



General Certificate of Secondary Education
2024–2025

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

Double Award Science: Physics

Unit P1

Higher Tier



[GDW32]

GDW32

WEDNESDAY 13 NOVEMBER 2024, 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 and use a dark HB pencil for drawings and graphs.

Do not write with a gel pen.

Answer **all ten** 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.

You may use a scientific calculator.

Quality of written communication will be assessed in Question 4.

14851



20GDW3201

- 1 (a) Some concrete paving slabs are shown below.



The concrete used has a density of 2400 kg/m^3 and the volume of a single slab is 0.02 m^3 .

Calculate the mass of a single slab.

Show your working out.

Mass of a slab = _____ kg [3]



- (b) Metal rods are made by pouring hot liquid metal into a mould and allowing it to cool and become solid metal.

Place a tick (✓) in the correct box to complete the statements below.

The density of liquid metal is

greater than the density of solid metal.

☐

the same as the density of solid metal.

☐

less than the density of solid metal.

☐

The distances between the particles in liquid metal are

greater than the distances between the particles in solid metal.

☐

the same as the distances between the particles in solid metal.

☐

less than the distances between the particles in solid metal.

☐

[2]

[Turn over



- 2 A plane flies in a straight line at a constant height.



- (i) The plane **accelerates** forwards.
How do the forward and backward forces compare?

Tick (✓) the correct box.

The forward force is greater than the backward force.

☐

The forward force is smaller than the backward force.

☐

The forward force is the same size as the backward force.

☐

If the forward force acting on the plane is positive, how would the backward force be described?

Tick (✓) the correct box.

positive

☐

negative

☐

neutral

☐

What is the name of the backward force that opposes the motion of the plane?

_____ [3]



- (ii) The plane remains at a **constant height**.
How do the upward and downward forces compare?

Tick (✓) the correct box.

The upward force is greater than the downward force.

☐

The upward force is smaller than the downward force.

☐

The upward force is the same size as the downward force.

☐

[1]

- (iii) The weight of the plane is 7570 N.

Calculate the mass of the plane.

Show your working out.

Mass = _____ kg [3]

[Turn over]



- 3 A helicopter is used to lift a load.



The helicopter has a mass of 660 kg and the load has a mass of 470 kg.

The helicopter and load accelerate vertically upwards at 7 m/s^2 .

Calculate the resultant force acting on the combined helicopter and load.

Show your working out.

Resultant force = _____ N [4]



4 Some nuclei are radioactive and emit radiation.

Give the names of the **three** types of radiation and describe what each type consists of.

Write your answers in the appropriate spaces below.

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

Name of radiation _____

Consists of _____

Name of radiation _____

Consists of _____

Name of radiation _____

Consists of _____

_____ [6]

[Turn over



5 Radioactive decay can be described in terms of half-life.

(a) Explain the meaning of the term half-life.

[2]

(b) A radioactive isotope of thorium is known to have an activity of 3200 Bq.

When the radioactive isotope is brought into a laboratory, the **total** activity is measured to be 3218 Bq.

What is the value of background activity in the laboratory?

Background activity = _____ Bq [1]

(c) A sample of uranium-229 has a mass of 0.8 g.

After 174 minutes, the mass of the sample is found to have decreased to 0.1 g.

Find the half-life of uranium-229.

Show your working out.

Half-life = _____ minutes [3]





BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

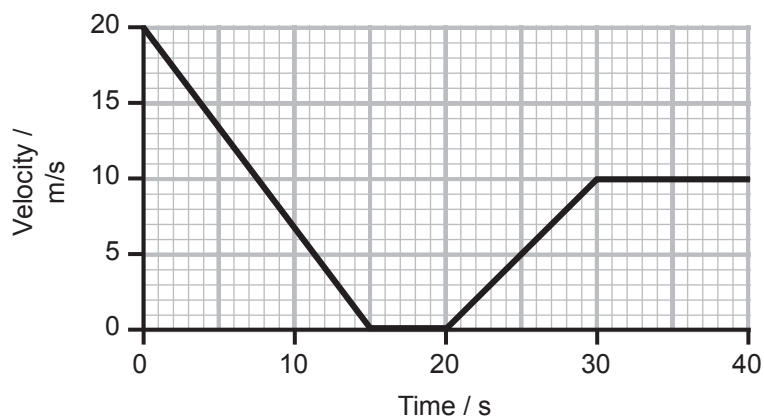
14851

[Turn over



20GDW3209

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



- (i) Describe the motion of the car during each of the time intervals listed below.

Calculations are not required.

0 to 15 seconds: _____

15 to 20 seconds: _____

20 to 30 seconds: _____

30 to 40 seconds: _____

[4]



(ii) Calculate the total displacement of the car during the time period 0 to 30 seconds.

