



Rewarding Learning

General Certificate of Secondary Education
2020–2021

Centre Number

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Candidate Number

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Double Award Science: Physics

Unit P1

Higher Tier



[GDW32]

GDW32

FRIDAY 13 NOVEMBER 2020, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

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 Question 1.



- 1 You are asked to give an account of nuclear fusion.

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

In your answer you should include:

a naturally occurring body which uses fusion as its source of energy;

the names of the two isotopes of hydrogen that could be used for nuclear fusion on earth;

where these isotopes are widely available;

an environmental advantage of producing energy from nuclear fusion rather than fossil fuels;

the major by-product of nuclear fusion.

[6]



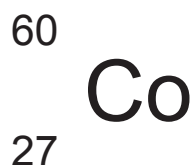
2 Atoms are made up of protons, neutrons and electrons.

(a) Complete the table below to show the location of each particle in an atom.

Particle	Location
proton	
neutron	
electron	

[3]

(b) The cobalt atom is represented below.



Complete the table below to show the number of each particle in the cobalt atom.

Particle	Number
proton	
neutron	
electron	

[3]

(c) Define an isotope in terms of particles.

[2]

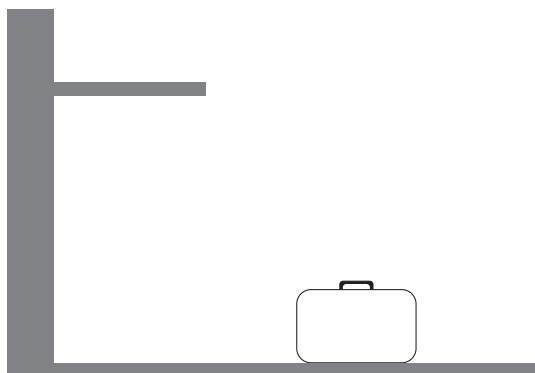
[Turn over]



3 A man lifts a suitcase of mass 12 kg onto a shelf.

- (i) The suitcase gains 264 J of gravitational potential energy when it is lifted onto the shelf.
Calculate the height of the shelf.

You are advised to show your working out.



Source: ©CCEA

Height of the shelf = _____ m [3]



(ii) The shelf breaks and the suitcase falls vertically to the ground.

The suitcase has a potential energy of 264 J on the shelf.

Calculate the velocity of the suitcase as it hits the ground.

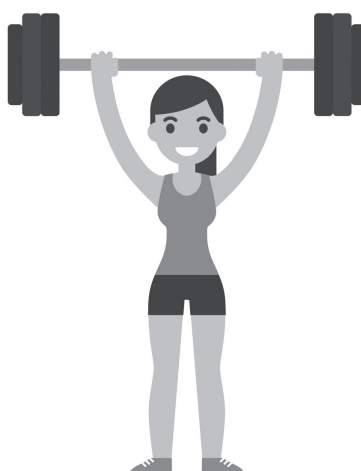
Assume no energy losses.

You are advised to show your working out.

Velocity = _____ m/s [4]



- 4 A weightlifter lifts some weights.



Source: ©Gettyimages

- (a) The weightlifter lifts the weights through a vertical height of 210 cm and in doing so does 630 J of work.
Calculate the force used to lift the weights.

You are advised to show your working out.

Force = _____ N [4]



- (b) On another occasion, the weightlifter does 720 J of work to lift weights.
She takes 0.5 seconds.
Calculate the average power produced as she lifts the weights.

You are advised to show your working out.

