Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Physics

GSD32

Unit P1
Higher Tier

[GSD32]

FRIDAY 26 FEBRUARY 2016, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
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 Questions **2** and **7(a)**.

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

Examiner Only	
Marks	Remark

1 **(a)** Three types of radiation, alpha, beta and gamma, may be emitted from radioactive sources.

Complete the table below by writing alpha, beta or gamma in the second column.

Can penetrate several cm of lead	
Consists of four particles	
Is a wave	
Comes from the nucleus and has a negative charge	

[4]

(b) **(i)** Explain, in detail, what is meant by half-life.

_____

_____

_____ [3]

(ii) When a radioactive substance is delivered to a laboratory its activity is 6000 counts per minute.

Complete the table below.

Activity/counts per minute	Number of half-lives
6000 (arrives)	0
	1
1500	
	4

[3]

2 Describe, in detail, the process of nuclear fission.

Your answer must include:

- the name of the fuel used;
- the name of the particle which starts the process;
- what happens in the fission process.

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

[6]

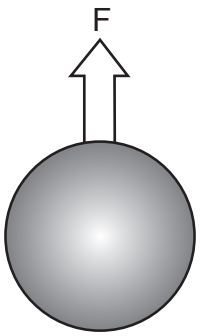
Examiner Only

Marks	Remark

3 When an object falls through the air a drag force, F, acts on the object.

Examiner Only

Marks	Remark



The size of the drag force, F, depends on the speed, v, of the falling object.
A scientist suggests that the drag force is proportional to the speed.

This suggestion may be written:

$$F = kv \qquad \textbf{Equation 3.1}$$

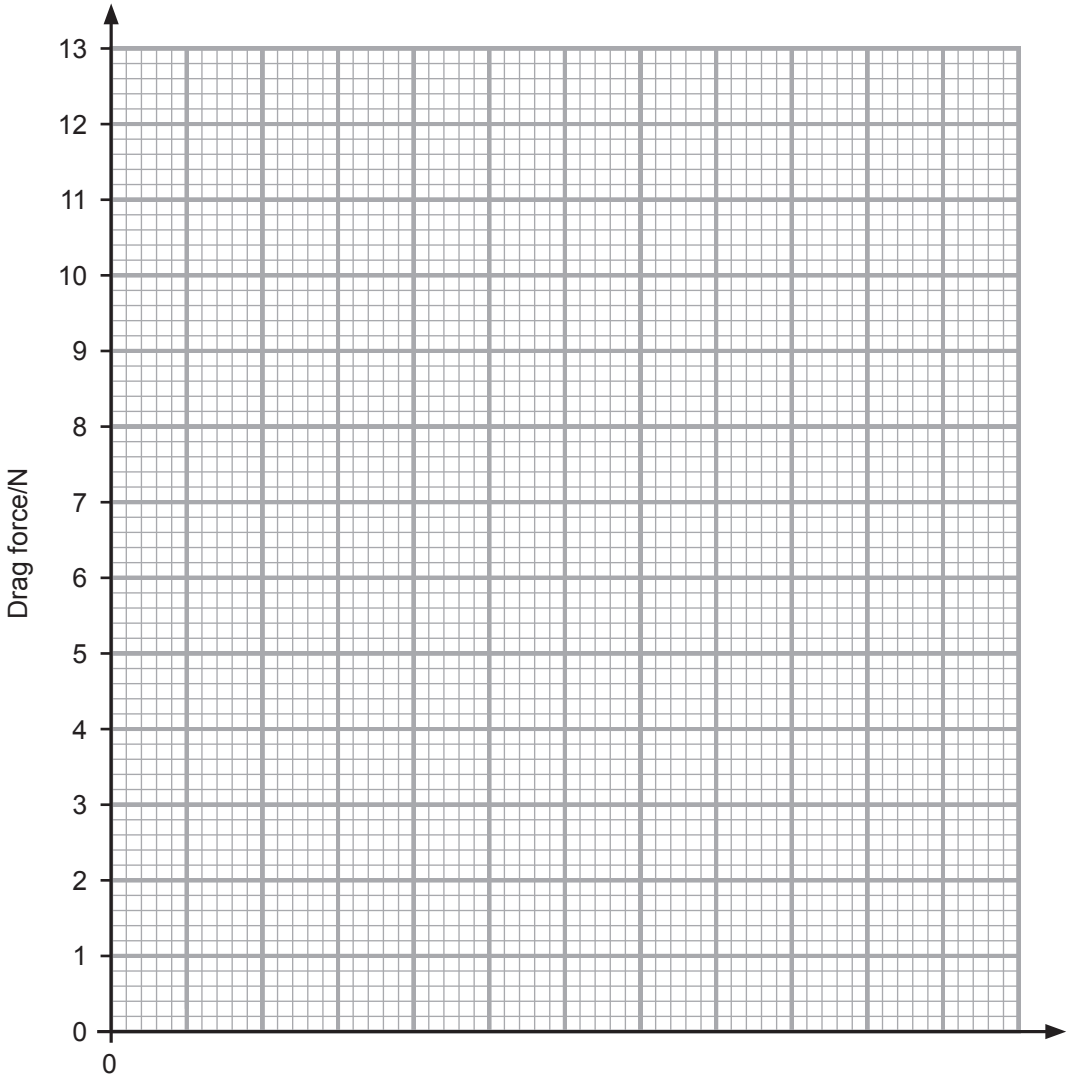
where k is a constant.

