Sheet.

.....

.....

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.....

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

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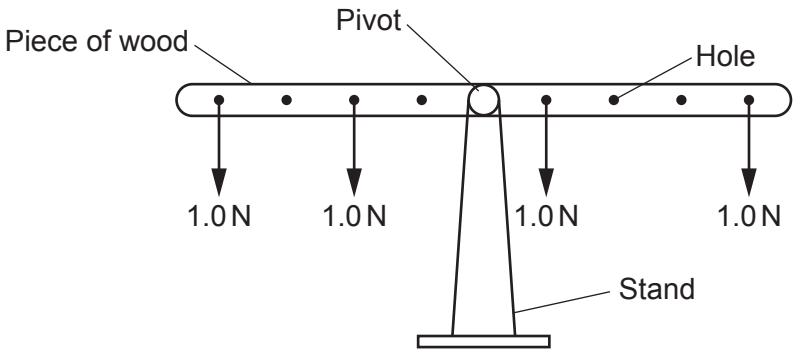
21

(a) A student uses a moment balance to investigate moments.

The moment balance is a piece of wood attached to a central pivot on a stand so that it can rotate freely.

There are holes 5.0 cm apart along the piece of wood. The pivot is at the hole in the centre.

(i) The student places four 1.0 N weights on the moment balance and holds it so that it does **not** move.



What happens to the moment balance when the student releases it?

Tick (✓) **one** box.

It does **not** rotate. ☐

It rotates anti-clockwise. ☐

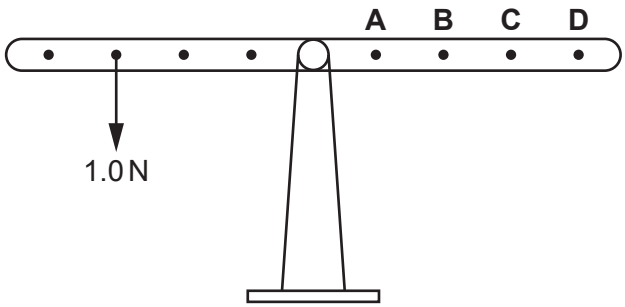
It rotates clockwise. ☐

[1]

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(ii) The student removes the four weights.

The student now places a 1.0 N weight on the left side of the moment balance, as shown.



The student places **two** 1.0 N weights on the right-hand side of the pivot to balance the moment balance.

At which positions, **A**, **B**, **C** or **D**, does the student place these two 1.0 N weights?

Explain your answer.

Use the equation: moment of a force = force × distance

Positions ..... and .....

Explanation .....

.....

.....

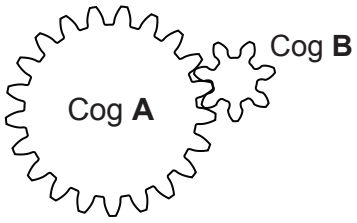
.....

[3]

(b) Gears can be used to transmit rotational forces.

The diagram shows 2 gear cogs.

Cog **A** has 21 teeth and cog **B** has 7 teeth.



Cog **A** turns clockwise and completes exactly **one** full rotation.

Describe how cog **B** rotates.

Direction .....

Number of rotations = ...

[2]

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22 A teacher investigates electrical circuits.

(a) The teacher makes a simple circuit which includes a battery.

On which quantities does the current in the circuit depend?

Tick (✓) **one** box.

Potential difference of battery only ☐

Resistance of circuit and potential difference of battery ☐

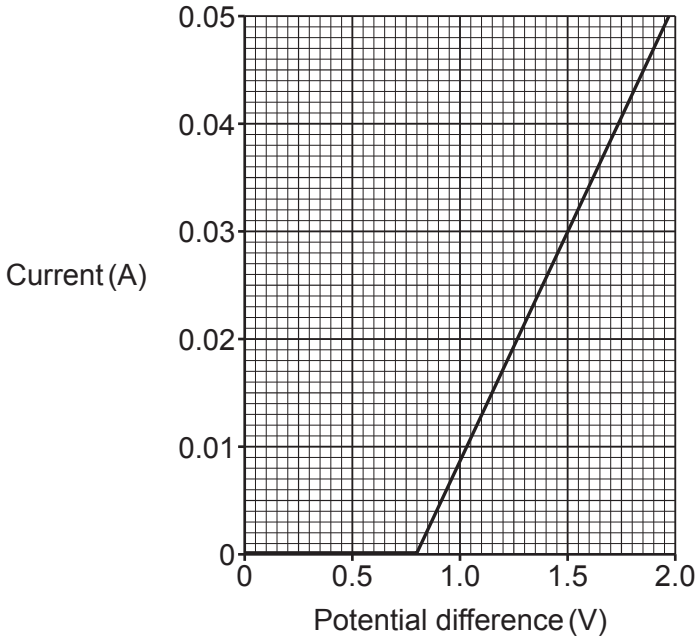
Resistance of circuit only ☐

[1]

(b) The teacher makes a different circuit to investigate the behaviour of a diode.

