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Candidate number

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# INTERNATIONAL GCSE

## PHYSICS

### Paper 1

Thursday 23 May 2019 07:00 GMT Time allowed: 1 hour 30 minutes

#### Materials

For this paper you must have:

- a ruler
- a scientific calculator
- a protractor
- the Physics Equations Sheet (enclosed).

#### Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you worked out your answer.

#### Information

- The maximum mark for this paper is 90.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.

For Examiner's Use

Question	Mark
1	
2	
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<b>TOTAL</b>	



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Answer **all** questions in the spaces provided.

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0 1

Drones are small flying machines that can carry a camera or a package.

**Figure 1** shows a drone hovering. Whilst hovering, the drone remains stationary in the air.

**Figure 1**

The following figure cannot be reproduced due to third-party copyright restrictions.

A student investigated how the mass of the package affected the time for which the drone could hover.

This is the method used:

- 1 Packages of different masses were added to the drone.
- 2 The time the drone could hover at 1.5 m from the ground was measured using a stop clock.
- 3 The stop clock was stopped when the “battery low” light came on.
- 4 In between each test the battery was recharged fully.
- 5 Each test was performed three times for each mass.

0 1 . 1

Complete the sentence.

Choose the answer from the box.

[1 mark]

categoric

dependent

independent

The mass of the package added to the drone is the \_\_\_\_\_ variable.

**Question 1 continues on the next page**

Turn over ►



**0 1 . 2** Identify **two** control variables in this investigation.

Tick (✓) **two** boxes.

**[2 marks]**

Hover time

The brightness of the “battery low” light

The initial charge stored in the battery

The mass of the drone

The mass of the package

**Table 1** shows the results.

**Table 1**

Mass of package in grams	Hover time in seconds			
	Test 1	Test 2	Test 3	Mean
0	263	267	268	266
40	226	227	231	228
80	186	186	183	<b>X</b>
120	146	145	144	145
160	106	101	108	105
200	72	67	71	70

**0 1 . 3** Calculate the mean hover time (**X**) when the mass of the package added was 80 g.

**[1 mark]**

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Mean hover time = \_\_\_\_\_ seconds

