



General Certificate of Secondary Education
2023–2024

Centre Number

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Candidate Number

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Single Award Science: Physics

Unit 3
Foundation Tier



[GSA31]

GSA31

WEDNESDAY 15 NOVEMBER 2023, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **10**.



- 1 (a) The table below gives some information about five planets in our Solar System.

Planet	Diameter/km	Gravity/ N/kg	Distance from Sun/ million km
A	4880	3.7	52
B	12 100	8.9	108
C	12 760	9.8	147
D	49 500	11.0	4529
E	143 000	23.1	771

Use this information to answer the following questions.

- (i) Complete the following sentence.

As the diameter of the planets increases, the gravity _____. [1]

- (ii) On which planet (A, B, C, D or E) would an astronaut have the most weight?

_____ [1]

- (iii) Suggest which planet (A, B, C, D or E) would be the coldest.

_____ [1]

- (b) (i) Complete the following sentences.

Gravity provides the force needed for the _____ motion
of the planets around our central star. Our central star is called the

_____. [2]

- (ii) How many planets are there in our Solar System?

_____ [1]



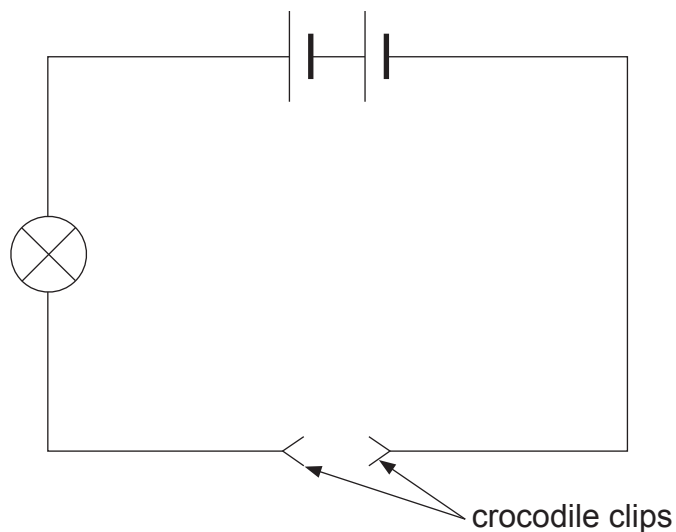
(iii) Name **one** of the gas planets in our Solar System.

[1]

[Turn over



- 2 (a) The circuit below can be used to find out which materials are conductors of electricity.



- (i) Explain fully how this circuit will show that a conductor has been placed between the crocodile clips.

[2]

- (ii) Each cell in this circuit supplies 1.5 V. Calculate the total voltage supplied to the circuit.

_____ V [1]



(b) In the table below, place a tick (✓) beside the **two** materials that are conductors.

Material	Conductor
plastic	
wood	
copper	
glass	
iron	

[2]

[Turn over



- 3 (a) The photograph below shows a builder climbing a ladder.



Answer the following questions about the different types of energy involved as the builder climbs the ladder.

Choose from:

sound

kinetic

potential

heat

chemical

- (i) Name the type of energy the builder uses as he climbs the ladder.

_____ [1]

- (ii) Name the type of energy the builder has when he stands at the top of the ladder.

_____ [1]

- (iii) Name **one** type of energy wasted as the builder climbs the ladder.

_____ [1]



(b) Complete the following sentences to state the Principle of Conservation of Energy.

Choose from:

changed

created

destroyed

saved

Energy cannot be _____ or _____ .

It can only be _____ from one type to another. [2]