The teacher uses a variable resistor to change the current in the circuit and the potential difference across the diode.

The teacher takes measurements of current and potential difference and plots a graph.



(i) Use the graph to determine the potential difference across the diode when the diode starts to conduct.

Potential difference = ... V **[1]**

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(ii) Use the graph to calculate the resistance of the diode at 1.5 V.

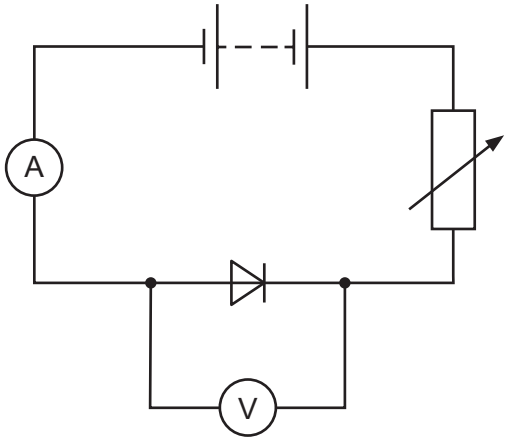
Use the Equation Sheet.

Include the unit for resistance.

Resistance = ... Unit ..... **[5]**

(iii) A student uses the same apparatus as the teacher.

The student sets up the circuit as shown.



Explain why the student does **not** get similar results to the teacher.

.....

.....

.....

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

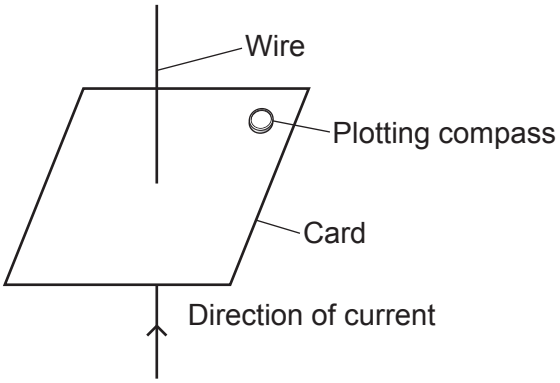
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23 A student uses a plotting compass to plot the magnetic field around a current-carrying wire.

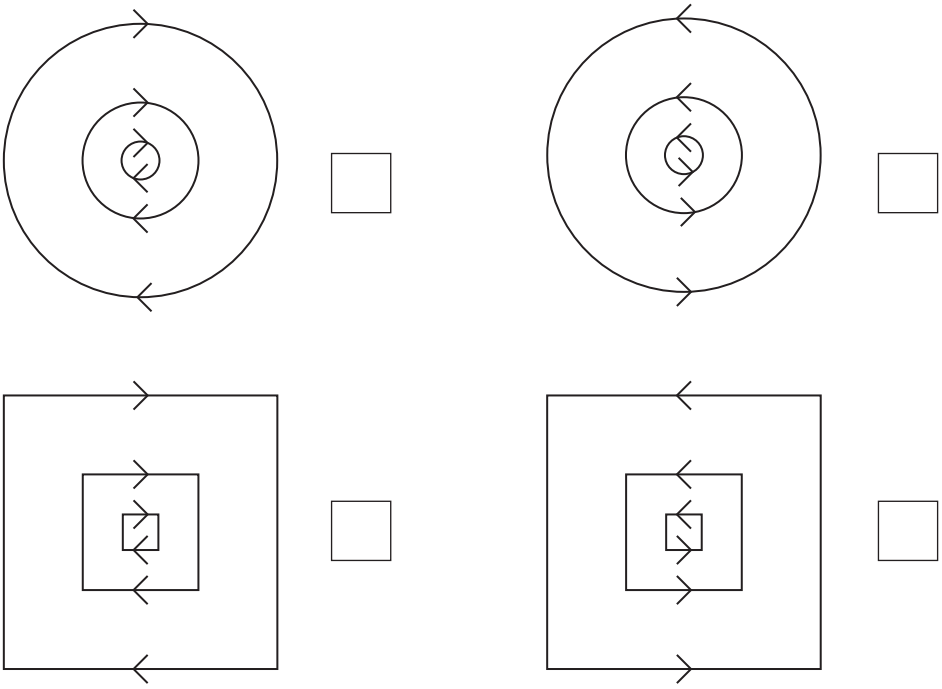


(a)

(i) The student plots the magnetic field pattern on the piece of card.

