OXFORD

INTERNATIONAL AQA EXAMINATIONS

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

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.

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There are no questions on this page

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ANSWER IN THE SPACES PROVIDED

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

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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	**X**
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]

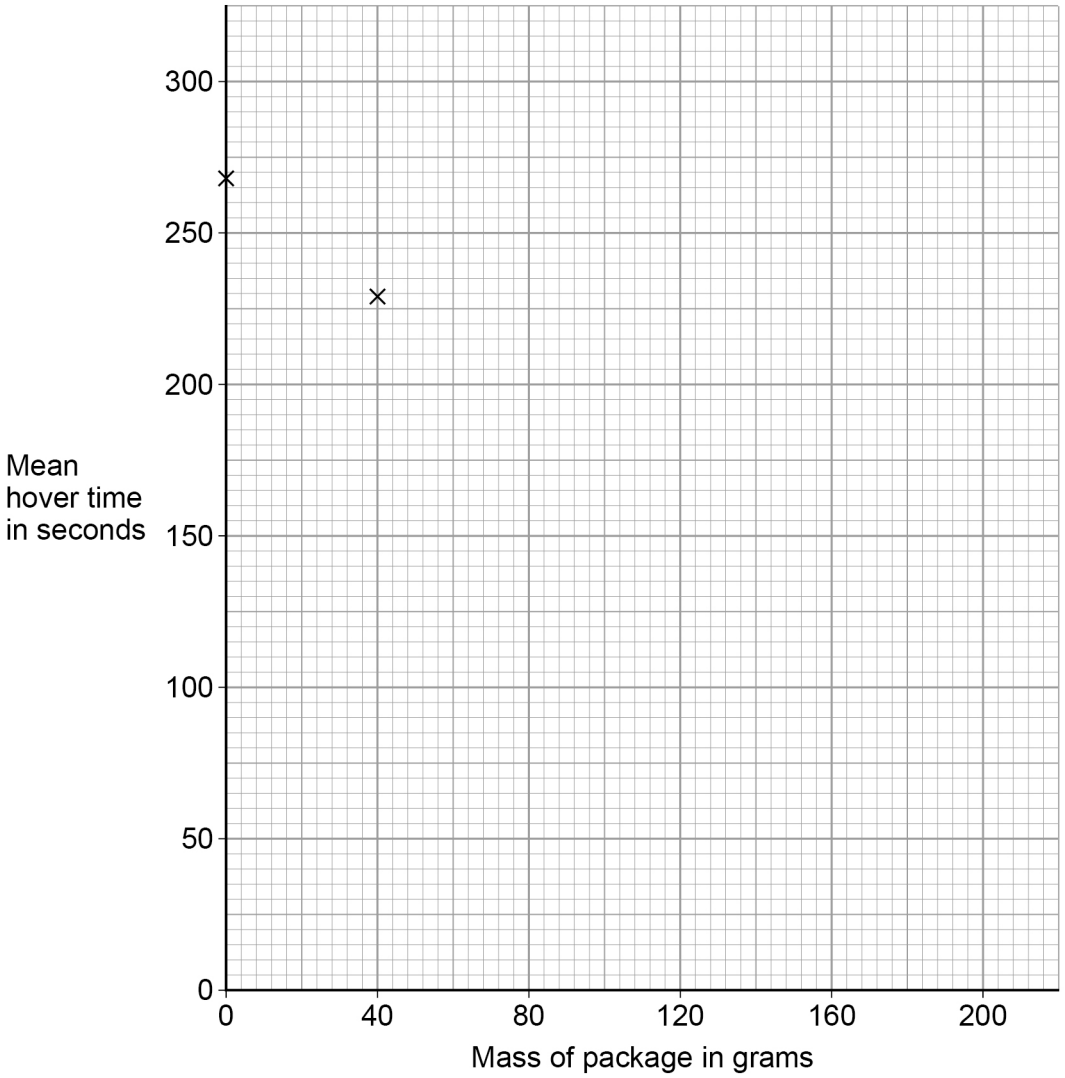
Mean hover time = _____ seconds

Do not write outside the box

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]

