



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

WEDNESDAY 24 NOVEMBER, 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

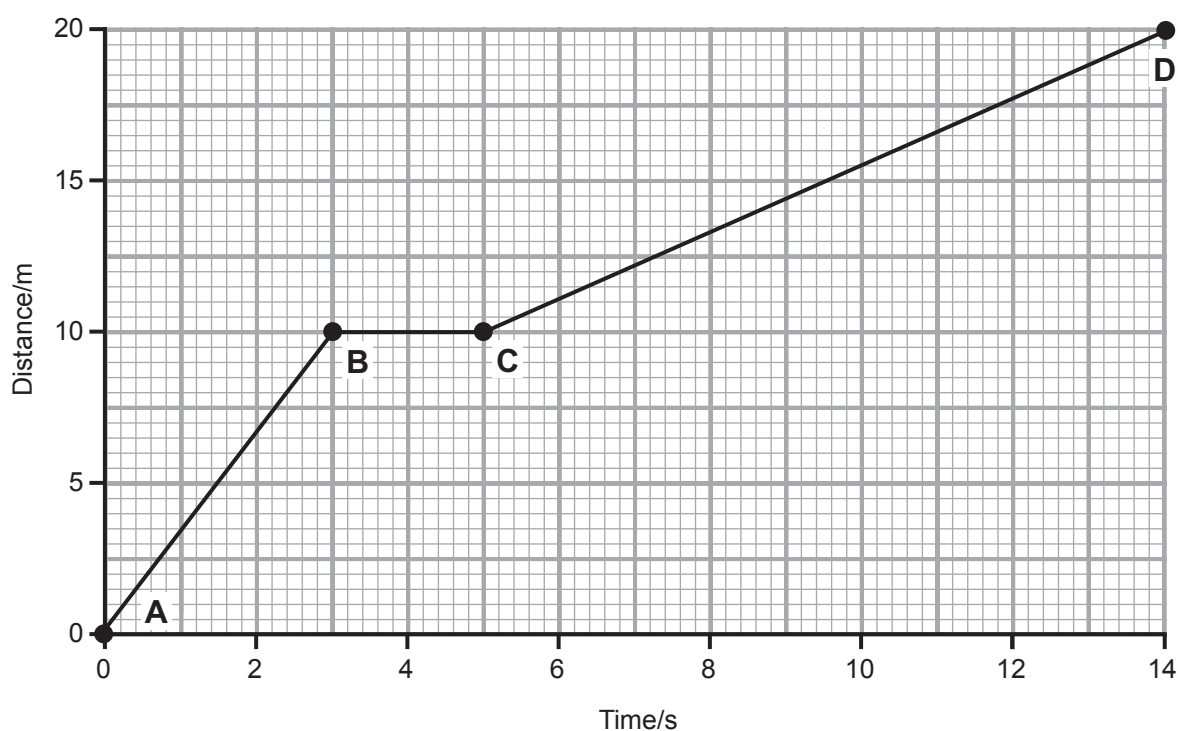
The total mark for this paper is 70.

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 2.



1 Below is the distance-time graph for a cycle journey.



(a) Describe the motion of the cyclist during AB.

Choose your answer from the following by placing a tick (✓) in the correct box.

Travelling at constant speed

☐

At rest

☐

Travelling with a constant rate of change of speed

☐

Without doing a calculation, how can you tell that the cyclist is travelling slower in CD than in AB?

_____ [2]



- (b) (i) State the distance travelled in the first 4 seconds.

Distance = _____ m [1]

- (ii) Use the graph to calculate the average speed of the cyclist over the first 5 seconds of the journey.

You are advised to show your working out.

Average speed = _____ m/s [3]

[Turn over]



- 2 This question is about renewable and non-renewable energy resources.

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

State what is meant by renewable energy resource and give an example.

Renewable energy _____

Example _____

Give **two** examples of **non-renewable** energy resources.

To which group, renewable or non-renewable, do fossil fuels belong?

Give an environmental disadvantage of using non-renewable energy resources.

