



Rewarding Learning

General Certificate of Secondary Education
2022–2023

Centre Number

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Candidate Number

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Double Award Science: Physics

Unit P1

Higher Tier



[GDW32]

GDW32

FRIDAY 24 FEBRUARY 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 nine** questions.

INFORMATION FOR CANDIDATES

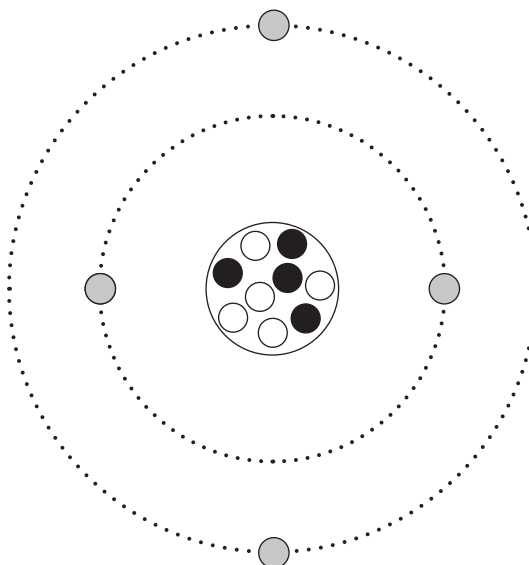
The total mark for this paper is 70.

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(a)**.



- 1 The diagram shows a **neutral** atom of an element X.



- (a) (i) State the mass number.

Mass number = _____

State the number of neutral particles.

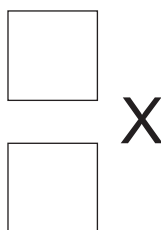
Number = _____

State the atomic number.

Atomic number = _____

[3]

- (ii) The nucleus of element X can be described using the notation below.
Insert the correct numbers in the two boxes.



[1]



(iii) If the neutral atom, X, is to become a positive ion what must happen to it?

_____ [2]

(b) What are isotopes? Give your answer in terms of **atomic number** and **mass number**.

_____ [2]

[Turn over]



2 (a) Radiation may be used in industry, medicine and agriculture.

Sources with different half-lives are used in each case below.

You are asked to consider the type of radiation emitted (alpha, beta or gamma) and in each case give a suitable half-life (long or short).

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

Radiation can be used to trace a leak in an underground pipe.
The detector is above ground.

Radiation emitted _____

Half-life _____

Smoke alarms are installed in many households.

Radiation emitted _____

Half-life _____

An isotope is injected into the bloodstream so that the flow of blood through the body can be monitored.

Radiation emitted _____

Half-life _____

_____ [6]

(b) Why do some nuclei disintegrate?

_____ [1]





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(Questions continue overleaf)



- 3 A speedboat moves with a **constant acceleration** of 3 m/s^2 .
The mass of the speedboat is 750 kg .



- (i) Calculate the resultant force acting on the speedboat.

You are advised to show clearly your working out.

Resultant force = _____ N [3]

- (ii) Calculate the weight of the speedboat.

You are advised to show clearly your working out.

Weight of speedboat = _____ N [2]



(iii) State what will happen to the speed of the boat when the size of the engine force is equal to the size of the resistive forces combined.

Tick (✓) the correct box below.

The speed will increase.

☐

The speed will be constant.

