Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

AQA

General Certificate of Secondary Education
Foundation Tier
June 2015

Additional Science
Unit Physics P2

PH2FP

F

Physics
Unit Physics P2

Wednesday 20 May 2015 1.30 pm to 2.30 pm

For this paper you must have:
- a ruler
- a calculator
- the Physics Equations Sheet (enclosed).

A

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

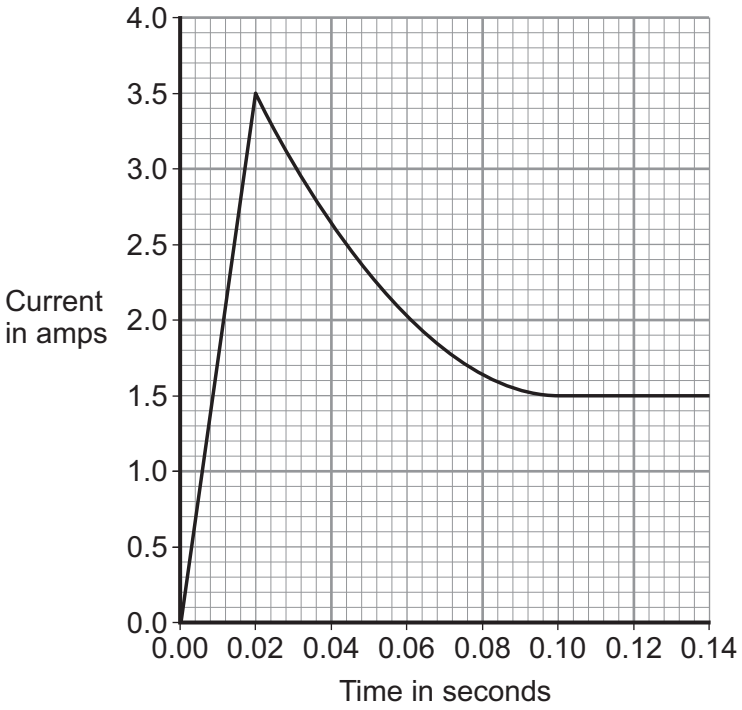
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 8(c) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

1 **Figure 1** shows how the current through a filament bulb changes after the bulb is switched on.

Figure 1



1 (a) What happens to the current through the bulb in the first 0.02 seconds after the bulb is switched on?

[1 mark]

.....

1 (b) Between 0.02 seconds and 0.08 seconds the current through the bulb decreases.

1 (b) (i) What, if anything, happens to the **resistance** of the bulb between 0.02 seconds and 0.08 seconds?

[1 mark]

Draw a ring around the correct answer.

decreases **does not change** **increases**

1 (b) (ii) What, if anything, happens to the **temperature** of the bulb between 0.02 seconds and 0.08 seconds?

[1 mark]

Draw a ring around the correct answer.

decreases **does not change** **increases**

1 (c) The bulb is connected to a 12 V power supply.

Calculate the power of the bulb when the current through the bulb is 1.5 A.

Use the correct equation from the Physics Equations Sheet.

[3 marks]

Choose the unit from the list below.

coulomb **joule** **watt**

.....

.....

Power = ... unit .....

6

Turn over for the next question

2 The equation below shows the process by which two atomic nuclei join to form a different nucleus.

$$ {}^{1}_{1}\mathrm{H} + {}^{2}_{1}\mathrm{H} \rightarrow {}^{3}_{2}\mathrm{He} $$

2 (a) Where does the process shown by the equation above happen naturally?

[1 mark]

Tick (✓) **one** box.

Inside the Earth ☐

Inside a nuclear power station ☐

Inside the Sun ☐

2 (b) Use the correct answer from the box to complete the sentence.

[1 mark]

fission	**force**	**fusion**

The process of joining two atomic nuclei to form a different nucleus is called

nuclear ..... .

2 (c) What is released during this process?

[1 mark]

Draw a ring around the correct answer.

charge **energy** **force**

3

3 (a) When a force is applied to a spring, the spring extends by 0.12 m.
The spring has a spring constant of 25 N/m.

