Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Physics

GSD31

Unit P1
Foundation Tier

[GSD31]

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 eleven** 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 **10**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total Marks	

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Examiner Only	
Marks	Remark

1 Many devices change energy from one form to another. Complete the boxes below to show the main energy change which each device is **designed** to bring about. One box has been completed for you.

(i) Electric bulb

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Electrical energy	→	_____ energy

[1]

(ii) Match

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_____ energy	→	_____ energy

[2]

(iii) Loudspeaker

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_____ energy	→	_____ energy

[2]

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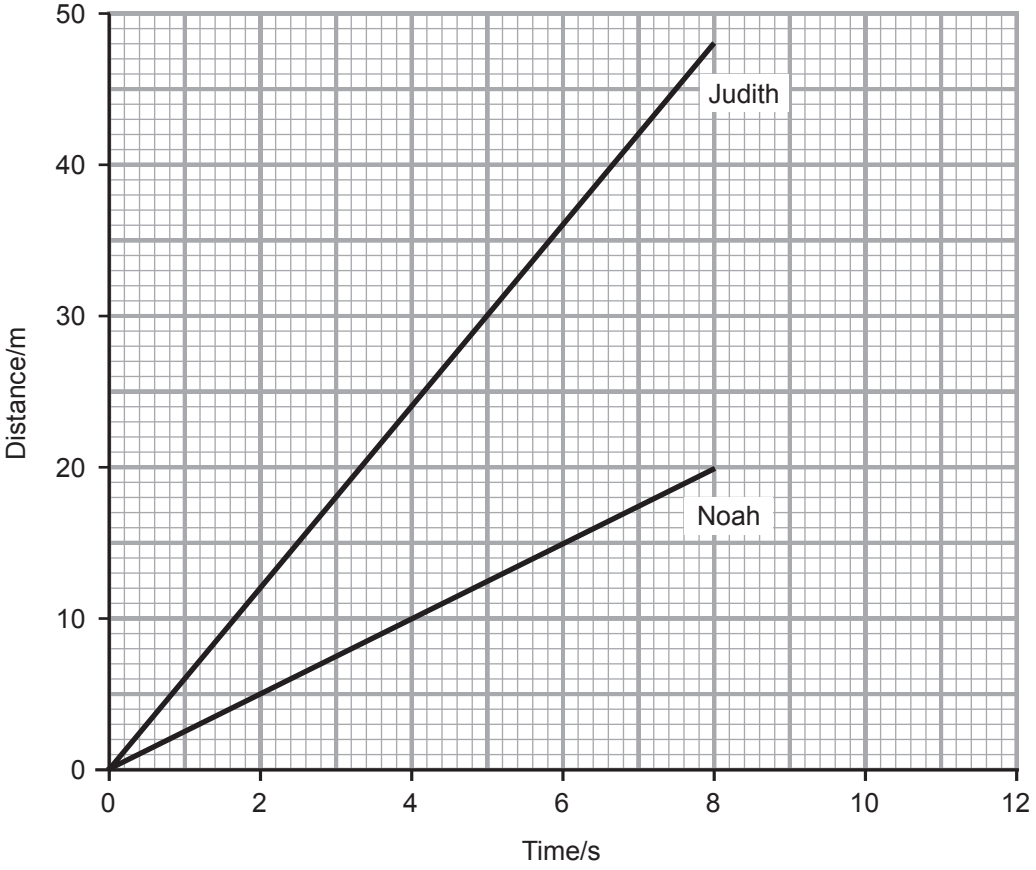
Marks	Remark

2 The graph below is the distance–time graph for two cyclists, Judith and Noah.



(i) How far has Judith cycled in 8 seconds?

Distance = _____ m [1]

(ii) How far apart are Judith and Noah after 8 seconds?

You are advised to show your working out.

Distance apart = _____ m [2]

(iii) Use the graph to find Judith's speed.

You are advised to show your working out.

Speed = _____ m/s [3]

(iv) Noah stops cycling after eight seconds. Complete the distance–time graph for Noah up to twelve seconds. [1]

Examiner Only	
Marks	Remark

3 Stephen parachutes from a plane. Air resistance causes a friction force on his parachute.

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(a) Mark with an arrow in the box on the diagram, the direction of this friction force. [1]

(b) A force of 850 N acts downwards on Stephen.
Put a tick (✓) in the correct box.

