



General Certificate of Secondary Education
2023–2024

Centre Number

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Candidate Number

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Double Award Science: Physics

Unit P1

Higher Tier



[GDW32]

GDW32

WEDNESDAY 15 NOVEMBER 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.



- 1 This question is about the densities of solids, liquids and gases and the distances between the particles in each state of matter.

Which state of matter generally has the lowest, intermediate (middle) and highest density?

Describe the average distance between the particles in each state.

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

Lowest density

State of matter with lowest density:

Average distance between the particles (smallest, intermediate or largest):

Intermediate density

State of matter with intermediate density:

Average distance between the particles (smallest, intermediate or largest):

Highest density

State of matter with highest density:

Average distance between the particles (smallest, intermediate or largest):

[6]



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(Questions continue overleaf)

14135

[Turn over



16GDW3203

- 2 (a) An object is travelling at a constant speed in a straight line.
The forward force acting on the object is 55 N.

What is the size of the backward force acting on the object?

Backward force = _____ N

The forward force on the object remains at 55 N and the backward force changes to 40 N.

What is the size of the resultant force acting on the object?

Resultant force = _____ N [2]



- (b) (i) A van is driven in a straight line along a road.



The van and its contents have a mass of 2300 kg.
There is a resultant force of 4830 N acting on the van.

Calculate the acceleration of the van.

You are advised to show your working out.

Acceleration = _____ m/s² [3]

- (ii) The resultant force acting on the van **decreases** by half.

How will this affect the acceleration of the van?

Place a tick (✓) in the correct box.

acceleration doubles

☐

acceleration halves

☐

acceleration stays the same

☐

[1]

[Turn over



- 3 (a) An object of mass 1 kg is placed on a table.

What is the name given to the force due to the pull of gravity on the object?

What is the size of this force acting on the 1 kg object?

Force = _____ N [2]

- (b) (i) A pram is pushed along a path.



The pram is pushed with a constant force of 40 N and 1200 J of work is done.

Calculate the distance moved by the pram.

You are advised to show your working out.

Distance = _____ m [3]



- (ii) 1200 J of work is done in pushing the pram for one minute.

Calculate the power produced during this time.

Include the unit in your answer.

You are advised to show your working out.

Power = _____ [5]

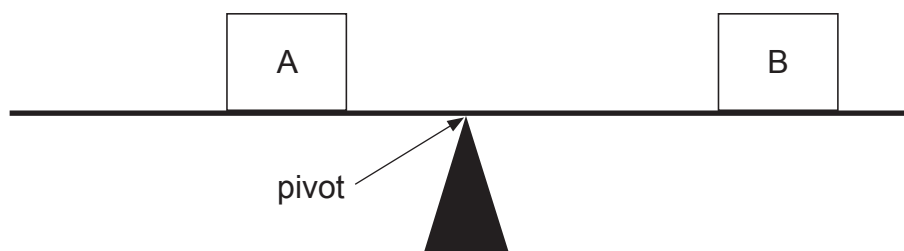
- (iii) Use your answer to (b)(ii) to state how many joules of energy are transferred per second.

Energy transferred per second = _____ J [1]

[Turn over]



- 4 (a) A uniform metre rule with boxes A and B is balanced at its midpoint as shown below.



- (i) Which box, A or B, has the greater mass?

The moment produced by box A is 12 Ncm.

What is the size and direction of the moment produced by box B?

Size = _____ Ncm

Direction = _____ [3]

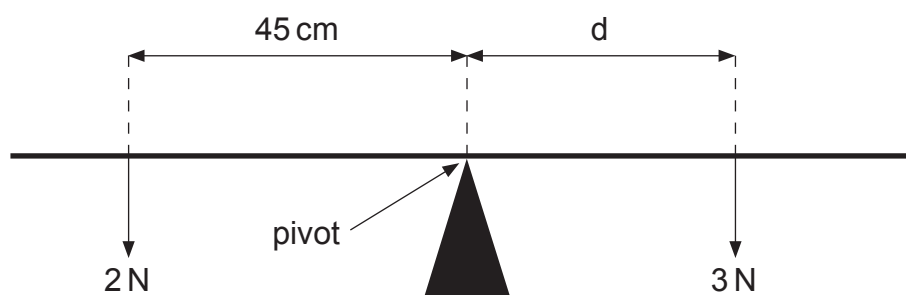
- (ii) Box A is moved closer to the pivot.