Calculate the force applied to the spring.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

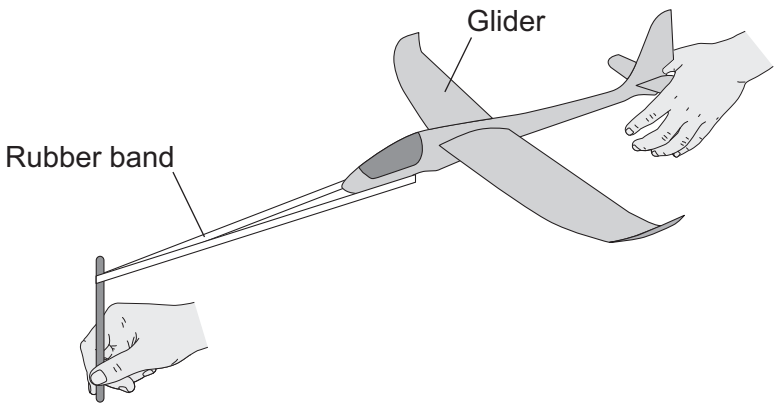
.....

.....

Force = ... N

3 (b) **Figure 2** shows a toy glider. To launch the glider into the air, the rubber band and glider are pulled back and then the glider is released.

Figure 2



3 (b) (i) Use the correct answers from the box to complete the sentence.

[2 marks]

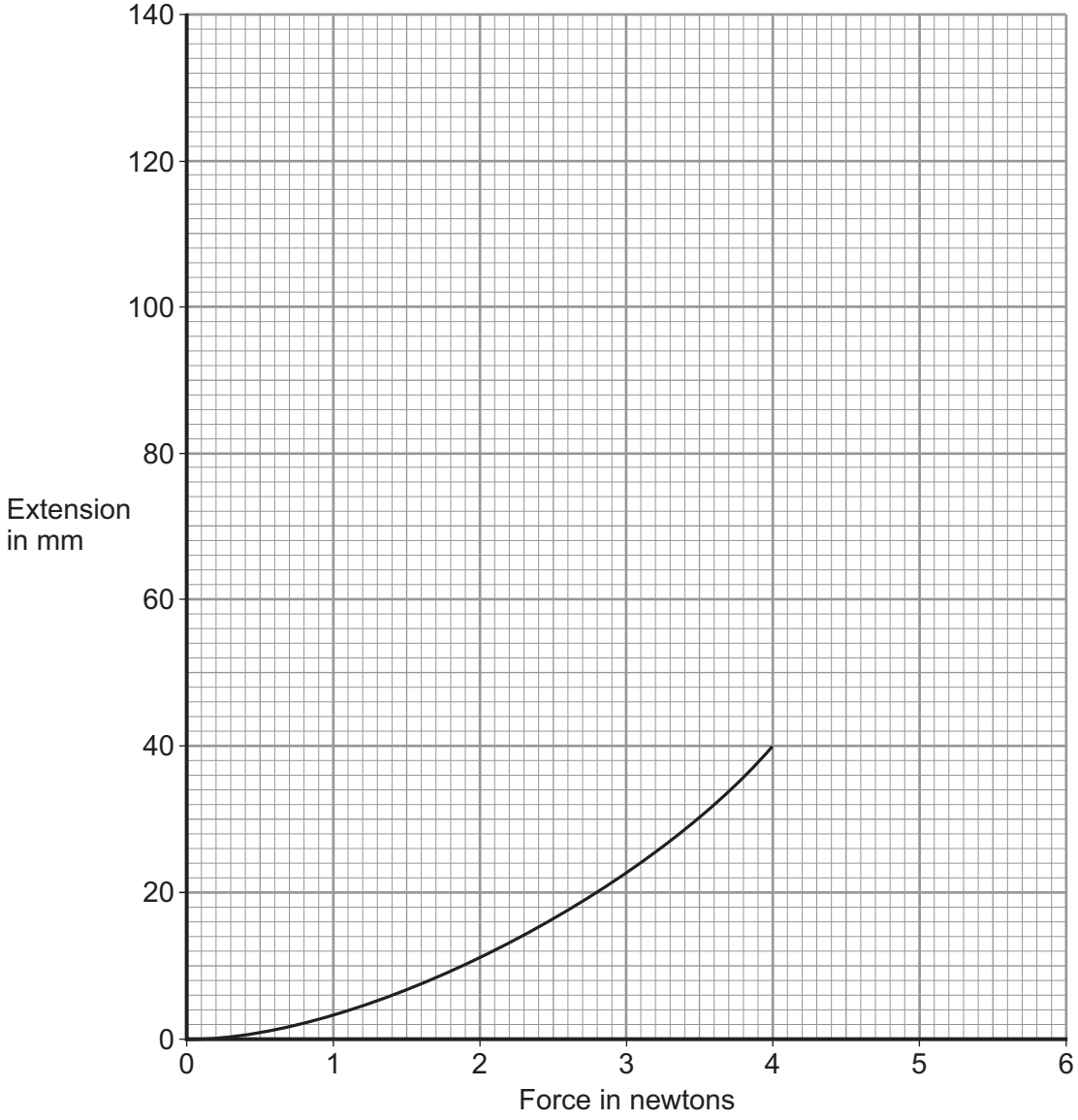
chemical	**elastic potential**	**kinetic**	**thermal**

When the glider is released, the ..... energy stored in the rubber band decreases and the glider gains ..... energy.