This force is caused by:

friction ☐

the weight of the atmosphere ☐

the attractive force between Stephen and the Earth ☐ [1]

Examiner Only

Marks	Remark

(c) Stephen falls at a steady speed.
Put a tick (✓) in the correct box.

The size of the friction force acting on the parachute is

equal to 850 N ☐

less than 850 N ☐

more than 850 N ☐ [1]

(d) The friction force decreases. Describe Stephen's motion when this happens.

_____ [1]

Examiner Only	
Marks	Remark

4 Energy resources may be described as renewable or non-renewable.

(i) Describe what is meant by a renewable energy resource.

_____

_____ [1]

(ii) In the table below put an R beside the energy resources which are renewable and N beside those which are non-renewable. One entry has been completed for you.

Energy resource	R or N
Oil	N
Wind	
Nuclear	
Solar	
Hydroelectric	

[4]

Examiner Only

Marks	Remark

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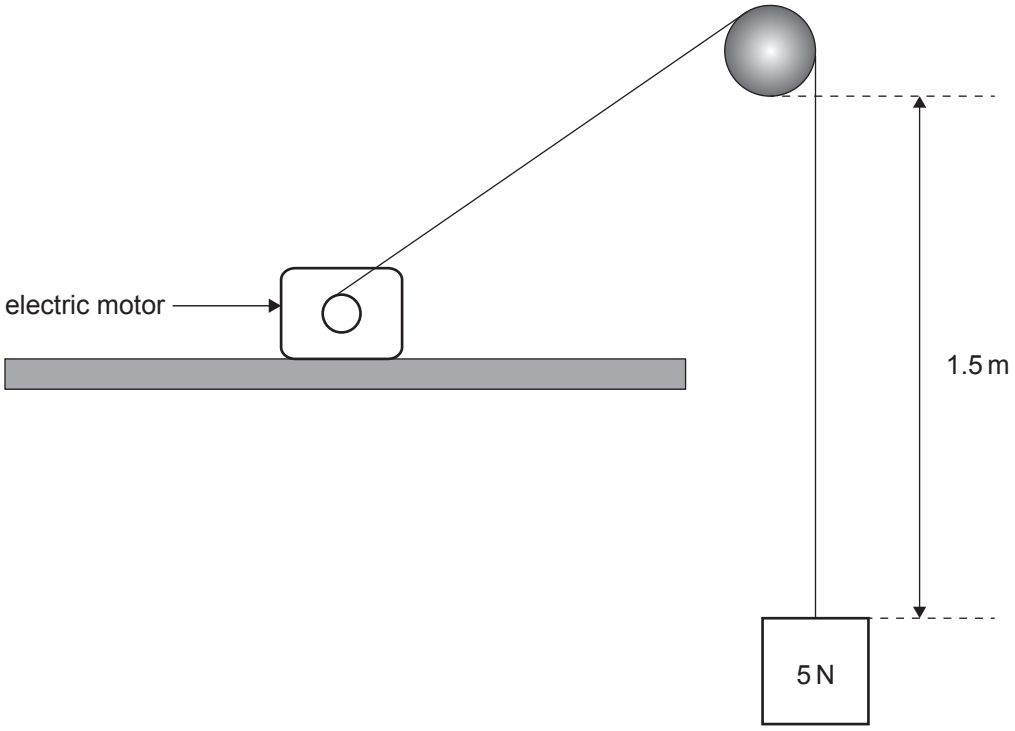
(Questions continue overleaf)

5 An electric motor is used to raise a weight of 5 N through a vertical height of 1.5 m.



Source: CCEA

(a) Calculate the work done by the electric motor.

You are advised to show your working out.

Work done = _____ J [3]

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Marks	Remark

(b) A different motor raises a load and does 20 J of useful work.
The electrical input energy is 25 J.

(i) Calculate the efficiency of the motor.

You are advised to show your working out.

Efficiency = _____ [3]

The load is raised in a time of 4 seconds.

(ii) Calculate the useful power output of the motor.
Remember to give the unit for power.

