AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE

ADDITIONAL SCIENCE PHYSICS

F

Foundation Tier Unit Physics P2

Friday 16 June 2017 Morning Time allowed: 1 hour

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

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(b) 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.

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

Do not write outside the box

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

1 (a) A student rubs a rubber balloon against the sleeve of her woollen jumper. The balloon becomes negatively charged.

1 (a) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

electrons	**neutrons**	**protons**

The balloon becomes negatively charged because it gains _____ from the jumper.

1 (a) (ii) After charging the balloon, what is the overall charge left on the jumper?

[1 mark]

Tick (✓) **one** box.

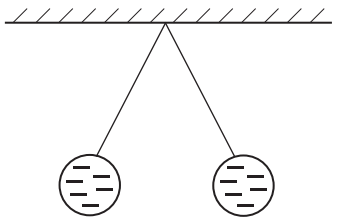
negative ☐

neutral ☐

positive ☐

1 (b) **Figure 1** shows two identically charged balloons hanging close together.

Figure 1



1 (b) (i) Complete the following sentence.

[1 mark]

The balloons carry the same type of charge and so _____ each other.

1 (b) (ii) From **Figure 1**, what can you conclude about the sizes of the **forces** acting on the balloons?

[1 mark]

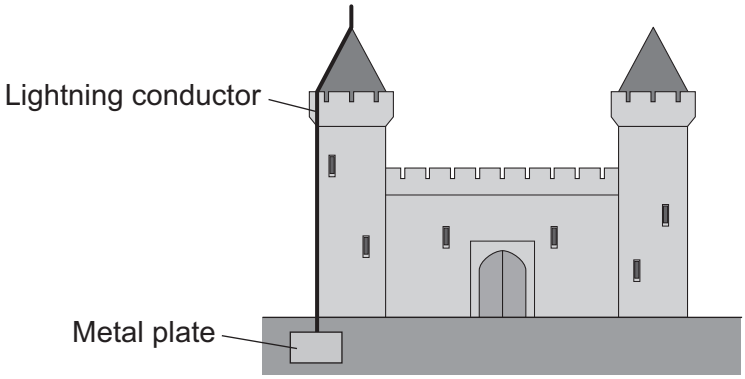
_____

_____

Do not write outside the box

1 (c) A lightning conductor attached to the outside of a building reduces the risk of damage being caused to the building by a lightning strike.

Figure 2



If the building is struck by lightning the electrical charge flows through the lightning conductor to earth.

1 (c) (i) Through which one of the following materials can electrical charge flow easily?

Draw a ring around the correct answer.

[1 mark]

copper **plastic** **rubber**

1 (c) (ii) What happens to the temperature of a lightning conductor when electrical charge flows through it?

[1 mark]

Tick (✓) **one** box.

the temperature decreases ☐

the temperature does not change ☐

the temperature increases ☐

1 (c) (iii) During a lightning strike, 4 coulombs of charge flow through a lightning conductor in 0.002 seconds.

Calculate the current in the lightning conductor.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

Current = _____ A

8

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2 A car driver sees the traffic lights ahead change to red. The driver applies the brakes to stop the car.

The stopping distance of the car is the thinking distance plus the braking distance.

