Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Double Award Science: Physics

Unit P1
Higher Tier

ML

[GSD32]

FRIDAY 24 FEBRUARY 2017, MORNING

TIME

1 hour, plus your additional time allowance.

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 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.
Quality of written communication will be assessed in Questions **1** and **5**.

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

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1 This question is about **renewable** and **non-renewable** energy forms.

- Write down what is meant by each type of energy resource.
- Write down **two** examples of each type of energy resource.

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

Renewable _____

_____

_____

_____

_____

_____

_____

Non-renewable _____

_____

_____

_____

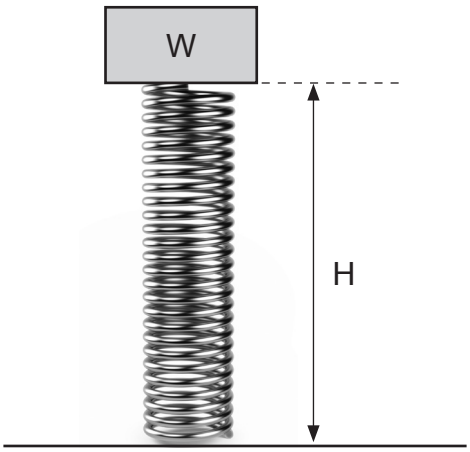
_____

_____

_____ [6]

Examiner Only	
Marks	Remark

2 Look at the diagram below. When a load, W, is added to a spring then the height, H, of the spring changes.



A pupil thinks that the height, H, is proportional to the load, W, according to the equation below:

$$H = kW \qquad \textbf{Equation 2.1}$$

where k is a constant.

She gets a number of readings for W and H. These are shown below.

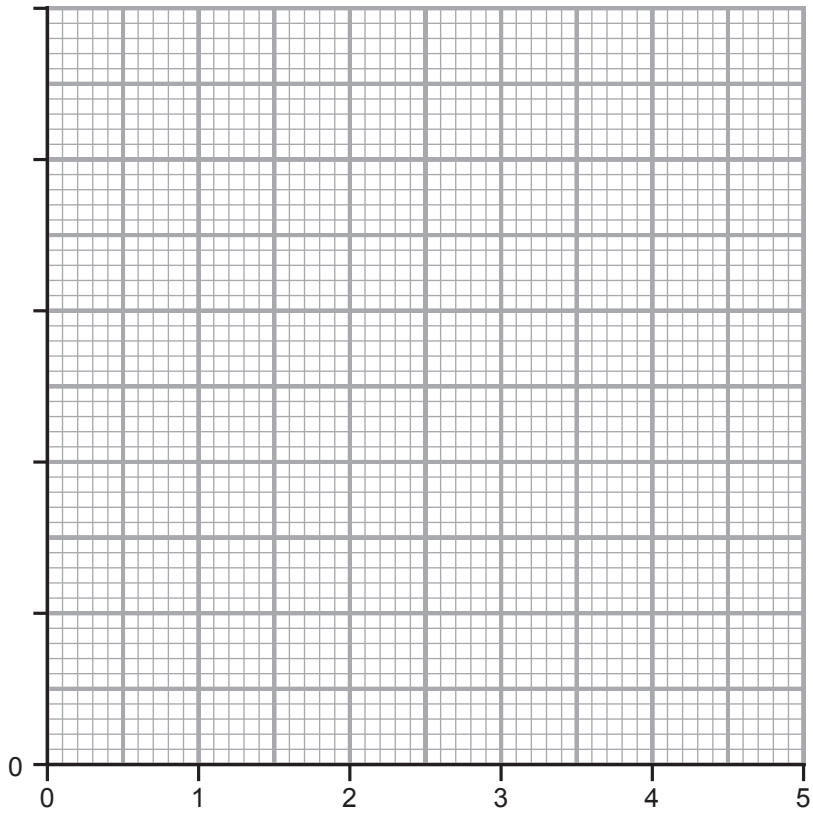
W/N	0	1	2	3	4
H/mm	100	80	60	40	20

Plot a graph of H (vertical axis) against W (horizontal axis).

(i) Choose a suitable scale for the vertical axis and label it. [2]

(ii) Plot the points on the grid. [2]

(iii) Draw the best fit line. [1]



(iv) Describe how the height, H, depends on the load, W.

_____ [1]

(v) Use your graph to find the original length of the spring. This is the length when no weight is added.

Original length = _____ mm [1]

(vi) Does your graph prove the theory described by **Equation 2.1**?

Yes / No Put a circle round your choice

Explain your answer.