Which diagram shows the correct magnetic field pattern around the wire when viewed from above?

Tick (✓) **one** box.



[1]

(ii) Write down **two** factors that affect the strength of the magnetic field at a point in the field.

Factor 1 .....

Factor 2 .....

[2]

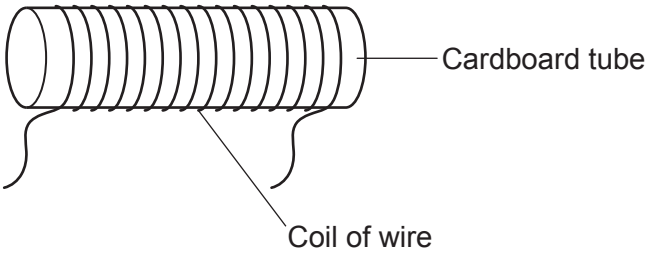
(iii) How does the student change the direction of the magnetic field around the wire?

.....

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

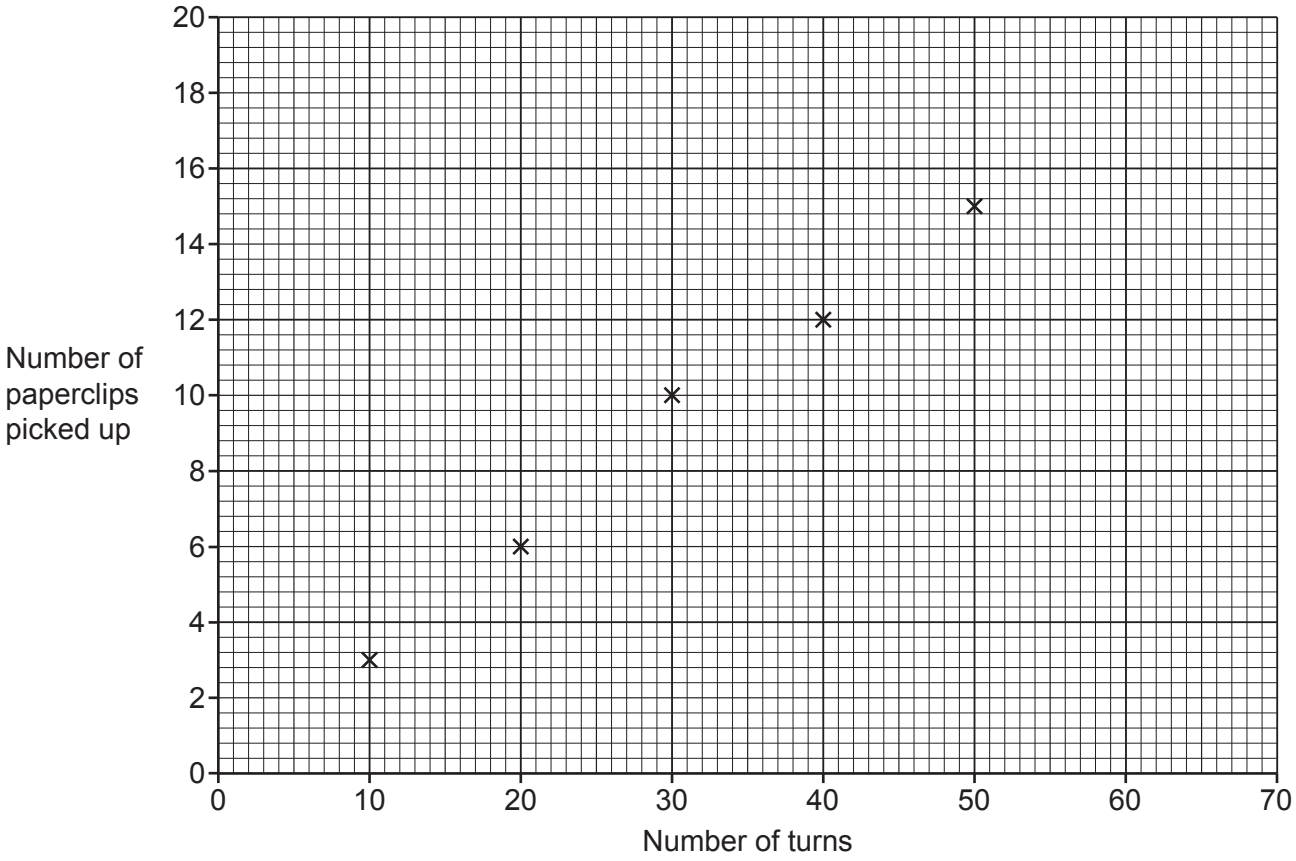
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(b) The student makes a solenoid by wrapping a coil of wire around a cardboard tube.