In which direction should box B be moved so that the metre rule remains balanced?

_____ [1]



(b) Another uniform metre rule is balanced at its midpoint as shown below.



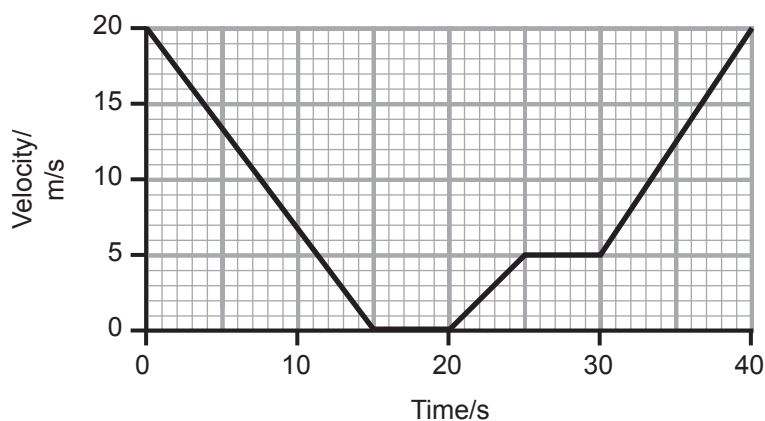
Use the Principle of Moments to calculate the distance, d , between the 3 N force and the pivot.

You are advised to show your working out.

Distance, d = _____ cm [4]



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



- (i) Calculate the total displacement of the car during the time period 0 to 15 seconds.

You are advised to show your working out.

Displacement = _____ m [3]

- (ii) Describe the motion of the car during the time period 25 to 30 seconds.

During which time period is the car stationary?

From _____ to _____ s [2]



(iii) Calculate the acceleration of the car during the time period 30 to 40 seconds.

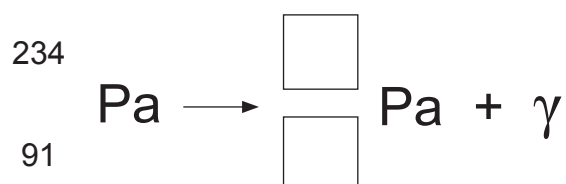
You are advised to show your working out.

Acceleration = _____ m/s² [4]



6 Radioactive nuclei decay to become more stable.

- (a) Complete the following decay equations by inserting numbers into the square boxes and the correct symbol into the circle.



[6]

- (b) The activity of a radioactive source falls from 800 counts per minute to 100 counts per minute after 87 years.

Calculate the half-life of the radioactive source.

You are advised to show your working out.

Half-life = _____ years [3]



7 Nuclear fusion has the potential to solve the energy needs of the world.

- (i) Name two different isotopes of hydrogen that could be used for nuclear fusion. State the major natural source of these isotopes and the name of the main by-product of the fusion reaction.

Isotopes used for fusion:

_____ and _____

Source: _____

By-product: _____ [4]

- (ii) Nuclear fusion is the source of energy for which group of objects in the Universe?

_____ [1]

- (iii) How many times more energy, per kg of fuel, does nuclear fusion release compared to burning coal?

_____ [1]

- (iv) State two major difficulties that must be overcome before nuclear fusion can be used to produce energy on a commercial scale on Earth.

1. _____

2. _____ [2]

[Turn over



- 8 (i) The average velocity for the first part of a car journey is 12 m/s.
The displacement is 3.12 km.

Calculate the time taken for the car journey.

You are advised to show your working out.

Time = _____ s [4]

- (ii) The car then completes the journey by returning to its original starting position.

What is the displacement and the average velocity of the car for the **entire** journey?

Displacement = _____ m

Average velocity = _____ m/s [2]



- 9 A bird hovers above the sea before diving downwards.



The bird has a mass of 6 kg and is initially at a height of 8 m above the water.

During its dive through the air, the bird **loses 10% of its initial energy**.

By first finding its initial gravitational potential energy, calculate the velocity of the bird as it enters the water.

You are advised to show your working out.

Velocity = _____ m/s [7]

THIS IS THE END OF THE QUESTION PAPER



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Q4(a) Principal Examiner

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Question Number	Marks
1	
2	
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Total Marks	
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Examiner Number

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