General Certificate of Secondary Education
2018

GCSE Physics

Unit 1

Foundation Tier

[GPH11]   *GPH11*

FRIDAY 15 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 **4(a)**.

1 **(a)** The driver of a car goes on a journey.
The distance–time graph for this journey is shown below.

Distance/m
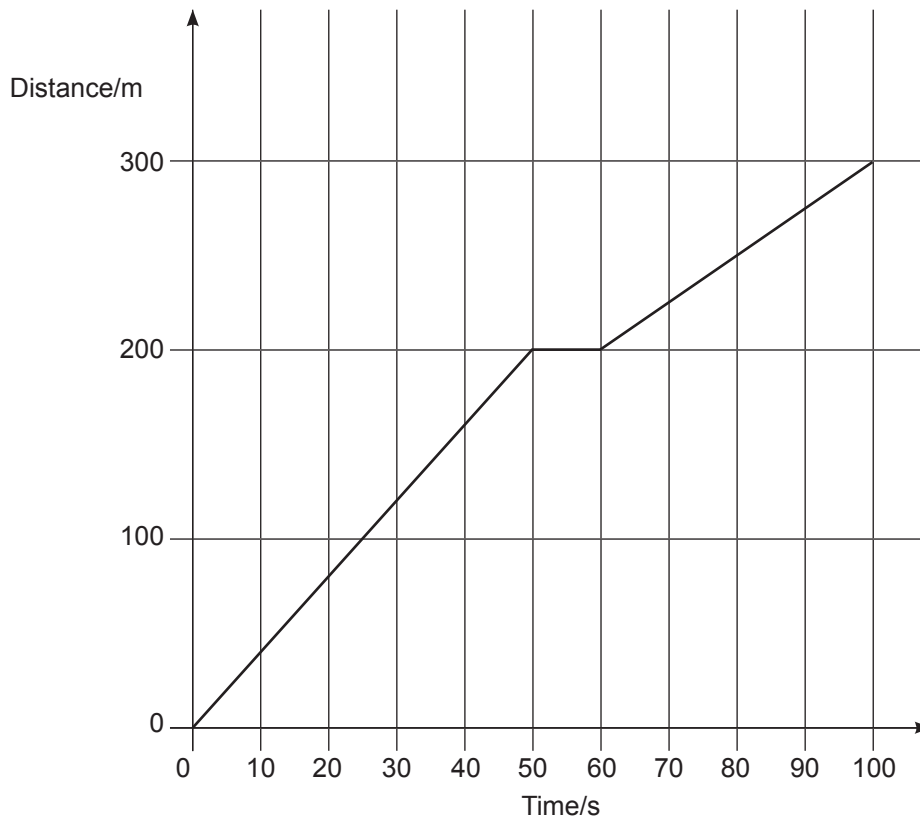
(i) Which one of the following terms describes the motion of the car during the first 50 s of the journey?

Tick (✓) the correct answer.

Constant speed

Decreasing speed

Increasing speed

[1]

(ii) How many times did the driver have to stop on the journey?

_____ [1]

(iii) Calculate the average speed of the car for the whole journey.

Remember to include the correct unit in your answer.

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

Average speed = _____ [4]

(b) A ball is allowed to roll down a slope several metres long.

The slope has markings **1 m apart** on its surface.

Describe how you would use a stopclock to show that the ball is accelerating.

