Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2025

Physics

Unit 1

Foundation Tier

GPY11

[GPY11]
THURSDAY 22 MAY, MORNING

TIME

1 hour 15 minutes.

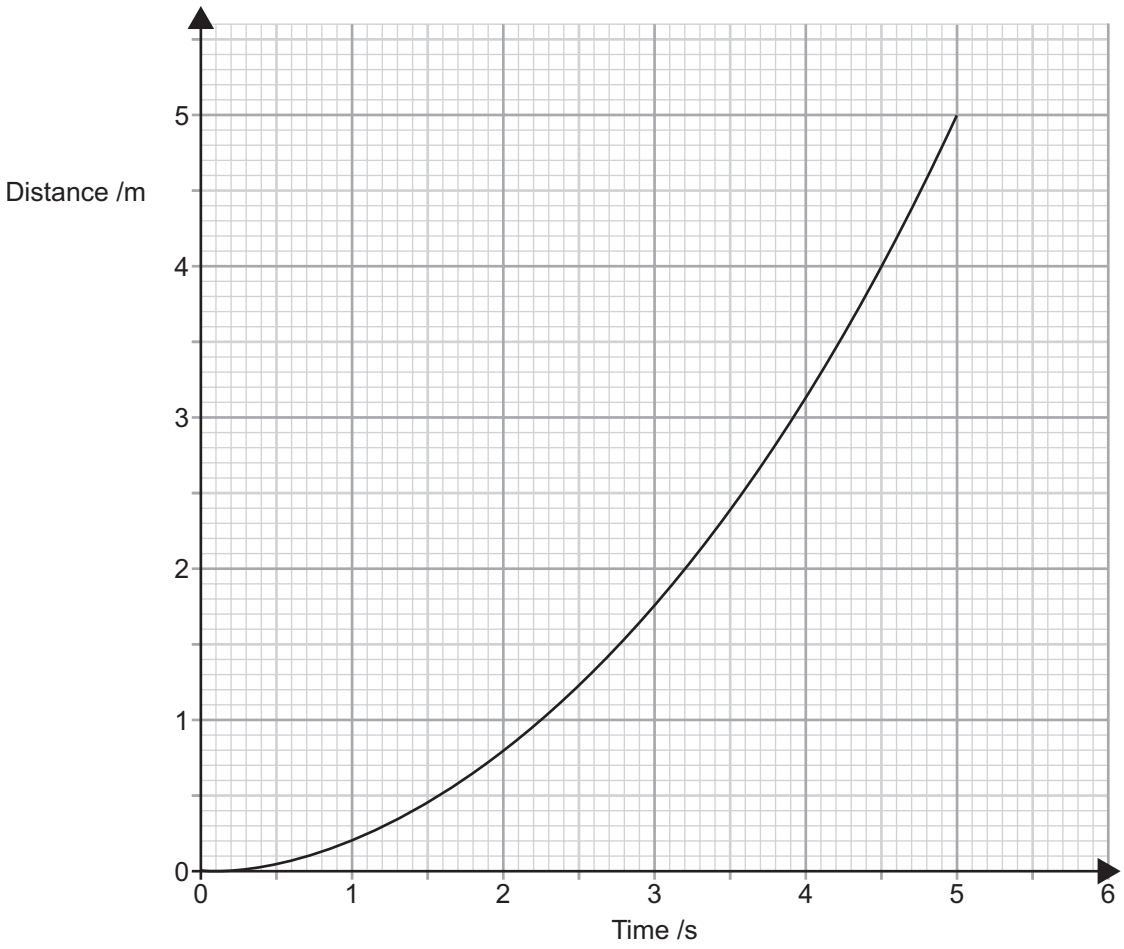
INSTRUCTIONS TO CANDIDATES

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 and use a dark HB pencil for drawings and graphs.
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.
You may use a scientific calculator.
Quality of written communication will be assessed in Question **1(e)**.

1 **(a)** The graph below shows how the distance travelled by a cyclist varies with time.



(i) Use the graph to determine the following distances.

Distance travelled after 1 s = _____ m

Distance travelled after 2 s = _____ m [1]

(ii) Explain how these two distances show that the speed of the cyclist is increasing.

