Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017

GCSE Physics

Unit 1

Foundation Tier

[GPH11]

GPH11

MONDAY 19 JUNE, MORNING

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 six** 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 **1(c)**.

(ii) What distance does the cyclist travel in 24 s?

Distance = _____ m [1]

(iii) Calculate the average speed of the cyclist for this 24 s journey.

You are advised to show clearly how you get your answer.

Average speed = _____ m/s [3]

[Turn over

(b) At another time the cyclist is pedalling in a straight line at a **constant speed**.

(i) Name the two **horizontal** forces acting on the cyclist.

_____

_____ [1]

(ii) What does Newton's first law of motion state about these forces?

_____

_____

_____ [1]

(iii) The cyclist is moving with a constant speed when he comes to a downwards hill. He stops pedalling but begins to accelerate at $0.2\,m/s^2$.
Calculate the size of the force causing this acceleration.
The mass of the cyclist and bicycle is 90 kg.

You are advised to show clearly how you get your answer.

Force = _____ N [2]

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(Questions continue overleaf)

(c) A student is asked to investigate how the **average speed** of a trolley that is allowed to move freely down a ramp is affected by the **mass of the trolley**. The trolley has a mass of 0.5 kg and the student is provided with a number of additional 0.5 kg masses. The student is also provided with a metre rule and a stop clock.

Describe how the student should carry out the investigation.

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

In your description you should state:

- what quantity has to be varied and how this is done

- what measurements need to be taken and what equipment is used to take them

- what measurement you would repeat

_____

_____

_____

- what calculations are made using the measurements

_____

_____

_____

- what graph should be drawn using the results of the investigation.

_____

_____ [6]

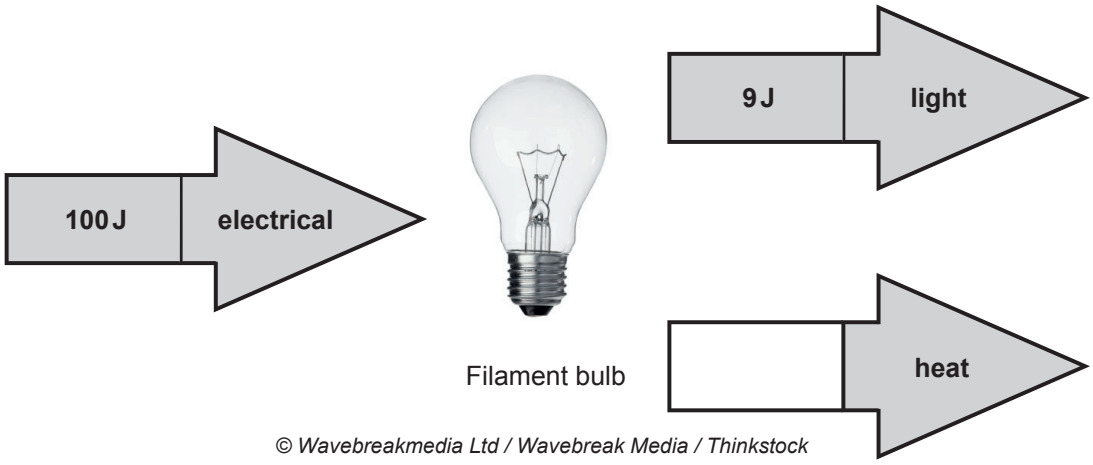
[Turn over

2 **(a)** The table shows a number of energy resources.
Tick (✔) those that are renewable.