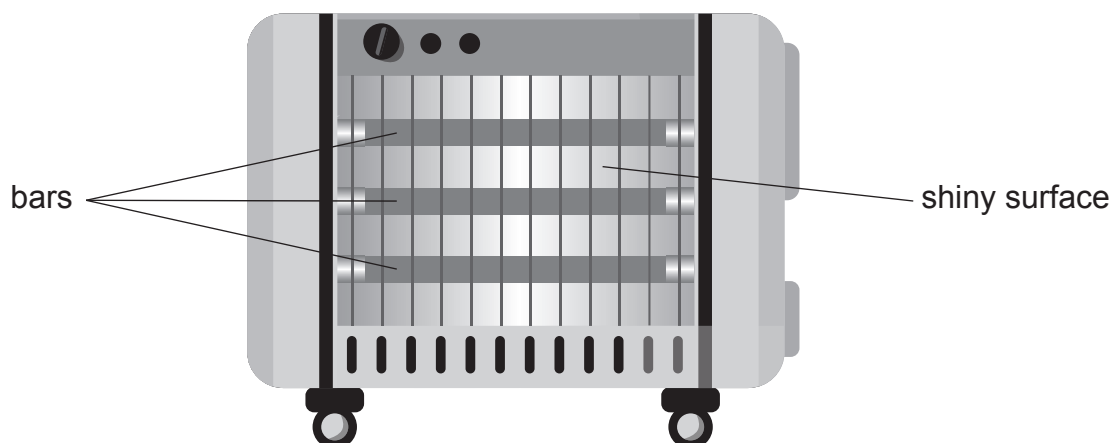
(c) Name the unit of energy.

_____ [1]

[Turn over



- 4 (a) The diagram below shows an electric bar fire.



At the back of the fire there is a shiny surface.

The hot bars of the fire radiate heat in all directions. They also heat the air around them causing the air to rise.

- (i) How does the shiny surface help to heat the area in front of the fire?

[1]

- (ii) Name the method of heat transfer that causes the hot air to rise.

[1]



The table below gives the current needed to heat wires of different cross-sectional areas (C.S.A.) to temperatures of 50 °C, 100 °C and 200 °C.

Temperature C.S.A./ mm²	Current needed/A		
	50 °C	100 °C	200 °C
10.00	5.4	10.9	22.4
6.00	3.7	7.8	16.2
4.00	2.4	5.3	11.6
0.33	0.5	1.3	2.9
0.03	0.1	0.3	0.7

(b) Complete the following statements to give **two** conclusions that can be made from this information.

1. As the cross-sectional area of the wire _____

2. As the temperature _____

_____ [2]

(c) Most homes today are heated using coal, oil or gas which are non-renewable.

(i) Complete the following sentence.

Coal, oil and gas are non-renewable and are examples of

_____ fuels. [1]

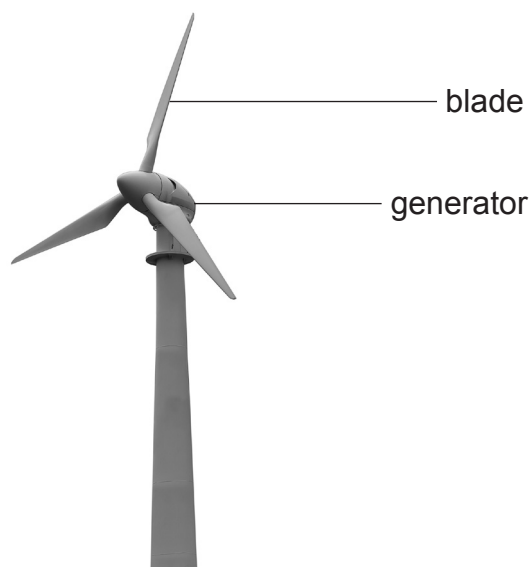
(ii) Name **one** renewable fuel that could be burned in homes to produce heat.