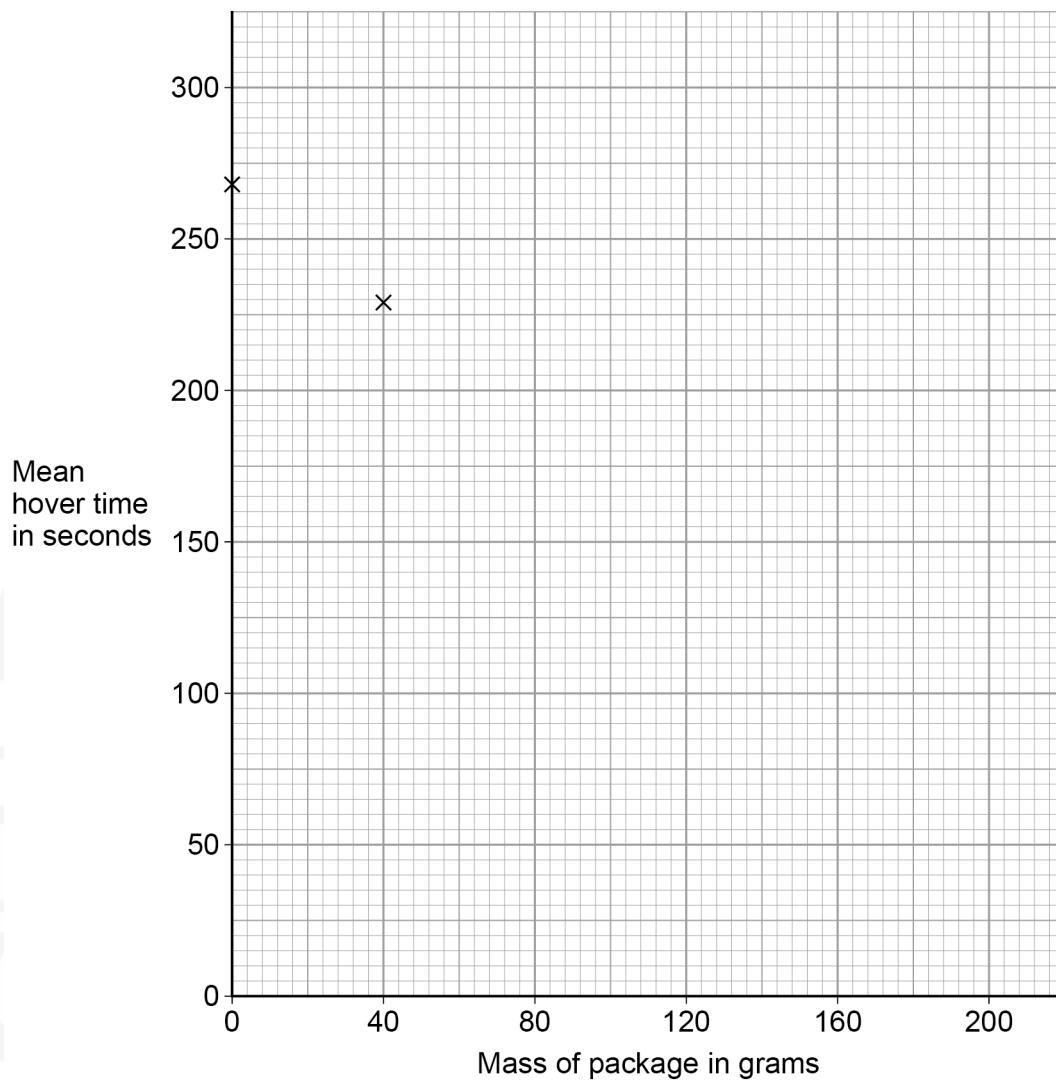


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**0 1 . 4** Plot a graph on **Figure 2** of the mass of the package against mean hover time.

**[2 marks]**

**Figure 2**



**0 1 . 5** Draw a line of best fit on **Figure 2**.

**[1 mark]**

**0 1 . 6** The drone can carry a camera. The mass of the camera is 140 g.

Determine the mean hover time for the drone carrying the camera.

**[1 mark]**

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Mean hover time = \_\_\_\_\_ seconds

**Question 1 continues on the next page**

**Turn over ►**



The mean hover time for the drone with no package or camera was 266 seconds.

**0 1 . 7** The drone has a maximum speed through the air of 5.0 m/s.

Calculate the maximum distance the drone could fly through the air in 266 seconds.

Use the Physics Equations Sheet.

**[3 marks]**

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Maximum distance = \_\_\_\_\_ m

**0 1 . 8** The maximum time the drone can fly through the air is less than 266 seconds.

Give **one** reason why.

**[1 mark]**

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**0 1 . 9** Suggest an ethical issue that might occur when using a drone.

**[1 mark]**

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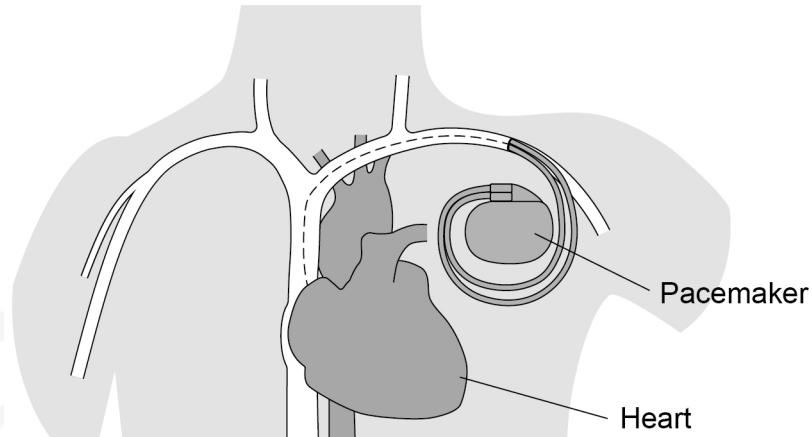
0 2

A pacemaker helps to control the rate at which a person's heart beats.