Energy resource	Tick if renewable
Coal	
Wind	
Nuclear Fission	
Oil	
Tidal	
Wood (willow pellets)	

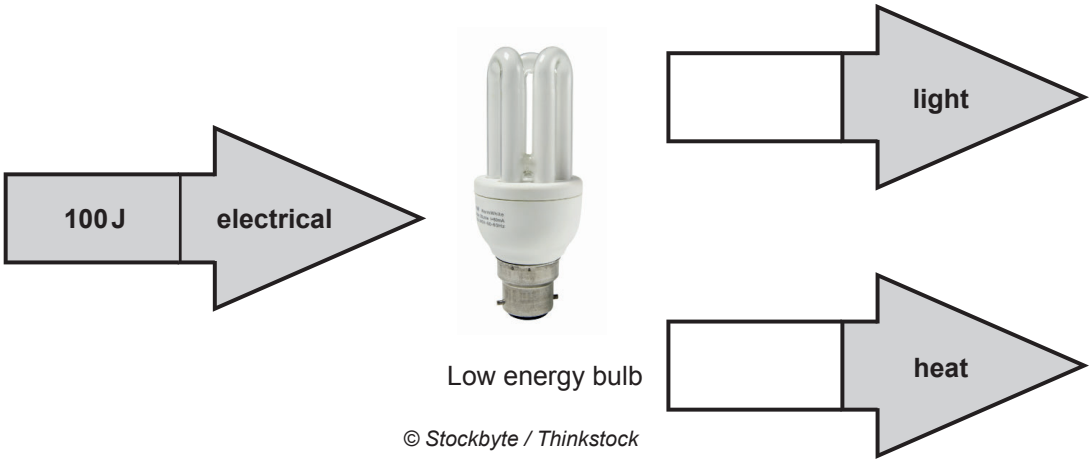
[3]

(b) The diagram below shows the energy changes that take place in a filament bulb.



(i) Complete the diagram by inserting the amount of energy converted to heat by the filament bulb. Write your answer above in the appropriate arrow. [1]

(ii) Low energy bulbs are more efficient at changing electrical energy into light energy.
One type of such bulb has an efficiency of 0.95.
Complete the energy flow diagram to show the amount of light and heat energy produced by a low energy bulb.



Low energy bulb

© Stockbyte / Thinkstock

Write your answers in the appropriate arrows. [2]

(iii) Calculate the energy input to the above low energy bulb needed to produce the same amount of light energy as a filament bulb.

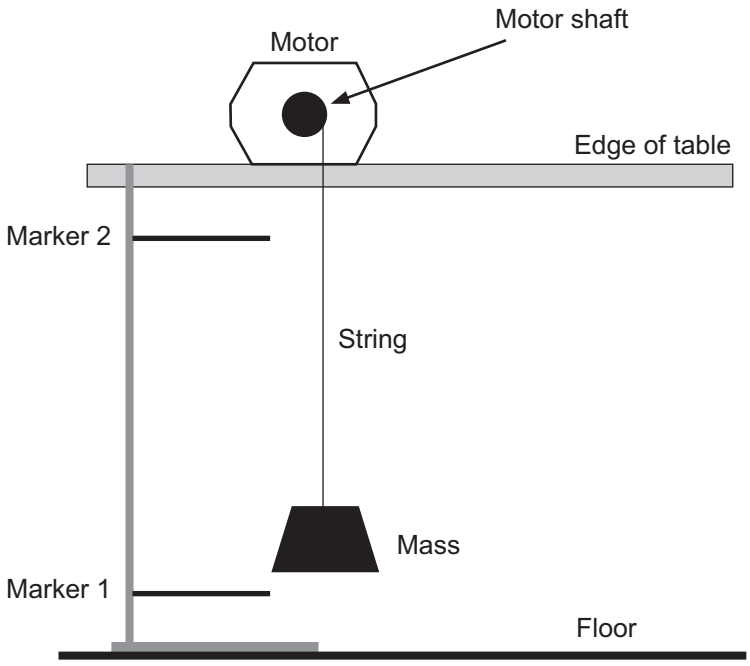
Use the equation

$$\text{input energy} = \frac{\text{useful output energy}}{\text{efficiency}}$$

Energy input = _____ J [3]

[Turn over

(c) To measure the power of an electric motor the apparatus shown below was used.



The following measurements were taken.
Mass of object raised = 0.5 kg
Distance between marker 1 and marker 2 = 0.75 m

(i) Calculate the potential energy gained by the mass as it moves from marker 1 to marker 2.

Potential energy gained = _____ J [3]

The experiment was carried out three times and the time to move the mass between the markers was recorded each time.

