



General Certificate of Secondary Education
2024

Centre Number

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Candidate Number

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Physics

Unit 1

Foundation Tier



[GPY11]

GPY11

FRIDAY 7 JUNE, AFTERNOON

TIME

1 hour 15 minutes.

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** questions.

INFORMATION FOR CANDIDATES

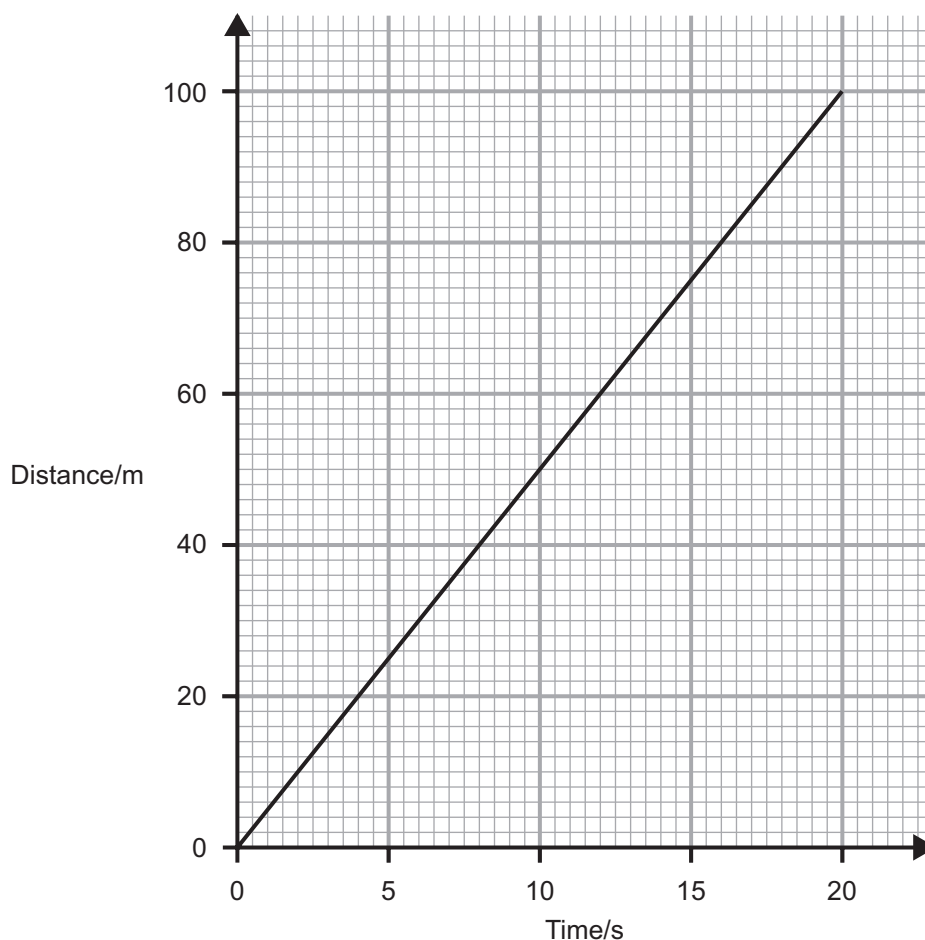
The total mark for this paper is 80.

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 **2(d)**.



1 (a) The distance–time graph for the journey taken by a car is shown below.



(i) Describe the motion of the car between 0 and 20 s.

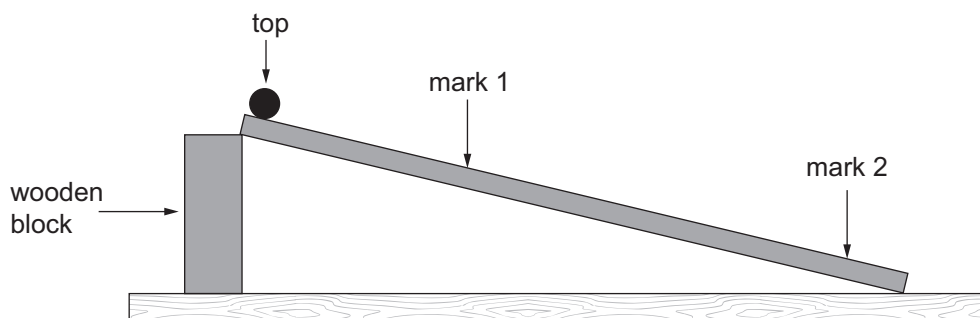
_____ [1]

(ii) Calculate the speed of the car for the journey shown in the graph.
Show clearly how you get your answer, starting with the equation you plan to use.