Question 3 continues on the next page

3 (b) (ii) **Figure 3** shows how the extension of the rubber band varies with the force applied to the rubber band.

Figure 3



What can you conclude, from **Figure 3**, would happen to the extension of the rubber band if the force applied to the rubber band was increased to 6 N?

The rubber band does **not** break.

[2 marks]

.....

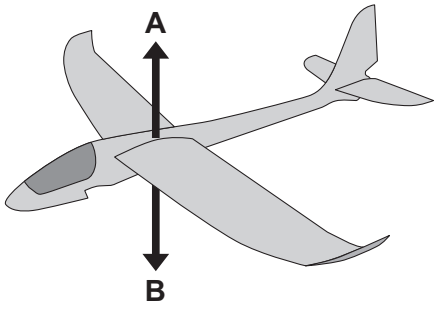
.....

.....

.....

3 (c) **Figure 4** shows the vertical forces, **A** and **B**, acting on the glider when it is flying.

Figure 4



3 (c) (i) What name is given to the force labelled **B**?

[1 mark]

Draw a ring around the correct answer.

drag **friction** **weight**

3 (c) (ii) Which **one** of the following describes the downward speed of the glider when force **B** is greater than force **A**?

[1 mark]

Tick (✓) **one** box.

Downward speed increases ☐

Downward speed is constant ☐

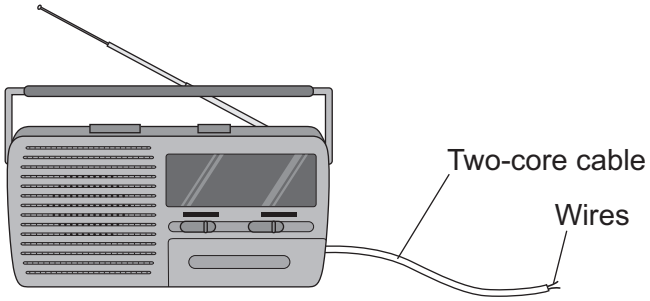
Downward speed decreases ☐

8

Turn over for the next question

4 **Figure 5** shows a radio. The radio can be powered by connecting the two-core cable to the mains electricity supply.

Figure 5



4 (a) (i) What must be fitted to the cable before it can be connected to the mains electricity supply?

[1 mark]

.....

4 (a) (ii) There are only two wires inside the cable.
What are the names of the two wires inside the cable?

[1 mark]

Tick (✓) **one** box.

Earth and live ☐

Earth and neutral ☐

Live and neutral ☐

4 (a) (iii) Use the correct answer from the box to complete the sentence.

[1 mark]

double	**extra**	**fully**

It is safe to connect the radio to the mains electricity supply using a two-core cable because the radio is ..... insulated.

4 (b) The radio can also be powered by a battery.

What type of current does a battery supply?

[1 mark]

Tick (✓) **one** box.

Alternating current (a.c.) only ☐

Direct current (d.c.) only ☐

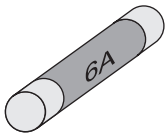
Both a.c. and d.c. ☐

4 (c) **Figure 6** shows a fuse and a circuit breaker.

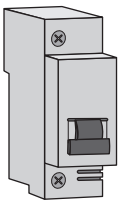
Fuses and circuit breakers are able to disconnect and switch off circuits.

Figure 6

Fuse



Circuit breaker



4 (c) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

earth	**live**	**neutral**

A fuse or a circuit breaker is connected to the ..... wire in a circuit.

4 (c) (ii) What happens to cause a fuse or circuit breaker to disconnect a circuit?

[1 mark]

.....

.....

Question 4 continues on the next page

Turn over ▶

4 (c) (iii) Suggest **two** advantages of using a circuit breaker to disconnect a circuit compared with using a fuse.

[2 marks]

1 .....

.....