_____

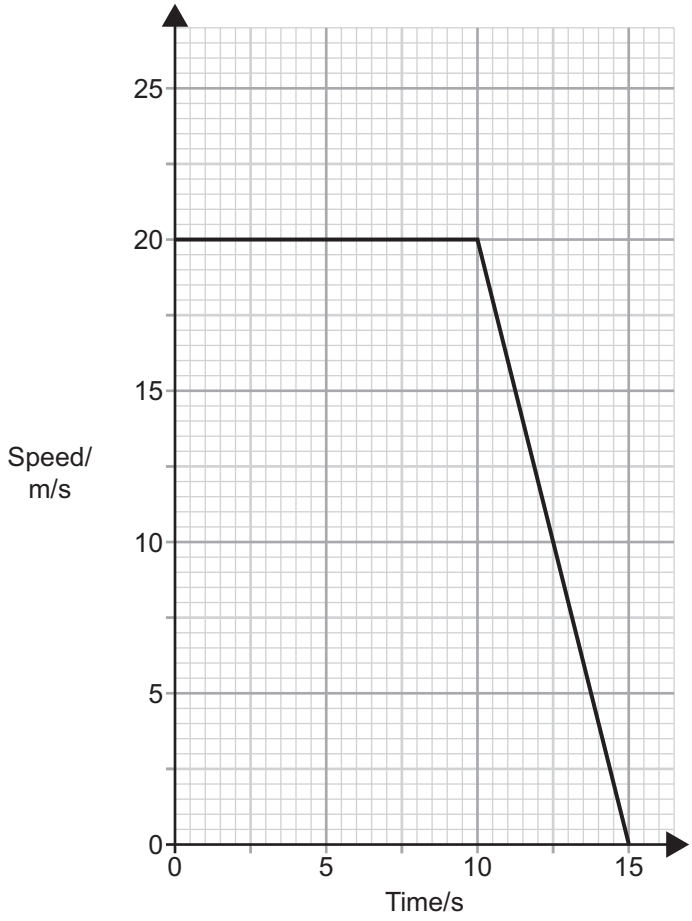
_____ [1]

(b) Another cyclist starts from rest and after 5s her speed is 2.0 m/s.
Calculate the rate of change of speed (acceleration) of the cyclist.
Show your working out.

Rate of change of speed = _____ m/s^2 [3]

[Turn over

(c) Below is the speed–time graph for a car.
The car was travelling at a constant speed, then the driver applied the brakes.
After a time the car stopped.



Using the graph, calculate the distance travelled by the car during the time it was **slowing** to a stop.
Show your working out.

Distance travelled when **slowing** to a stop = _____ m [3]

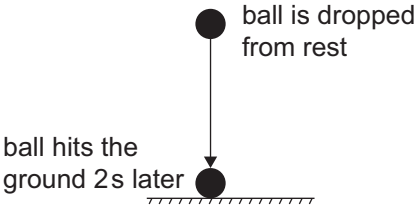
(d) When an object is dropped it experiences a rate of change of speed (acceleration) of 10 m/s^2.

(i) Explain what this means.

_____

_____ [1]

(ii) A ball is dropped from rest and takes 2 s to reach the ground.



Source: Chief Examiner

Calculate the speed of the ball when it hits the ground.
Show your working out.

Speed = _____ m/s [3]

(iii) Choose the correct equation from the three listed below that you would use to calculate the **average** speed of the ball.

$$\text{Average speed} = \frac{\text{Initial speed} - \text{Final speed}}{2} \quad \square$$

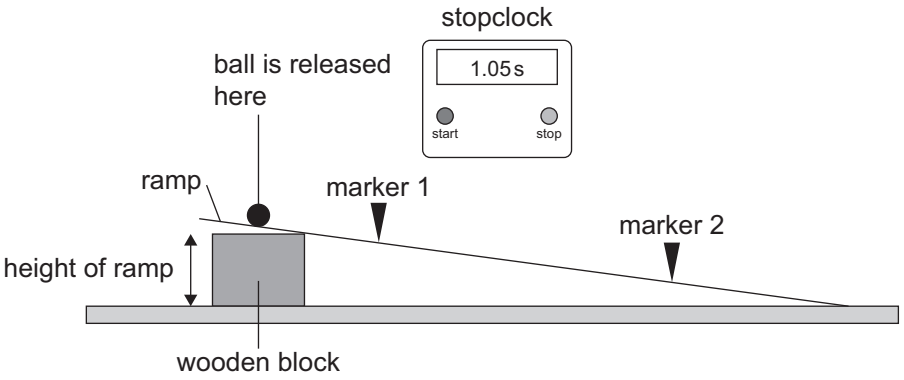
$$\text{Average speed} = \frac{\text{Initial speed} + \text{Final speed}}{2} \quad \square$$

$$\text{Average speed} = \frac{\text{Initial speed} + \text{Final speed}}{\text{time taken}} \quad \square$$

[1]

[Turn over

(e) The diagram below shows the equipment used to investigate the time it takes a ball to travel down a ramp from marker 1 to marker 2, for different heights of the ramp. The time is measured using a stopclock and the height of the ramp is changed using wooden blocks of different sizes.