_____ [6]



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(Questions continue overleaf)

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[Turn over



16GDW3205

- 3 A gardener pushes a lawnmower over his lawn.



Source: © Getty Images

He exerts an average force of 24 N.

By the time he has finished mowing he has done 2160 J of work.

- (a) (i) How far has the gardener pushed the mower in doing this work?

You are advised to show your working out.

Distance = _____ m [3]

- (ii) Express your answer to (a) (i) in km.

Distance = _____ km [1]



(b) On another occasion the gardener does 72 000 J of work in 15 minutes.

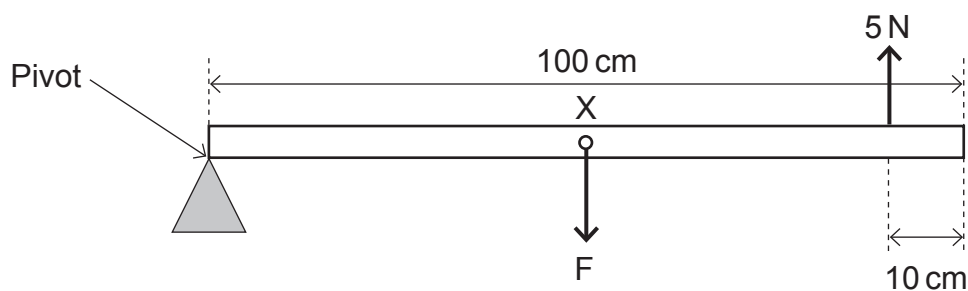
Calculate his power.

You are advised to show your working out.

Power = _____ W [4]



- 4 A uniform piece of wood 100 cm long is held in a horizontal position by exerting an upwards vertical force of 5 N as shown.



Source: Chief Examiner

- (i) Another vertical downwards force, F , acts at the midpoint, X , of the piece of wood.

What is the name of the force F ?

What name is given to the point X ?

_____ [2]



(ii) Record the following distances:

Pivot to the point X = _____

Pivot to the 5 N force = _____

Use the Principle of Moments and the values recorded above to calculate the force F acting at X.

You are advised to show your working out.

Force F = _____ N [6]



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

The nucleus of an atom of lithium can be described using the notation ${}^7_3\text{Li}$

(a) (i) Complete the table below to show how many of each particle there are in a **nucleus** of an atom of lithium.

Particle	Number of particles
Proton	
Neutron	
Electron	

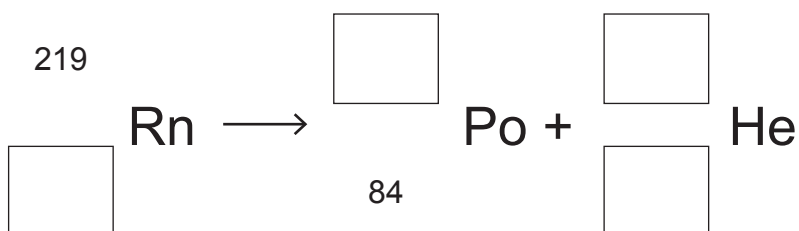
[3]

(ii) Explain in terms of **particles** what isotopes are.

[2]

(b) Radioactive nuclei decay to become more stable.

Complete the following decay equation.



[4]



6 (a) State what is meant by the half-life of a radioactive substance.

[2]

(b) Sodium-24 is used in medicine to study blood circulation.

A 40 g sample of sodium-24 decays to 5 g in a period of 44.7 hours.

Calculate the half-life of sodium-24.

You are advised to show your working out.

Half-life = _____ hours [3]

(c) Name **one** danger of working with radioactive sources.

Radioactive sources may be stored in a lead lined container.

State three other precautions that may be taken to protect a worker when using them.