To test her theory she obtains a set of results and these are shown.

F/N	0.0	0.5	2.0	4.5	8.0	12.5
v/ m/s	0	1	2	3	4	5

You are asked to plot a graph of drag force F against speed, v.

(i) Choose a suitable horizontal scale and label the horizontal axis. [2]



(ii) Plot a graph of force against speed. [3]

(iii) From your graph, estimate the drag force when the speed is 4.5 m/s.

Drag force = _____ N [2]

(iv) Is the scientist correct to say that the force and speed are directly proportional? Circle the correct answer.

YES NO

Give a reason for your answer.

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

4 Nuclear fusion could help solve our energy needs.

(a) (i) Give one technical difficulty which must be overcome if we are to make use of fusion to supply energy.

_____ [1]

(ii) Where does fusion occur naturally?

_____ [1]

This part of the question is about a nuclear disintegration involving alpha (α) decay.

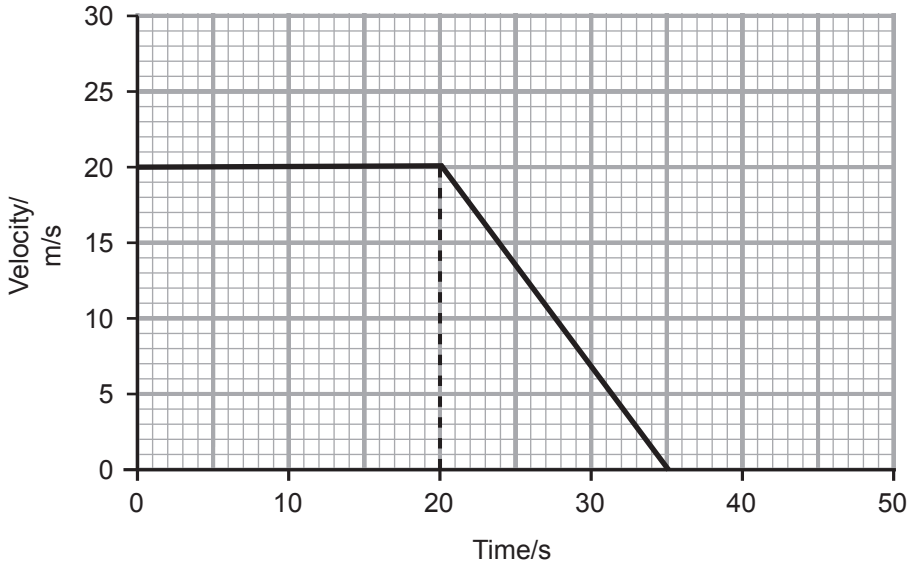
(b) Thorium undergoes alpha decay to radium.

Complete the nuclear equation for this disintegration.

$$^{232}_{90}\text{Th} \xrightarrow{\text{Alpha decay}} \,^{\square}_{\square}\text{Ra} + \,^{\square}_{\square}\alpha$$

[4]

5 Frank is driving a van at a constant velocity of 20 m/s and after 20 seconds he applies the brakes until the vehicle comes to rest.



(i) Calculate the displacement of the van from the instant the brakes are applied until it comes to rest.

You are advised to show your working out.

Displacement = _____ m [3]

(ii) State the acceleration of the van during the time interval 0 to 20 s.

_____ m/s^2 [1]

(iii) Calculate the acceleration of the van during the 20 to 35 s time interval.

You are advised to show your working out.