Source: Chief Examiner

Describe how this investigation is carried out.
In your answer you should;

- name the independent variable, the dependent variable and a controlled variable;
- explain how the time measurements can be made more reliable;
- predict what happens to the time as the height of the ramp increases;
- explain what an anomalous reading is and how it should be treated if one is recorded during the experiment.

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 on the next page.

[6]

[Turn over

2 **(a)** **(i)** What is meant by the mass of an object?

_____

_____ [1]

(ii) What is meant by the weight of an object?

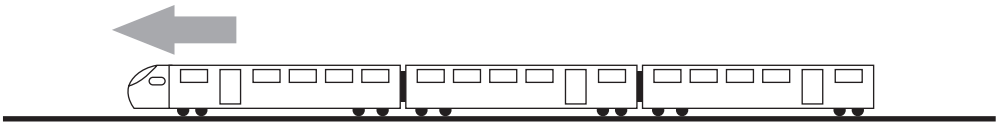
_____

_____ [1]

(iii) What force always opposes the motion of an object?

_____ [1]

(b) A train of mass 225 000 kg is travelling along a straight track at a **constant speed**.



Source: Principal Examiner

The total force opposing the motion of the train is **0.3 N for every kilogram** of the mass of the train.

(i) Calculate the total force opposing the motion of the train.

Force opposing motion = _____ N [2]

(ii) State the size of the force provided by the engine of the train.
Explain your answer.

Engine force = _____ N

Explanation _____

_____

_____ [2]

(iii) Calculate the weight of the train.
Show your working out.

Weight = _____ N [3]

(c) A different train is approaching a station at a constant speed when the driver applies the brakes. The train then decelerates at a constant rate of 0.4 m/s^2 and eventually comes to rest.

The mass of the train is 200 000 kg.
Calculate the size of the resultant force on the train.
Show your working out.

Resultant force = _____ N [3]

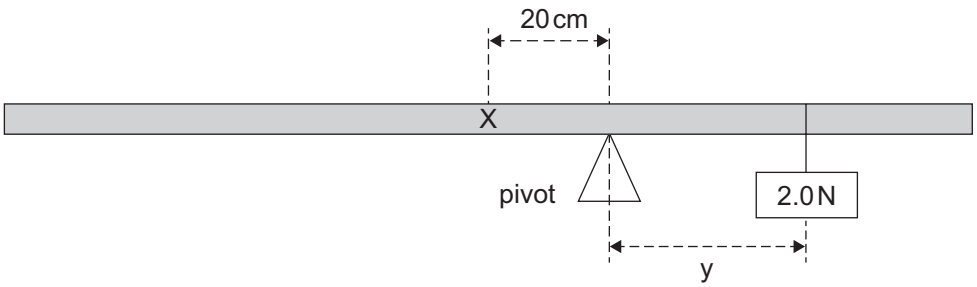
[Turn over

(d) (i) Explain what is meant by the term centre of gravity.

_____

_____ [2]

(ii) A uniform beam has a weight of 3.0 N.
Its centre of gravity is labelled X.
A pivot is positioned 20 cm from X.



Source: Principal Examiner

The 2.0 N weight is moved until the beam is balanced as shown above.

Use the Principle of Moments to calculate the distance y.

Distance y = _____ cm [4]

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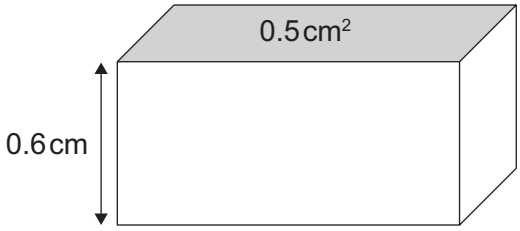
(Questions continue overleaf)

[Turn over

3 **(a)** A small block of metal is shown below. The height of the block is 0.6 cm and the surface area of the shaded face is 0.5 cm^2.

