



General Certificate of Secondary Education
2016–2017

Centre Number

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Candidate Number

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Double Award Science: Physics

Unit P1
Higher Tier

[GSD32]

FRIDAY 24 FEBRUARY 2017, MORNING

MV18

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 at the end of each question indicate the marks awarded to each question or part question.

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

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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.

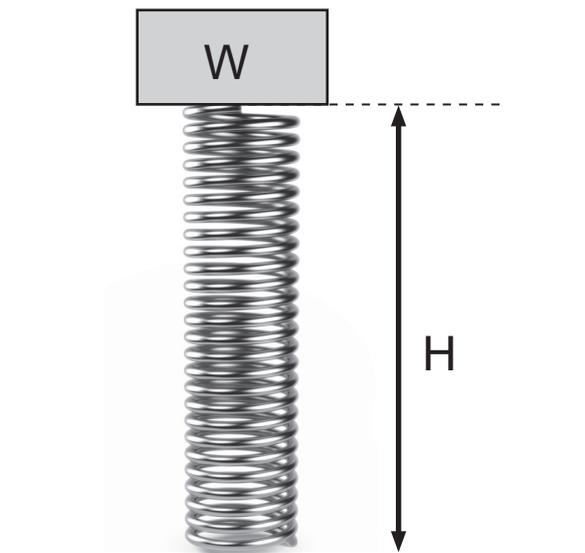
[6 marks]

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

Renewable _____

Non-renewable _____

- 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:

$$H = kW \quad \text{Equation 2.1}$$

where k is a constant.

She obtains a number of readings of W and H and these are shown.

