



*Rewarding Learning*

General Certificate of Secondary Education  
2022–2023

Centre Number

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Candidate Number

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# Double Award Science: Physics

Unit P1

Higher Tier



[GDW32]

\*GDW32\*

**WEDNESDAY 23 NOVEMBER 2022, 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(a)**.



- 1 (a) The following question is about the harm that radioactive emissions can cause.

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

Radioactive emissions can be dangerous because of a process called ionisation.

What is ionisation?

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What harm can ionisation cause to the human body?

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What is background radiation?

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State one type of human behaviour that adds **significantly** to background radiation.

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Some homes have to be well ventilated because of the presence of a particular radioactive gas. Name this gas.

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 [6]

- (b) There are three types of radiation.

Which is stopped by a thin sheet of paper?

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Which is most penetrating?

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 [2]



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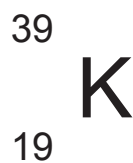
**[Turn over**



**\*20GDW3203\***

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

(a) A potassium **atom** is described below.



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

| Particle | Number |
|----------|--------|
| Proton   |        |
| Neutron  |        |
| Electron |        |

What is the overall charge on the potassium **atom**?

\_\_\_\_\_ [4]



(b) (i) Explain, in terms of particles, what an isotope is.

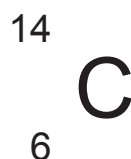
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[2]

An isotope of carbon is described below.



(ii) What is the atomic number and the mass number of this isotope?

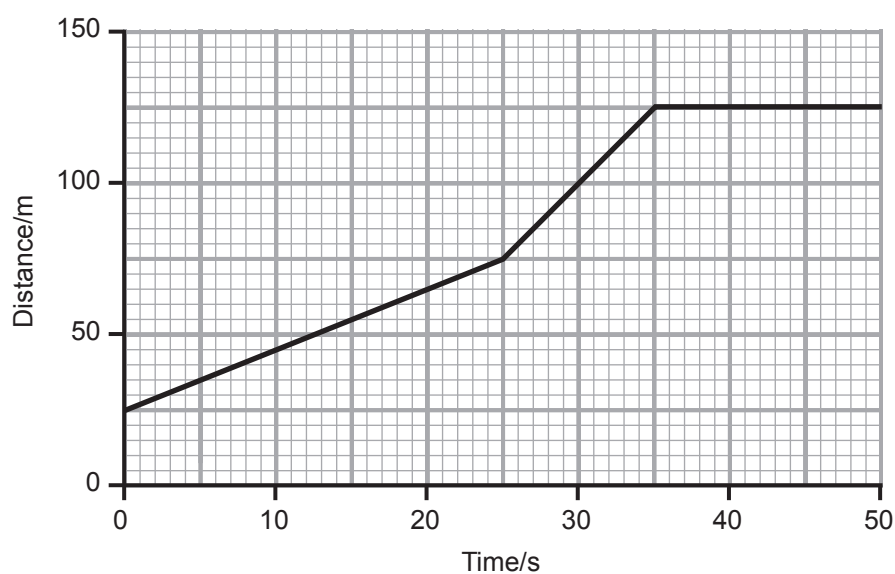
Atomic number = \_\_\_\_\_

Mass number = \_\_\_\_\_ [2]

[Turn over



- 3 The graph of distance against time for part of a bike journey is shown below.



- (i) During which time period is the bike travelling the fastest?  
Give a reason for your answer.

\_\_\_\_\_ to \_\_\_\_\_ s

Reason \_\_\_\_\_

Describe the motion of the bike during the time period 35 to 50 seconds.

\_\_\_\_\_

How far has the bike travelled during the time period 0 to 30 seconds?

\_\_\_\_\_ m [4]



- (ii) Use values from the graph to calculate the speed of the bike during the first 25 seconds.

**You are advised to show your working out.**

Speed = \_\_\_\_\_ m/s [4]



- 4 (a) This question is about the efficiency of a light bulb.



© Getty Images

The light bulb uses 600 J of electrical energy.  
450 J of energy are wasted.

Calculate the efficiency of the light bulb.

**You are advised to show your working out.**

Efficiency = \_\_\_\_\_ [4]





(b) A drawer can be opened to a maximum distance of 60 cm.

To open the drawer fully, 0.72 J of work is done.

Calculate the force used to open the drawer fully.

**You are advised to show your working out.**

Force = \_\_\_\_\_ N [4]

[Turn over



- 5 (a) (i) Complete the sentence below for an object falling freely (free fall) in a **vacuum**.

Due to a force called \_\_\_\_\_ the object will fall with an  
acceleration of \_\_\_\_\_  $\text{m/s}^2$  and this acceleration is given the  
symbol \_\_\_\_\_.

[3]

- (ii) When this object falls through **air**, a second force acts on it.

Name this force and give its direction.

Force \_\_\_\_\_

Direction \_\_\_\_\_

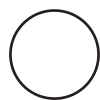
What effect will this have on the size of the acceleration compared with the  
acceleration of an object falling freely?

[3]



(b) An object falls through the air as shown.

falling object



← A    Velocity = 12 m/s



← B    Velocity = 36 m/s

At position A its velocity is 12 m/s and at position B its velocity is 36 m/s.  
The time interval between these two velocities is 3 seconds.  
Calculate the acceleration of the object.

**You are advised to show your working out.**

Acceleration = \_\_\_\_\_ m/s<sup>2</sup> [3]

[Turn over



- 6 (a) The image shows a digger with caterpillar tracks.



© Getty Images

The digger has a weight of 60 000 N.  
It exerts a pressure on the ground of 10 000 Pa.  
Calculate the area of **one** of the caterpillar tracks in contact with the ground.  
Include the unit with your answer.