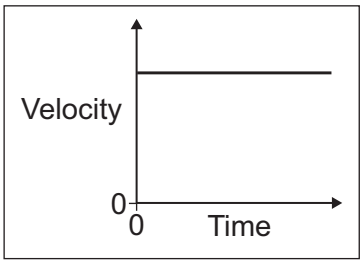
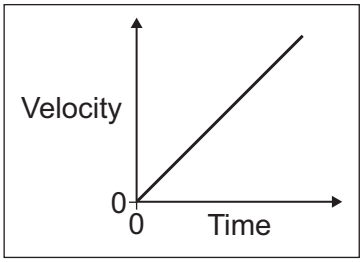
2 .....

.....

8

5 (a) Draw **one** line from each velocity–time graph to the statement describing the motion shown by the graph.

[2 marks]

Velocity–time graph	**Motion shown by graph**
	Constant acceleration
	Not moving
	Constant deceleration
	Constant velocity

5 (b) Use the correct answer from the box to complete the sentence.

[1 mark]

energy	**momentum**	**speed**

The velocity of an object includes both the ..... of the object and the direction the object is moving.

Question 5 continues on the next page

5 (c) At the start of a race, a horse accelerates from a velocity of 0 m/s to a velocity of 9 m/s in 4 seconds.

5 (c) (i) Calculate the acceleration of the horse.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

Acceleration = ... m/s^2

5 (c) (ii) When the horse accelerates, what, if anything, happens to the air resistance acting against the horse?

[1 mark]

Tick (✓) **one** box.

The air resistance decreases. ☐

The air resistance is constant. ☐

The air resistance increases. ☐

5 (d) A horse and a pony walk across a field at the same constant speed.

The horse has 4000 joules of kinetic energy.

The pony is **half** the mass of the horse.

What is the kinetic energy of the pony?

[2 marks]

Draw a ring around the correct answer.

2000 J **4000 J** **8000 J**

Give a reason for your answer.

.....

.....

8

6 (a) Radioactive sources that emit alpha, beta or gamma radiation can be dangerous.

What is a possible risk to health caused by using a radioactive source?

[1 mark]

.....

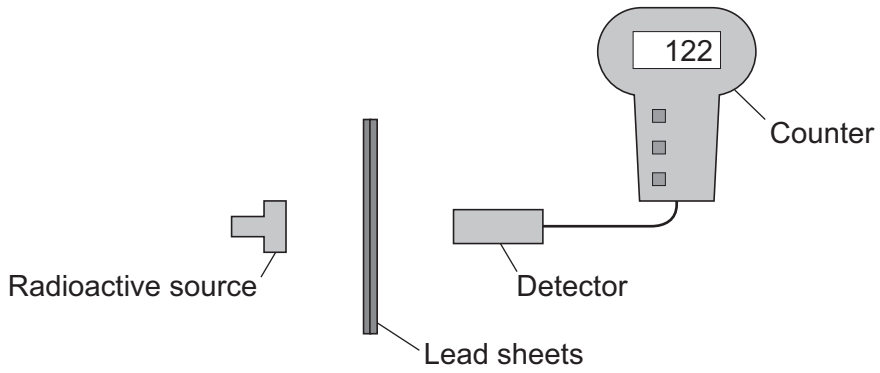
.....

6 (b) In an experiment, a teacher put a 2 mm thick lead sheet in front of a radioactive source. She used a detector and counter to measure the radiation passing through the lead sheet in one minute.

She then put different numbers of lead sheets, each 2 mm thick, in front of the radioactive source and measured the radiation passing through in one minute.

The apparatus the teacher used is shown in **Figure 7**.

Figure 7



6 (b) (i) When using a radioactive source in an experiment, how could the teacher reduce the risk to her health?

Suggest **one** way.

[1 mark]

.....

.....

Question 6 continues on the next page

6 (b) (ii) The number recorded on the counter is actually higher than the amount of radiation detected from the source.