**Figure 3** shows a pacemaker attached to a person's heart.

In the past, radioactive sources were used to power pacemakers. The radioactive sources emitted alpha particles.

**Figure 3**



0 2 . 1

What is an alpha particle?

Tick (✓) **one** box.

An electron

A neutron

A proton

Two neutrons and two protons

[1 mark]

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0 2 . 2

A source had a half-life of 87.7 years.

Why is a source with a half-life of 87.7 years suitable for use in a pacemaker?

[1 mark]

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**Question 2 continues on the next page**

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**0 2 . 3** What is a beta particle?

Tick (✓) **one** box.

**[1 mark]**

An electron emitted from an energy level of the atom.

An electron emitted from the nucleus.

A neutron emitted from the nucleus.

Two neutrons and two protons emitted from the nucleus.

**0 2 . 4** The source was contained in a plastic case.

Explain why a source that emitted beta particles would **not** be suitable as a power source for pacemakers.

**[2 marks]**

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**0 2 . 5** Modern pacemakers contain electrical cells.

Give **one** advantage and **one** disadvantage of using electrical cells instead of radioactive sources to power a pacemaker.

**[2 marks]**

Advantage \_\_\_\_\_

\_\_\_\_\_

Disadvantage \_\_\_\_\_

\_\_\_\_\_

**7**





0 3

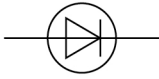
Diodes are components used in electrical circuits.

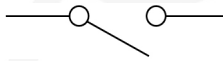
0 3 . 1

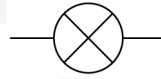
Which of the following is the symbol for a diode?

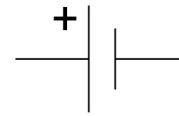
Tick (✓) **one** box.

[1 mark]







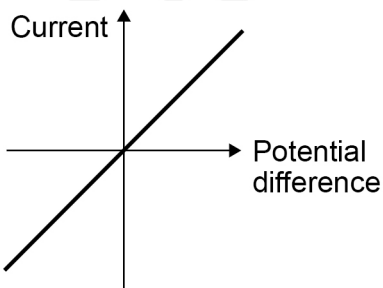


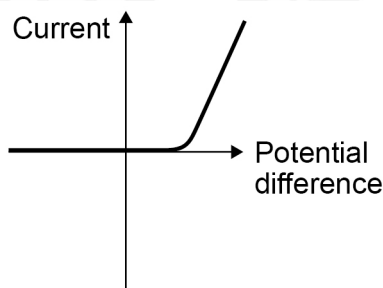

0 3 . 2

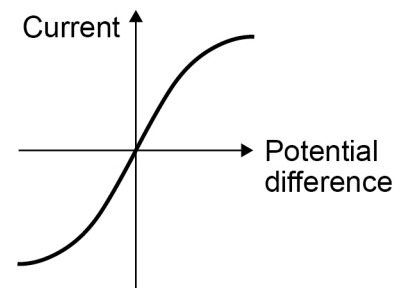
Which graph shows how the current in a diode varies with the potential difference across it?

Tick (✓) **one** box.

[1 mark]








0 3 . 3

Describe the resistance of a diode when connected in a circuit in the forward direction.

[1 mark]

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Question 3 continues on the next page

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0 3 . 4

**Figure 4** shows a torch which uses LEDs. Some torches use filament lamps instead of LEDs.

**Figure 4**



Explain **one** advantage of using LEDs rather than a filament lamp.

**[2 marks]**

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Different LEDs emit light of different colours.