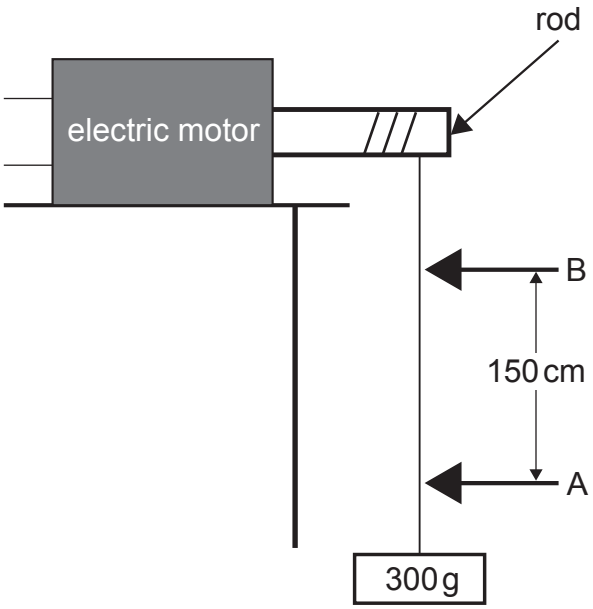
Acceleration = _____ m/s^2 [3]

Examiner Only

Marks	Remark

6 In an experiment with an electric motor, the apparatus below was set up.

Examiner Only	
Marks	Remark



Source: CCEA

As the rod turns, a mass of 300 g moves upwards at a steady speed.

(a) Find the tension in the string.

You are advised to show your working out.

Tension = _____ N [2]

(b) (i) Calculate the change in the potential energy of the 300 g mass as it rises through 150 cm, from marker A to marker B.

You are advised to show your working out.

Change in potential energy = _____ J [4]

(ii) How much work is done in raising this mass from marker A to marker B?

Work done = _____ J [1]

(c) The output power of a different motor is 0.9 W.

Calculate the time taken for this motor to do 36 J of work.

You are advised to show your working out.

Time = _____ s [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 **(a)** Describe an experiment to measure the density of a stone. In your description you must:

- list the apparatus you would use;
- state what you would do;
- state what measurements you need to take.

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

_____

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_____

_____ [6]

(b) Calculate the mass of a 1.60 m^3 block of iron, the density of which is 7.95×10^3 kg/m^3.

You are advised to show your working out.

Mass = _____ kg [3]

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(Questions continue overleaf)

8 A skydiver falls from a very tall building and during the first 4 seconds his average speed is 19 m/s.

(a) How far does the skydiver fall during this 4 second interval?

You are advised to show your working out.

Distance = _____ m [3]

Examiner Only	
Marks	Remark

(b) The skydiver accelerates downwards. The forces on the skydiver are shown in the diagram below.

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(i) Why does the skydiver accelerate downwards?

_____ [1]

(ii) The skydiver, who has a mass of 60 kg, accelerates downwards at 8 m/s^2. Calculate the size of the drag force.

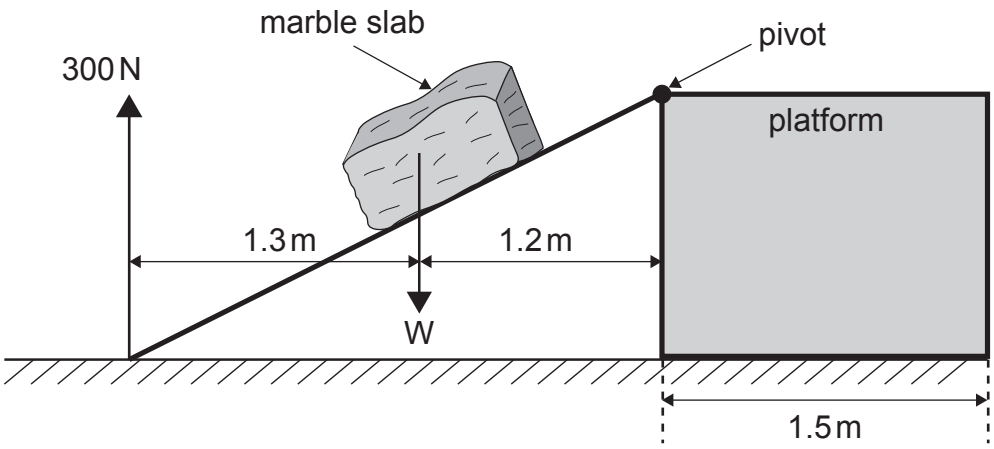
You are advised to show your working out.

Drag force = _____ N [4]

Examiner Only

Marks	Remark

9 A quarry worker has to lift a marble slab of weight W, so that it is level with a platform.



Source: CCEA

The quarry worker can exert a maximum force of 300 N, as shown in the diagram above.

(a) Calculate the maximum moment, about the pivot, that the quarry worker can produce with this 300 N force. Include the unit in your answer.

You are advised to show your working out.

Maximum moment = _____ [3]

Examiner Only

Marks	Remark

(b) Use the Principle of Moments to calculate the maximum weight of the marble slab that the quarry worker can lift, when it is in the position shown in the diagram.

You are advised to show your working out.

Maximum weight = _____ N [3]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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