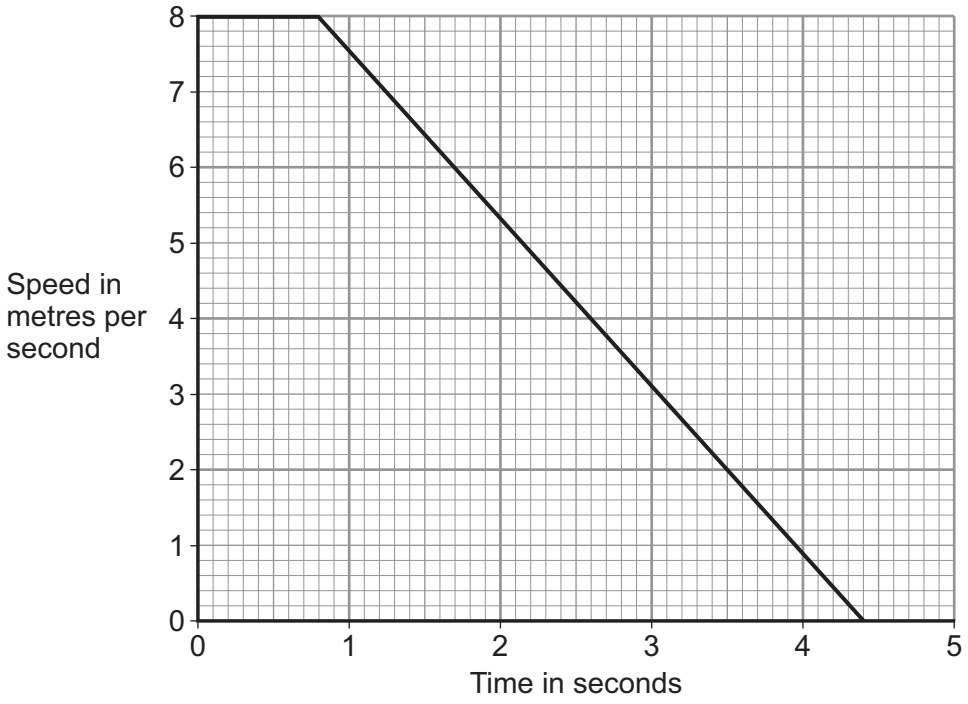
2 (a) Draw **one** line from each distance to the description of that distance.

[2 marks]

Distance	Description
Stopping	The distance the car moves between the brakes being applied and the car stopping.
Braking	The distance the car moves between the driver seeing the red light and the car stopping.
	The distance the car moves between the driver seeing the red light and applying the brakes.

2 (b) **Figure 3** shows how the speed of the car changes from the instant that the driver sees the traffic lights change to red.

Figure 3



Do not write outside the box

2 (b) (i) What is the reaction time of the driver?

[1 mark]

Tick (✓) **one** box.

0.8 s ☐ 3.6 s ☐ 4.4 s ☐

2 (b) (ii) Using a mobile phone while driving may increase the reaction time of the driver.

Explain the effect of an increased reaction time on the stopping distance of the car.

[2 marks]

_____

_____

_____

_____

2 (b) (iii) The car has a mass of 750 kg

How is the kinetic energy of the car calculated when the car is travelling at 8 m/s?

[1 mark]

Tick (✓) **one** box.

$\frac{1}{2} \times 750 \times 8$ ☐

$\frac{1}{2} \times 750 \times 8^2$ ☐

$\frac{1}{2} \times 750^2 \times 8^2$ ☐

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

Each answer may be used once, more than once or not at all.

[2 marks]

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

When the brakes of the car are applied,

the kinetic energy of the car _____ and

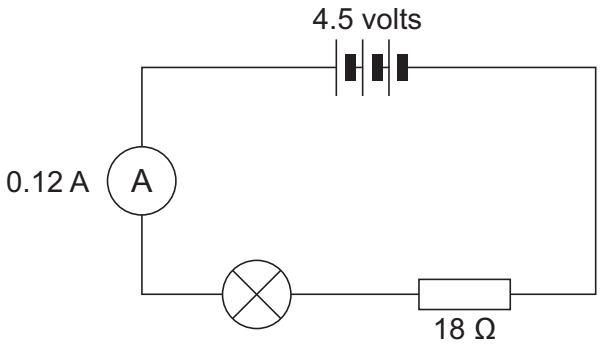
the temperature of the brakes _____ .

8

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3 **Figure 4** shows a lamp and an 18 Ω resistor connected in a series circuit.

Figure 4



3 (a) (i) Calculate the potential difference (***V***) across the 18 Ω resistor.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

Potential difference (***V***) = _____ volts

3 (a) (ii) How would you calculate the potential difference across the lamp?

[1 mark]

Tick (✓) **one** box.