Average power = _____ W [3]

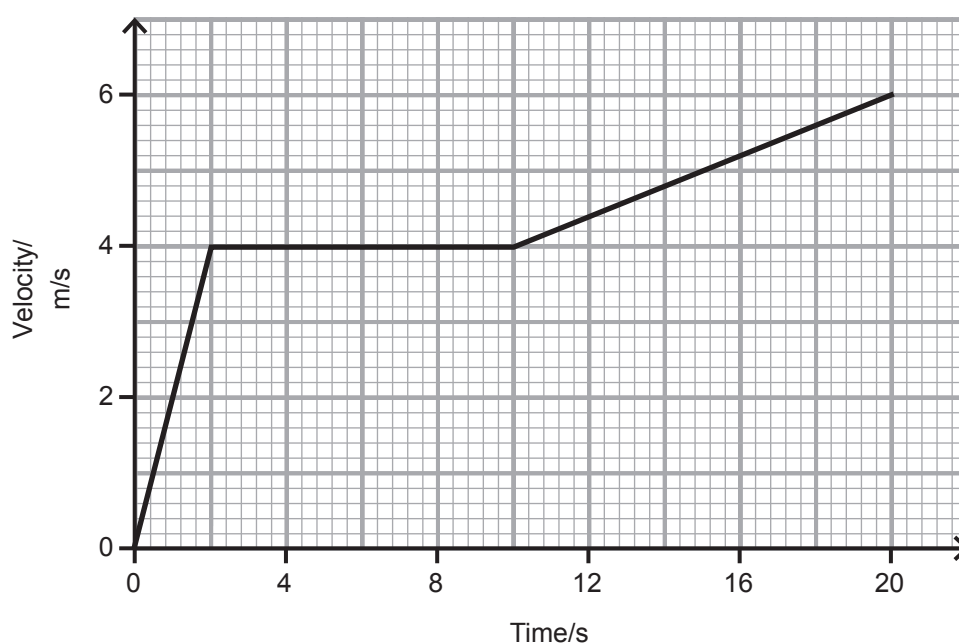
- (c) Another weightlifter develops 2300 W of power lifting some weights.
How much energy does the weightlifter transfer in one second?

Energy transferred in one second = _____ J [1]

[Turn over]



- 5 The velocity–time graph for an athlete’s sprint is shown.



Source: ©CCEA

- (a) (i) Calculate the distance travelled in the **final** 10 seconds of his sprint.

You are advised to show your working out.

Distance travelled = _____ m [4]



- (ii) Find the average velocity of the athlete during the **final** 10 seconds of his sprint.

You are advised to show your working out.

Average velocity = _____ m/s [3]

- (b) Calculate the **maximum** acceleration of the athlete.

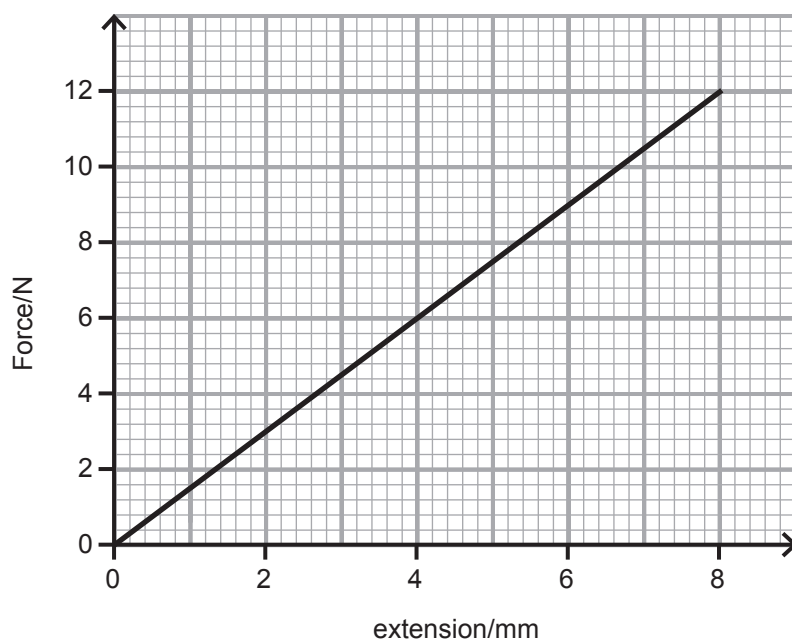
You are advised to show your working out.