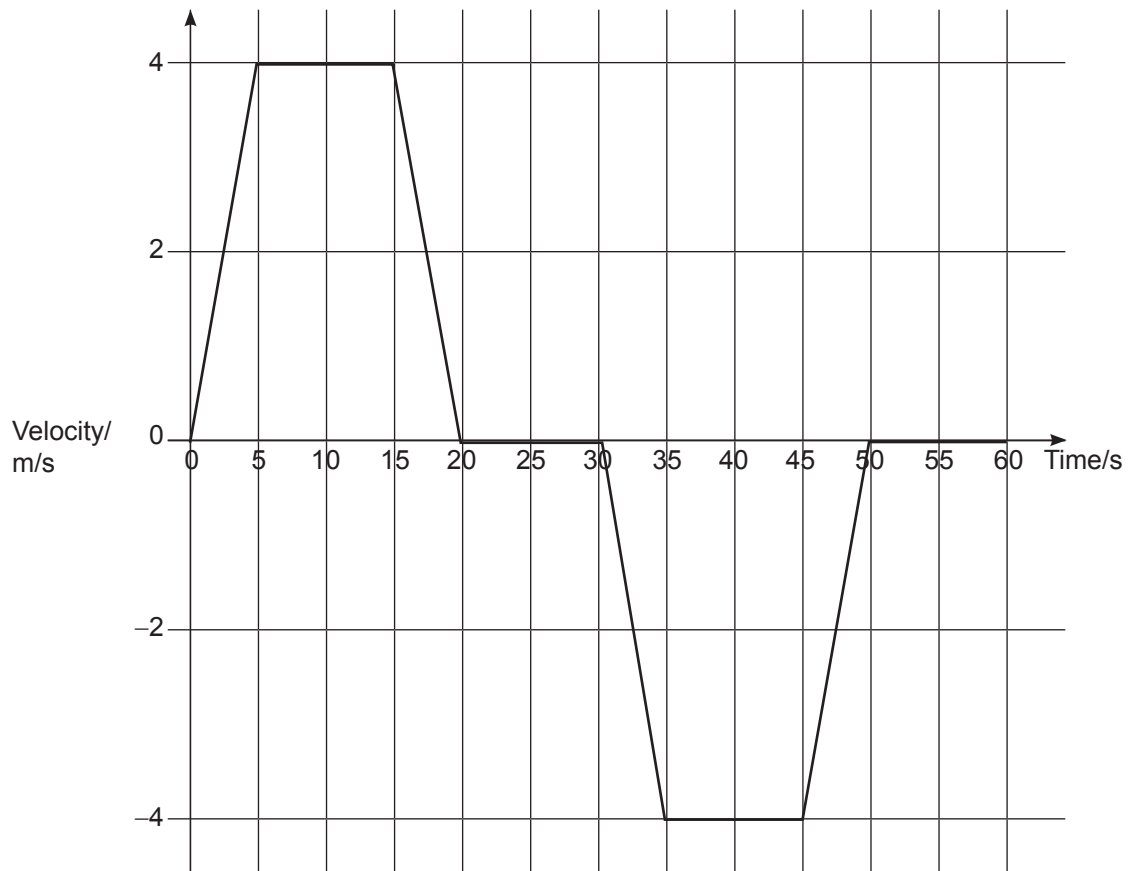State how your measurements would show that the ball is accelerating.
What would you do to improve the reliability of any measurements?

_____

_____

_____

_____

_____

_____ [3]

[Turn over

(c) The graph below shows how the velocity of a lift changes as it moves from the ground floor of a building to the top floor and returns to the ground floor.

(i) Explain why the velocity is sometimes positive (+) and at other times negative (−).

_____

_____ [1]

(ii) Using the graph calculate the acceleration of the lift during the first 5 s of the motion.

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

Acceleration = _____ m/s² [2]

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(iii) Using the graph calculate the distance the lift travels from the ground floor to the top floor of the building.

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

Distance = _____ m [3]

2 (a) (i) Complete the sentence below by choosing words and statements from those in the box.
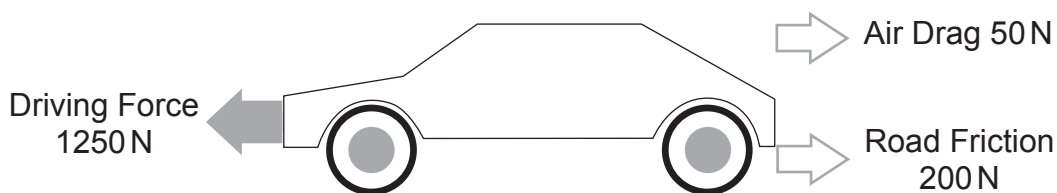
a form of energy	*newtons*	*joules*	*a force*

Friction is _____

and is measured in _____   [2]

The diagram shows a car moving along a straight level road.
The arrows show the three horizontal forces acting on the car.

Air Drag 50 N

Driving Force
1250 N

Road Friction
200 N

Source: Chief Examiner

(ii) Calculate the resultant of the two forces that oppose the motion of the car.

Resultant opposing force = _____ N [1]

(iii) Calculate the resultant forward force moving the car.

Resultant forward force = _____ N [1]

(iv) The mass m of the car is 750 kg.

Using the equation below calculate the acceleration a of the car.

$$a = F/m$$

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

Acceleration = _____ [3]

(v) Calculate the weight of the car.

Weight of the car = _____ N [1]

(vi) Explain why the car has weight.