You are advised to show your working out.

Power = _____ [4]

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Marks	Remark

6 Two identical glasses, A and B, one containing liquid sit on a table.

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Marks	Remark

A

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B

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(a) (i) How does the stability of glass B compare with the stability of glass A? Tick (✓) the correct box.

A is more stable ☐

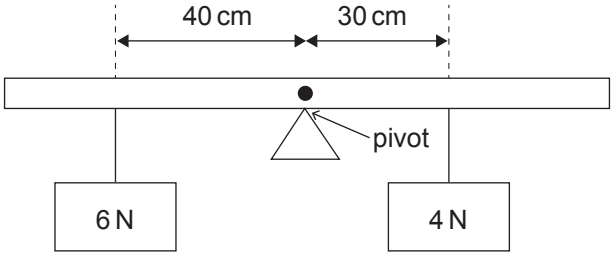
B is more stable ☐

both are equally stable ☐ [1]

(ii) Give a reason for your answer.

_____ [1]

The uniform lever shown below is pivoted at its midpoint. The lever is **unbalanced** and will rotate.



(b) (i) Give the reason why the lever will rotate.

_____ [1]

(ii) How far from the pivot should the 4 N weight be placed to balance the lever?

You are advised to show your working out.

Distance from pivot = _____ cm [4]

Examiner Only

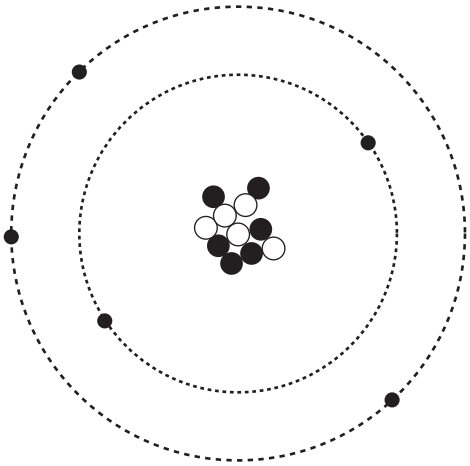
Marks	Remark

Examiner Only	
Marks	Remark

7 **(a)** Historically, different models for the structure of the atom have been proposed. What is the name of the current model?

_____ [1]

The diagram shows a neutral atom.



(b) Complete the table for this atom.

Mass number	
Number of neutrons	
Number of protons	
Atomic number	

[4]

8 The picture shows a satellite at a distance from the Earth.

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A force, called the centripetal force, acts on the satellite.

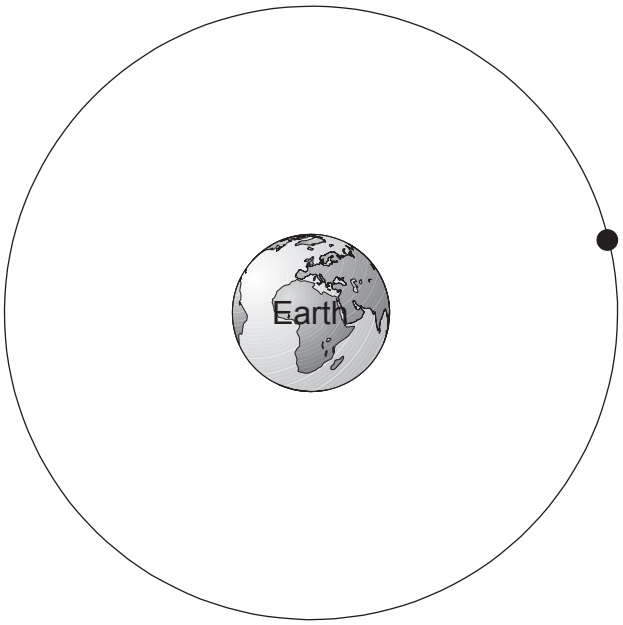
(i) What supplies the centripetal force in this case?

_____ [1]

(ii) What effect does this force have on the direction of the satellite's motion?

_____ [1]

(iii) Starting at the satellite, draw an arrow on the diagram below to show the direction of the centripetal force.