☐

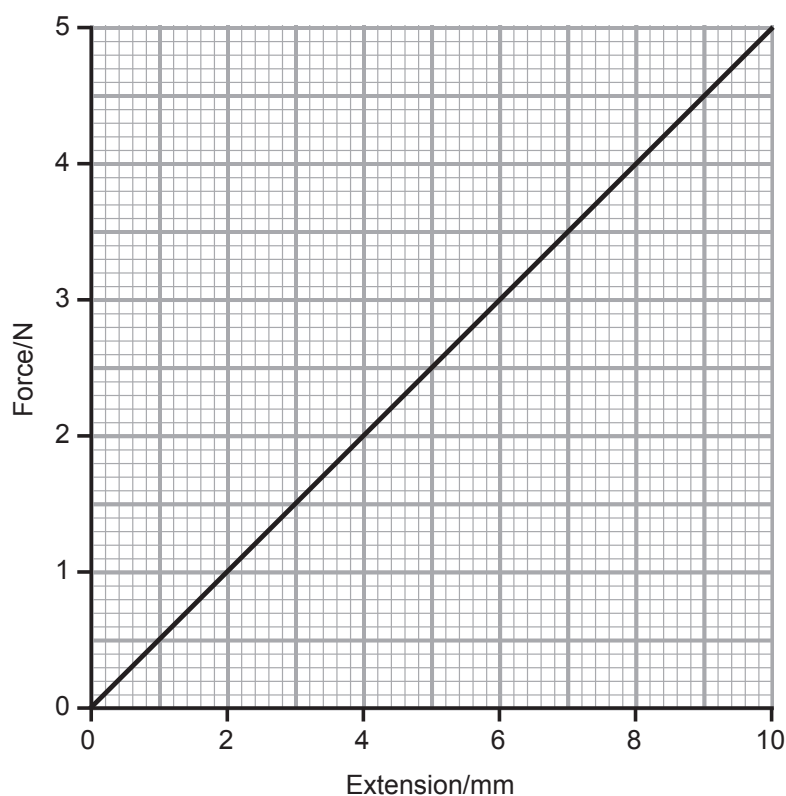
The speed will decrease.

☐

[1]



- 4 (i) A student carries out an experiment with a spiral spring to obtain readings of force and extension.
The graph of her results is shown.



Find the gradient of the graph and give its unit.

Do not change any units.

You are advised to show clearly your working out.

Gradient = _____

What property of the spring does the gradient represent?

[5]



- (ii) The student wants to find the extension of the **same** spring when the force is 16 N.

The spring has not reached the limit of proportionality when the force is 16 N.

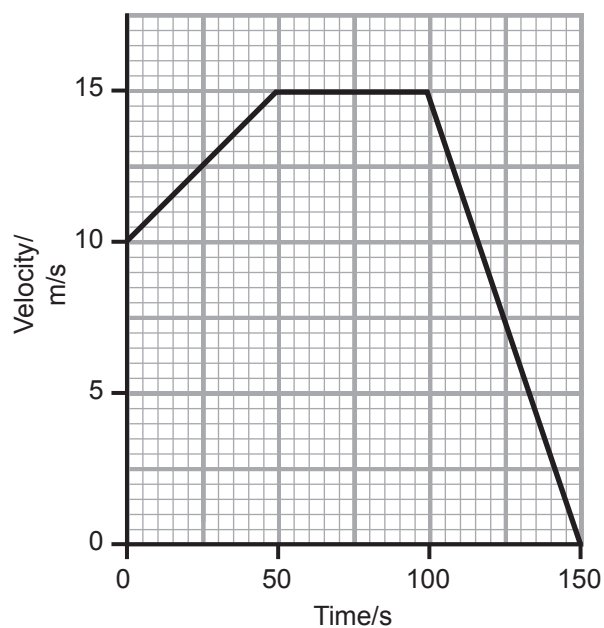
Use your answer to part (i) to find the extension of the spring when the force is 16 N.

You are advised to show clearly your working out.

Extension = _____ mm [3]



- 5 (a) The velocity-time graph for part of a car journey is shown below.



- (i) Calculate the acceleration of the car during the first 50 seconds.

You are advised to show clearly your working out.

Acceleration = _____ m/s² [4]



(ii) Calculate the total displacement of the car during the first 50 seconds.

You are advised to show clearly your working out.

Displacement = _____ m [4]

(iii) During the last 50 seconds the car has a negative acceleration.

Explain what is meant by negative acceleration in terms of velocity.

_____ [1]

(b) Quantities can be scalar or vector.

Tick (✓) the boxes below to show which quantities are vectors.