**Table 2** shows the potential difference across, and current in, different LEDs.

**Table 2**

Colour of LED	Current in milliamps	Potential difference in volts
red	20	2.0
yellow	20	2.1
green	20	3.4

**0 3 . 5** Give the reason the green LED transfers the most energy per second.

**[1 mark]**

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**0 3 . 6** Determine the resistance of the green LED.

Use the Physics Equations Sheet.

**[4 marks]**

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Resistance = \_\_\_\_\_  $\Omega$

**10**

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0 4 Refraction can occur when light passes from one material to another.

0 4 . 1 Complete the sentence.

Choose the answer from the box.

[1 mark]

brightness

colour

frequency

speed

Light refracts when it passes from one material into another. This is  
because the \_\_\_\_\_ of the light changes.

0 4 . 2 Complete the sentence.

Choose the answer from the box.

[1 mark]

0°

45°

60°

90°

The light does **not** change direction as it passes from one material into another when  
the angle of incidence is \_\_\_\_\_.



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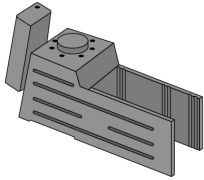
0 4 . 3

Describe how a student could take measurements to determine the refractive index of Perspex.

Use the equipment in **Figure 5**.

[6 marks]

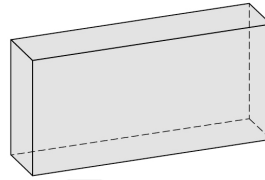
**Figure 5**



Ray box



Single slit



Perspex block



Protractor

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**0 4 . 4** The refractive index of Perspex is 1.49

Calculate the critical angle of Perspex.

**[2 marks]**

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Critical angle = \_\_\_\_\_ °

**0 4 . 5** Some people wear glasses to correct their vision.

The lenses in glasses can be made from different materials.

**Table 3** shows the features of two different materials that could be used to make lenses.

**Table 3**

Material	Refractive index	Percentage of ultraviolet transmitted	Density in g/cm <sup>3</sup>
Glass	1.50	39.1	2.60
Trivex	1.53	0	1.11

Explain why Trivex is a better material than glass for making lenses.

**[3 marks]**

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**13**



**0 5**

A protostar is the first stage in the life cycle of a star.

A protostar is made from a cloud of dust and gas.

**0 5 . 1**

Which force pulls together dust and gas to make a protostar?

Tick (✓) **one** box.

**[1 mark]**

Air resistance

Friction

Gravity

**0 5 . 2**

Which **two** statements describe a main sequence star?

Tick (✓) **two** boxes.

**[2 marks]**

Chemical reactions happen inside the core of the star to release energy.

Energy is released by the fusion of hydrogen nuclei to make helium nuclei.

The forces inside a main sequence star are unbalanced.

The less massive a star, the hotter the star's core.

The temperature and density of a star are greatest at the core of the star.

**Question 5 continues on the next page**

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0 5 . 3

The star Betelgeuse has a much greater mass than the Sun.

Describe the similarities and the differences between the life cycle of the Sun and the life cycle of the star Betelgeuse.

[6 marks]

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**0 6**

Small nuclear reactors are used in submarines to generate electricity.

The electricity can then be used to drive the propellers to make the submarine move.

**0 6 . 1**

Uranium can be used as a fuel in a nuclear reactor.

Which other fuel could be used in a nuclear reactor?

Tick (✓) **one** box.

**[1 mark]**

Argon

Lithium

Plutonium

Radon

**0 6 . 2**

Fission occurs inside a nuclear reactor.

What is meant by nuclear fission?

**[1 mark]**

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**Question 6 continues on the next page**

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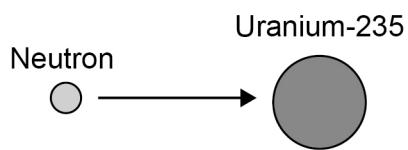
0 6 . 3

Complete **Figure 6** to show how the nuclear fission of uranium-235 may lead to a chain reaction.