The times are shown in the table below.

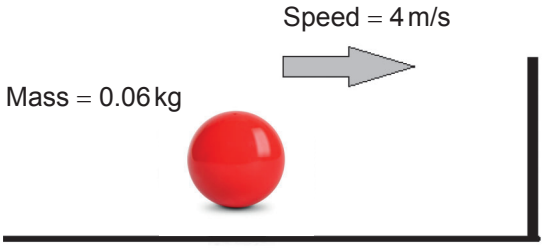
Time to move between the markers/s	3.5	4.1	3.8

(ii) Using the values shown in the table calculate the most **reliable** value for the power produced by the motor.

Power = _____ W [3]

[Turn over

3 A snooker ball of mass **0.06 kg** is moving from left to right at a speed of **4 m/s**.



(a) (i) Calculate the momentum of the snooker ball.
Remember to give the correct unit for momentum.

You are advised to show clearly how you get your answer.

Momentum = _____ [3]

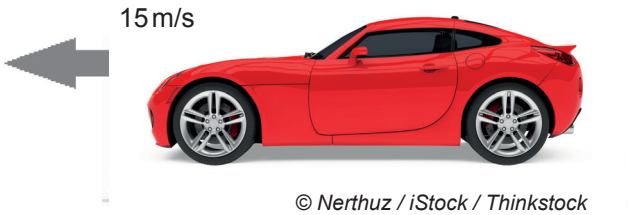
The ball collides head-on with the side of the snooker table.
The table exerts a force of **0.6 N** on the ball for a time of **0.3 s**.

(ii) Calculate the change in the ball's momentum as a result of this collision.

You are advised to show clearly how you get your answer.

Change in momentum = _____ [3]

(b) A car of mass 1800 kg is moving with a speed of 15 m/s.



Calculate the kinetic energy of the car.

You are advised to show clearly how you get your answer.

Kinetic energy = _____ J [3]

(c) **(i)** On another occasion brakes are applied exerting a force of 5000 N bringing the car to rest in 40 m. Calculate the work done by the brakes.

You are advised to show clearly how you get your answer.

Work done = _____ J [3]

(ii) What two forms of energy is the kinetic energy of the car changed to when braking?

_____

_____ [1]

[Turn over

(d) A sportsman prepares to shoot an arrow vertically into the air.

The arrow leaves the bow with a kinetic energy of 75 J.
Assuming no energy losses due to air resistance, state the kinetic energy and gravitational potential energy when the arrow reaches its maximum height.

Gravitational potential energy = _____ J

Kinetic energy = _____ J

[2]

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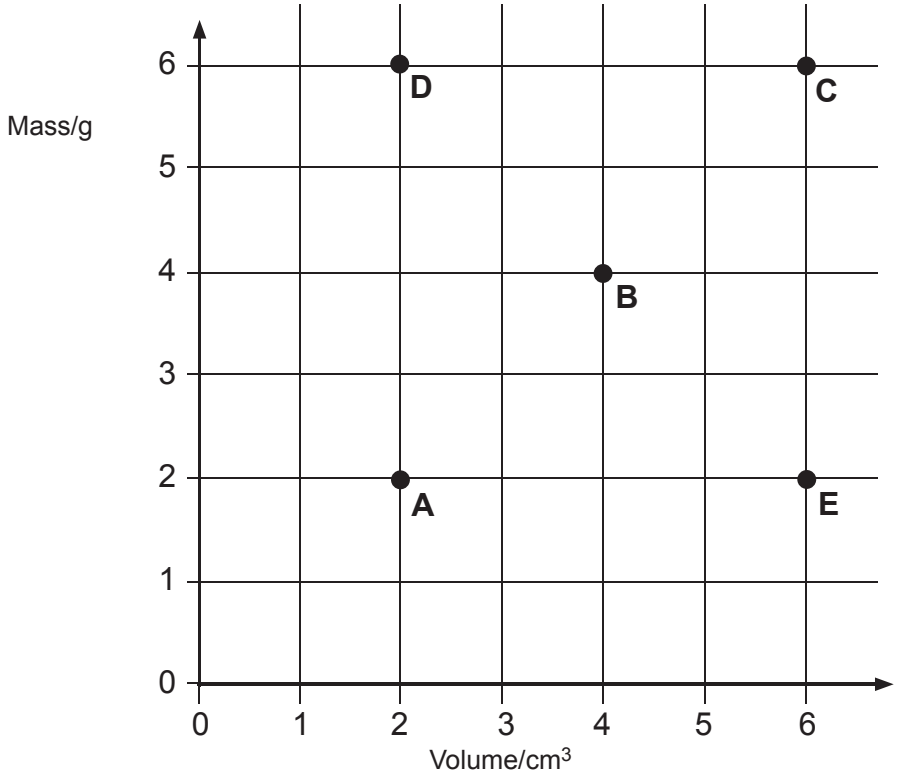
4 **(a)** The grid below shows the mass of five different solids and their volumes.