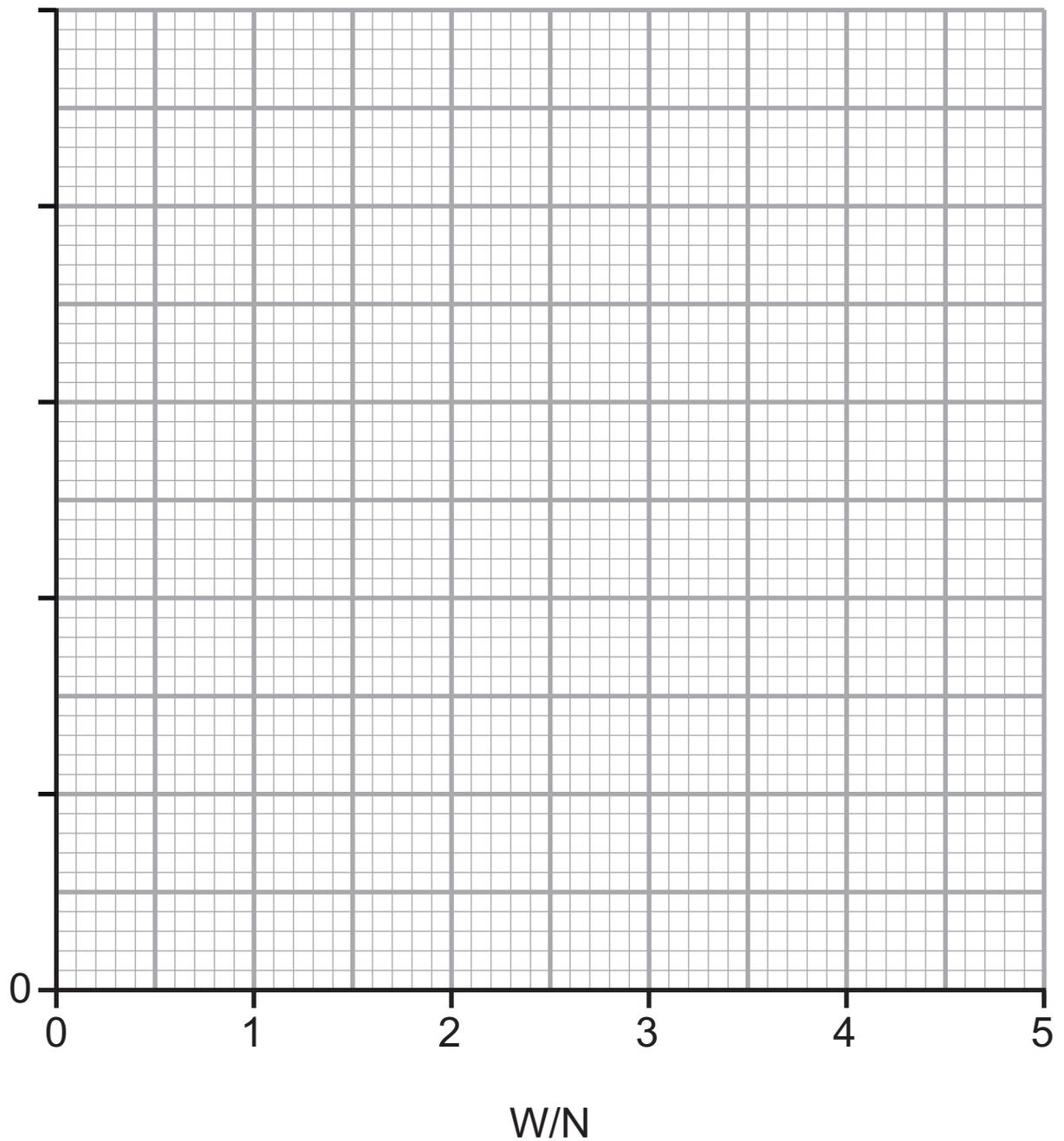
W/N	0	1	2	3	4
H/mm	100	80	60	40	20

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 marks]

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

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



(iv) Describe how the height, H , depends on the load, W .
[1 mark]

(v) Use your graph to find the original length of the spring.
This is the length when no weight is added. [1 mark]

Original length = _____ mm

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

Yes / No Circle your choice

Explain your answer. [1 mark]

(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. [3 marks]

Load = _____ N

- 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.
[6 marks]

Particle	Location	Charge
proton		
	nucleus	
	in orbit	

4 The nucleus of the element uranium is represented below.



(a) (i) What is the mass number of uranium? [1 mark]

Mass number = _____

(ii) How many neutrons does the uranium nucleus contain? [1 mark]

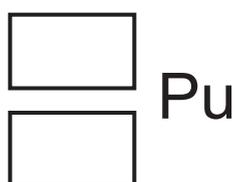
Number of neutrons = _____

(iii) What is the total number of particles in the uranium nucleus? [1 mark]

Total number of particles = _____

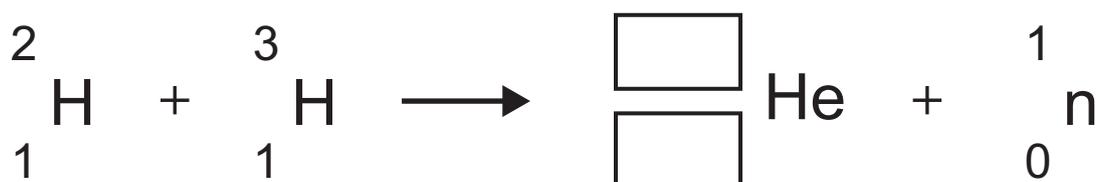
- (b) Uranium is formed when an unstable nucleus of plutonium (Pu) decays and emits an alpha particle. Complete the two boxes below for plutonium. [2 marks]

Remember the nucleus of uranium is represented by



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

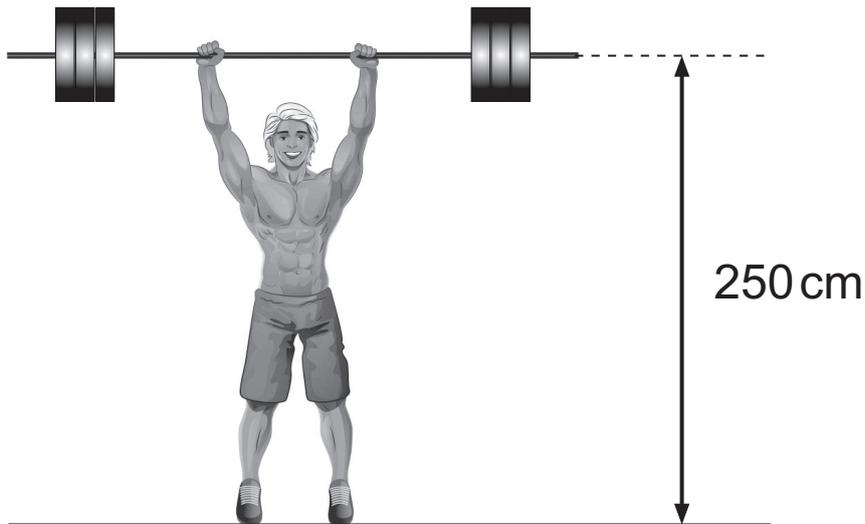
- (c) (i) Complete the equation for the following fusion reaction. [2 marks]



- (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 marks]

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6 A weightlifter lifts a bar with attached masses.