_____ [1]

(vii) When the spring is actually used in a machine it **compresses by 30 mm** when a force is applied. Calculate the value of H, when the spring compresses by 30 mm.

H = _____ mm

Use this value of H and your graph to find the force that has been applied.

Load = _____ N [3]

Examiner Only	
Marks	Remark

3 Information about the particles that make up an atom can be shown in a table.

Fill in the missing answers in the table below for the three different particles.

Particle	Location	Charge
proton		
	nucleus	
	in orbit	

[6]

Examiner Only

Marks	Remark

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(Questions continue overleaf)

4 The nucleus of the element uranium is represented below.

$$^{235}_{92}U$$

Examiner Only	
Marks	Remark

(a) (i) What is the mass number of uranium?

Mass number = _____ [1]

(ii) How many neutrons does the uranium nucleus have?

Number of neutrons = _____ [1]

(iii) What is the total number of particles in the uranium nucleus?

Total number of particles = _____ [1]

(b) Uranium is formed when an unstable nucleus of plutonium (Pu) decays and emits an alpha particle.
Fill in the two boxes below for plutonium.

Remember the nucleus of uranium is shown by $^{235}_{92}U$

$$\begin{matrix}\square\\\square\end{matrix}Pu$$

[2]

Scientists hope to harness the energy of fusion to help solve our energy needs.

Examiner Only	
Marks	Remark

(c) (i) Complete the equation for the following fusion reaction.

$$ {}^{2}_{1}\mathrm{H} + {}^{3}_{1}\mathrm{H} \longrightarrow \square\!\!\square\,\mathrm{He} + {}^{1}_{0}\mathrm{n} $$

[2]

(ii) The two nuclei on the left-hand side of the above equation are isotopes.
Explain, in terms of particles, why they are isotopes.

_____

_____ [2]

5 Describe fully how you would measure the density of a liquid.
In your answer you must write about:

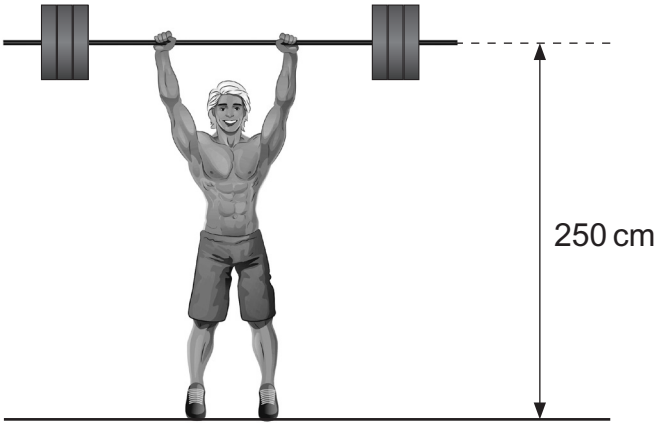
- the apparatus you would use,
- the measurements you would make,
- the equation you would use to find the density,
- one precaution you would take to obtain a reliable result.

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

[6]

Examiner Only	
Marks	Remark

6 A weightlifter lifts a bar with masses added to each side.



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The bar has a mass of 12 kg. 3 masses of 15 kg each are then added to each end.

(i) Calculate the total weight lifted by the weightlifter.

Show your working out.

Weight = _____ N [2]

(ii) On a different day, the weightlifter lifts a total weight of 1200 N, to a height of 250 cm above the floor.

Calculate the work done by the weightlifter.