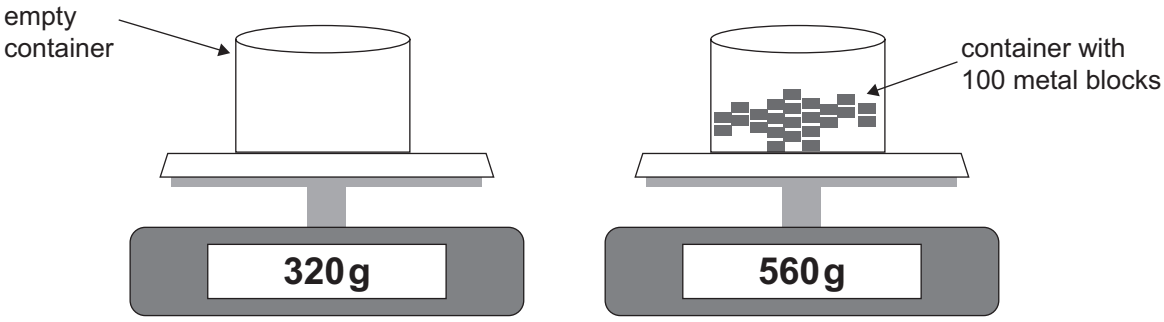


Source: Chief Examiner

(i) Calculate the volume of the block of metal.
Show your working out.

Volume of block = _____ cm^3 [2]

One hundred of these metal blocks were placed into an empty container on a balance as shown below.



Source: Chief Examiner

(ii) Calculate the mass of one of the metal blocks in the container.
Show your working out.

Mass of one metal block = _____ g [2]

(iii) Use your answers to parts **(a)(i)** and **(a)(ii)** to calculate the density of the metal.
Show your working out.

Density = _____ g/cm^3 [3]

(b) The density of the metal is much greater than the density of air.
Use the kinetic theory of matter to explain why this is the case.

_____

_____

_____ [2]

[Turn over

4 **(a)** **(i)** Explain the difference between a renewable energy resource and a non-renewable energy resource.

_____

_____

_____

_____ [2]

(ii) Name two renewable energy resources.

1. _____

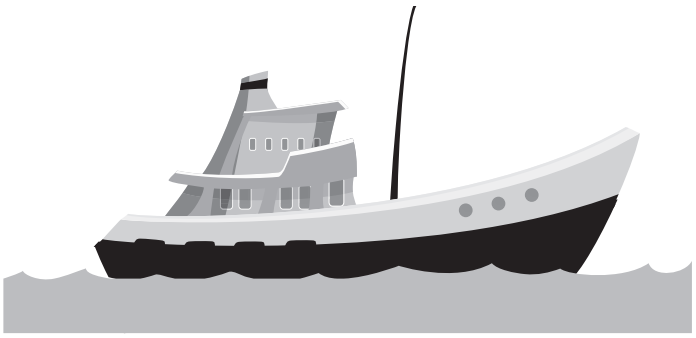
2. _____ [2]

(iii) Name two non-renewable energy resources.

1. _____

2. _____ [2]

(b) A small boat of mass 1200 kg is moving at 2 m/s.



Source: CCEA

(i) Calculate the kinetic energy of the boat.
Show your working out.

Kinetic energy = _____ J [3]

(ii) How much work would be done in bringing the boat to a stop?

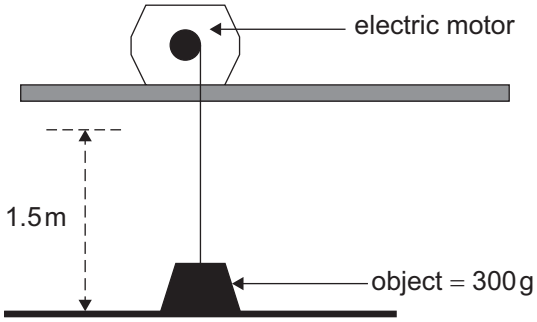
Work done = _____ J [1]

(iii) The boat requires 20 m to come to a stop.
Using the value for work done, calculate the braking force needed to bring the boat to a stop.
Show your working out.

Braking force = _____ N [3]

[Turn over

(c) An electric motor is used to lift an object from the ground to a height of 1.5 m as shown in the diagram below.



(i) Calculate the potential energy of the object when it is 1.5 m above the ground.
Show your working out.

Potential energy = _____ J [4]

(ii) The motor takes 2 s to lift the object the 1.5 m.
Calculate the power of the motor.
Include the unit for power with your answer.
Show your working out.

Power = _____

Unit = _____ [4]

(iii) In a class experiment, a group of students calculated the efficiency of an electric motor to be 1.2 (120%).
Explain why this is not possible.

