Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Double Award Science: Physics

GSD32

Unit P1
Higher Tier

[GSD32]

FRIDAY 24 FEBRUARY 2017, 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 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	

BLANK PAGE

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

- State what is meant by each type of energy resource.
- Give **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]

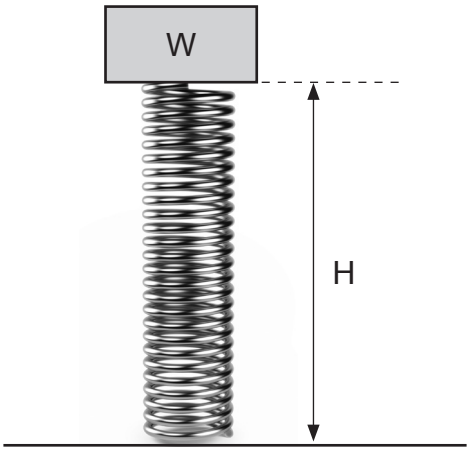
Examiner Only

Marks	Remark

Examiner Only

Marks	Remark

2 When a load, W, is added to a spring as shown then the height, H, of the spring changes.



A student suspects 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 obtains a number of readings of W and H and these are shown.

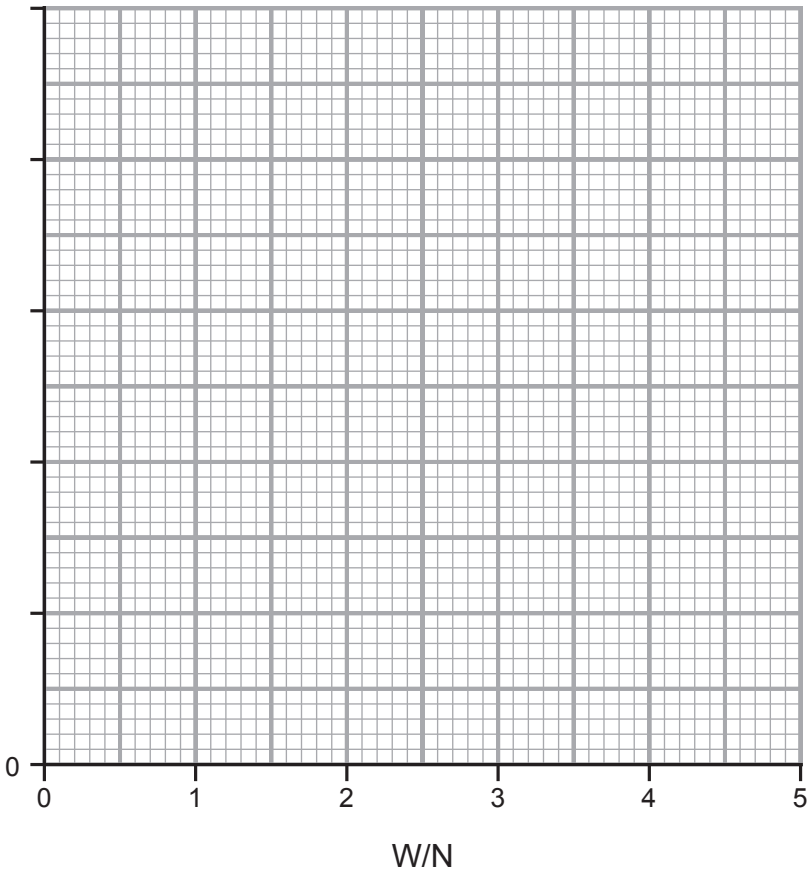
W/N	0	1	2	3	4
H/mm	100	80	60	40	20

You are asked to 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 confirm the theory described by **Equation 2.1**?

Yes / No Circle 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 which has been applied.

Load = _____ N [3]

Examiner Only	
Marks	Remark

3 Information about the particles which make up an atom can be presented in a table.

Complete the table below for the three different particles.

Particle	Location	Charge
proton		
	nucleus	
	in orbit	

[6]

Examiner Only

Marks	Remark

BLANK PAGE

(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 contain?

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.
Complete the two boxes below for plutonium.

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

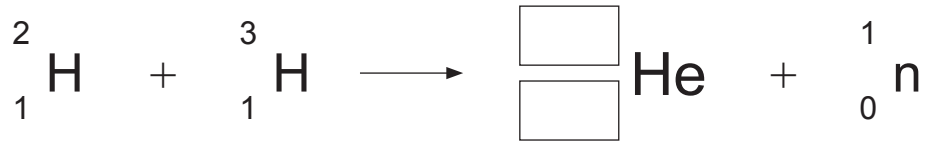
$$\square\!\!\square Pu$$

[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]

(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 in detail how you would measure the density of a liquid.
In your answer you must state:

- 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.