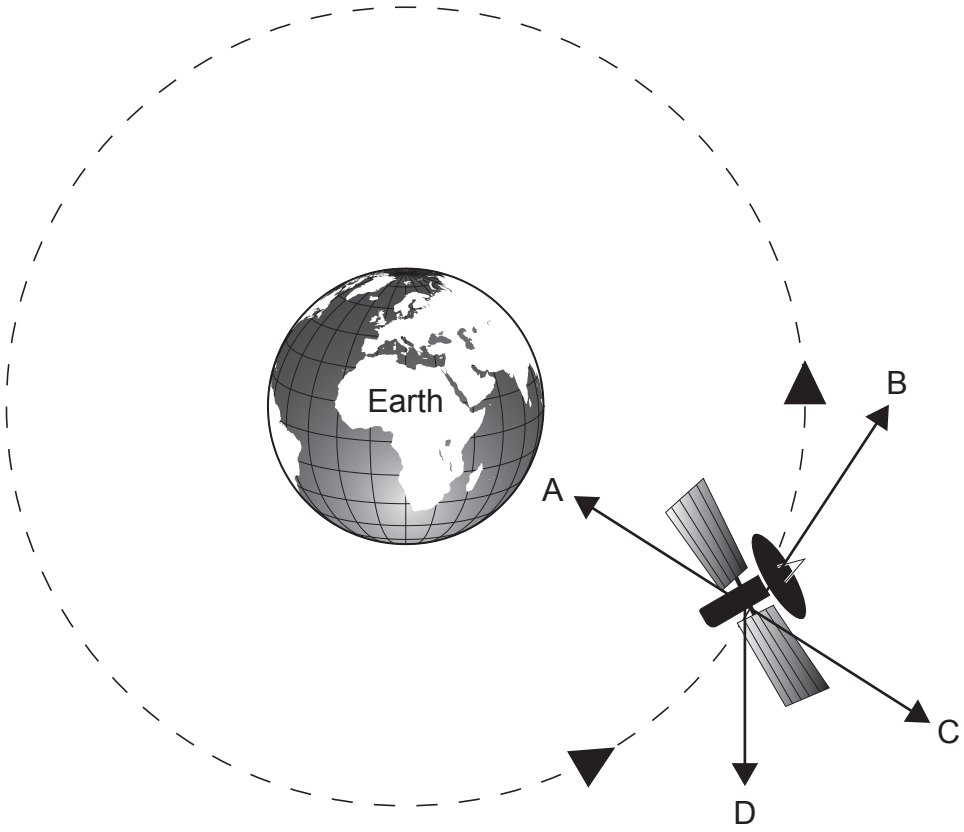
Show your working out.

Work done = _____ J [4]

Examiner Only

Marks	Remark

7 The diagram shows a satellite orbiting the earth.



Source: CCEA

Four directions, A, B, C and D are shown on the satellite. Answer the questions below. Each letter can be used once, more than once or not at all.

(i) A force, called the centripetal force, keeps the satellite in orbit. What letter shows the direction of the centripetal force?

Letter _____ [1]

(ii) What letter shows the direction that the satellite would move if the centripetal force was not there?

Letter _____ [1]

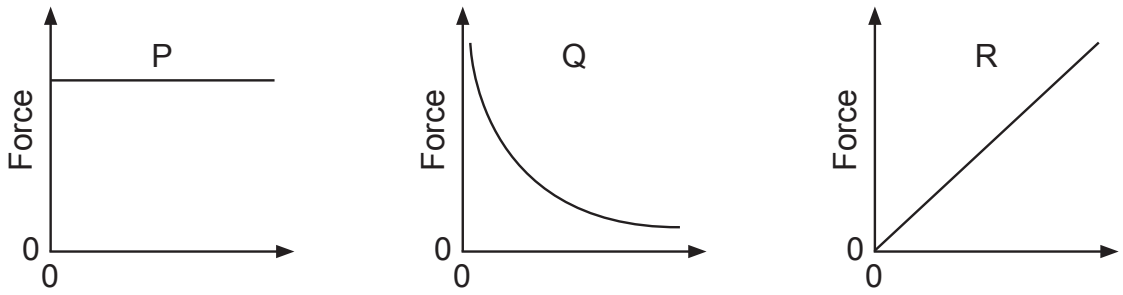
(iii) What letter shows the direction of the weight of the satellite?

Letter _____ [1]

Examiner Only

Marks	Remark

Three graph shapes, P, Q and R are shown.



(iv) What graph shows how the centripetal force depends on the mass of the satellite?

Graph _____ [1]

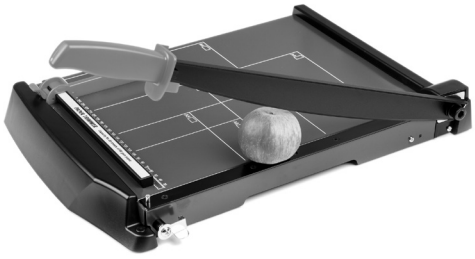
(v) What graph shows how the centripetal force depends on the radius of orbit?

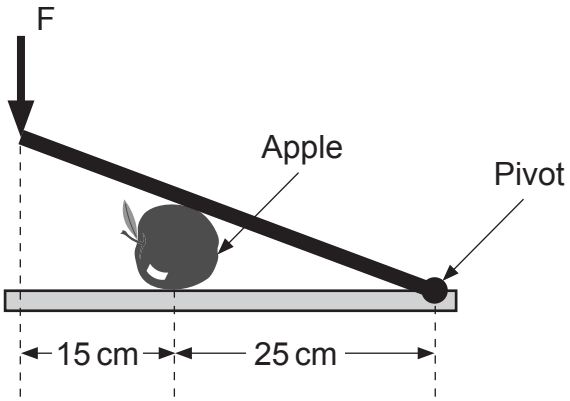
Graph _____ [1]

Examiner Only

Marks	Remark

8 A guillotine is used to cut an apple. The diagram on the right shows this.





(i) What is the direction of the moment exerted **by the apple** on the blade, as the apple is being cut?