(i) Which one of the five solids (A – E) has the greatest density?

Solid _____ [1]

(ii) Name the three solids (A – E) which have the same density.

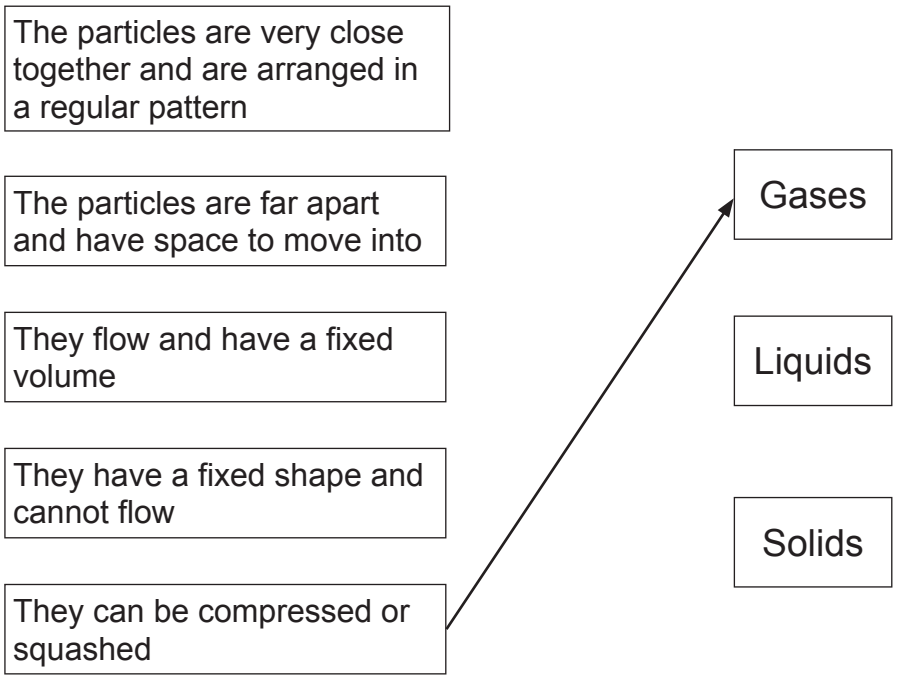
Solids _____ [1]

(iii) Calculate the density of solid E.
Remember to give the correct unit for density.

You are advised to show clearly how you get your answer.

Density = _____ [4]

(b) Kinetic Theory helps us understand the properties of solids, liquids and gases by looking at the arrangements of the molecules and their motion.
Join together with an arrow each property on the left-hand side of the diagram below with the correct state of matter (Gas, Liquid or Solid).
One has already been drawn for you as an example.