_____

_____ [1]

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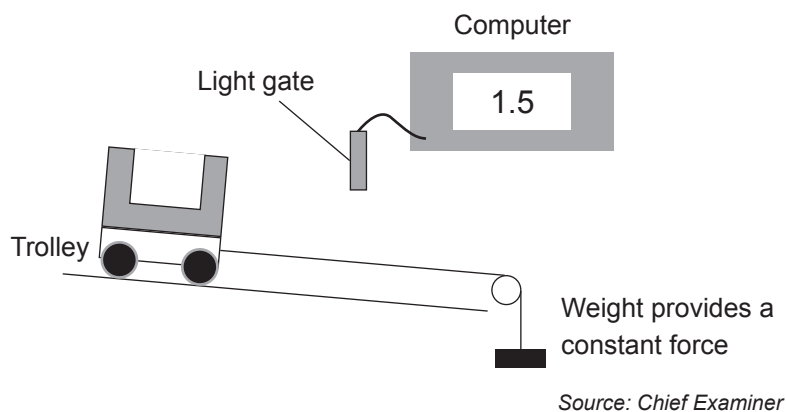**(b)** To investigate how the acceleration of a trolley down a slope depended on the mass of the trolley, the apparatus shown below was set up.

The trolley was pulled along by a constant force.

The acceleration was measured using a light gate connected to a computer.

Computer

Light gate

1.5

Trolley

Weight provides a constant force

Source: Chief Examiner

The results of the experiment are shown in the table below.

Mass of the trolley/kg	0.5	1.0	1.5	2.0
Acceleration/m/s^2	1.2	0.6	0.4	0.3

(i) On the grid opposite plot a graph of the mass of the trolley (x-axis) and acceleration (y-axis). Draw a curve of best fit through the points.

[4]

(ii) Which of the following relationships between the mass of the trolley and the acceleration of the trolley is indicated by this graph?

Tick (✓) the correct answer.

Acceleration increases as the mass of the trolley increases

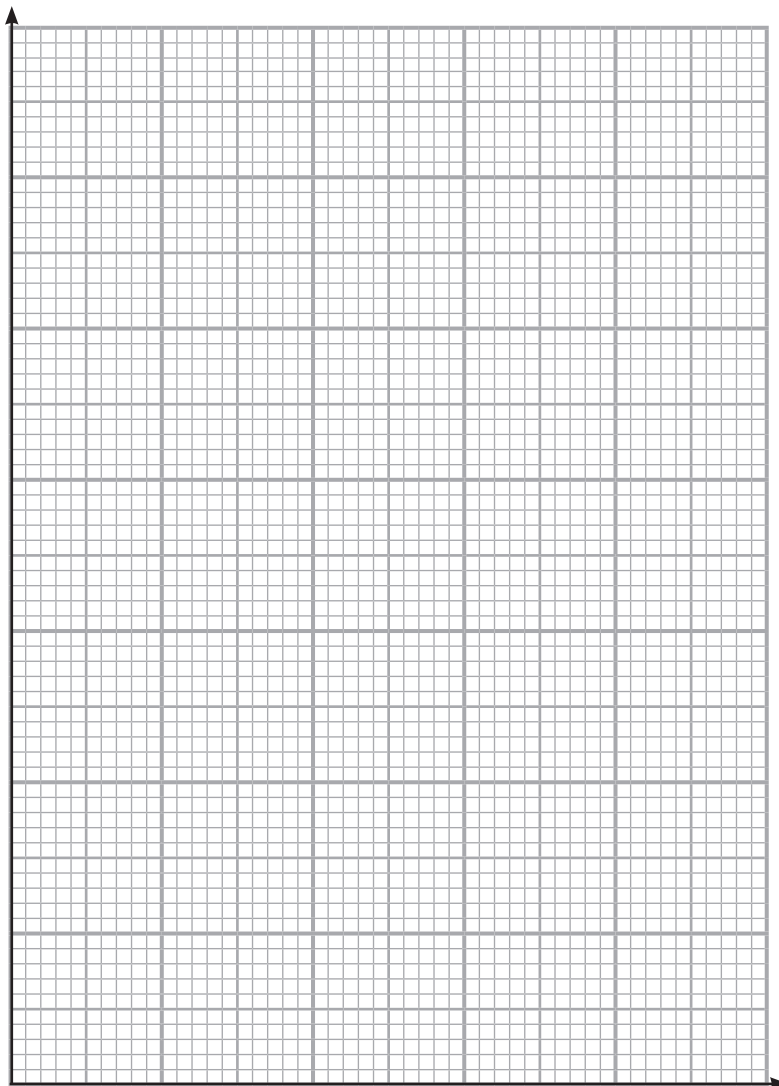Acceleration decreases as the mass of the trolley increases