Direction _____ [1]

(ii) The apple is cut when the moment exerted **by force F** about the pivot is 320 N cm.

Calculate the smallest force, F, that will cut the apple.

Show your working out.

Force = _____ N [4]

Examiner Only	
Marks	Remark

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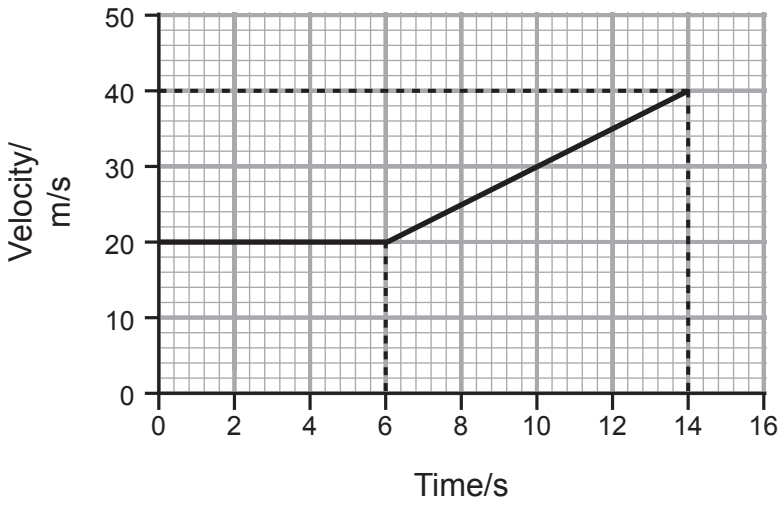
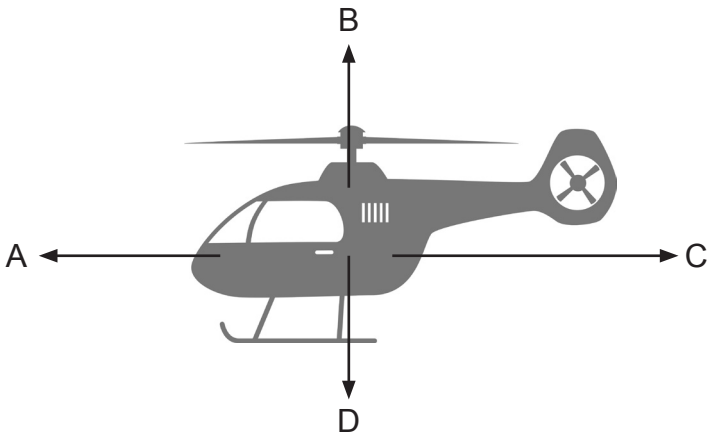
(Questions continue overleaf)

Examiner Only	
Marks	Remark

9 A helicopter flies **horizontally** for 6 seconds and then accelerates for 8 seconds. The velocity–time graph below shows the helicopter's motion.



Four forces act on the helicopter.



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(a) Look at the statements below. Which statement describes the forces during the **first 6 seconds** of the motion? Tick (✓) the correct box.

1. B is equal to D, A is greater than C. ☐
2. A is equal to C, B is greater than D. ☐
3. A is equal to C, B is equal to D. ☐
4. A is greater than C, B is greater than D. ☐

[1]

(b) Calculate the distance travelled by the helicopter in the last 8 seconds of its motion.

Show your working out.

Distance = _____ m [4]

(c) **(i)** Use the graph to calculate the acceleration of the helicopter in the last 8 seconds of its motion.

Show your working out.

Acceleration = _____ m/s^2 [3]

(ii) In the last 8 seconds of its motion the resultant force on the helicopter is 6 kN.
Calculate the mass of the helicopter.

Show your working out.

Mass = _____ kg [3]

Examiner Only	
Marks	Remark

10 A golf ball has a mass of 0.05 kg and a momentum of 4 kg m/s.

Examiner Only	
Marks	Remark

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Calculate the kinetic energy of the golf ball.

Show your working out.

Kinetic energy = _____ J [5]

THIS IS THE END OF THE QUESTION PAPER

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