



General Certificate of Secondary Education
2021–2022

Centre Number

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Candidate Number

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Double Award Science: Physics

Unit P1

Higher Tier



[GDW32]

GDW32

TUESDAY 7 JUNE, 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 eight** 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 **3(i)**.



- 1 (a) A footballer kicks a ball of mass 0.5 kg into the air.

At one point the ball has a speed of 8 m/s.

Calculate the kinetic energy of the ball at this point.

You are advised to show your working out.

Kinetic energy = _____ J [3]



- (b) On another occasion the footballer gives the ball a **total energy of 45 J** when he kicks it.



Later, the ball reaches a height, h , where its **kinetic energy is 30 J**

Calculate the height, h , of the ball.

Remember the mass of the ball is 0.5 kg.

Assume no energy losses.

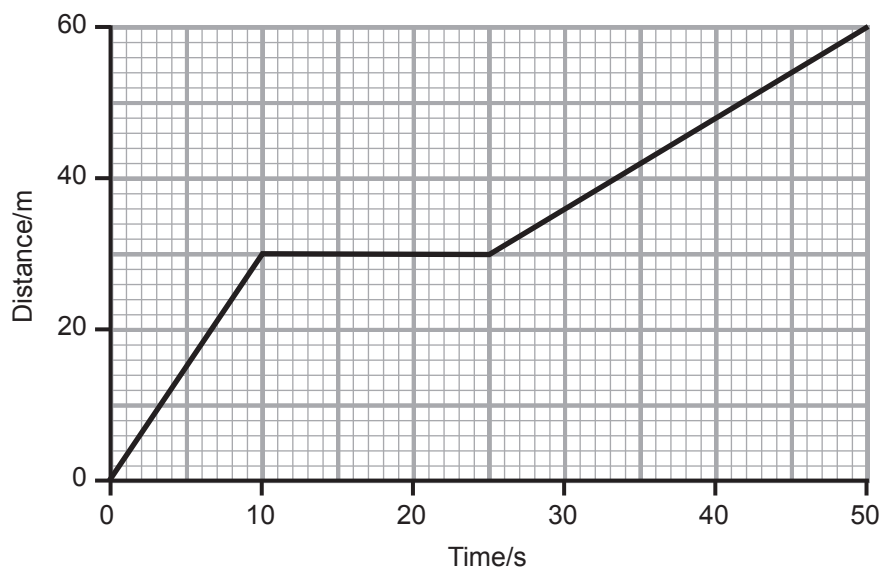
You are advised to show your working out.

Height, h = _____ m [4]

[Turn over



- 2 (a) The distance–time graph for a cycle journey is shown below.



- (i) During what time interval is the cyclist travelling fastest?

_____ s to _____ s

[1]

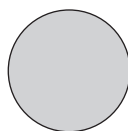
- (ii) Calculate his speed during the last 25 seconds of his journey.

You are advised to show your working out.

Speed = _____ m/s [4]



- (b) An object falls from rest.
During its fall no air resistance (friction) acts on the object.



- (i) What is the speed of the object 3 seconds after its release from rest?

Speed = _____ m/s [1]

- (ii) Calculate the average speed of the object during these 3 seconds.

You are advised to show your working out.

Average speed = _____ m/s [3]

[Turn over



- 3 (i) In the following question you are asked to name, **in words**, the three types of radiation that may be emitted by radioactive nuclei.

For each type of radiation state its relative charge, if any.

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

Radiation 1

Radiation 2

Radiation 3

[6]

- (ii) State a danger of working with radioactive substances.

People should stay **far away** from radioactive sources whilst using them.
Give a practical way of doing this.

[2]





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[Turn over



20GDW3207

- 4 (a) (i) Explain the meaning of the term half-life.

[2]

- (ii) A radioactive substance has a half-life of 3 days.