_____

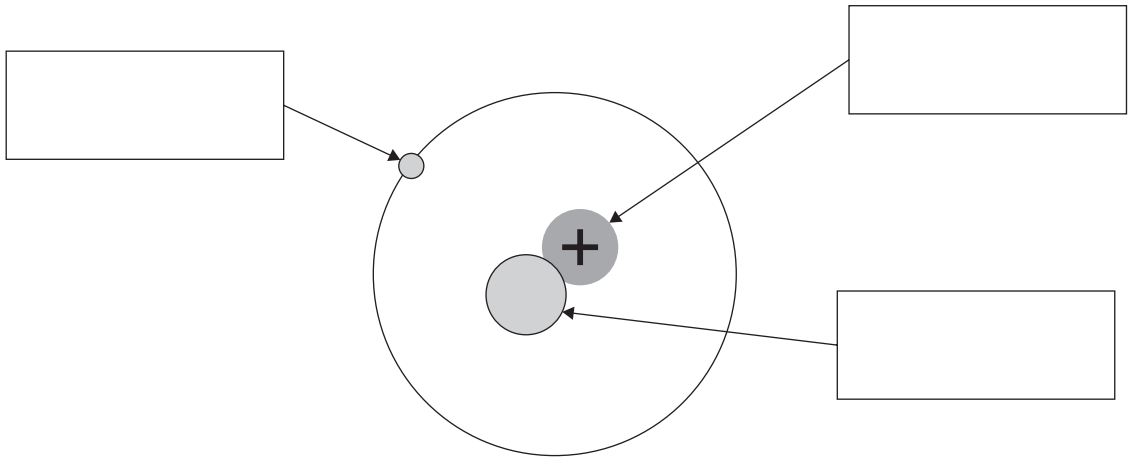
_____

_____ [2]

[Turn over

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

(i) Name the particles that make up the atom by writing the names in the boxes below.



Source: Principal Examiner

[3]

The atom above is an isotope of hydrogen.

(ii) Explain in terms of particles what an isotope is.

_____

_____

_____ [2]

(iii) The notation ${}^{A}_{Z}X$ describes the structure of any nucleus.

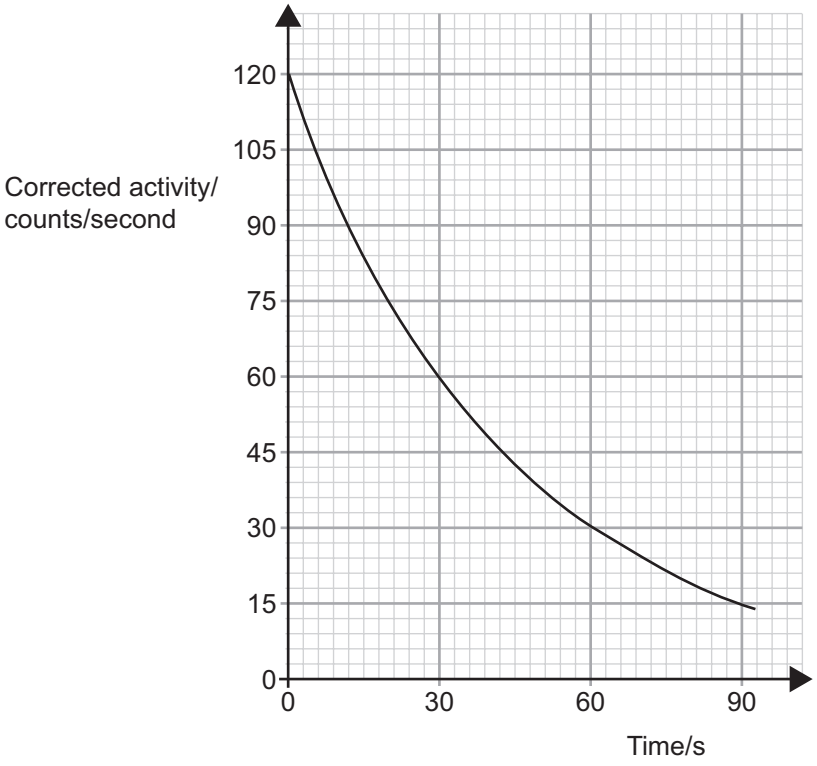
What does A tell us about the nucleus?

_____

What does Z tell us about the nucleus?

_____ [2]

(b) The graph below shows how the activity of a radioactive source changes with time.
The measurements of activity have been corrected for background activity.



(i) Describe how the measurements of activity are corrected for background activity.

_____

_____ [1]

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

Half-life = _____ s [2]

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

Examiner Number