1. _____

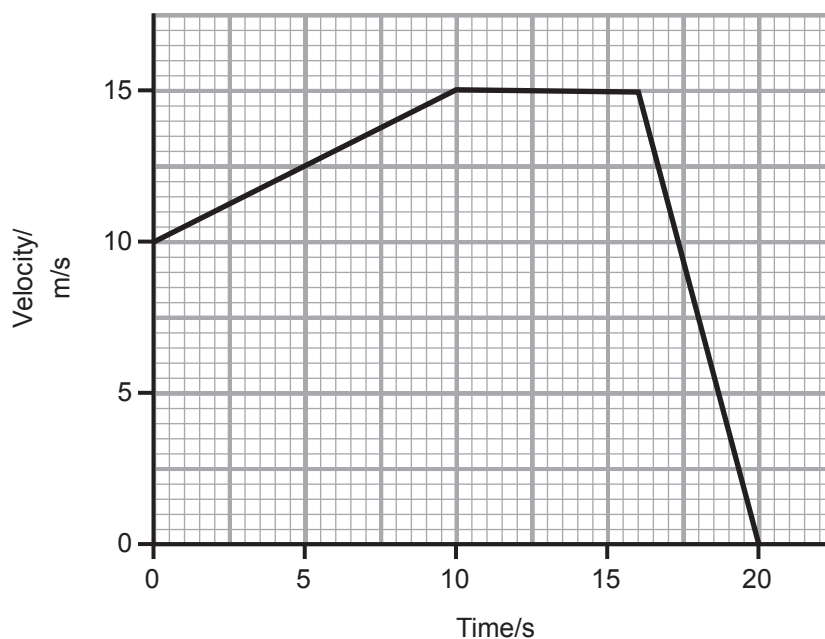
2. _____

3. _____ [4]

[Turn over



- 7 The velocity-time graph for part of a bike journey is shown below.



- (i) Describe the motion of the bike between 10 and 16 seconds.

_____ [1]

- (ii) Describe the motion of the bike between 16 and 20 seconds.

_____ [1]

- (iii) Calculate the acceleration of the bike during the first 10 seconds.

You are advised to show your working out.

Acceleration = _____ m/s² [3]



(iv) What is the displacement of the bike after the first 10 seconds?

You are advised to show your working out.

Displacement = _____ m [4]

[Turn over



- 8 A man standing on both feet exerts an overall downward pressure of 6 N/cm^2 .

The area of each foot is 75 cm^2 .

- (i) Calculate the mass of the man.

You are advised to show your working out.

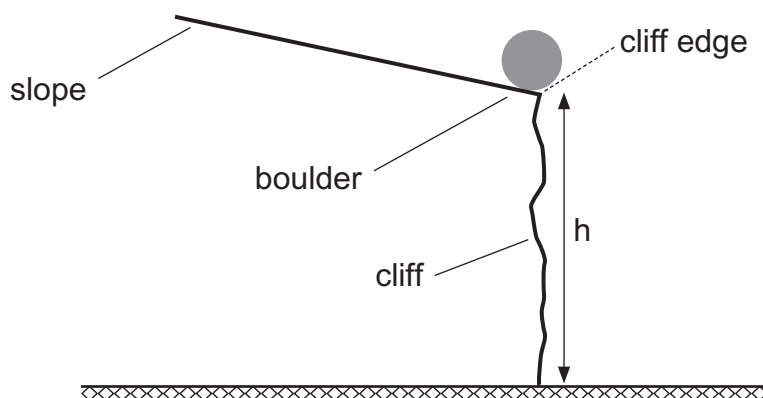
Mass of man = _____ kg [5]

- (ii) The man now stands on one foot. Will this cause the pressure exerted on the floor to increase, decrease or stay the same? Explain your choice.

_____ [2]



- 9 A boulder rolls down a slope that leads to the top of a cliff. It then falls vertically from the top of the cliff to the ground below.



Source: Principal Examiner

At the cliff edge the boulder has a total energy of 82 620 J.
The kinetic energy at this point is 11 220 J.
The mass of the boulder is 510 kg.

- (i) Calculate the height, h , of the cliff.

You are advised to show your working out.

Height, h = _____ m [4]

- (ii) Assuming there are no energy losses, calculate the speed at which the boulder hits the ground.

You are advised to show your working out.

Speed = _____ m/s [4]



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**For Examiner's
use only**

Question Number	Marks
1	
2	
3	
4	
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9	

**Total
Marks**

Examiner Number

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