**You are advised to show your working out.**

Area of one track = \_\_\_\_\_ [5]

- (b) Caterpillar tracks are used so that the digger will not sink in muddy ground.

Why does the digger not sink in muddy ground?

Explain fully your answer in terms of **pressure**.

\_\_\_\_\_  
\_\_\_\_\_ [2]





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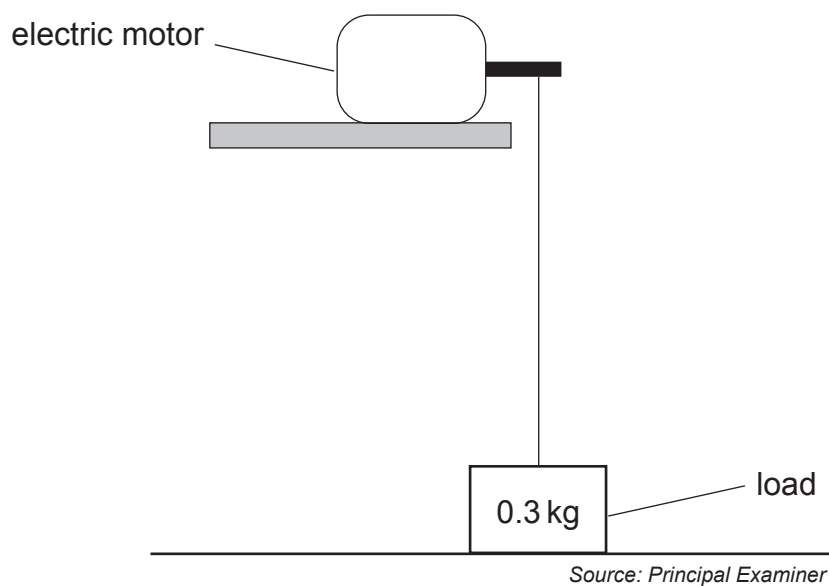
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**[Turn over**



**\*20GDW3213\***

- 7 An electric motor is used to lift a load of 0.3 kg.



The load is lifted to a height of 150 cm above the ground.

- (a) Calculate the increase in potential energy of the load.

**You are advised to show your working out.**

Increase in potential energy = \_\_\_\_\_ J [4]



- (b) A different electric motor of power output 750 W did 2250 J of work in lifting a load.

How long did it take to lift the load?

**You are advised to show your working out.**

Time = \_\_\_\_\_ s [3]



- 8 (a) Define the moment of a force **using words only**. Do not use symbols.

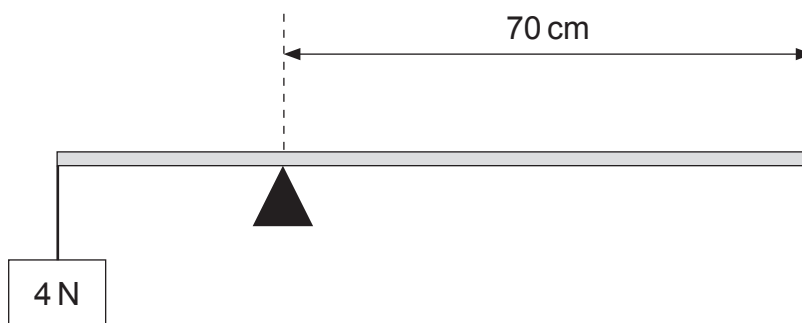
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[3]

- (b) A uniform rule, 100 cm long, is balanced by a 4 N force as shown in the diagram. The weight,  $W$ , of the rule is not shown.



Source: Principal Examiner

- (i) What is the direction of the moment exerted by the weight of the rule?

Direction = \_\_\_\_\_

What do we call the point where the weight of the rule acts?

\_\_\_\_\_ [2]

- (ii) Calculate the value of the moment exerted by the weight of the rule and give the unit. Do not change any units.  
Remember, the metre rule is balanced.

**You are advised to show your working out.**

Moment = \_\_\_\_\_ [4]







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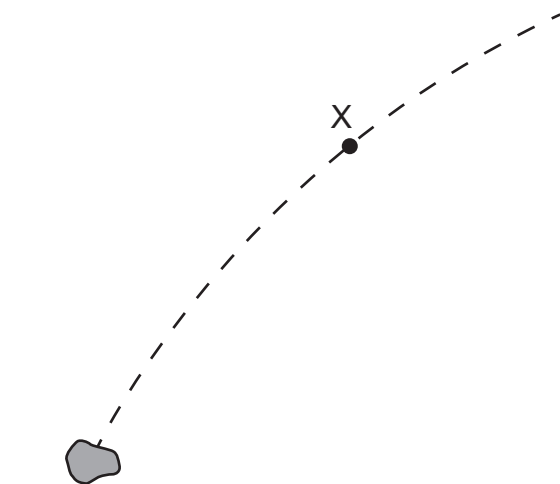
**\*20GDW3217\***

- 9 (i) Energy can be changed from one form to another but the total amount of energy does not change.

What name is given to this principle?

\_\_\_\_\_ [1]

- (ii) A stone of mass 50 g is projected into the air.



Source: Principal Examiner

The stone is projected with an initial energy of 12.0 J

At point X its potential energy is 7.2 J

Calculate the speed of the stone at the point X.

Assume no energy losses.

Give your answer correct to one decimal place.

**You are advised to show your working out.**

Speed = \_\_\_\_\_ m/s [5]



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| For Examiner's use only |       |
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| Question Number         | Marks |
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Examiner Number

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