[1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

9 **(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]

10 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]

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Marks	Remark

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

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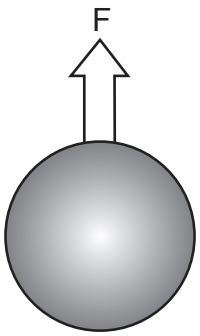
Marks	Remark



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:

$$F = kv \qquad \textbf{Equation 11.1}$$

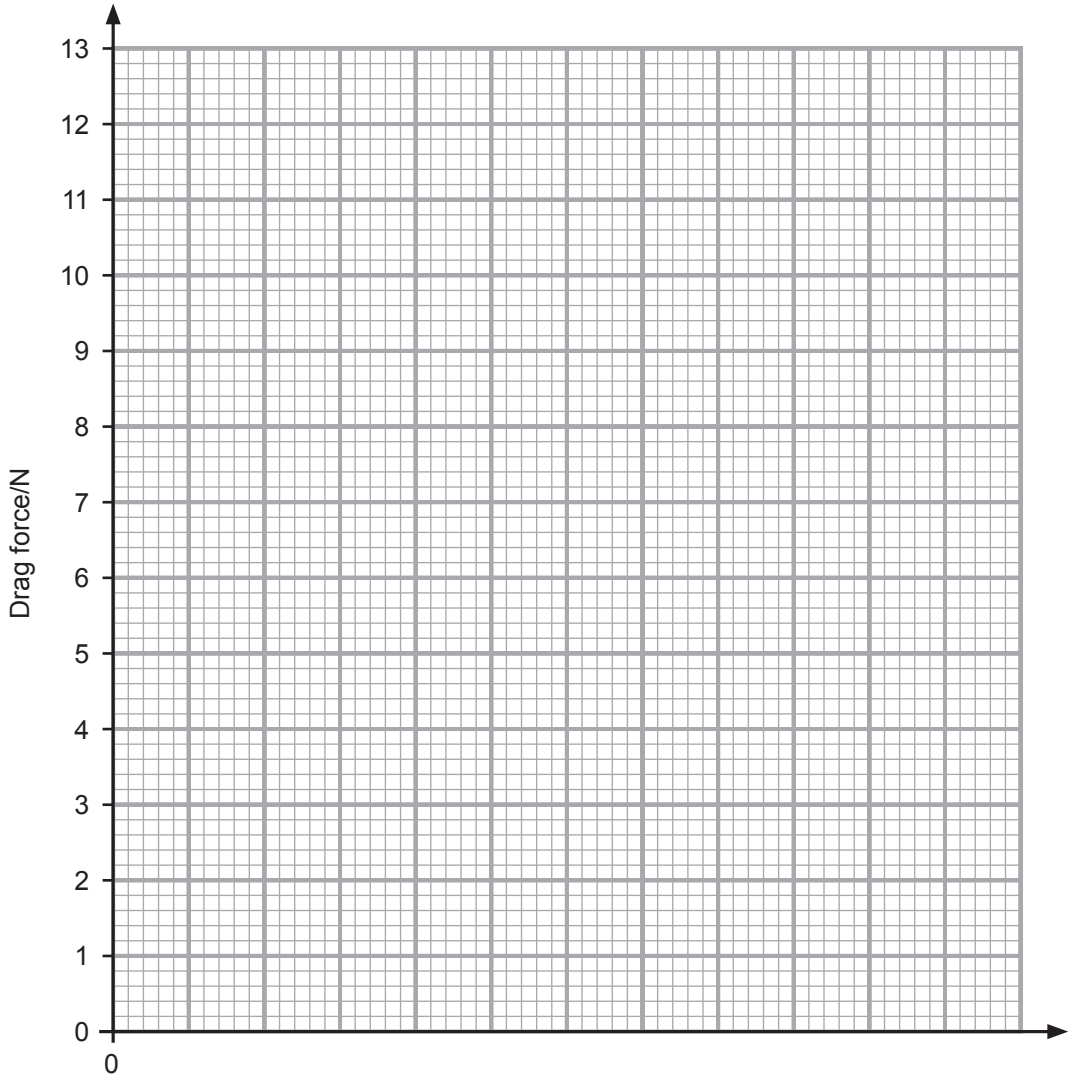
where k is a constant.

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]

THIS IS THE END OF THE QUESTION PAPER

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