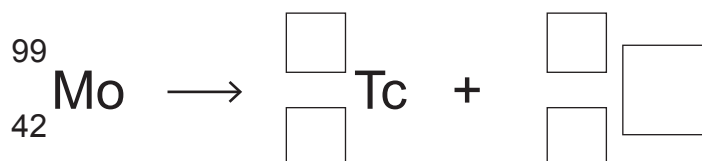
Initially the substance has 14 000 undecayed nuclei.

By first finding the number of undecayed nuclei after 9 days, calculate the number of nuclei which have decayed in this time.

You are advised to show your working out.

Number of decayed nuclei = _____ [3]

- (b) Technetium (Tc) is a radioactive element used in hospitals.
It is made when molybdenum (Mo) emits a **negatively charged** radioactive **particle**.
An incomplete equation for the change is shown below.



Write the symbol for the emitted particle in the large box on the right-hand side and then complete the decay equation. [5]



(c) Sometimes radioactivity causes ionisation.

What do you understand by ionisation?

[2]

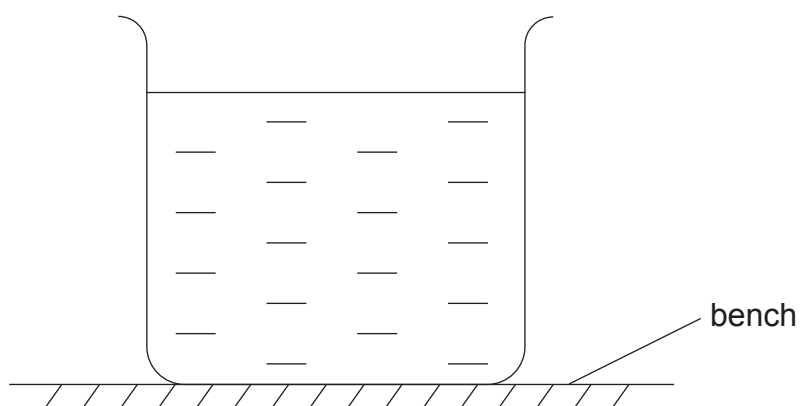
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20GDW3209

- 5 (a) A student adds 5 N of water to an empty container of weight 3 N.



Source: Principal Examiner

The pressure exerted on the bench is 160 Pa.

Calculate the area of the base of the container and give its unit.

You are advised to show your working out.

Area of base = _____ [5]



(b) What does a vector quantity have that a scalar quantity does not?

In part (a) of this question area and weight were mentioned.
For each quantity, write S for scalar or V for vector in the second column.

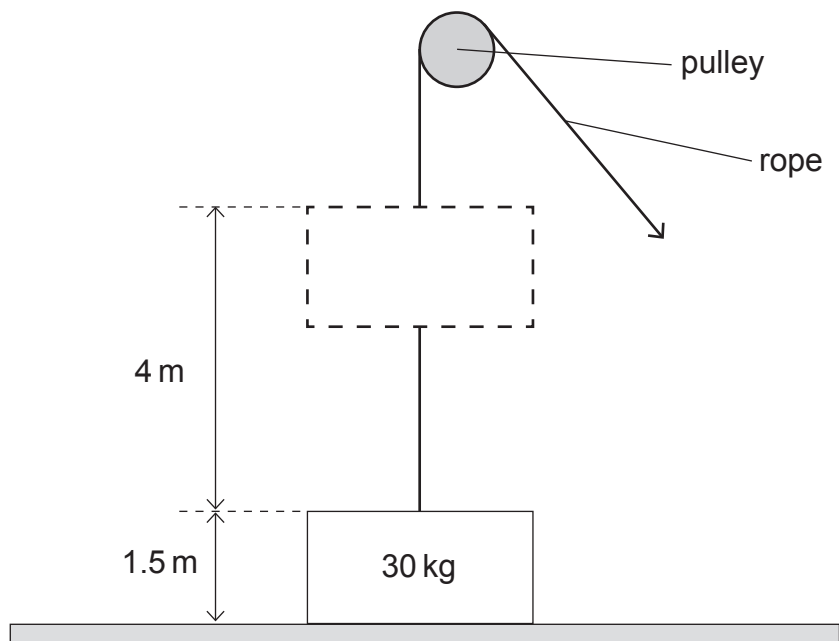
Quantity	S or V
Weight	
Area	

[3]

[Turn over



- 6 A workman uses a rope and pulley to raise a block of mass 30 kg from the ground to the position shown.