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.
[2 marks]

You are advised to show your working out.

Weight = _____ N

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

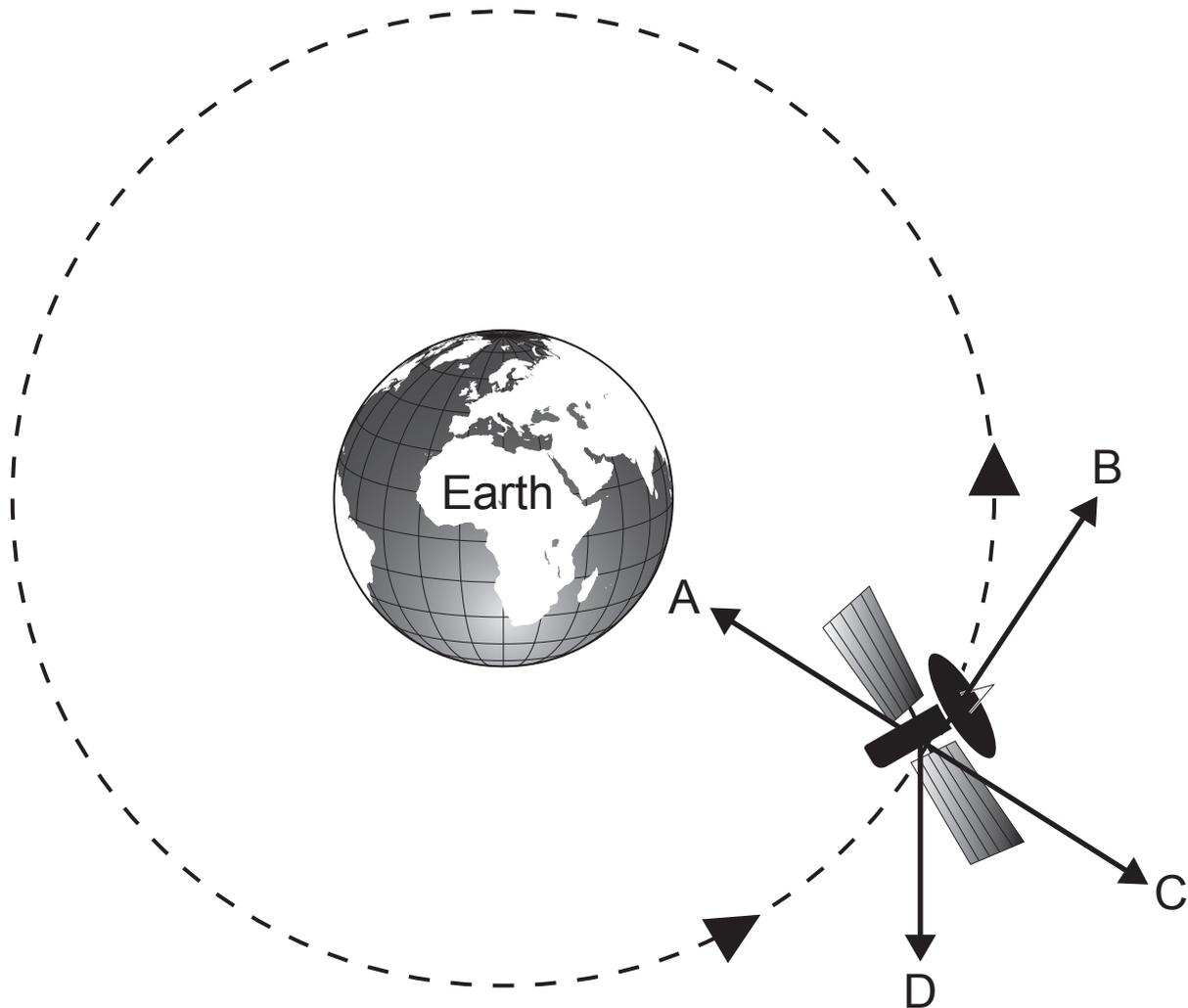
Calculate the work done by the weightlifter.

[4 marks]

You are advised to show your working out.