_____ [1]

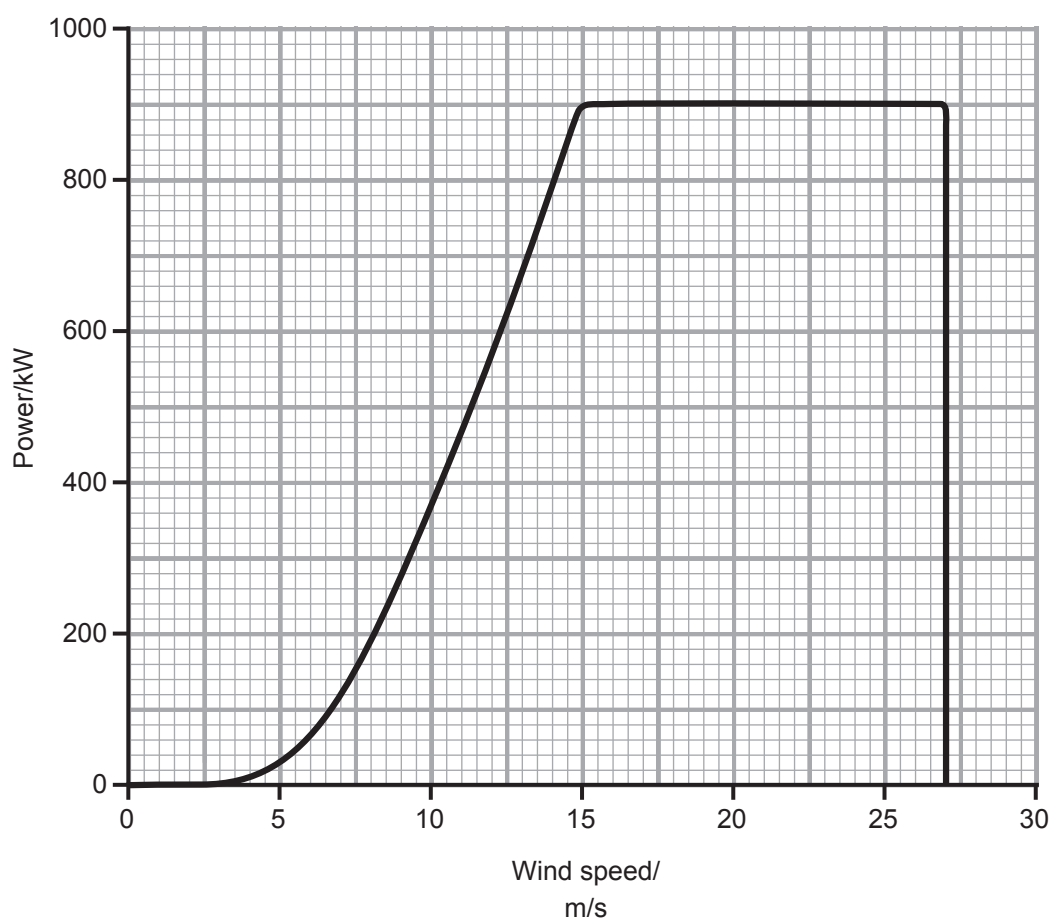
[Turn over



5 The photograph below shows a wind turbine.



The graph below shows how the power produced by the wind turbine changes with wind speed.



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(a) What is the maximum power produced by this turbine?

_____ kW [1]

(b) Describe fully how the power produced changes as the wind speed increases from 0 m/s to 15 m/s.

_____ [2]

(c) What range of speed produces the maximum power?

from _____ m/s to _____ m/s [1]

(d) The wind turbine contains a generator that produces electricity.

(i) Complete the following sentence.

The generator produces electricity when a _____
moves inside a coil of wire. [1]

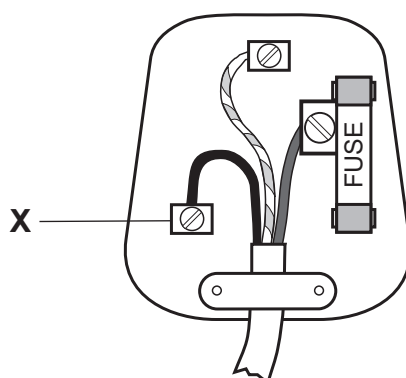
(ii) Apart from the blades moving faster, suggest **one** other way that the generator could produce more electricity.

_____ [1]

[Turn over]



- 6 (a) The diagram below shows a 3-pin plug.



- (i) Name the pin labelled **X**.

_____ [1]

- (ii) What colour of wire should be connected to the fuse?

_____ [1]

- (iii) Apart from the fuse, name **one** other safety feature of this plug.

_____ [1]

- (b) This plug is used to connect a 920 W dishwasher to the 230 V mains.

- (i) Use the equation:

$$\text{current} = \frac{\text{power}}{\text{voltage}}$$

to calculate the current flowing to the dishwasher.

(Show your working out.)



(ii) Which fuse should be fitted to the plug used for this dishwasher?

Choose from:

1 A

3 A

5 A

13 A

_____ [1]

(c) Some modern household appliances have double insulation.

(i) Give **one** feature of a double insulated appliance.