Acceleration is not affected by the mass of the trolley

[1]

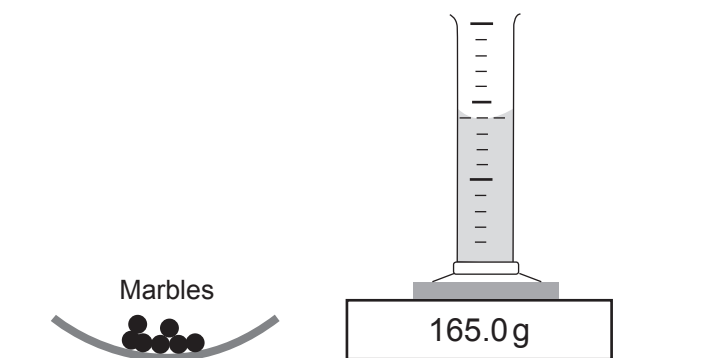**(iii)** What could a person performing this experiment do to improve the reliability of the measurements?

_____

_____ [1]

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3 **(a)** A student was asked to find the density of glass used in the manufacture of marbles. The student decided to measure the volume of the marbles using the Displacement of Water method and used the equipment shown below.

Marbles

165.0 g

The measuring cylinder was partly filled with water and then placed on the electronic scales. Marbles were added to the cylinder. The measurements taken by the student are shown below.

Mass of the cylinder + water   = 165.0 g
Mass of the cylinder + water + marbles   = 265.0 g
Volume of water in the measuring cylinder   = 60.0 cm^3
Volume of water + marbles   = 100.0 cm^3

(i) Using the measurements above calculate the density of the glass.

Include the unit for density with your answer.

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

Density of glass = _____ [4]

(ii) State how the student should accurately read the volume of water in the measuring cylinder.

_____

_____ [1]

(iii) State one precaution the student should have taken when adding marbles to the water in the measuring cylinder.

_____

_____ [1]

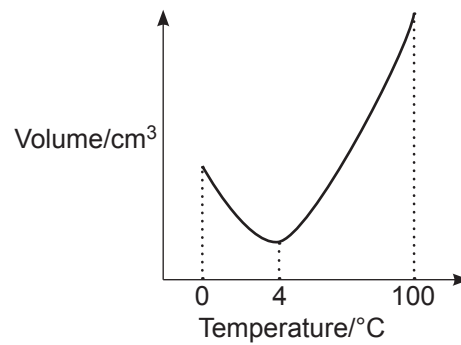**(b)** Using kinetic theory describe carefully the difference between the motion of the molecules in the water and in the glass.

_____

_____

_____

_____

_____

_____ [3]

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(c) The volume of water was measured as it was cooled.
The results of this investigation are shown in the graph below.

Explain why the density of the water increases as the temperature decreases from 100 °C to 4 °C.

_____

_____ [1]

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(Questions continue overleaf)

4 **(a)** Describe, in detail, how you would measure the personal power of a student **of known weight**.

In your description you should state:
- what apparatus you would use;
- what measurements you would make;
- how you would use these measurements to calculate the student's power.

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

Apparatus:

_____

_____

_____

_____

Measurements:

_____

_____

_____

_____

Calculation:

_____

_____

_____

_____

_____ [6]

The production of methane gas from grass in biodigesters is increasing in Northern Ireland. The methane gas produced is then burned to produce heat energy.

One advantage of producing methane from grass is that it conserves fossil fuels.

(b) (i) State another advantage, not related to cost, of producing methane from grass.

_____

_____ [1]

(ii) State an environmental disadvantage of producing methane from grass.

_____

_____ [1]

(iii) What type of energy is possessed by methane gas?

_____ [1]

[Turn over

(c) A student uses her mobile phone.

©scanrail/iStock/Thinkstock

**(i)** Where is the energy stored inside the mobile phone when it is switched off?

_____ [1]

(ii) Name two useful forms of energy the mobile phone produces when it is in use.

_____ energy and _____ energy   [2]

(d) A car engine is designed to change chemical energy to kinetic energy.
The energy input and output figures for a particular car engine are given below.