[4]

[Turn over

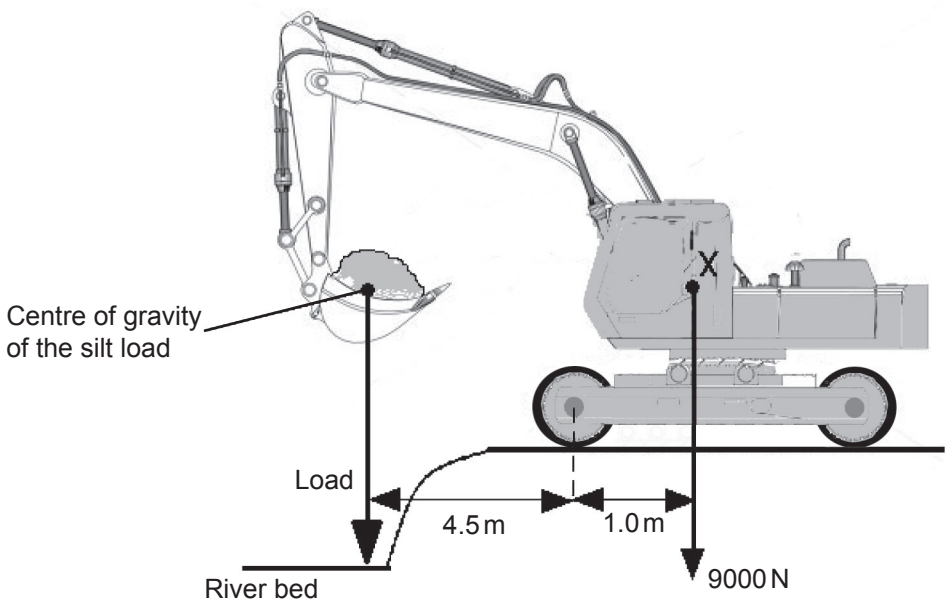
5 (a) (i) State the Principle of Moments.

_____

_____

_____ [2]

The diagram below represents a digger being used to remove silt from a river bed.



(ii) If the digger was to become unstable due to the silt being lifted, mark clearly with the letter **P** the point about which it would topple.

[1]

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(Questions continue overleaf)

6 **(a)** **(i)** Complete the table below naming the particles that make up the atom.

Found in the nucleus	
Found in the nucleus	
Found outside the nucleus	

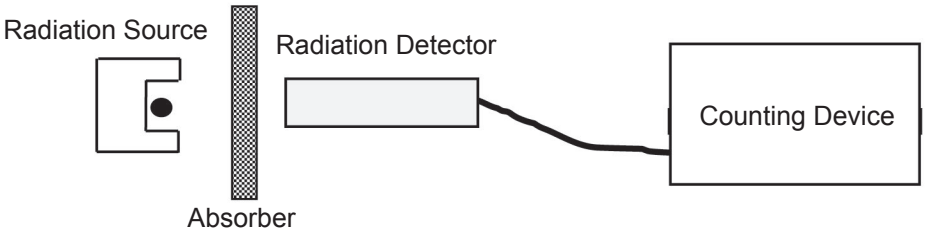
[3]

(ii) Explain in terms of particles why an atom is electrically neutral.

_____

_____ [1]

(b) The experiment below was performed with three radioactive sources. One was a pure alpha(α) source, one a pure beta(β) source and one a pure gamma(γ) source.



The count rates per minute with different absorbers were measured for each source. The results obtained are shown in the table below. The sources are labelled A, B and C.

Absorber	Count rate/minute for source		
	A	**B**	**C**
None	900	300	465
Thin Paper	875	294	40
Thin Aluminium Sheet	148	286	38

The background count was measured as 35 counts per minute.

(i) What causes the background count?

_____

_____ [1]

(ii) Which source of radiation (A, B or C) is

almost unaffected by the thin aluminium sheet? _____

almost completely absorbed by thin paper? _____ [2]

(iii) Complete the table below to identify the type of radioactivity that comes from each of the sources A, B and C.

Source	Type of Radioactivity
A	
B	
C	

[3]

[Turn over

(c) The corrected count rate obtained from a radioactive source was measured and recorded at various times. The results are shown in the table below.