Circle your answer.

the outer cover of the appliance is made of metal

the wires are covered in two layers of plastic

the outer cover of the appliance is made of plastic

[1]

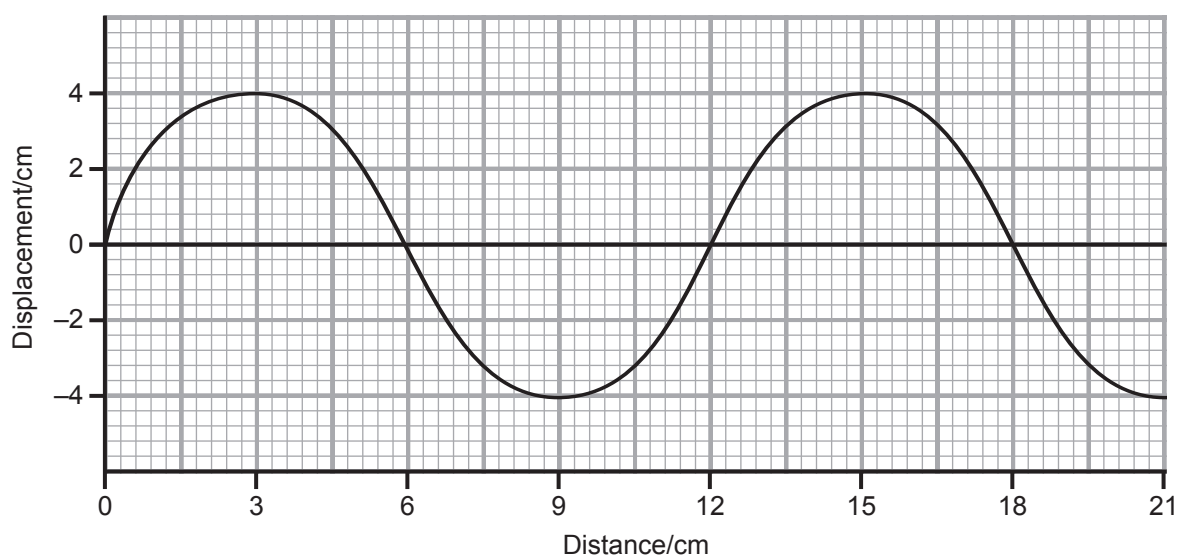
(ii) Name the wire **not** needed in a 3-pin plug if the appliance is double insulated.

_____ [1]

[Turn over]



- 7 (a) The graph below shows how the displacement of a wave changes with distance.



- (i) What is the amplitude of this wave?

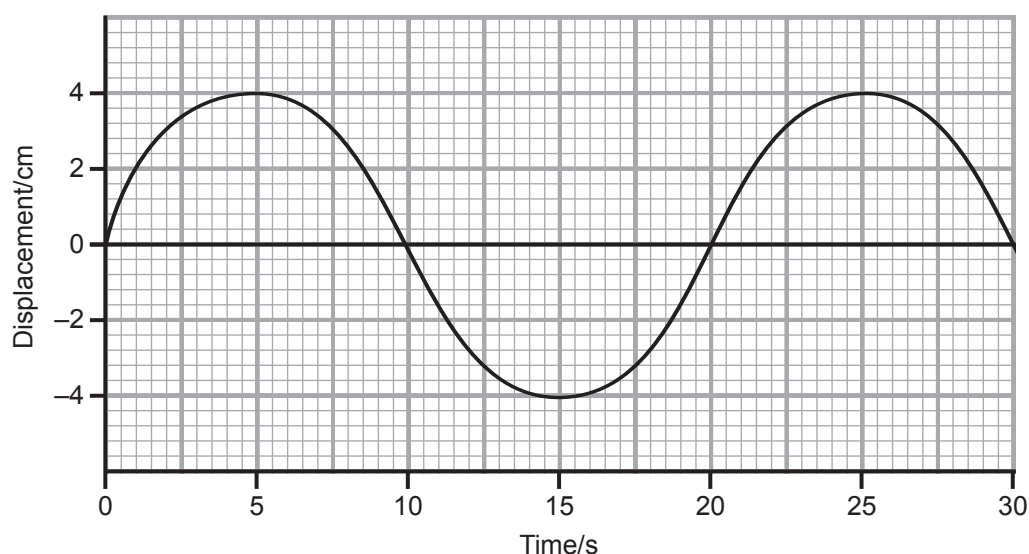
_____ cm [1]

- (ii) What is the wavelength of this wave?