Maximum acceleration = _____ m/s² [3]

[Turn over



- 6 The graph below shows how the extension of a spring depends on the force applied to it.



Source: ©CCEA

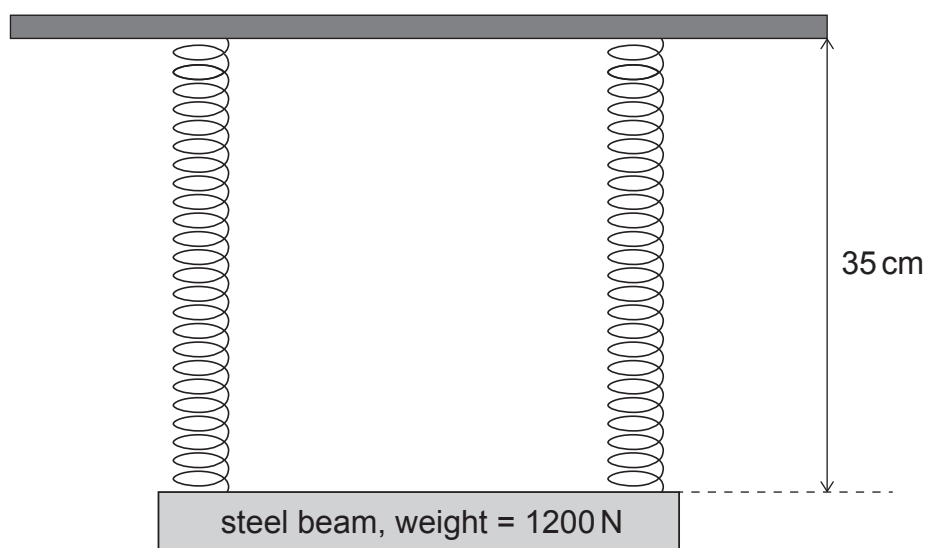
- (a) Use the graph to calculate the spring constant.

You are advised to show your working out.

Spring constant = _____ N/mm [3]



- (b) A steel beam of weight 1200 N is suspended from the ceiling by two identical springs. The springs, which each have a spring constant of 80 N/cm, share the load equally. Their extended length is 35 cm.



Source: ©CCEA

Each spring has the same unstretched length.
Calculate the original unstretched length of one of the springs.
Give your answer to the nearest cm.

You are advised to show your working out.

Original length = _____ cm [6]

[Turn over]



- 7 (a) A radioactive thorium (Th) nucleus emits a particle to become a radium (Ra) nucleus.
An incomplete equation for this decay is given below.



Insert the symbol for the particle in the large box on the right. Then complete the remaining empty boxes. [4]

- (b) Radiation from radioactive sources can be harmful to the human body.
State the damage that could be caused by gamma radiation.

Alpha radiation is not as dangerous as the others if the source is touched by the human body.
Explain why this is so.

Give a situation where alpha radiation **would** be very dangerous.

When not in use radioactive sources are contained in a lead box.
Give two other methods of protecting the user when handling radioactive sources.

[5]



8 Two people ride on a tandem.



Source: ©Gettyimages

The total area of the tyres in contact with the ground is 24 cm^2 .
The combined weight of one of the cyclists and the bike is 800 N and the total pressure exerted on the ground is 60 N/cm^2 .

Calculate the weight of the other cyclist.