Label your diagram.

[3 marks]

**Figure 6**



0 6 . 4

Explain the function of the control rods in a nuclear reactor.

[3 marks]

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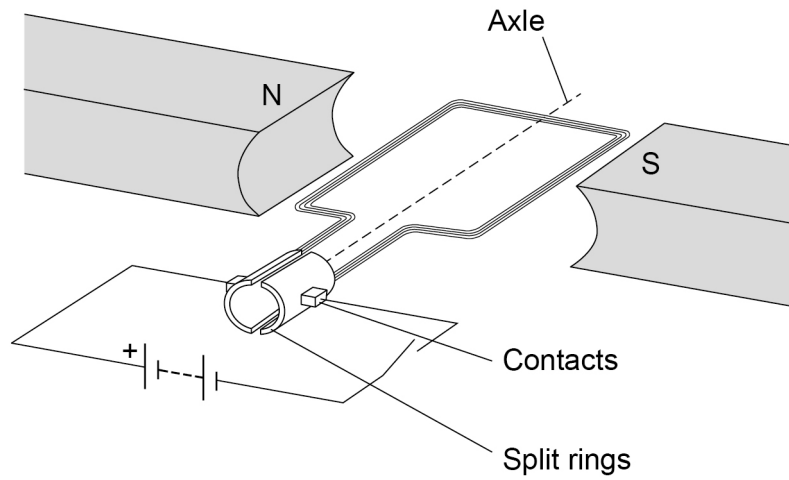


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0 7

Figure 7 shows a simple electric motor.

Figure 7



0 7 . 1

When there is a current in the coil, the coil rotates continuously.

Explain why the coil rotates continuously when there is current in the coil.

[4 marks]

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During an earthquake buildings can collapse.

**Figure 8** shows a robot designed to find people inside collapsed buildings.

The robot is operated remotely and has a camera on the front.

An electric motor makes the legs of the robot rotate, moving the robot forwards.

**Figure 8**

The following figure cannot be reproduced due to third-party copyright restrictions.

**0 7 . 2** Give **two** changes to the electric motor that would make the robot move faster.

**[2 marks]**

1 \_\_\_\_\_  
\_\_\_\_\_

2 \_\_\_\_\_  
\_\_\_\_\_

**0 7 . 3** Give **two** changes to the electric motor that would make the robot move backwards.

**[2 marks]**

1 \_\_\_\_\_  
\_\_\_\_\_

2 \_\_\_\_\_  
\_\_\_\_\_

**Question 7 continues on the next page**

**Turn over ►**



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0 7 . 4

Suggest **two** advantages of using this robot to find people inside collapsed buildings instead of rescue dogs and their handlers.

[2 marks]