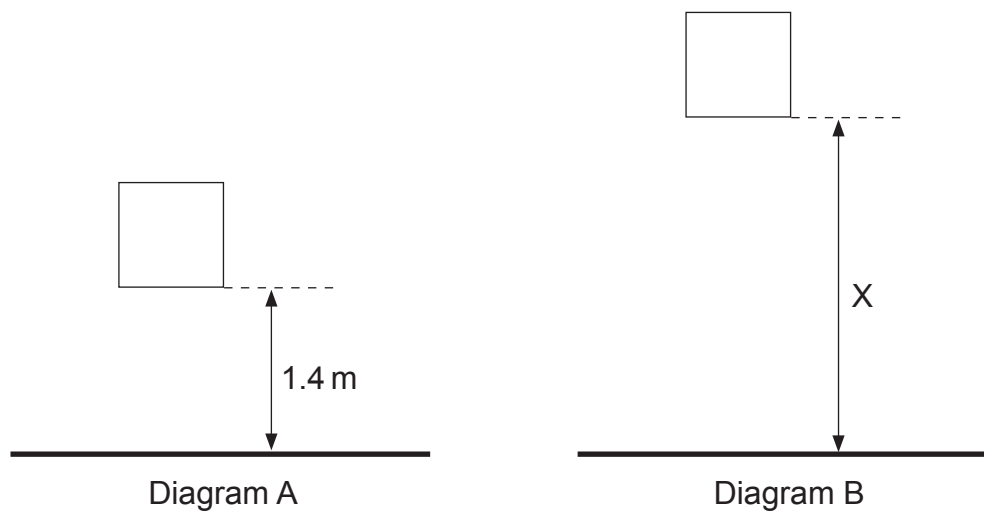
Show your working out.

Displacement = _____ m [4]

[Turn over



- 7 (a) A box is raised vertically to a height of 1.4 m, as shown in Diagram A below. It is then raised to a greater height, X, as shown in Diagram B.



The box has 36 J of gravitational potential energy at height, X, in Diagram B.

The box has a mass of 2 kg.

Calculate the **increase** in height between Diagram A and Diagram B.

Show your working out.

Increase in height = _____ m [4]



(b) Another box is raised vertically.

This box has a weight of 1.7 N.

Calculate the work done in raising the box to a height of 340 cm.

Give your answer to the nearest whole number.

Show your working out.

Work done = _____ J [5]

[Turn over



8 This question is about the particles that make up atoms.

(a) The nucleus of an atom can be described using the following notation:

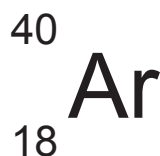


What does the letter A represent in the above notation?

What does the letter Z represent in the above notation?

[2]

(b) The nucleus of an argon atom is described below:



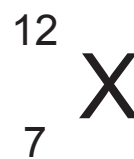
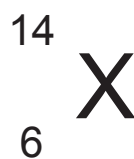
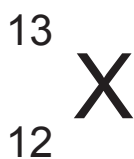
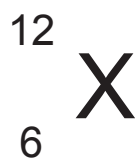
Complete the table below to show the number of each particle in the **nucleus** of the argon atom.

Particle	Number
Proton	
Neutron	
Electron	

[3]



(c) Some nuclei are described below:



Circle the **two** nuclei that represent isotopes of the same element.

Define an isotope, in **terms of the particles** that make up the nucleus.

[3]

[Turn over



9 This question is about nuclear energy.

(i) Name a suitable fuel for nuclear fission.

Is the energy obtained from nuclear fission renewable or non-renewable?

For nuclear fission to occur, a nucleus must first absorb a particle.
Name this particle.

_____ [3]

(ii) Nuclear fission releases energy. Name two other things produced by nuclear fission.

1. _____

2. _____

A single fission can go on to cause further fissions.
What is the name of this process?

_____ [3]

(iii) What is the major environmental disadvantage of generating electricity by nuclear fission?

_____ [1]

(iv) A nuclear **fusion** reaction produces 100 units of energy per kg of fuel.
How many units of energy would be released, per kg of fuel, in a nuclear fission reaction?

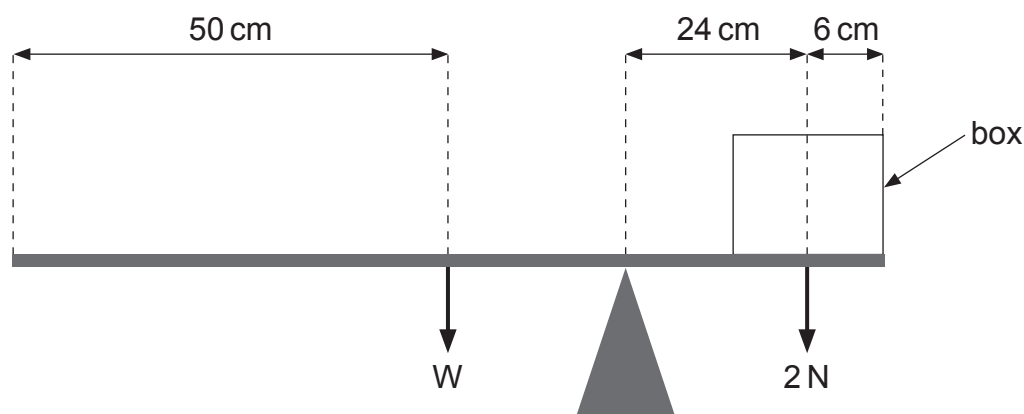
_____ units [1]



- 10 (i) Explain fully what is meant by the term centre of gravity.

[2]

A box is placed on a uniform metre rule so that it is balanced, as shown below.



- (ii) State, **in words**, the Principle of Moments and include a unit for the moment of a force.

Unit = _____ [4]

- (iii) Use the Principle of Moments to calculate the weight, W , of the metre rule.
Show your working out.

Weight, W = _____ N [3]



THIS IS THE END OF THE QUESTION PAPER

BLANK PAGE

DO NOT WRITE ON THIS PAGE





BLANK PAGE

DO NOT WRITE ON THIS PAGE

14851



20GDW3219

Sources:

Q1(a) . . ©Gettyimages

Q2. ©Gettyimages

Q3. ©Gettyimages

Q10(ii) . . *Principal Examiner*

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Total Marks	
-------------	--

Examiner Number

Permission to reproduce all copyright material has been applied for.

In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.