Quantity	Vector
Energy	
Acceleration	
Velocity	
Speed	

[2]

[Turn over



- 6 A box is placed on a table.
The box has a weight of 40 N and the table weighs 160 N.
The total pressure exerted on the floor is 25 N/cm².

- (i) Calculate the total area of the table legs in contact with the floor and give the correct unit.
Do not change any units.

You are advised to show your working out.

Total area = _____ [5]

- (ii) The box is replaced with another box of smaller mass. Explain fully what effect this will have on the pressure exerted on the floor.

The pressure will _____ because _____

_____ [3]



7 It takes 4 seconds and a power of 140 W to raise an object vertically.

(i) Calculate the work done in raising the object.

You are advised to show clearly your working out.

Work done = _____ J [3]

(ii) On another occasion, 35 J of work is done in raising the object.
The object, which has a mass of 0.7 kg, now falls.

Calculate the velocity with which it hits the ground.

Assume no energy losses.

You are advised to show clearly your working out.

Velocity = _____ m/s [3]

[Turn over]



8 This question is about radioactivity.

- (a) Steps should be taken to minimise the risk to those handling radioactive sources.

State three different ways in which these risks could be minimised.

1. _____
2. _____
3. _____ [3]

- (b) (i) Explain the meaning of half-life.

_____ [2]

- (ii) The background activity in a laboratory is measured to be 7 counts per minute (cpm).

When a radioactive source is brought into the laboratory, the total activity including background is 367 cpm.

This value then decreases to 52 cpm in 1 hour.

By first finding the initial and final activities due to the radioactive source alone, calculate its half-life.

You are advised to show clearly your working out.

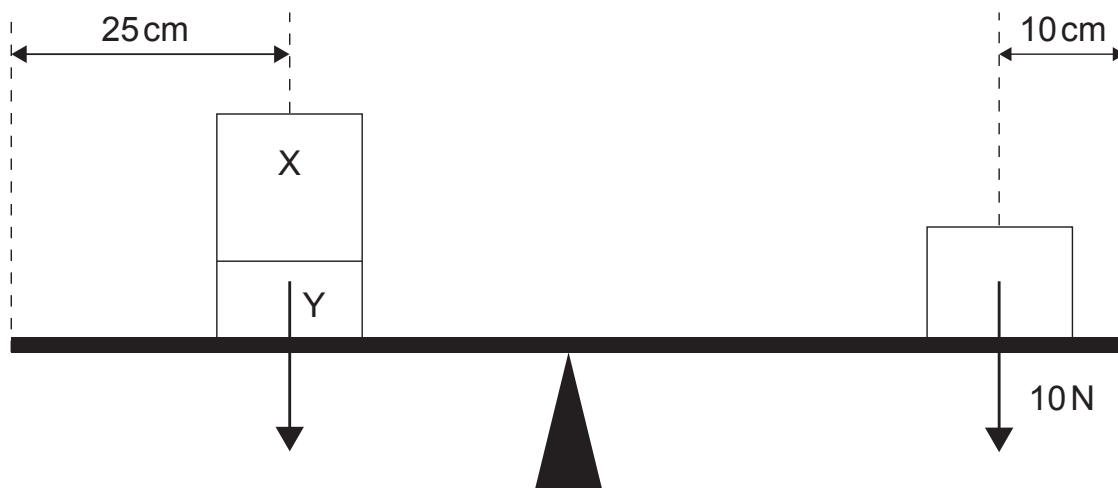
Half-life = _____ minutes [4]



9 (a) What is meant by the term centre of gravity?

[2]

(b) A metre rule is **balanced** at the mid-point with three boxes as shown.



Box Y has a weight of 11.0 N and is placed directly below box X.

Calculate the weight of box X.

You are advised to show clearly your working out.

Weight of box X = _____ N [5]



Sources:

Q1 *Principal*

Q3 © *Getty Images*

Q5(a) *Principal Examiner* .

Q9(b) *Principal Examiner*

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**For Examiner's
use only**

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	

Total Marks	
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Examiner Number

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