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

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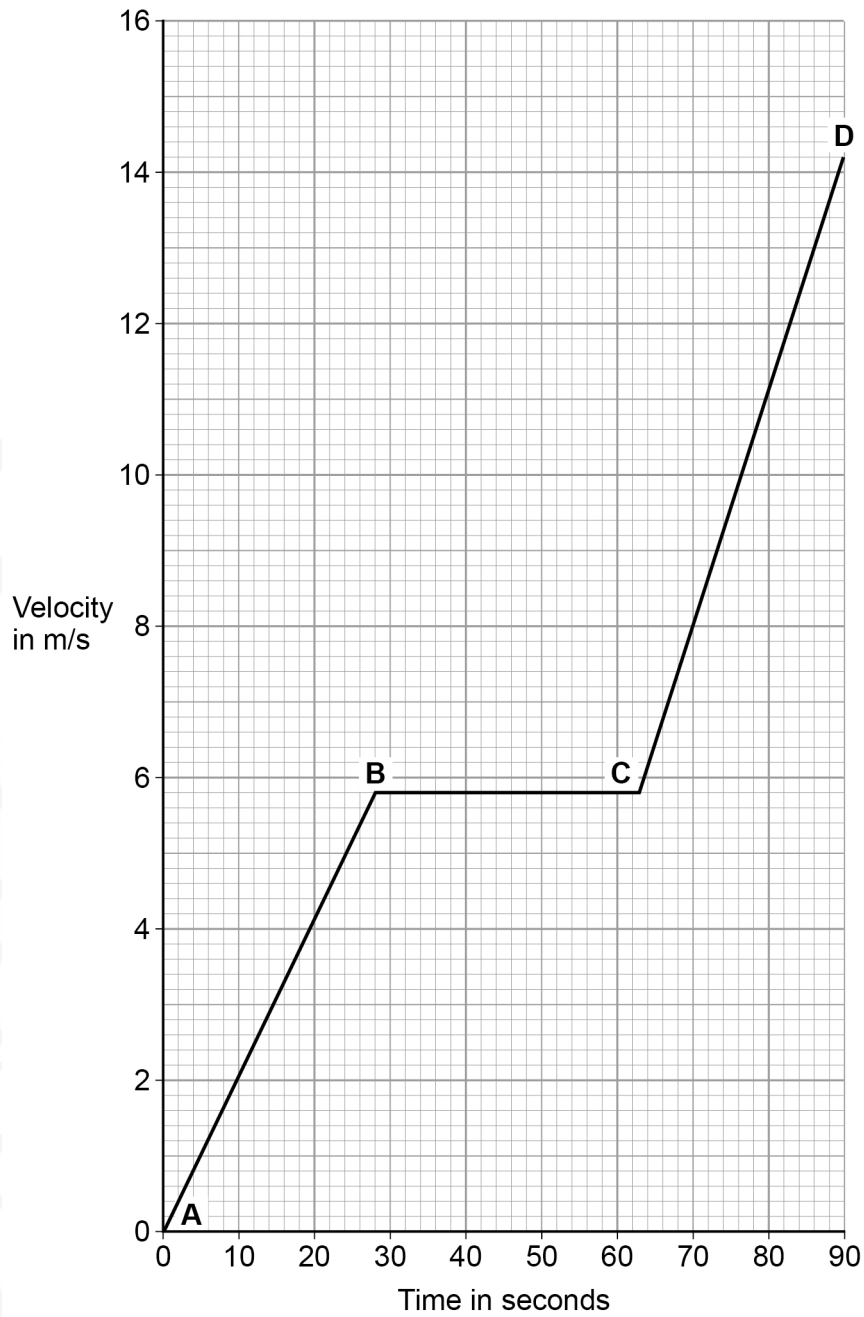


0 8

A horse is ridden along a straight track.

Figure 9 shows the velocity-time graph of the journey.

Figure 9



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**0 8 . 1** Determine the time for which the horse was travelling at a constant velocity.

[1 mark]

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Time = \_\_\_\_\_ seconds

**0 8 . 2** How can you tell there is the greatest acceleration between points **C** and **D**?

[1 mark]

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**0 8 . 3** Calculate the acceleration between points **C** and **D**.

[2 marks]

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Acceleration = \_\_\_\_\_ m/s<sup>2</sup>

**0 8 . 4** Determine the total distance travelled while the horse was accelerating.

[4 marks]

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Total distance = \_\_\_\_\_ m

**Question 8 continues on the next page**

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**0 8 . 5** The weight of the horse is 6.37 kN.

Calculate the kinetic energy of the horse at point **B**.

gravitational field strength = 9.8 N/kg

Give your answer to 2 significant figures.

Use the Physics Equations Sheet.