Work done = _____ J

7 The diagram shows a satellite orbiting the earth.



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?
[1 mark]

Letter _____

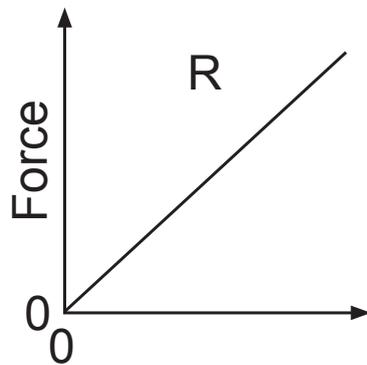
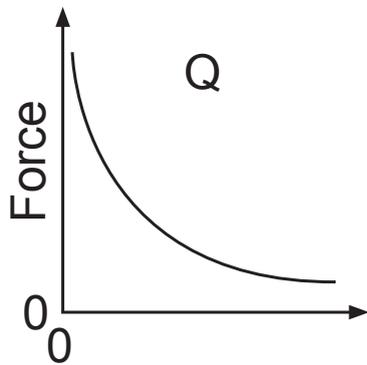
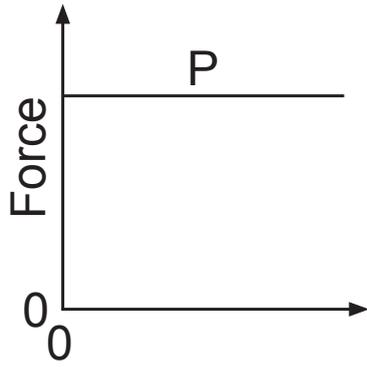
(ii) Which letter indicates the direction the satellite would move if the force referred to in (i) above ceased to exist? [1 mark]

Letter _____

(iii) Which letter gives the direction of the weight of the satellite? [1 mark]

Letter _____

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



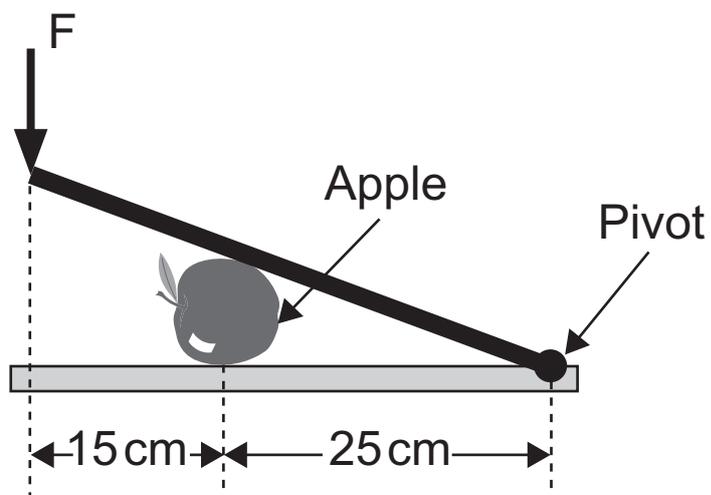
(iv) Which graph shows how the centripetal force depends on the mass of the satellite? [1 mark]

Graph _____

(v) Which graph shows how the centripetal force depends on the radius of orbit? [1 mark]

Graph _____

- 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. [1 mark]