The student investigates how the number of turns on the solenoid affects the number of paperclips that the solenoid picks up. The current in the solenoid is constant.

The student records the results on a graph.



(i) Draw a line of best fit. **[1]**

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(ii) Describe the trend shown on the graph.

.....

.....

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

(iii) Determine the number of turns needed to pick up 14 paperclips.

Use the graph.

Show on the graph how you get your answer.

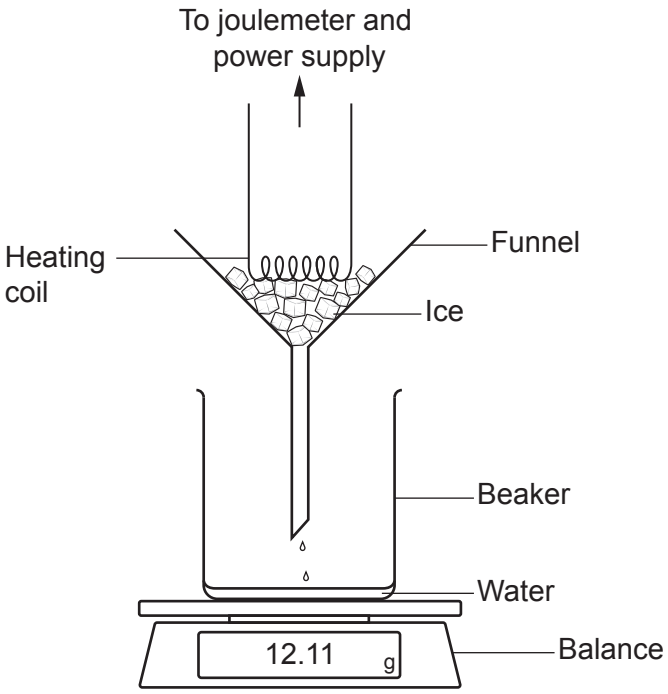
Number of turns = ... **[2]**

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24 Two students investigate the specific latent heat of fusion of ice.

They place ice in a funnel with a heating coil as shown in **Figure 24.1**. The heating coil is connected to a joulemeter and a power supply.

Figure 24.1



The students turn on the heating coil for 300 s and measure the mass of ice that melts in this time.

(a) Which type of change is melting?

Tick (✓) **one** box.

Chemical ☐

Physical ☐

Sublimation ☐

[1]

(b) Explain your answer to **(a)**.

.....

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

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(c) Which quantity is conserved when the ice melts?

Tick (✓) **one** box.

Density ☐

Mass ☐

Volume ☐

[1]

(d) What happens to the temperature of the ice as it changes state?

Tick (✓) **one** box.

Decreases ☐

Increases ☐

Stays the same ☐

[1]

(e)

(i) The students record the following measurements:

Thermal energy transferred by heating coil = 18 000 J

Mass of ice that melts = 0.015 kg

Calculate the specific latent heat of fusion of ice using the students' results.

Use the Equation Sheet.

Specific latent heat = ... J / kg **[3]**

(ii) The value calculated in **(e)(i)** using the students' results is much higher than the true value for the specific latent heat of fusion of ice.

Use **Figure 24.1** to suggest **two** ways that the experiment could be improved to get a more accurate value.

1 .....

.....

2 .....

.....

[2]

END OF QUESTION PAPER

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EXTRA ANSWER SPACE

If you need extra space use these lined pages. You must write the question numbers clearly in the margin.

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