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]

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]

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

[1 mark]

13

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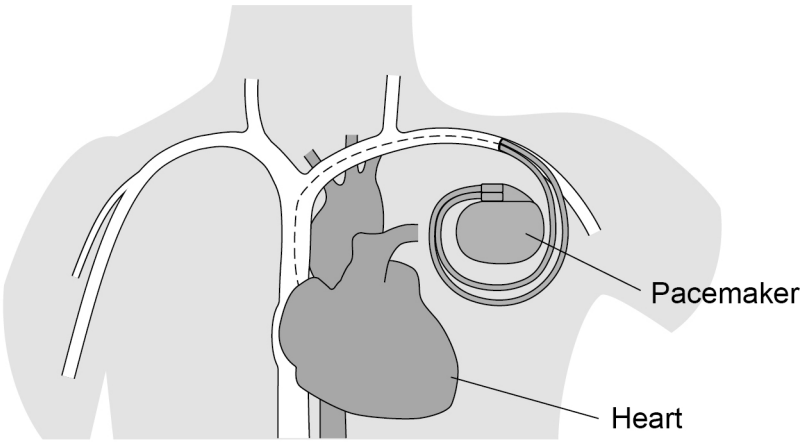
0 2 A pacemaker helps to control the rate at which a person's heart beats.

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.

[1 mark]

An electron ☐

A neutron ☐

A proton ☐

Two neutrons and two protons ☐

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]

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]

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

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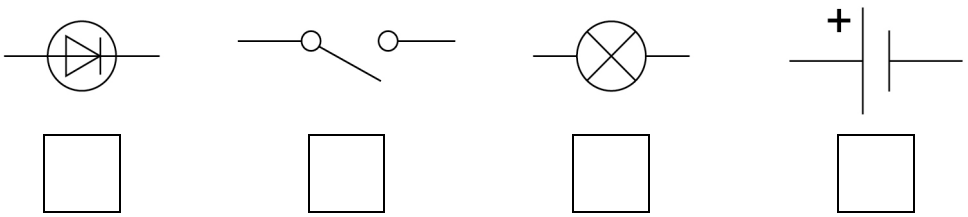
0 3 Diodes are components used in electrical circuits.

0 3 . 1 Which of the following is the symbol for a diode?

Tick (✓) **one** box.

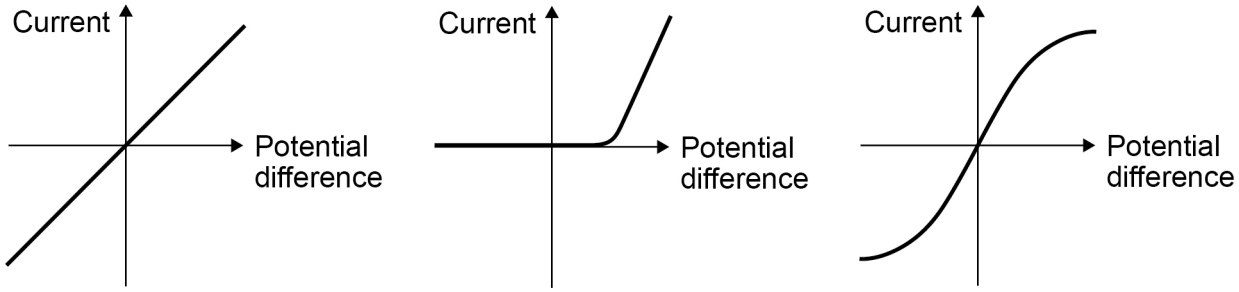
[1 mark]



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]

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]

Do not write outside the box

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]

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

Use the Physics Equations Sheet.

[4 marks]

Resistance = _____ Ω

10

Turn over for the next question

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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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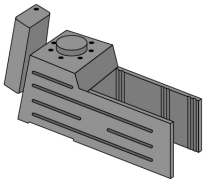
0 4 . 3 Describe how a student could take measurements to determine the refractive index of Perspex.