_____ cm [1]



The graph below shows the time taken for one and a half vibrations to occur.



(b) How long does it take for one complete vibration?

_____ s [1]

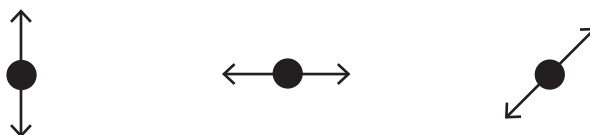
(c) Water waves are an example of transverse waves.

(i) Give **one** other example of a transverse wave.

_____ [1]

(ii) Which of the diagrams below shows how the particles vibrate as a transverse wave moves from left to right?

Circle your answer.

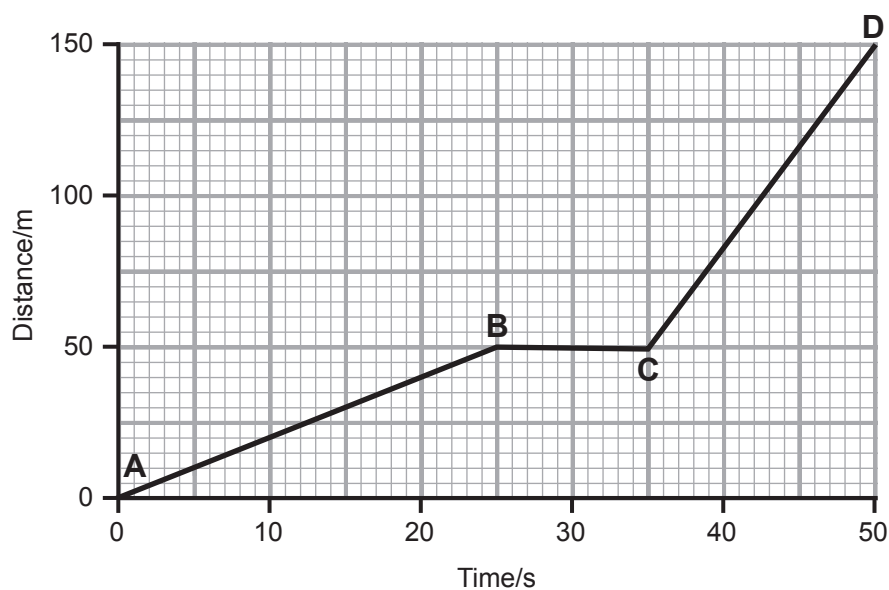


[1]

[Turn over



- 8 (a) Shown below is the distance–time graph for a short bicycle journey.



- (i) Describe fully the motion of this bicycle between **A** and **C**.

[2]

- (ii) Compare the motion of the bicycle between **A** and **B** to its motion between **C** and **D**.

[1]



(b) Use the equation:

$$\text{average speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

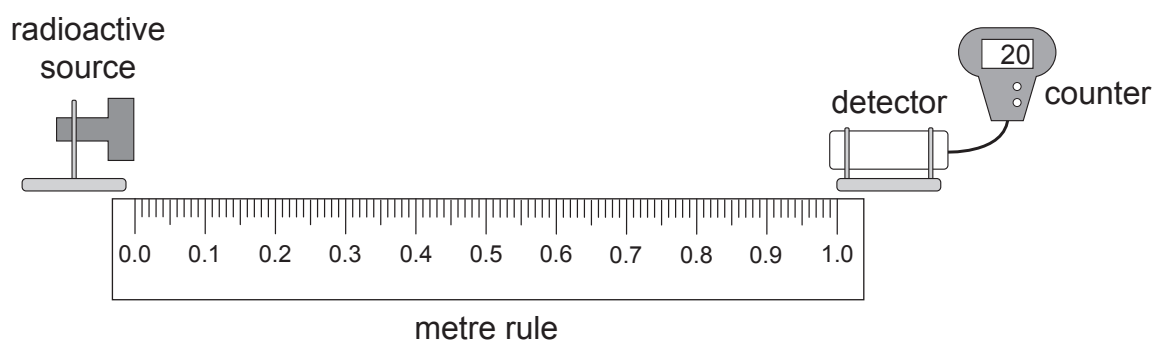
to calculate the average speed of the bicycle from **A** to **D**.

