



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

THURSDAY 25 MAY 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 1.

14010



20GDW3201

1 Atoms are made of protons, neutrons and electrons.

For each of these particles, state:

- their location within the atom;
- their relative mass.

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

Proton: _____

Neutron: _____

Electron: _____

[6]



2 This question is about nuclear fission.

(i) Name a suitable fuel for nuclear fission.

_____ [1]

(ii) State fully what must happen first for a nucleus to undergo fission and state **two** things, **other than energy**, that are produced as a result.

_____ [4]

(iii) A nuclear fission reaction can cause many further fissions to happen. What is the name given to this process?

_____ [1]

(iv) A major incident at a nuclear power plant could cause huge economic, health and environmental damage.

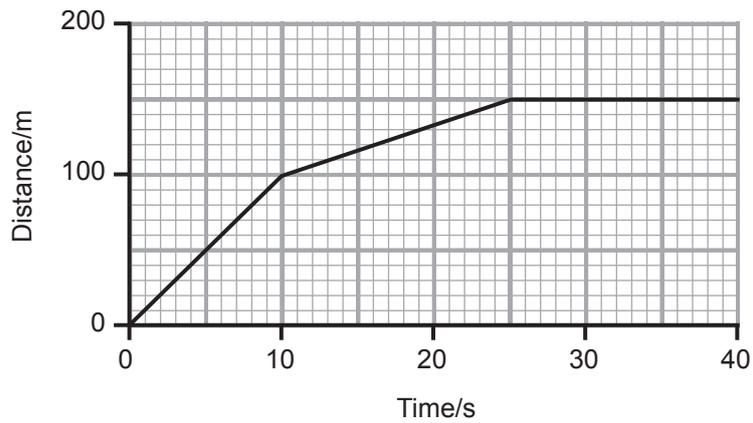
Name a country in which such an incident has occurred.

_____ [1]

[Turn over



3 The graph of distance against time for part of a motorbike journey is shown below.



(i) During which time period is the motorbike travelling the fastest?

From _____ to _____ s

Give a reason for your answer.

Describe the motion of the motorbike from 25 to 40 seconds.

_____ [3]



(ii) Use values from the graph to calculate the average speed of the motorbike during the time period from 10 to 25 seconds.

Give your answer to one decimal place.

You are advised to show your working out.

Average speed = _____ m/s [5]

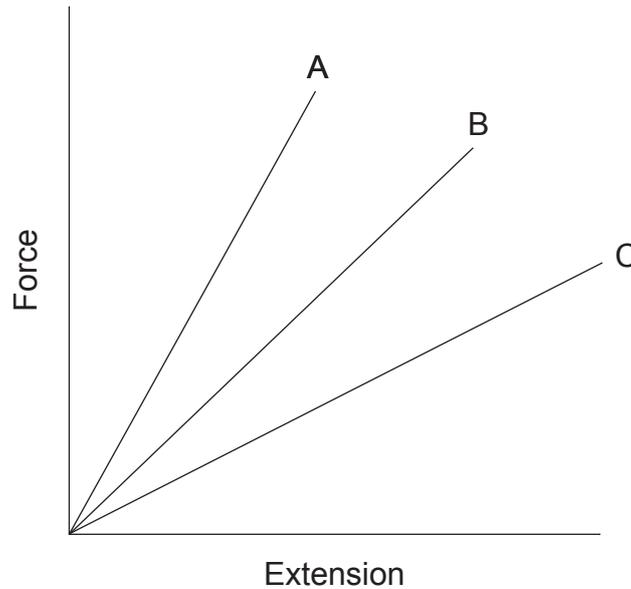


- 4 (a) Hooke's Law states the relationship between the force applied and the extension of a spring, provided that a certain point is not exceeded.

What is the name of this point?

_____ [1]

- (b) A graph of force against extension for three different springs is shown below.



State which spring you would expect to have the **smallest** spring constant and give a reason for your choice.

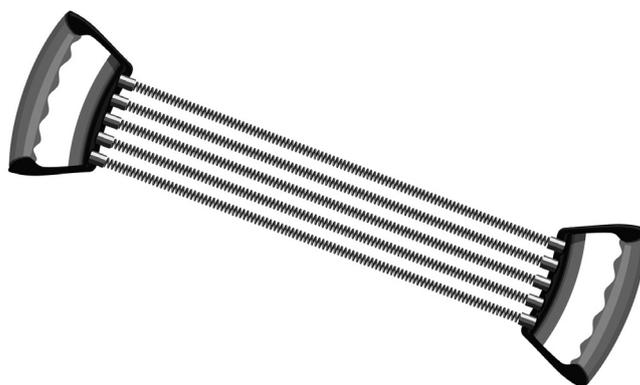
Spring _____

Reason _____

_____ [2]



(c) A piece of gym equipment has five identical springs.



Each spring has an unstretched length of 50 cm.

A stretching force of 60 N is applied and this force is **shared equally** by all five springs.

Each spring extends to a length of 58 cm.