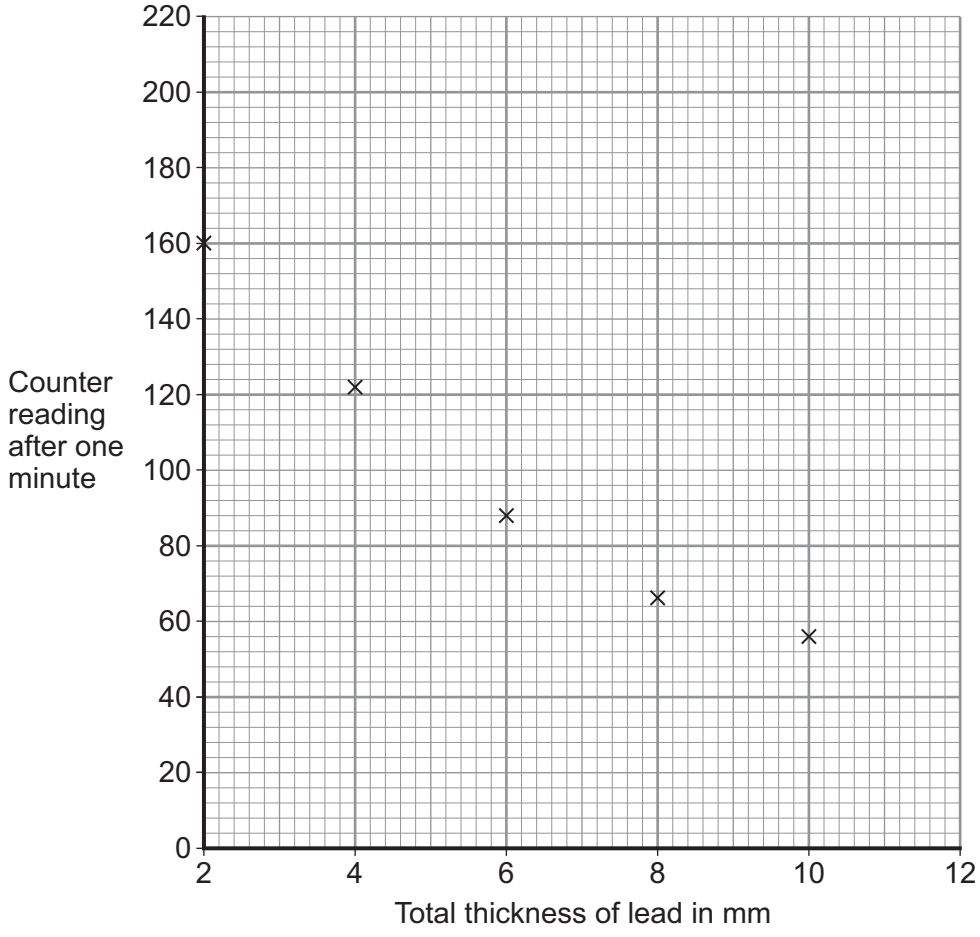
Complete the following word equation.

[1 mark]

The number recorded on the counter	=	The amount of radiation detected from the source	+	..... radiation

6 (c) The readings taken by the teacher are plotted in **Figure 8**.

Figure 8



6 (c) (i) Draw a line of best fit to complete **Figure 8**.

[1 mark]

6 (c) (ii) How does the amount of radiation **absorbed** by the lead change as the total thickness of the lead is increased?

[1 mark]

.....

.....

6 (c) (iii) Use **Figure 8** to estimate the reading on the counter when the total thickness of the lead is increased to 12 mm.

[1 mark]

Estimated counter reading = ...

6 (d) What type of radiation was emitted from the radioactive source?

[2 marks]

Draw a ring around the correct answer.

alpha **beta** **gamma**

Give a reason for your answer.

.....

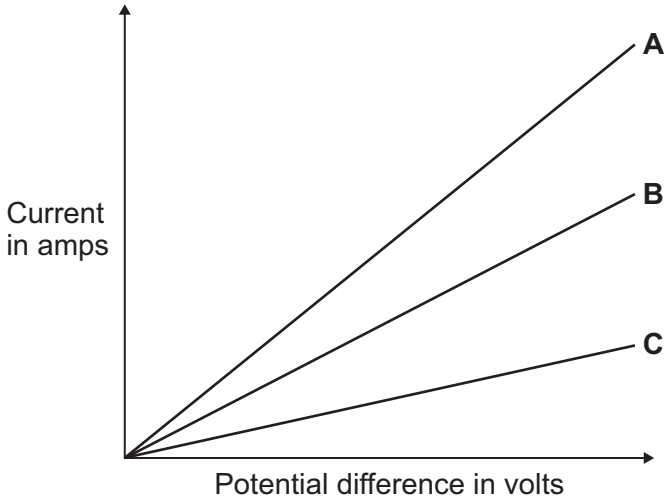
.....

8

Turn over for the next question

7 (a) **Figure 9** shows the current–potential difference graph for three wires, **A**, **B** and **C**.

Figure 9



7 (a) (i) Using **Figure 9**, how can you tell that the temperature of each wire is constant?

[1 mark]

.....

.....

7 (a) (ii) Which **one** of the wires, **A**, **B** or **C**, has the greatest resistance?