(Show your working out.)

_____ m/s [2]



- 9 The equipment shown below was used to measure the count rate at different distances from a radioactive source.

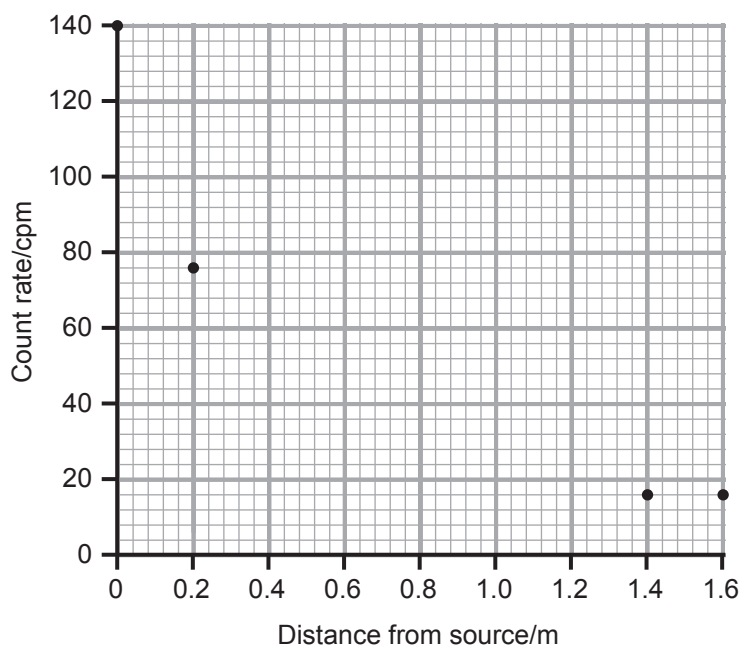


The results are shown below.

Distance from source/m	Count rate/cpm
0.0	140
0.2	76
0.4	50
0.6	40
0.8	30
1.0	20
1.2	16
1.4	16
1.6	16



- (a) On the grid below, plot and draw a line graph for these results.
Some of the points have been plotted for you.



[3]

- (b) State the trend shown by this information.

[2]

Background radiation is around us all the time.

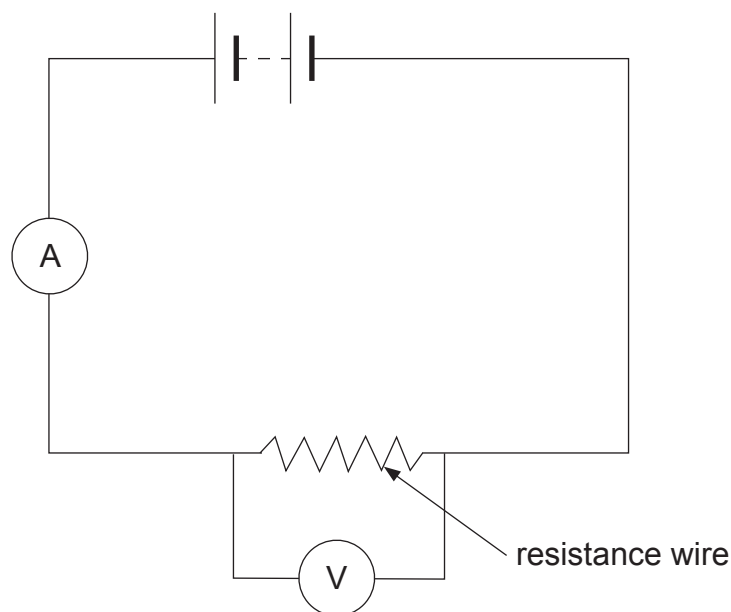
- (c) Use these results to suggest a value for background radiation.

_____ cpm [1]

[Turn over



10 The circuit shown below can be used to prove Ohm's Law.



Describe fully how this circuit can be used to prove Ohm's Law.

Your answer should include:

- the names of the meters used and how they are connected in the circuit;
- a description of the method used to collect results; and
- how the results can be used to prove Ohm's Law.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.





[6]

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Question Number	Marks
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Total Marks	

Examiner Number

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