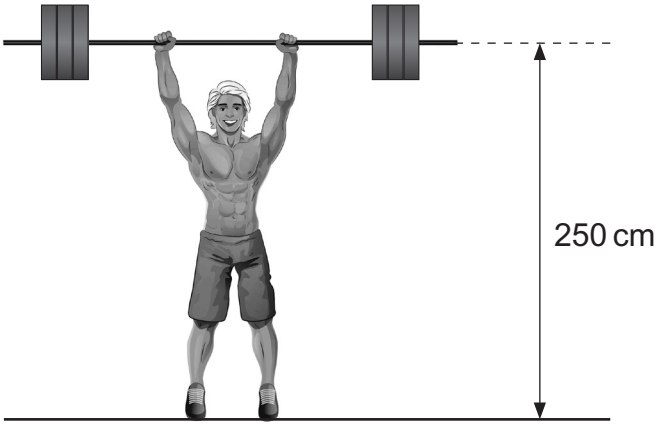
[6]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

6 A weightlifter lifts a bar with attached masses.



© gmast3r / iStock / Thinkstock

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

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

You are advised to show your working out.

Weight = _____ N [2]

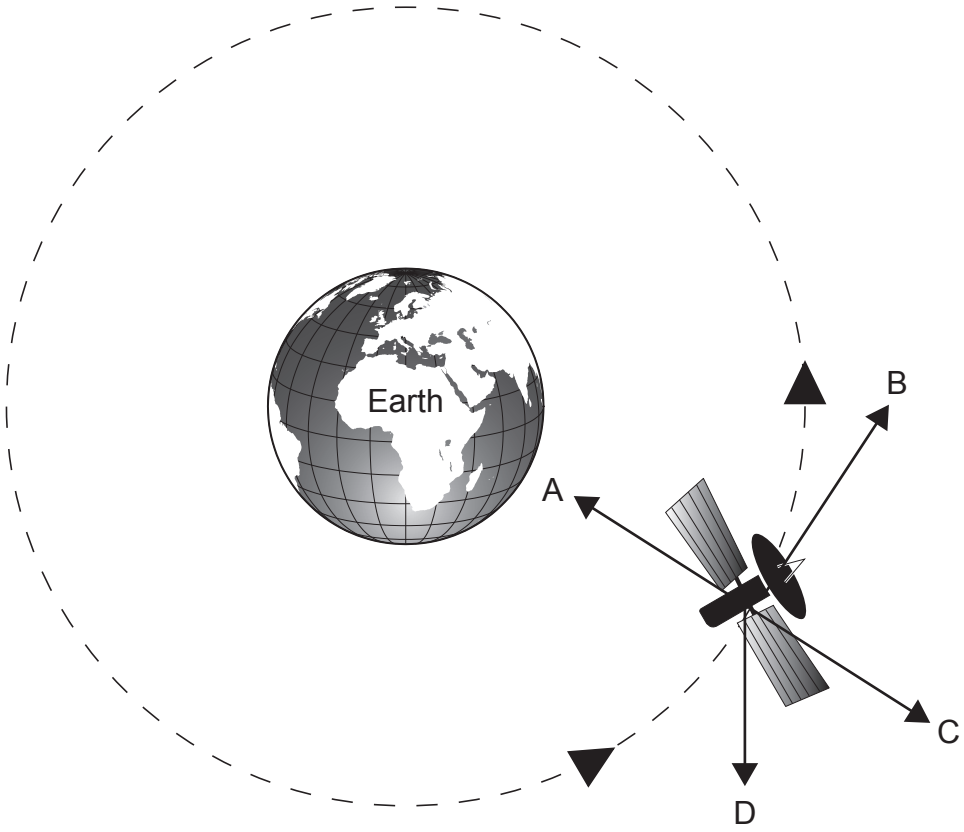
(ii) On another occasion, the weightlifter lifts a total weight of 1200 N, to a height of 250 cm above the floor.

Calculate the work done by the weightlifter.

You are advised to show your working out.

Work done = _____ J [4]

7 The diagram shows a satellite orbiting the earth.



Source: CCEA

Four directions, A, B, C and D are given on the satellite. In answering the following questions each letter may be used once, more than once or not at all.

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

Letter _____ [1]

(ii) Which letter indicates the direction the satellite would move if the force referred to in **(i)** above ceased to exist?

Letter _____ [1]

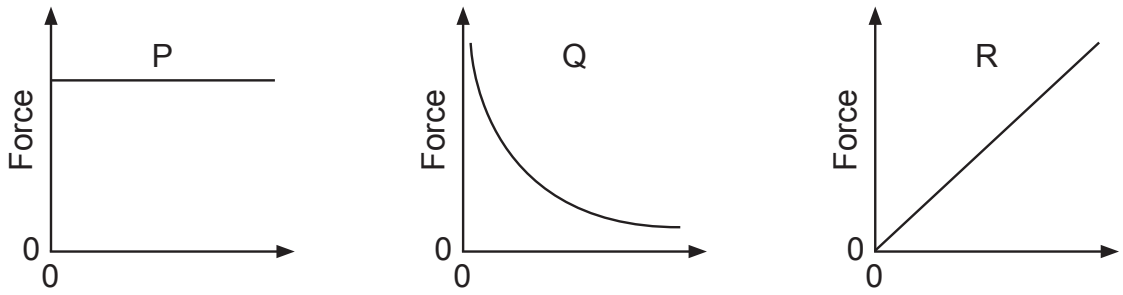
(iii) Which letter gives the direction of the weight of the satellite?