Use the equipment in **Figure 5**.

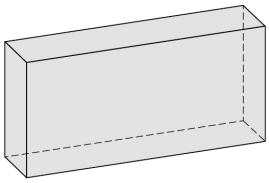
[6 marks]

Figure 5



Ray box

Single slit



Perspex block

Protractor

Question 4 continues on the next page

0 4 . 4 The refractive index of Perspex is 1.49

Calculate the critical angle of Perspex.

[2 marks]

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^3
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]

13

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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]

9

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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]

_____

_____

Question 6 continues on the next page

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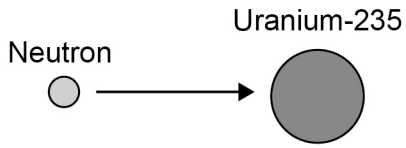
0 6 . 3 Complete **Figure 6** to show how the nuclear fission of uranium-235 may lead to a chain reaction.

Label your diagram.

[3 marks]

Figure 6



0 6 . 4 Explain the function of the control rods in a nuclear reactor.

[3 marks]

Do not write outside the box

0 6 . 5 Diesel engines can be used in submarines to charge batteries. The electricity from the batteries is then used to power the propellers, so the submarine can move.

Evaluate the use of nuclear reactors and diesel engines to generate electricity for submarines.

[4 marks]

12

Turn over for the next question

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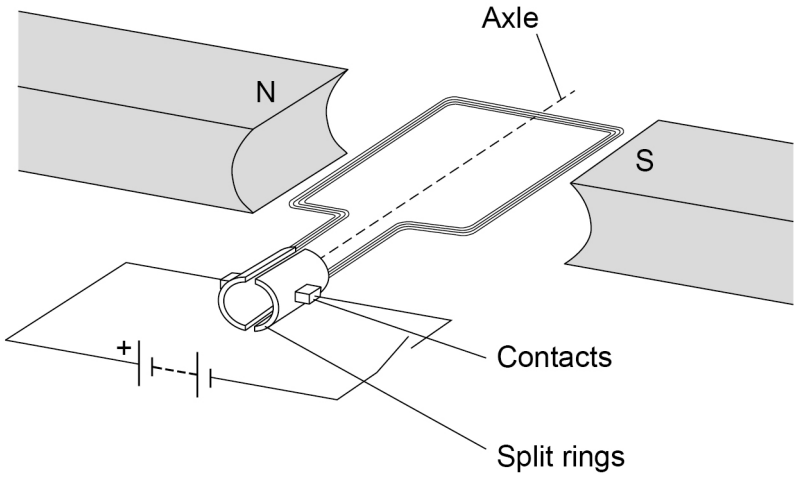
0 7 **Figure 7** shows a simple electric motor.