Source: Principal Examiner

- (i) Calculate the work done in raising the block to this new position. Ignore the effect of friction.

You are advised to show your working out.

Work done = _____ J [4]



- (ii) The work is done in one minute.
Calculate the power.

You are advised to show your working out.

Power = _____ W [4]

- (iii) In practice, the pulley exerts a force of friction.
In lifting the block to the same height does the workman do more work, less work or the same amount of work as your answer to part (i)?

Give your answer by placing a tick (✓) in a box below.

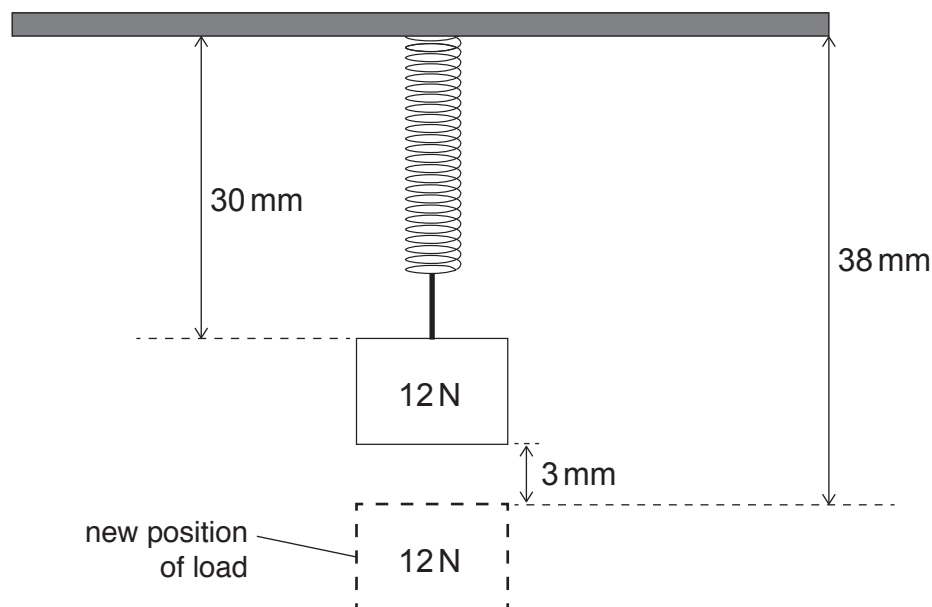
More work ☐ Less work ☐ Same work ☐ [1]



- 7 (a) A load of 12 N is added to a spring but not released.

The distance from the top of the spring to the top of the load is 30 mm.

The dotted box shows the new position of the 12 N load when it is released.



Source: Principal Examiner

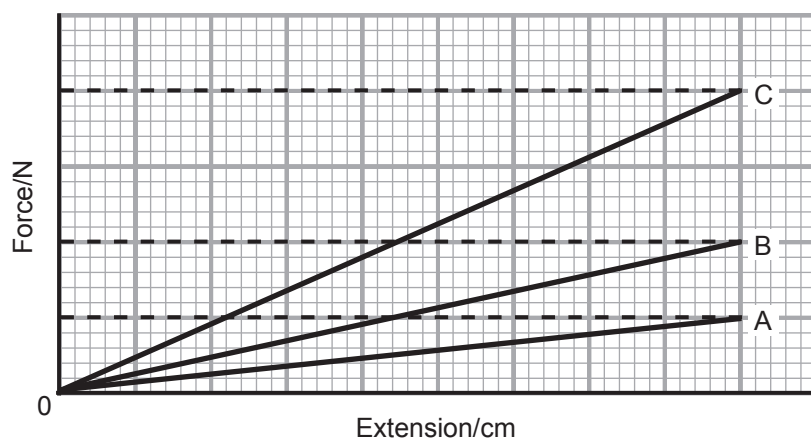
Calculate the spring constant and give its unit.