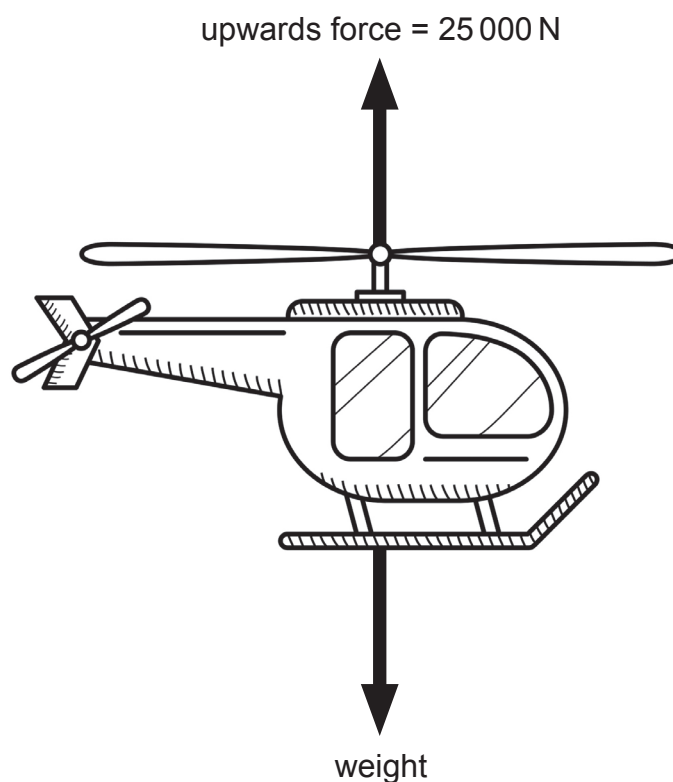
You are advised to show your working out.

Weight of other cyclist = _____ N [4]

[Turn over



- 9 A helicopter has a mass of 2000 kg and lifts off vertically.



Source: ©Gettyimages

- (a) (i) The upwards force exerted by the helicopter blades is 25 000 N. By first finding the weight of the helicopter, calculate its upwards acceleration.

You are advised to show your working out.

Weight = _____ N

Acceleration = _____ m/s² [5]

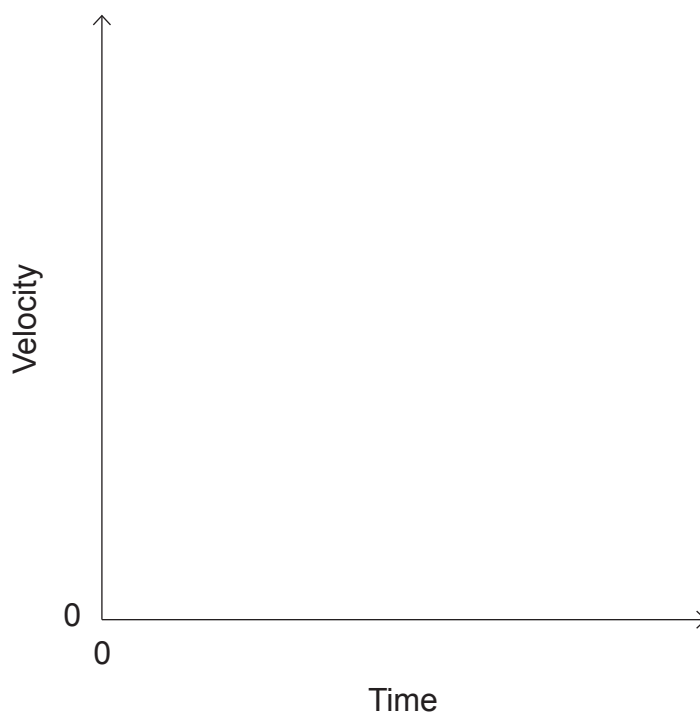


- (ii) The helicopter lifts off from rest.
Calculate its velocity 4 seconds later.

You are advised to show your working out.

Velocity = _____ m/s [3]

- (b) Another helicopter rises from rest with **constant** acceleration.
Sketch the velocity–time graph on the axes below.



[1]

THIS IS THE END OF THE QUESTION PAPER



DO NOT WRITE ON THIS PAGE

For Examiner's
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
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9	

Total Marks	
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Examiner Number

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