Letter _____ [1]

Examiner Only

Marks	Remark

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



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

Graph _____ [1]

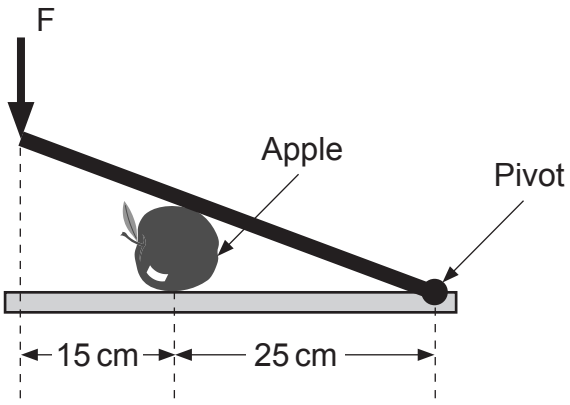
(v) Which graph shows how the centripetal force depends on the radius of orbit?

Graph _____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

8 A guillotine is used to cut an apple. The diagram on the right illustrates the situation.



(i) State 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.

You are advised to show your working out.

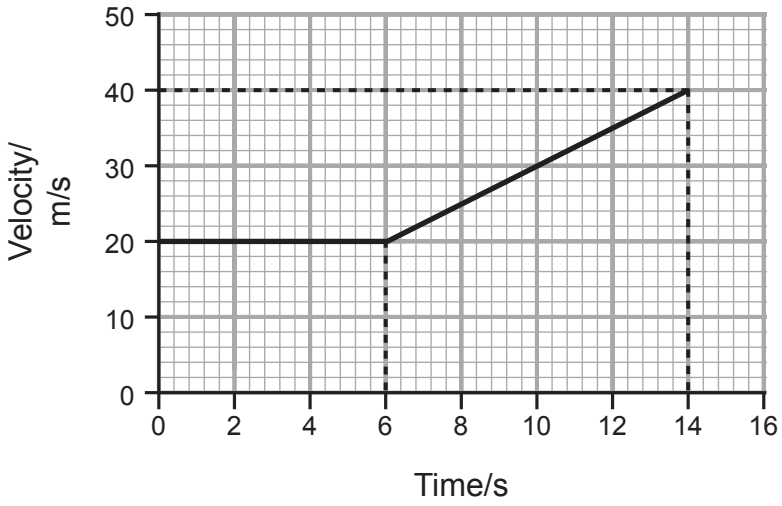
Force = _____ N [4]

BLANK PAGE

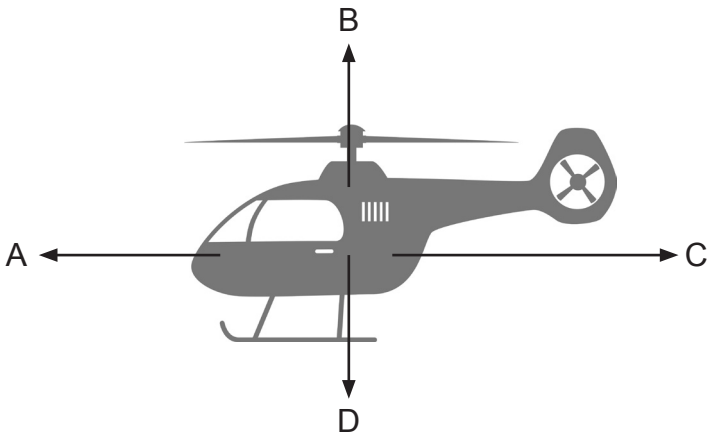
(Questions continue overleaf)

Examiner Only	
Marks	Remark

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



Four forces act on the helicopter.



© Anthonycz / iStock / Thinkstock

(a) Choose the correct statement below to describe 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 during the last 8 seconds of its motion.

You are advised to show your working out.

Distance = _____ m [4]

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

You are advised to show your working out.

Acceleration = _____ m/s^2 [3]

(ii) The resultant force on the helicopter is 6 kN, in this time interval. Calculate the mass of the helicopter.

You are advised to 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

© LarsZahnerPhotography / iStock / Thinkstock

Calculate the kinetic energy of the golf ball.

You are advised to show your working out.

Kinetic energy = _____ J [5]

THIS IS THE END OF THE QUESTION PAPER

112901