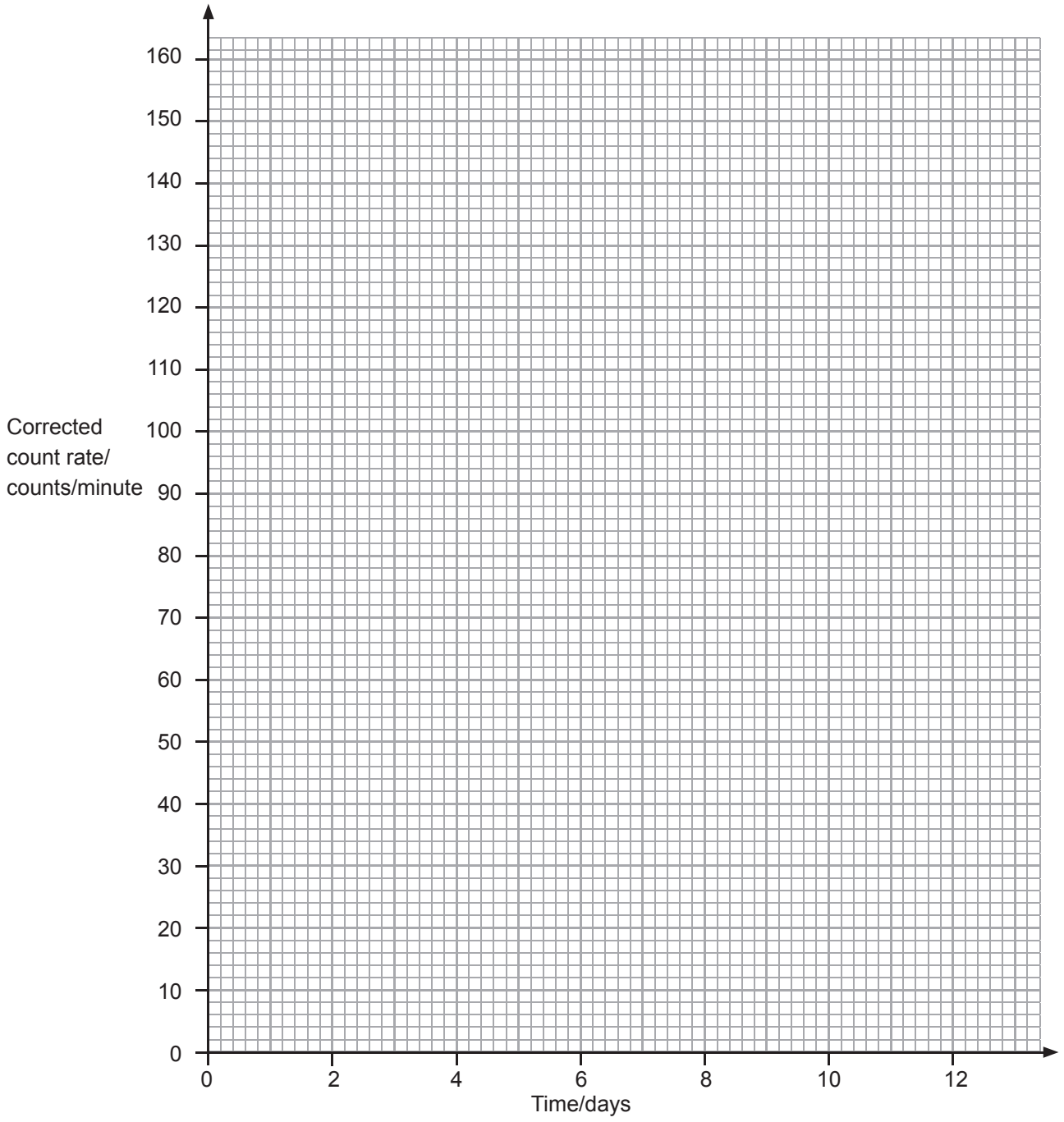
Time/days	Corrected count rate/counts/minute
0	160
3	95
6	57
9	34
12	20

(i) Use the data and the grid opposite to plot a graph of the corrected count rate against time for the source. Draw a curve of best fit through the points. [3]

(ii) Use the graph to estimate the half-life of the source.

Half-life = _____ days [1]

(iii) On the graph sketch the curve you would expect to obtain for a different source which had an initial count rate of 160 counts per minute but a shorter half-life. [1]



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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
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Total Marks	

Examiner Number