Calculate the spring constant of **one** of the springs and give its unit.

Do not change any units.

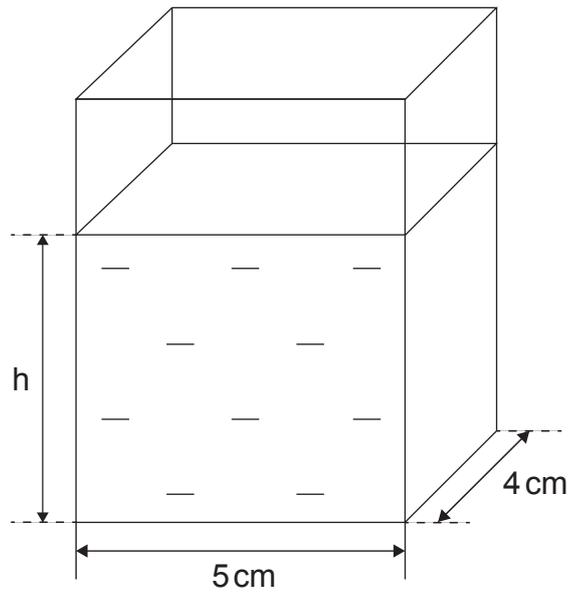
You are advised to show your working out.

Spring constant = _____ [5]

[Turn over



5 (a) A liquid is stored in a container.



The density of the liquid is 0.8 g/cm^3 .

The mass of the liquid is 96 g.

The dimensions of the base of the container are shown.

By first finding the volume of the liquid, calculate the height, h , of the liquid in the container.

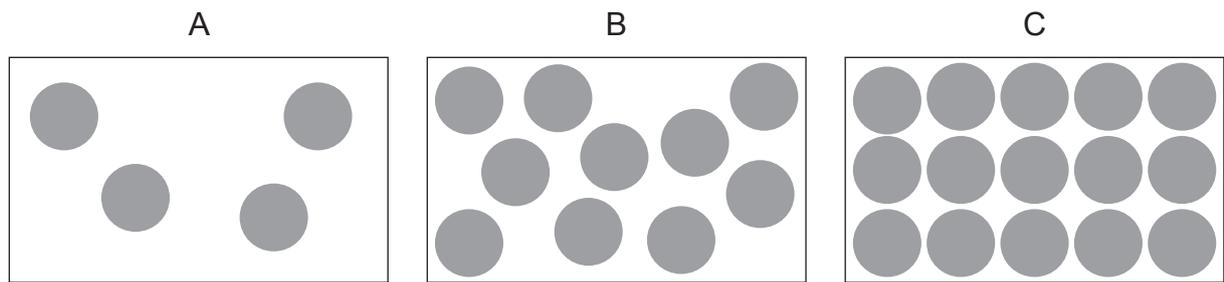
Do not change any units.

You are advised to show your working out.

Height, $h =$ _____ cm [5]



(b) Three molecular arrangements are shown below.



Which molecular arrangement, A, B or C could represent a solid?

Molecular arrangement _____

Which molecular arrangement, A, B or C could represent a liquid?

Molecular arrangement _____ [2]



6 (a) A man performs pull-ups on a bar.



He raises himself by 60 cm in one pull-up.
He has a mass of 65 kg.

Calculate the work done in one pull-up.

You are advised to show your working out.

Work done = _____ J [4]



- (b) On another occasion the man produces 280 W of power while doing pull-ups for 2 minutes.

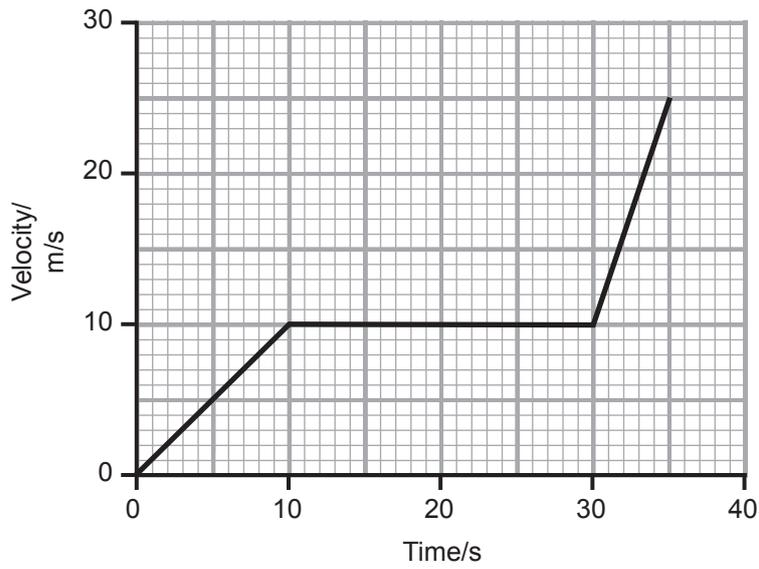
Calculate the work done by the man during this time.

You are advised to show your working out.