Speed of the car = _____ m/s [3]



- (b) The diagram below shows the apparatus which can be used to calculate the average speed of a ball moving down a runway.



- (i) State **two** pieces of apparatus needed to take measurements to allow average speed to be calculated.

[2]

- (ii) The average speed of a ball, released from rest at the top of the runway, is calculated for two journeys. Firstly, from the top to mark 1 and then from the top to mark 2.

The average speed can be calculated using the equation below.

$$\text{Average speed} = \frac{\text{final speed} + \text{initial speed}}{2}$$

How would the average speed of the ball for the longer journey compare with the average speed for the shorter journey?

Place a tick (✓) in the correct box below.

Same as.	
Less than.	
Greater than.	

[1]

Explain your choice using the equation above.

Do not refer to distance in your answer.

[2]

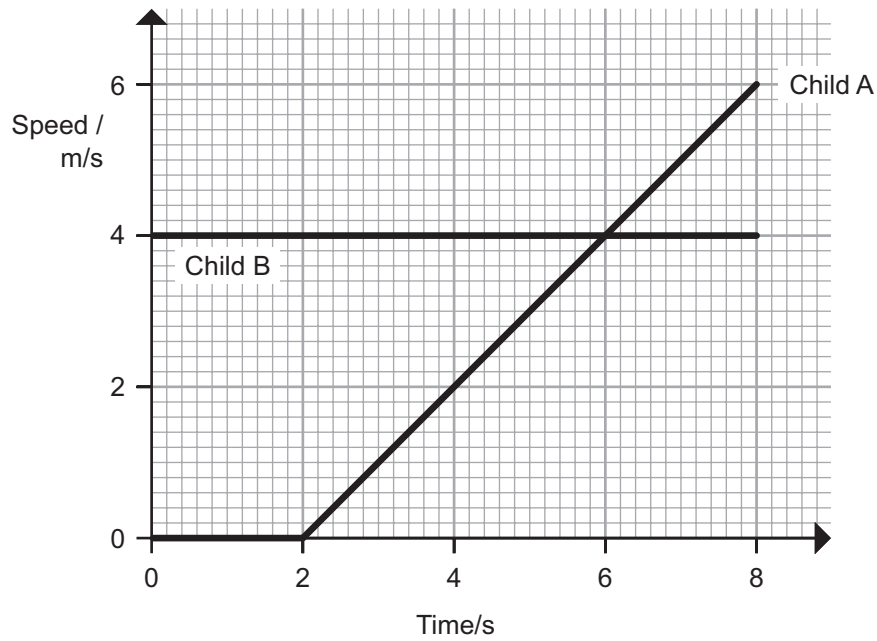
[Turn over



(c) Two children, A and B, are riding their bicycles on a straight track.

The speed–time graph for each child is shown below.

- (i) Calculate the distance travelled by child A at 6 s.
Show clearly how you get your answer.



Distance = _____ m [3]



(ii) Use your answer to part (i) to calculate how far apart the children are at 6 seconds.

Show clearly how you get your answer.

Distance apart = _____ m [3]

(iii) Calculate the rate of change of speed of child A between $t = 2$ seconds and $t = 6$ seconds.

Remember to include the unit with your answer.

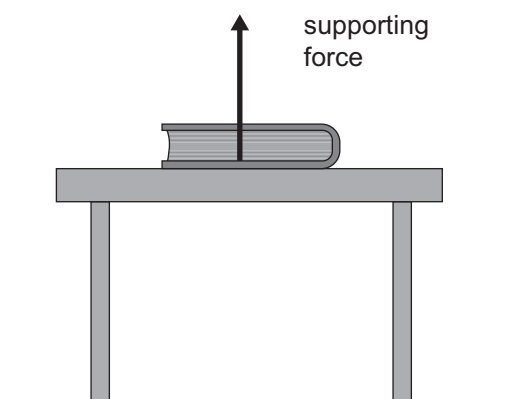
Show clearly how you get your answer.