4.5 – ***V*** ☐

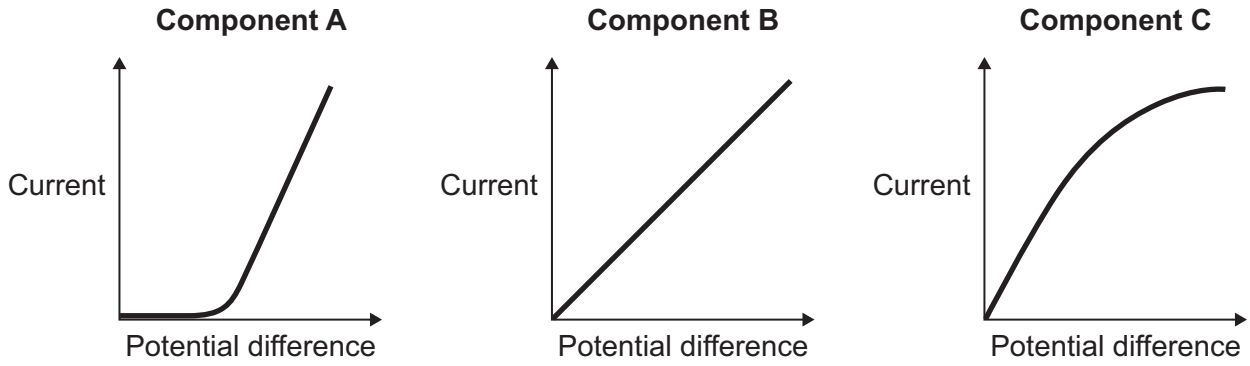
4.5 + ***V*** ☐

$\frac{4.5}{V}$ ☐

Do not write outside the box

3 (b) **Figure 5** shows the current-potential difference graphs for three electrical components, **A**, **B** and **C**.

Figure 5



3 (b) (i) Which component, **A**, **B** or **C** is a lamp?

[1 mark]

3 (b) (ii) Which component, **A**, **B** or **C** is a diode?

[1 mark]

5

Turn over for the next question

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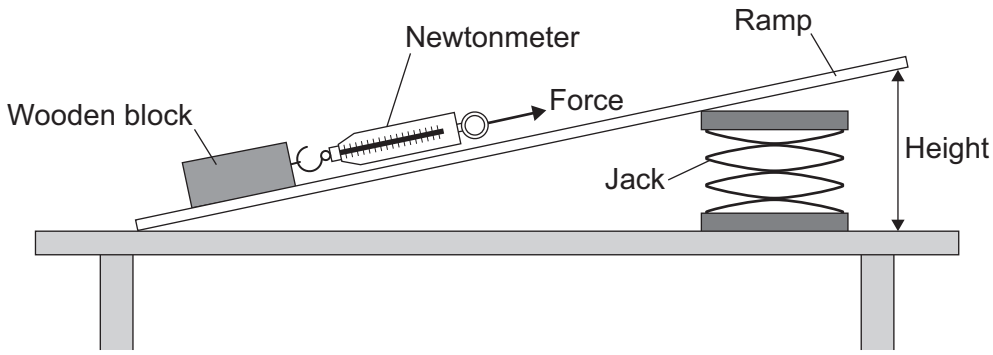
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ANSWER IN THE SPACES PROVIDED

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4 A student investigated how the height of a ramp affects the force needed to pull a wooden block up the ramp at a steady speed. **Figure 6** shows the apparatus used by the student.

Figure 6



4 (a) Complete the following sentence.

[1 mark]

To pull the wooden block up the ramp the student must do work against the force of friction and the force of _____ .

4 (b) (i) What was the independent variable in this investigation?

[1 mark]

Tick (✓) **one** box.

The force used to pull the wooden block. ☐

The height of the ramp. ☐

The mass of the wooden block. ☐

4 (b) (ii) What was a control variable in this investigation?

[1 mark]

Tick (✓) **one** box.