300 J of chemical energy → car engine → 40 J of sound energy / 170 J of heat / 90 J of kinetic energy
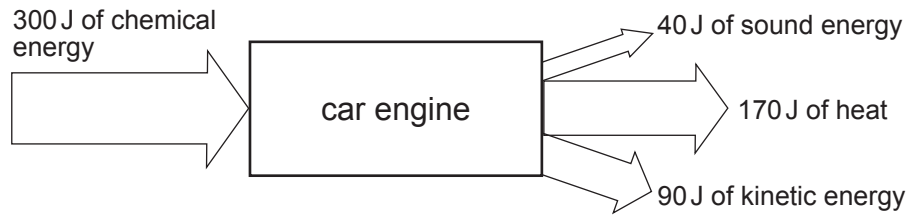
Source: Principal Examiner

Calculate the efficiency of the engine.

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

Efficiency = _____ [3]

5 **(a)** Complete the sentence below to explain what physicists mean by the centre of gravity of an object.

The centre of gravity is the point where

_____

_____ [1]

(b) A student makes a simple bird feeder by tying a piece of string to a uniform piece of wooden rod and hanging it from the branch of a tree.

She now hangs a bird feeder, of weight 8 N, on one side and moves it until the wooden rod is horizontal, as in the diagram below.
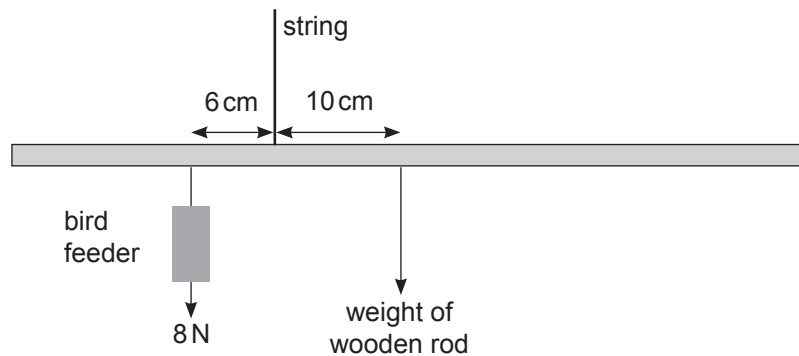
(i) When the wooden rod is horizontal as shown above what can you say about the clockwise moments acting on it?

_____ [1]

(ii) Calculate the size and state the direction of the moment caused by the weight of the bird feeder about the pivot.

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

Size of moment = _____ [3]

Direction of moment = _____ [1]

(iii) Calculate the weight of the wooden rod.

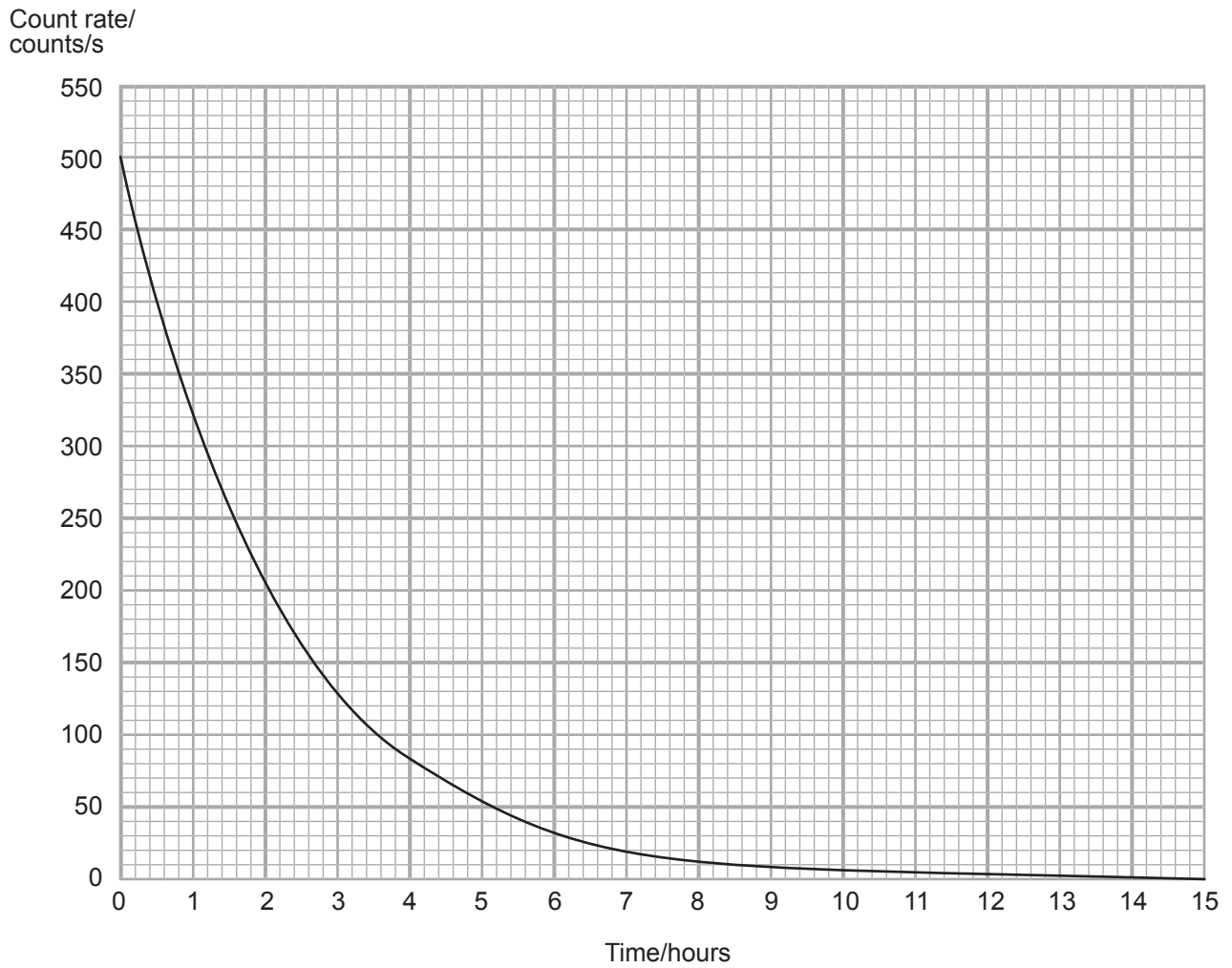**You are advised to show clearly how you get your answer.**