You are advised to show your working out.

Spring constant = _____ [5]



- (b) An engineer is given a data sheet with the force–extension graphs for three springs, A, B, and C.



Unfortunately, the numbers were missing from the axes.
The engineer needs the spring with the smallest spring constant.

Which spring, A, B or C should he choose?

Spring _____

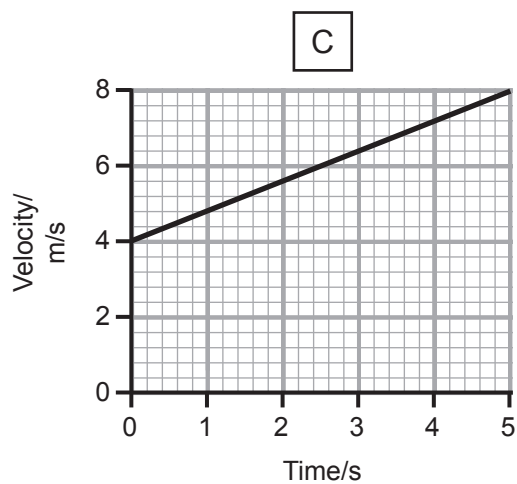
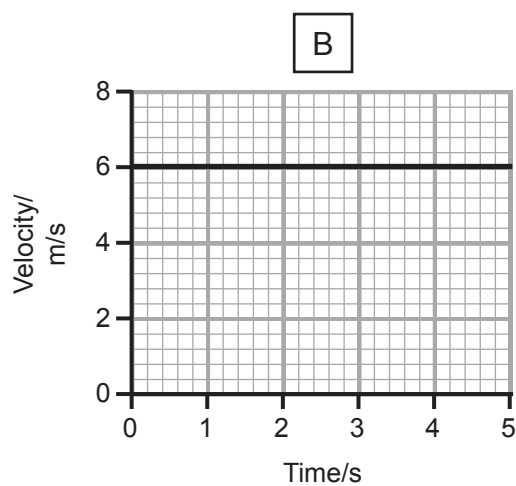
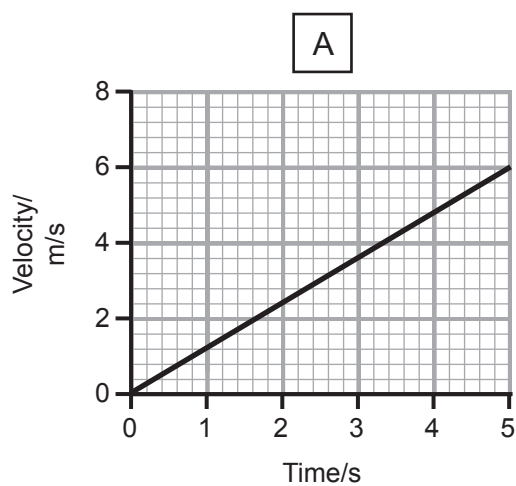
Give a reason for your choice.

[1]

[Turn over



8 Below are three velocity–time graphs, A,B and C.



- (i) Choose from letters A, B or C to answer the following.

Which graph(s) show constant velocity?

Letter(s) _____

In which graph(s) are the forces acting on the object balanced?

Letter(s) _____

Which graph(s) show constant (non-zero) acceleration?

Letter(s) _____ [4]

- (ii) The object in graph C is acted on by a resultant force of 12 N.
Calculate the mass of the body.

You are advised to show your working out.

Mass = _____ kg [7]

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For Examiner's
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Question Number	Marks
1	
2	
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4	
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7	
8	

Total Marks	
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Examiner Number

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