The force used to pull the wooden block. ☐

The height of the ramp. ☐

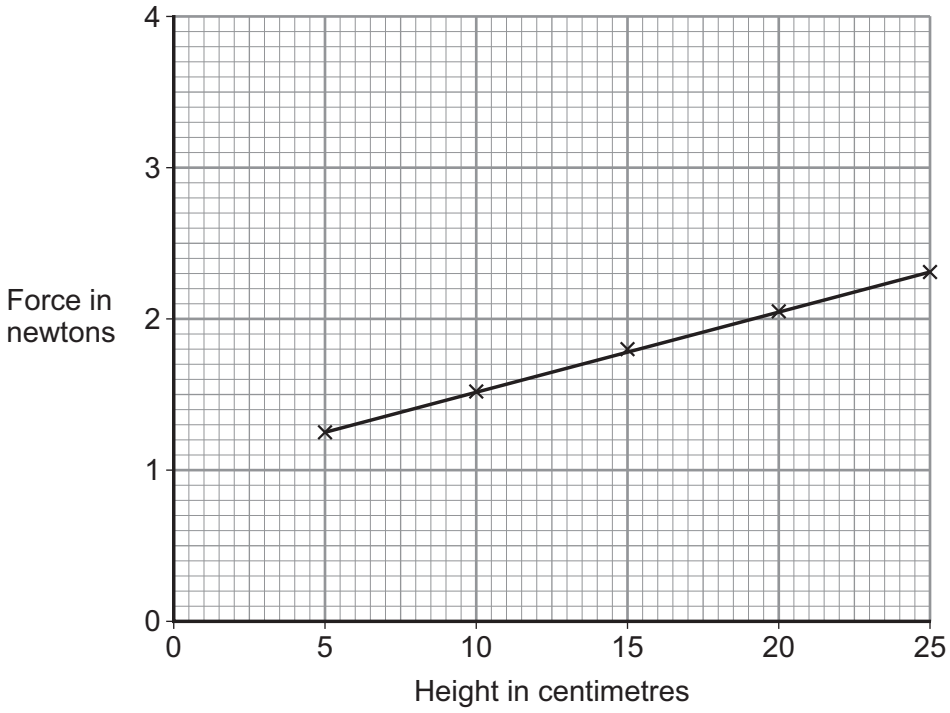
The mass of the wooden block. ☐

Question 4 continues on the next page

Do not write outside the box

4 (c) The results from the investigation are plotted in **Figure 7**.

Figure 7



4 (c) (i) How do you know from **Figure 7**, that none of the results were anomalous?

[1 mark]

_____

_____

4 (c) (ii) Use **Figure 7** to estimate the force needed to pull the wooden block along the ramp when the ramp is lying flat on the bench.

[1 mark]

Force = _____ N

4 (c) (iii) What conclusion should be made from the results shown in **Figure 7**?

[2 marks]