Rate of change of speed = _____

Unit = _____ [4]



- 2 (a) (i) The diagram shows a book sitting on a table. The arrow shows the direction of the supporting force of the table. Using an arrow, mark the direction and name the other force acting on the book.

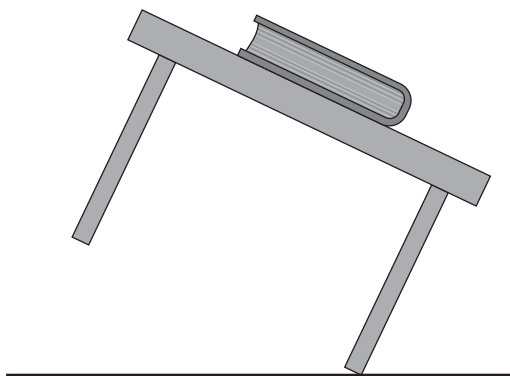


[2]

- (ii) Explain how we know these forces are equal.

[1]

- (iii) The table is now tilted as shown below.



What force prevents the book from sliding off the table?

[1]

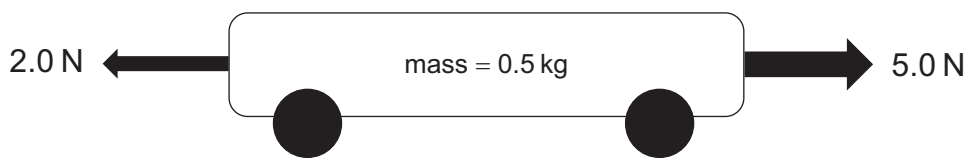


- (b) (i) Complete the following statement of Newton's first law.
Write the word in the space provided.

In the absence of unbalanced forces an object will continue to move
in a straight line at constant _____.

[1]

The diagram shows a trolley used in school science.



- (ii) Calculate the resultant force acting on the trolley.

Resultant force = _____ N [1]

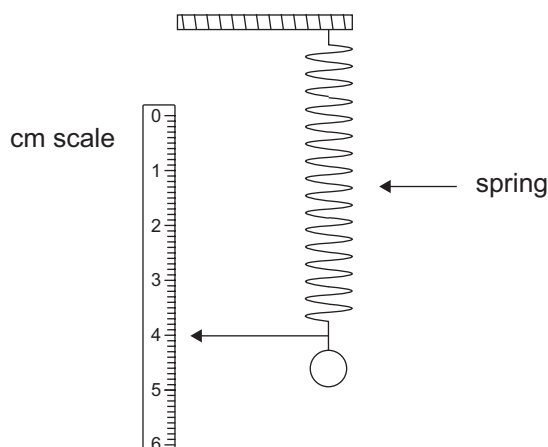
- (iii) The trolley has a mass of 0.5 kg.
Calculate the acceleration of the trolley produced by the resultant force in
part (ii).
**Show clearly how you get your answer, starting with the equation you
plan to use.**

Acceleration = _____ m/s² [3]

[Turn over



(c) To investigate Hooke's law the apparatus shown below was set up.



(i) A force is added to stretch the spring. Complete the table below.

Force/N	Reading on the vertical scale/cm	Extension of the spring/cm
0	4.0	0
1	8.0	
2		8.0
3	16.0	12.0

[2]

(ii) Using values from the table when the force is 3 N, calculate the value of the spring constant and state its unit.

Spring constant $k =$ _____

Unit = _____ [4]



(d) Describe how the position of an object's centre of gravity and the width of its base both affect its stability.

In your answer you should:

- state the meaning of centre of gravity;
- describe how to locate the centre of gravity of a rectangular piece of wood;
- explain why an object pivoted at its centre of gravity will not turn;
- explain how the position of the centre of gravity affects the stability of an object;
- explain how the width of the base of an object affects its stability.

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

Write your answers in the appropriate space below.

Centre of gravity _____

How to locate the centre of gravity _____

Why it does not turn _____

Centre of gravity and stability _____

Width of base and stability _____

[6]

[Turn over



3 (a) The kinetic theory of matter states that all matter is composed of small particles.

Below are a number of statements about the properties of matter and the particles from which they are made.