Weight of the wooden rod = _____ N [4]

6 **(a)** An experiment was completed to measure the half-life of a radioactive source.

The count rate in counts per second was recorded at set time intervals and used to plot a decay graph as shown below.

(i) Explain how the readings would have been adjusted to allow for background count.

_____

_____ [1]

**(ii)** Using the graph find a value for the half-life of the radioactive source.

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

Half-life = _____ hours [3]

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(b) All of the organs in the human body are supplied with blood.
Unfortunately, on occasion, some blood vessels rupture and internal bleeding occurs.

If this happens it is necessary to locate the bleed and have it attended to.

Radiation detector

Radioactive
substance injected
into patient
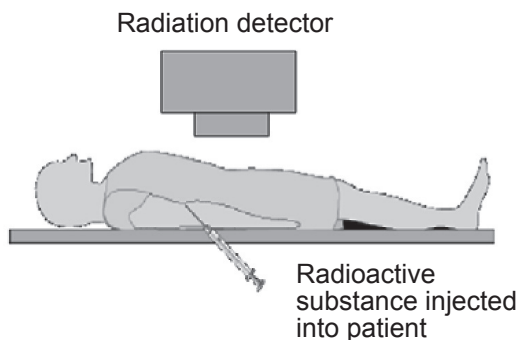
" Republished with permission of Royal Society of Chemistry from Metals and Life,
Eleanor Crabb, Elaine Moore, Open University, 2010;
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One of the techniques used in hospital is to inject a radioactive substance into the blood and scan the body with a radiation detector.

(i) Which type of radiation (alpha, beta or gamma) should be used?

Give a reason for your answer.

Type of radiation _____

Explanation _____

_____

_____ [2]

(ii) How would the hospital technician know the region in which the bleed is occurring?

_____

_____

_____ [1]

Several radioactive substances are available with different half-lives. They are listed in the table below.

Radioactive substance	Half-life
A	30 seconds
B	6 hours
C	20 days

(iii) Which source would you recommend to be used?

Give an explanation for your choice.

Radioactive substance _____

Explanation _____

_____

_____

_____

_____ [3]

(iv) State one precaution that should be taken when working with a radioactive substance before it is injected into the patient.

_____

_____

_____ [1]

(c) Name the two processes by which energy can be produced using nuclear reactions.

1. _____

2. _____ [2]

(d) The element hydrogen has three isotopes.

Explain, **in terms of the particles that make up the nucleus of an atom**, what an isotope is.

_____

_____

_____

_____ [2]

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