_____

_____

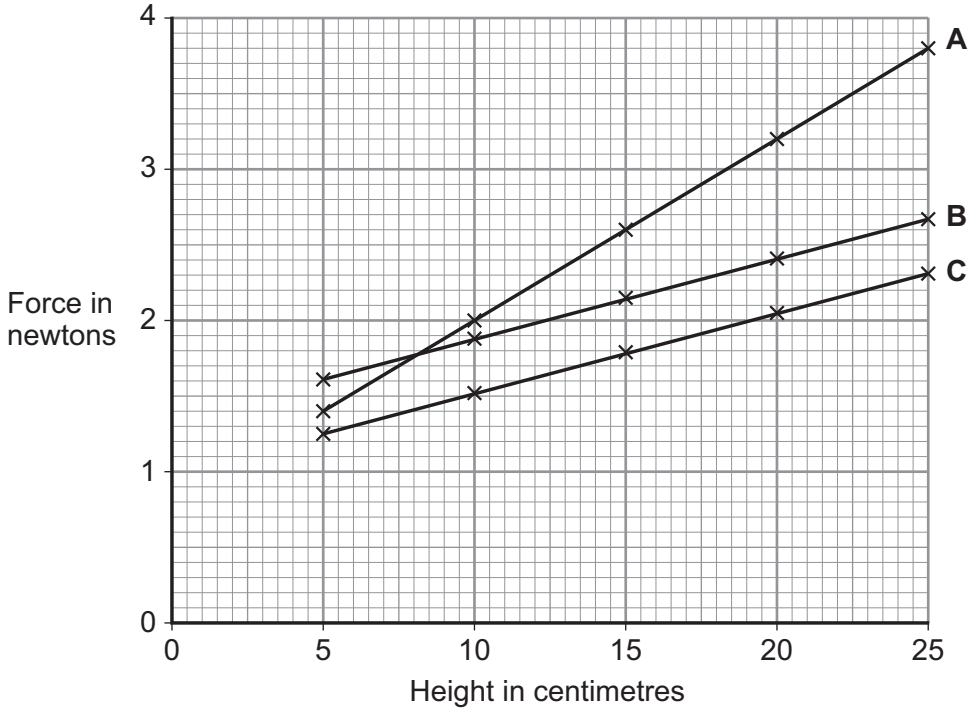
_____

_____

Do not write outside the box

4 (c) (iv) Another student used the same apparatus to repeat the investigation.
The student increased the force of friction by fixing a rough material to the bottom of the wooden block.

Figure 8



Which of the following, **A**, **B** or **C**, in **Figure 8**, shows the results obtained by this student?

[1 mark]

Tick (✓) **one** box.

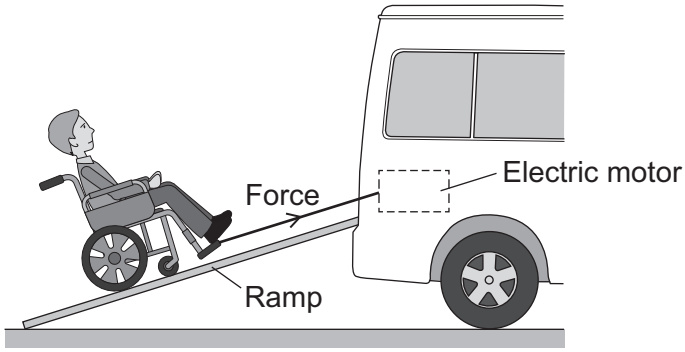
A ☐ **B** ☐ **C** ☐

Question 4 continues on the next page

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4 (d) **Figure 9** shows how a ramp is used to help move a child in a wheelchair into a car. The wheelchair is pulled up the ramp by a cable attached to an electric motor.

Figure 9



A force of 260 N is used to pull the child and wheelchair up the ramp.
The ramp is 1.2 m long.

Calculate the work done to pull the child and wheelchair up the ramp.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

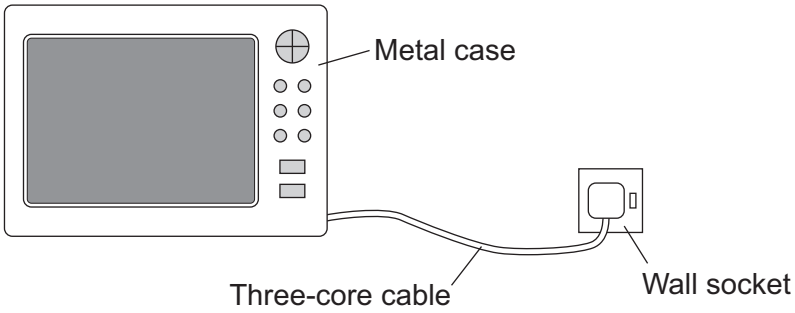
Work done = _____ J

10

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5 **Figure 10** shows a microwave oven.

Figure 10



5 (a) The microwave oven is connected to the mains electricity supply using a three-core cable and plug.

Explain why a three-core cable must be used and not a two-core cable.

[2 marks]

5 (b) (i) The microwave oven draws a current of 3.3 amps from the mains electricity supply.

Which one of the following fuses should be used inside the plug?

[2 marks]

Tick (✓) **one** box.

1 A ☐ **3 A** ☐ **13 A** ☐

Give the reason for your answer.