Work done = _____ J [4]



7 A new sports car is taken for a test drive. Part of its velocity–time graph is shown.



(a) (i) Calculate the displacement of the car during the first 30 seconds of its journey.

You are advised to show your working out.

Displacement = _____ m [4]



- (ii) Calculate the acceleration of the car when the resultant force acting on it is a maximum.

You are advised to show your working out.

Acceleration = _____ m/s² [4]

(b)



The resultant force acting on a different car and its driver is 1800 N.
The acceleration is 1.5 m/s².
The driver has a mass of 75 kg.

Calculate the mass of the car.

You are advised to show your working out.

Mass of car = _____ kg [4]

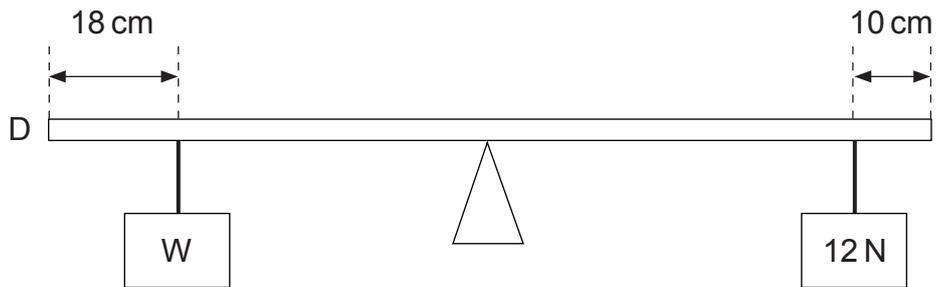
[Turn over



8 (a) State the Principle of Moments in words.

[3]

(b) The metre rule shown is balanced at its mid-point under the action of two forces.



Calculate the weight, W.

You are advised to show your working out.

Weight, W = _____ N [3]





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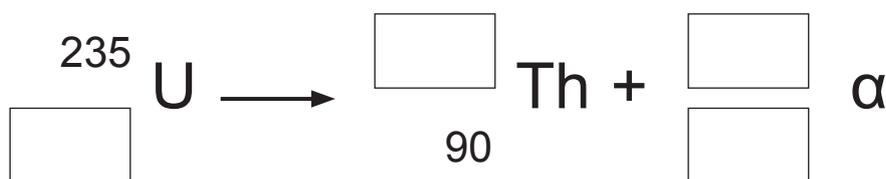
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9 (a) A radioactive element, U, decays to another element, Th, by emitting radiation.

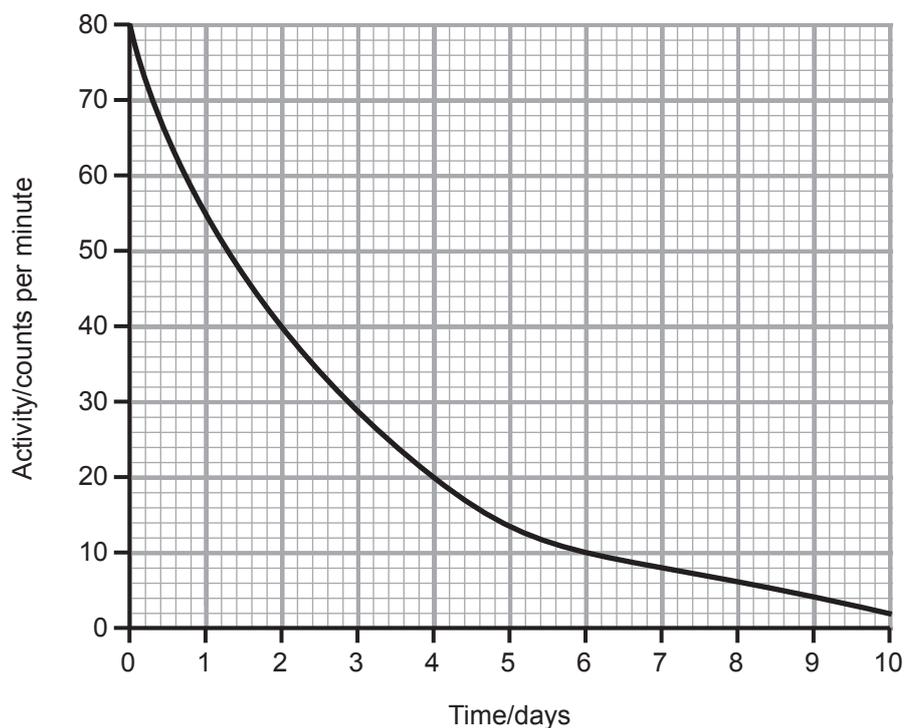
Complete the equation for this decay by inserting the numbers in the boxes.



[4]



(b) The graph below shows how the activity of a radioactive substance varies with time.



At the beginning (Time = 0 days) there are 30 000 undecayed nuclei.

Use the graph to find how long it takes for the number of undecayed nuclei to fall to 3750.

You are advised to show your working out.

Time = _____ days [4]

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Question Number	Marks
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Total Marks	
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Examiner Number

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