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

Do not write outside the box

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 _____

_____

10

Turn over for the next question

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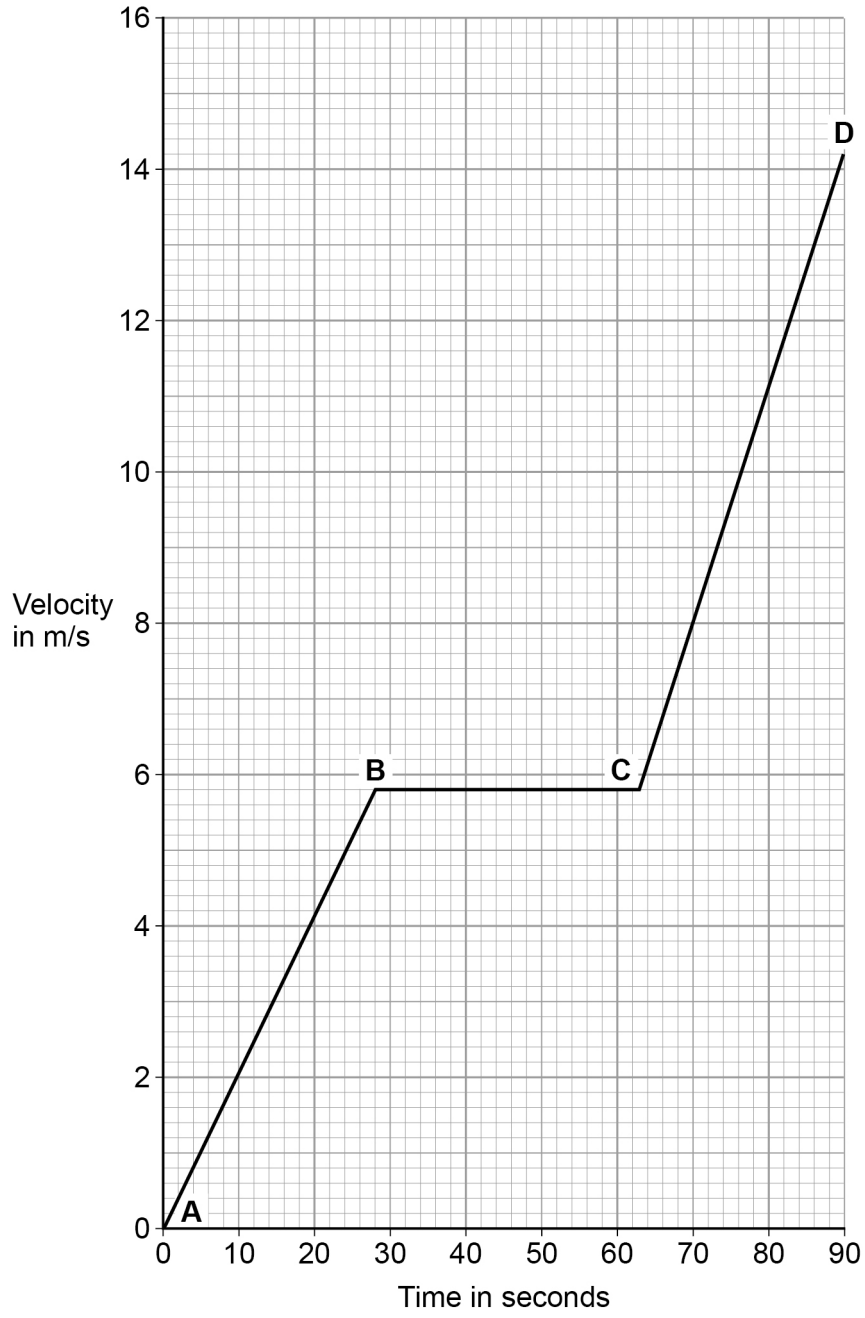
0 8 A horse is ridden along a straight track.

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]

Time = _____ seconds

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

[1 mark]

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

[2 marks]

Acceleration = _____ m/s^2

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

[4 marks]

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]

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

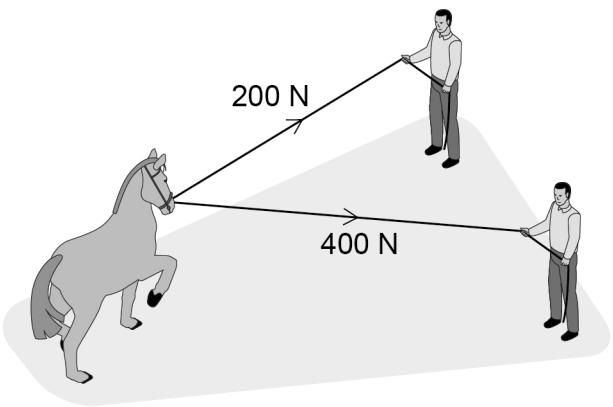
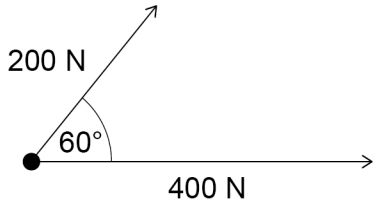


Figure 11 shows the forces from the two ropes acting on the horse. The angle between the forces is 60°

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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