1. Have a fixed shape.
2. Have a fixed volume and will take up the shape of its container.
3. Will occupy the complete volume of its container.
4. Particles have very weak forces between them.
5. Particles can move around.
6. Particles are held in fixed positions.

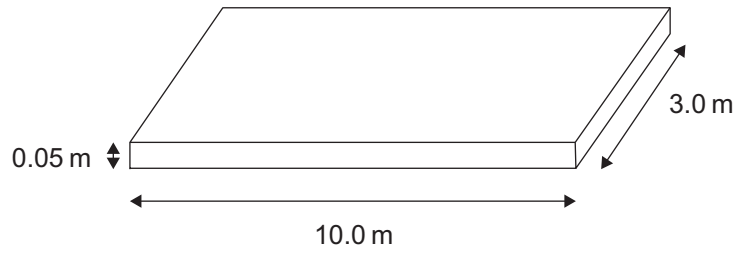
Complete the table below by writing in the numbers of the statements which apply to each state of matter.

State of matter	Statement Numbers
Solid	
Liquid	
Gas	

[2]



- (b) A house owner wants to lay a concrete driveway.
The diagram below shows the dimensions of the driveway.



- (i) Calculate the volume of concrete required.
Show clearly how you get your answer.

Volume = _____ m³ [2]

- (ii) Concrete has a density of 2400 kg/m³.
Calculate the mass of concrete needed.
Show clearly how you get your answer, starting with the equation you plan to use.

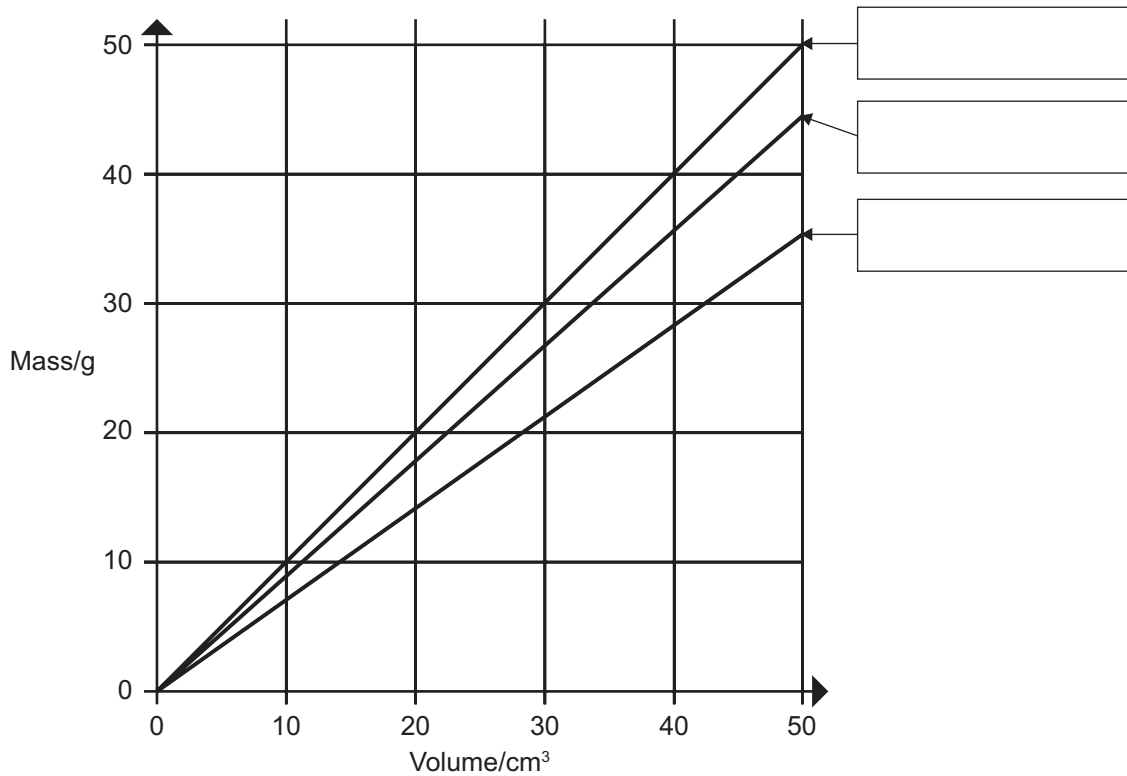
Mass of concrete = _____ kg [3]



(c) (i) The densities of three liquids are shown below.