Question 5 continues on the next page

Do not write outside the box

5 (b) (ii) The microwave oven is used to cook a meal.
The microwave oven is switched on for 300 seconds.

During this time 225 000 joules of energy are transferred from the mains electricity supply to the oven.

Calculate the power of the microwave oven.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

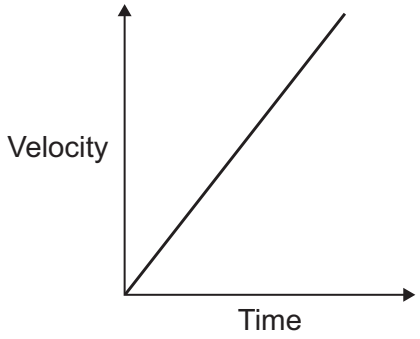
Power = _____ W

6

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6 (a) **Figure 11** shows the velocity-time graph for an object that is accelerating.

Figure 11



How do you know from the velocity-time graph that the object is accelerating?

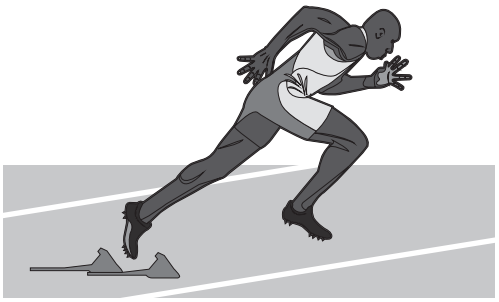
[1 mark]

_____

_____

6 (b) **Figure 12** shows an athlete sprinting away from the starting blocks.

Figure 12



The athlete has a mass of 85 kg
The force causing the athlete to accelerate is 425 N

Calculate the acceleration of the athlete.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