Direction _____

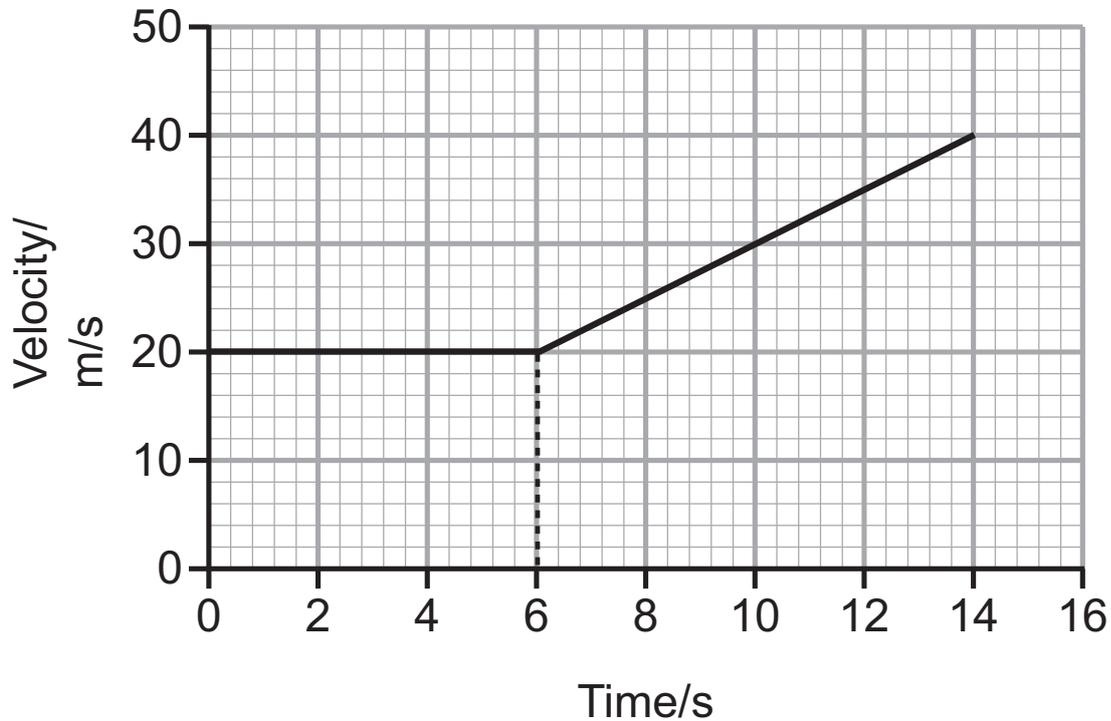
(ii) The apple is cut when the moment exerted **by force F** about the pivot is 320 N cm.

Calculate the smallest force, F, that will cut the apple.
[4 marks]

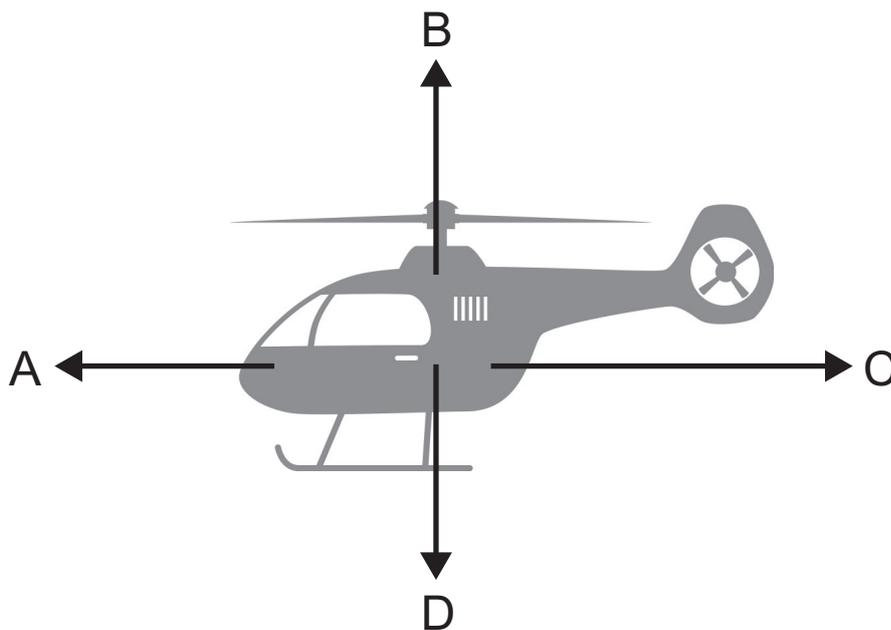
You are advised to show your working out.

Force = _____ N

- 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.



(a) Choose the correct statement below to describe the forces during the **first 6 seconds** of the motion.

Tick (✓) the correct box. [1 mark]

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.

(b) Calculate the distance travelled by the helicopter during the last 8 seconds of its motion. [4 marks]

You are advised to show your working out.

Distance = _____ m

- (c) (i) Use the graph to calculate the acceleration of the helicopter during the last 8 seconds of its motion.
[3 marks]

You are advised to show your working out.

Acceleration = _____ m/s²

- (ii) The resultant force on the helicopter is 6 kN, in this time interval.
Calculate the mass of the helicopter. [3 marks]

You are advised to show your working out.

Mass = _____ kg

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



Calculate the kinetic energy of the golf ball. [5 marks]

You are advised to show your working out.

Kinetic energy = _____ J

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Question Number	Marks
1	
2	
3	
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Total Marks	

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