**[5 marks]**

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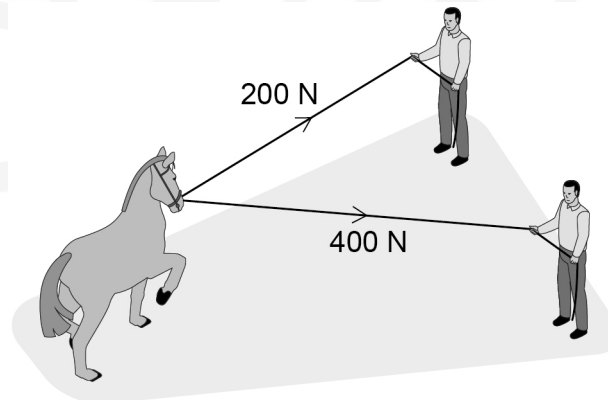
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Kinetic energy = \_\_\_\_\_ J

**0 8 . 6** After being ridden, the horse is led away by two people using ropes as shown in **Figure 10**.

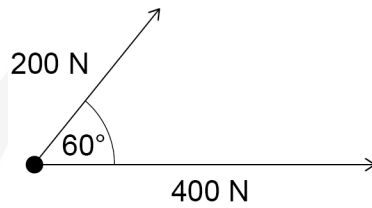
**Figure 10**



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**Figure 11** shows the forces from the two ropes acting on the horse. The angle between the forces is  $60^\circ$

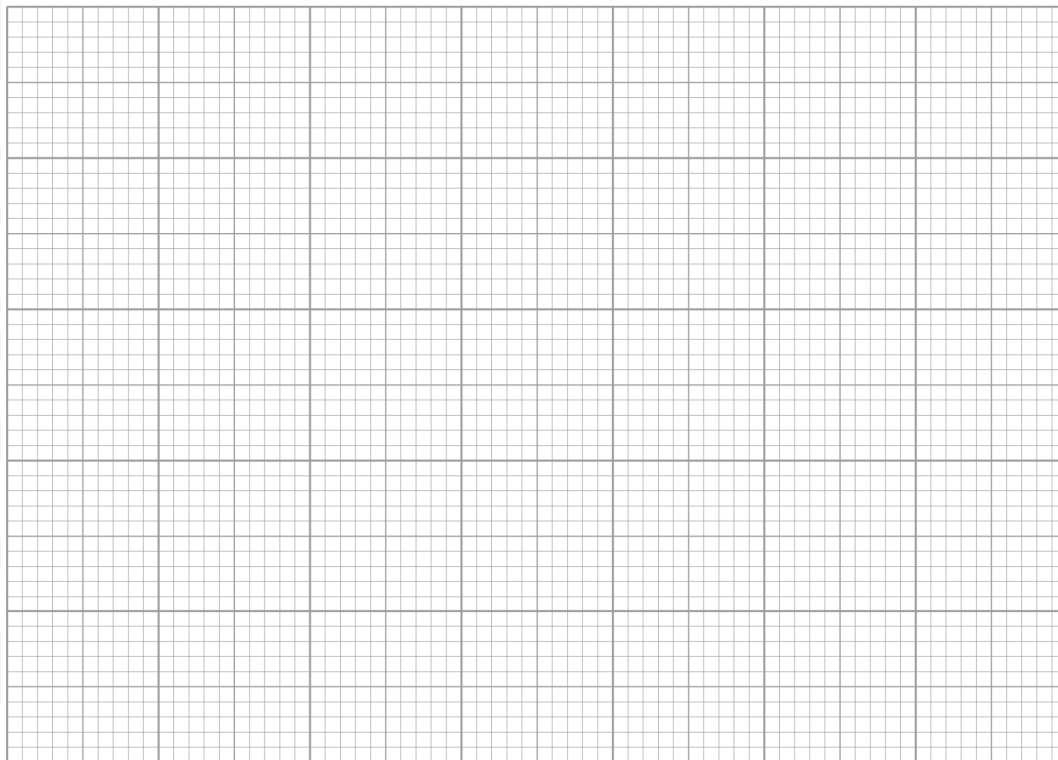
**Figure 11**



Draw a vector diagram to determine the magnitude of the resultant force from the ropes on the horse.

**[3 marks]**

**Figure 12**



Resultant Force = \_\_\_\_\_ N

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**END OF QUESTIONS**



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