_____

_____

_____

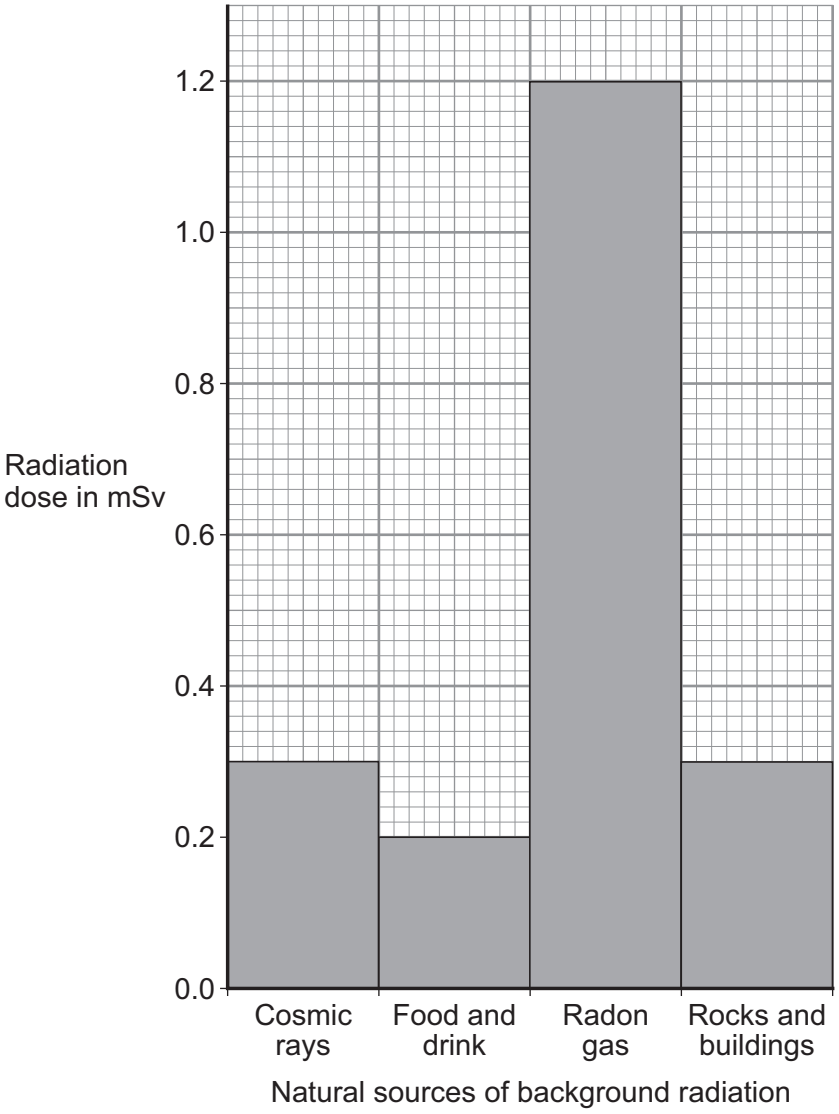
Acceleration = _____ m/s^2

3

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7 **Figure 13** shows the total radiation dose that the average person in the UK gets from natural background radiation sources in one year.

Figure 13



7 (a) (i) Calculate the percentage of the total radiation dose the average person in the UK receives from cosmic rays.

[2 marks]

Percentage radiation dose from cosmic rays = _____ %

Do not write outside the box

7 (a) (ii) Over one year, a person may get a higher than average dose of radiation from cosmic rays.

Suggest **one** reason why.

[1 mark]

_____

_____

7 (a) (iii) Some sources of background radiation are man-made.

Name **one** man-made source of background radiation.

[1 mark]

_____

_____

7 (b) Before using a radioactive source a teacher measured the background radiation in her laboratory. She did this three times. The measurements were taken correctly but the three measurements were different.

Why were the three background measurements different?

[1 mark]

_____

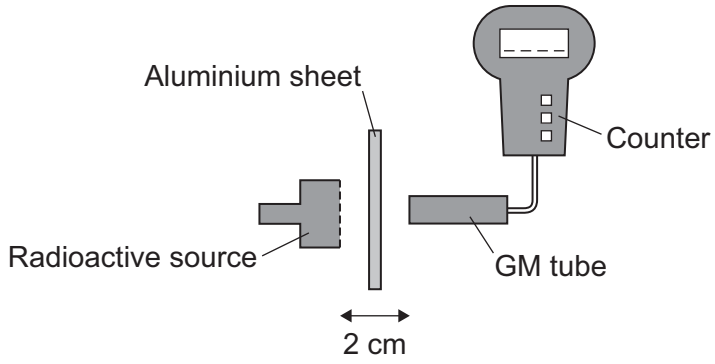
_____

Question 7 continues on the next page

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7 (c) **Figure 14** shows the apparatus the teacher used to investigate the radiation emitted by a source.

Figure 14



The teacher changed the thickness of the aluminium between the source and the Geiger-Müller (GM) tube.

The number of counts recorded for each thickness is given in **Table 1**.
The mean background measurement was 20 counts in one minute.

Table 1

Thickness of aluminium in millimetres	Counts in one minute
2	350
4	68
6	20

7 (c) (i) A student concluded that the radioactive source emits beta radiation.

Explain how the information in **Table 1** supports this conclusion.

[2 marks]

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7 (c) (ii) The teacher said that the source also emits alpha radiation.

Describe how the investigation could be changed in order to show that the source emits alpha radiation.

[2 marks]

9

Turn over for the next question

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8 The lifecycle of some stars includes a supernova stage.

8 (a) (i) What happens to a star during the supernova stage?

[1 mark]

_____

8 (a) (ii) Complete the following sentence.

[1 mark]

After the supernova stage either a black hole or a _____ star will be formed.

8 (a) (iii) The lifecycle of the Sun will **not** include a supernova stage.

Give the reason why.

[1 mark]

_____

_____

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

Describe what happens to a star like the Sun as it passes through its lifecycle.

Your answer should include how the star was formed and the names of the stages the star passes through.

[6 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

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Extra space

8 (c) There are a number of theories about how the Universe will end.
A recent theory suggests that 22 billion years from now the Universe will rip itself apart.

Suggest why scientists may support one particular theory and reject others.

[2 marks]

11

END OF QUESTIONS

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