Liquid	Density/ g/cm^3
Petrol	0.7
Oil	0.9
Water	1.0

The graph below shows how the mass of each liquid depends on its volume. Using the values shown above, name the liquid each line represents. Write the name in the box provided.



[2]

(ii) Liquid water has a density of 1.0g/cm^3 and ice has a density of 0.9g/cm^3 . Describe what happens to the volume of water as it begins to freeze.

[1]





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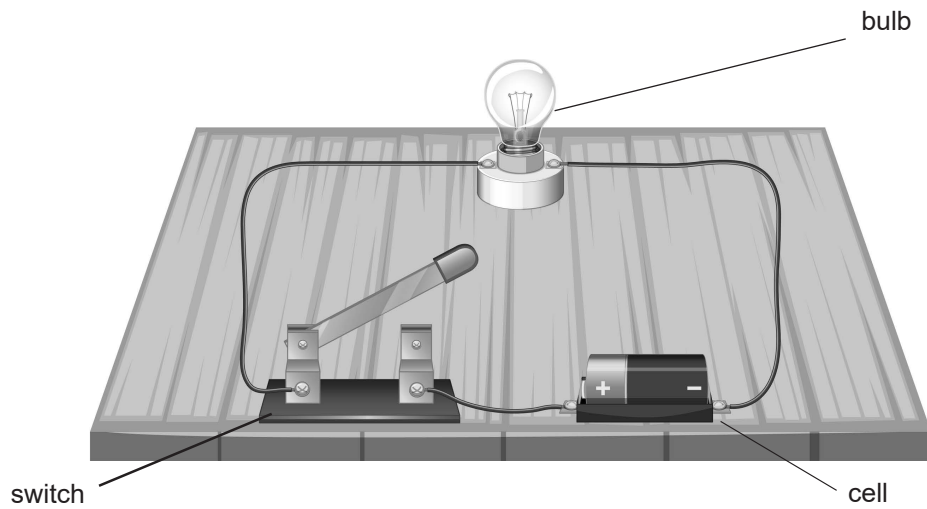
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20GPY1113

4 (a) The diagram shows a bulb connected to a switch and a cell.



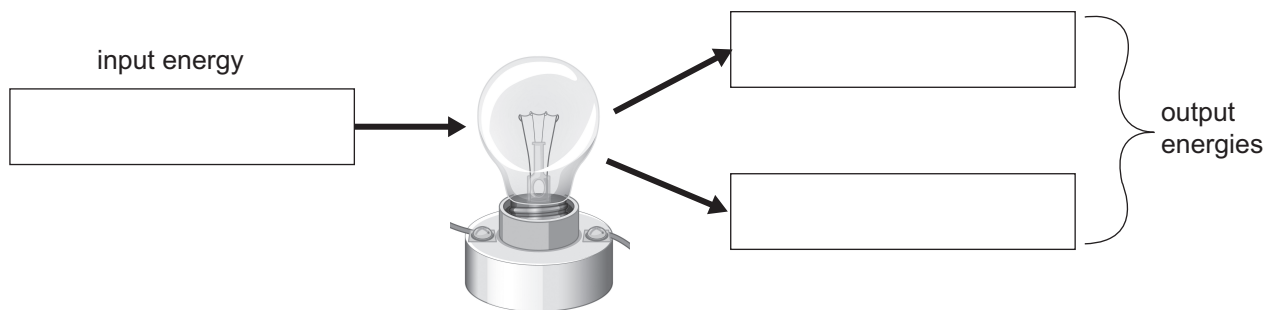
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(i) What form of energy is stored in the cell?

_____ [1]

(ii) State the energy changes that take place in the bulb when the switch is closed.

Write the form of energy in the boxes provided.



[3]



(b) The table shows a number of energy resources.

(i) By placing a tick (✓) in the appropriate box, identify the energy resource as renewable or non-renewable.