[2 marks]

Write the correct answer in the box. ☐

Give a reason for your answer.

.....

.....

.....

7 (b) A student measured the resistance of four wires.

Table 1 shows the resistance of, and other data about, each of the four wires, **J**, **K**, **L** and **M**.

Table 1

Wire	Type of metal	Length in cm	Diameter in mm	Resistance in …….
J	copper	50	0.17	0.36
K	copper	50	0.30	0.12
L	copper	100	0.30	0.24
M	constantan	100	0.30	7.00

7 (b) (i) The last column of **Table 1** should include the unit of resistance.

[1 mark]

What is the unit of resistance?

.....

7 (b) (ii) The resistance of a wire depends on many factors.

Look at **Table 1**. Which **two** wires from **J**, **K**, **L** and **M** show that the resistance of a wire depends on the **length** of the wire?

[2 marks]

Wire ☐ and wire ☐

Give a reason for your answer.

.....

.....

.....

Question 7 continues on the next page

7 (b) (iii) A student looked at the data in **Table 1** and wrote this conclusion:

'The resistance of a wire depends on the type of metal from which the wire is made.'

The student could **not** be certain that her conclusion is true for **all** types of metal.

Suggest what extra data is needed for the student to be more certain that the conclusion is correct.

[1 mark]

.....

.....

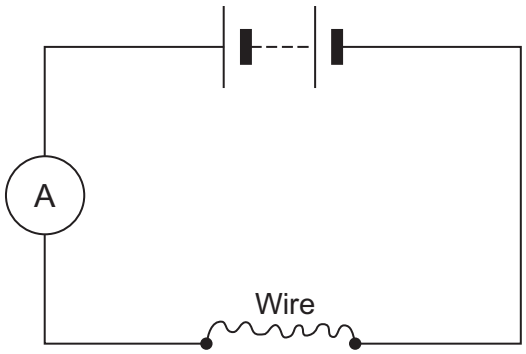
.....

7 (c) The resistance of a wire can be calculated using the readings from an ammeter and a voltmeter.

7 (c) (i) Complete **Figure 10** by drawing a voltmeter in the correct position in the circuit. Use the correct circuit symbol for a voltmeter.

[1 mark]

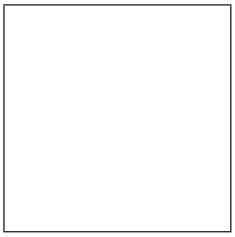
Figure 10



7 (c) (ii) In a circuit diagram, a wire can be represented by the symbol for a resistor.

In the box below, draw the circuit symbol for a resistor.

[1 mark]



9

Turn over for the next question

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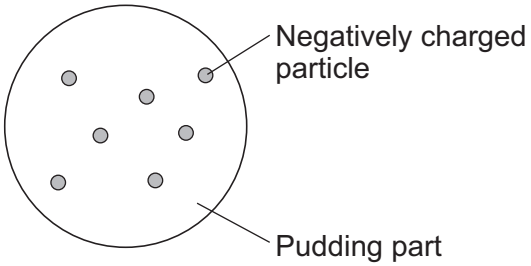
ANSWER IN THE SPACES PROVIDED

8 (a) Over 100 years ago, scientists thought the atom was like a 'plum pudding'.
Figure 11 shows the plum pudding model of the atom.

Figure 11



The scientists knew that an atom has negatively charged particles. They also knew that an atom has no overall charge.

What did the scientists conclude about the **charge** on the 'pudding part' of the atom?
[1 mark]

.....

.....

Question 8 continues on the next page

8 (b) Two scientists named Rutherford and Marsden devised an experiment to investigate the plum pudding model of the atom. The experiment involved firing alpha particles at a thin sheet of gold. The scientists measured how many of the alpha particles were scattered.

Using the plum pudding model, the scientists predicted that only a few of the alpha particles would be scattered by more than 4°.

Over several months, more than 100 000 measurements were made.

8 (b) (i) The results from this experiment caused the plum pudding model to be replaced by a new model of the atom.

Explain why.

[2 marks]

.....

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.....

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.....

.....

8 (b) (ii) Suggest **one** reason why other scientists thought this experiment provided valid evidence for a new model of the atom.

[1 mark]

.....

.....

.....

8 (c) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Describe the model now used for the structure of an atom.

In your answer you should:
- give details of the individual particles that make up an atom
- include the relative masses and relative charges of these particles.

Do **not** include a diagram in your answer.

[6 marks]

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Extra space .....

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10

END OF QUESTIONS

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