Energy resource	Renewable	Non-renewable
Wind		
Coal		
Hydroelectricity		
Natural gas		

[4]

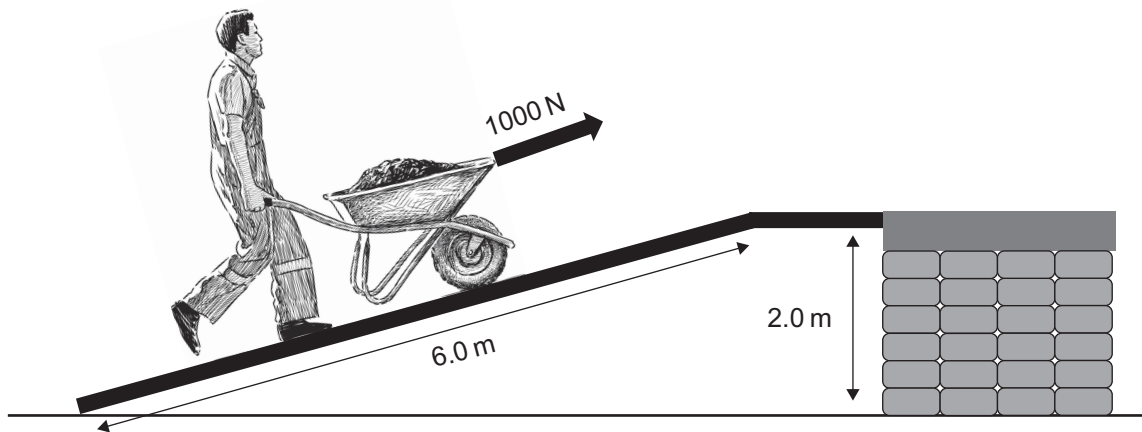
(ii) State two reasons why the use of fossil fuels has a harmful effect on our environment.

[2]

[Turn over



(c) A wheelbarrow is used to move sand up a slope.



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- (i) The wheelbarrow is pushed 6.0 m up the slope with a force of 1000 N. Calculate the work done.
Show clearly how you get your answer, starting with the equation you plan to use.

Work done = _____ J [3]

- (ii) The wheelbarrow and sand have a mass of 250 kg. Calculate the potential energy gained by the wheelbarrow and sand at the top of the slope.
Show clearly how you get your answer, starting with the equation you plan to use.

Potential energy = _____ J [3]



(iii) Explain fully why the gain in potential energy is less than the work done in pushing the wheelbarrow to the top of the slope.

[3]

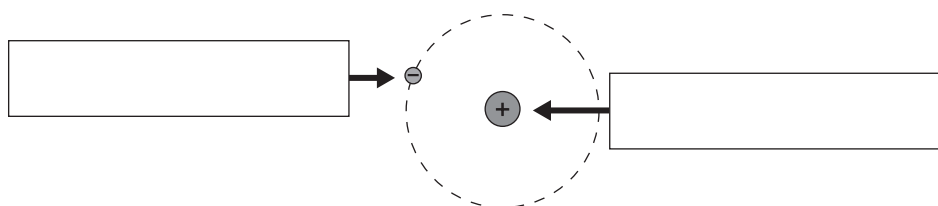
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14066



20GPY1117

5 (a) The diagram below shows the structure of the atom of hydrogen.



(i) Name the particles indicated by the arrows.
Write the names in the boxes provided. [2]

(ii) Hydrogen has two other isotopes.
Describe how these are different from the atom of hydrogen shown above. [1]

(iii) Describe how these are similar to the atom of hydrogen shown above. [1]

(b) The count rate from a radioactive source is corrected for background radiation and the results are shown in the table below.

Time/s	0	50	100	150	200	250
Corrected count rate/ counts/minute	120	85	60	42	30	21

(i) How is the count rate corrected for background radiation? [1]

(ii) Use the table above to determine the half-life of this radioactive source.
Show clearly how you get your answer.

Half-life = _____ s [2]



(c) The International Thermonuclear Experimental Reactor (ITER) is a research and development programme based in France.

(i) Name the nuclear process that ITER is investigating.

_____ [1]

(ii) Describe what happens during the nuclear process under investigation by ITER.

_____ [2]

(iii) Where does this nuclear process occur naturally in our Solar System?

_____ [1]

THIS IS THE END OF THE QUESTION PAPER



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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	

Total Marks	
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Examiner Number

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