

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE PHYSICS

Foundation Tier

Paper 2

F

Time allowed: 1 hour 45 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. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- 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).
- In all calculations, show clearly how you work out your answer.

Information

- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	



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

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0 1

When two magnets are close together they exert a force on each other.

0 1 . 1

Complete **Table 1** to show if the magnets would attract or repel.

[2 marks]

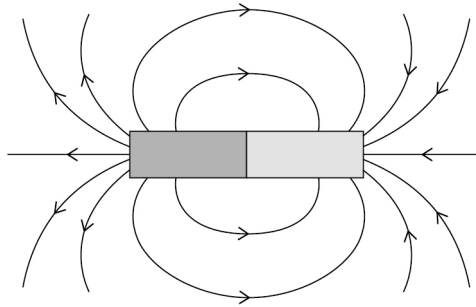
Tick (✓) **one** box in **each** row.

Table 1

		Attract	Repel
			
			
			
			



0 1 . 2

Figure 1 shows the magnetic field around a bar magnet.**Figure 1**Which statements are true for the magnetic field shown in **Figure 1**?**[2 marks]**Tick (✓) **two** boxes.

The magnetic field gets weaker further from the magnet.

☐

The magnetic field is strongest at the poles.

☐

The magnetic field is uniform away from the poles.

☐

The magnetic field lines all meet at a single point.

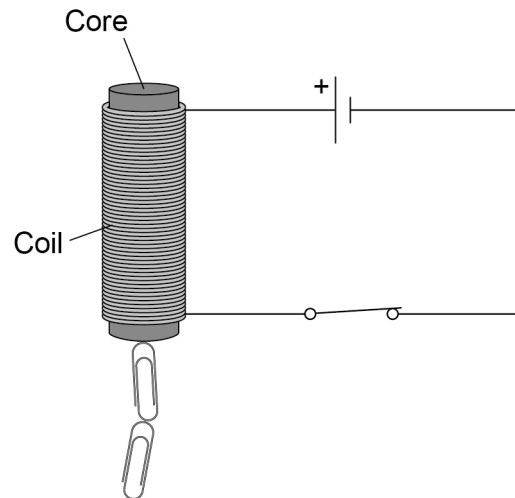
☐

The magnetic field lines point from south to north.

☐**Question 1 continues on the next page****Turn over ►**

Figure 2 includes an electromagnet.

Figure 2



0 1 . 3 Which metal is used to make the core of the electromagnet?

[1 mark]

Tick (✓) **one** box.

Aluminium

☐

Copper

☐

Iron

☐

Magnesium

☐

0 1 . 4 Complete the sentence.

Choose the answer from the box.

[1 mark]

coil	metal core	paper clip
------	------------	------------

The switch is closed. There is a current in the _____.



0 1 . 5

The number of turns on the coil is increased. The current remains the same.

How does this affect the strength of the magnetic field around the electromagnet?

[1 mark]

Tick (✓) **one** box.

The magnetic field would be stronger.

☐

The magnetic field would stay the same.

☐

The magnetic field would be weaker.

☐

0 1 . 6

The metal core was removed. The current remains the same.

How does this affect the strength of the magnetic field around the electromagnet?

[1 mark]

Tick (✓) **one** box.

The magnetic field would be stronger.

☐

The magnetic field would stay the same.

☐

The magnetic field would be weaker.

☐

8

Turn over for the next question

Turn over ►



0 2

Hailstones are small balls of ice. Hailstones form in clouds and fall to the ground.

Figure 3 shows different-sized hailstones.

Figure 3

**0 2 . 1**

Which force causes the hailstones to fall to the ground?

[1 mark]

Tick (✓) **one** box.

Air resistance

☐

Gravitational force

☐

Magnetic force

☐

Tension

☐

0 2 . 2 As the hailstones begin to fall they accelerate.

Which force increases as the hailstones accelerate?

[1 mark]

Tick (✓) **one** box.

Air resistance

☐

Gravitational force

☐

Magnetic force

☐

Tension

☐

0 2 . 3 After a short time hailstones fall at terminal velocity.

Which of the following statements is true at terminal velocity?

[1 mark]

Tick (✓) **one** box.

The hailstones begin to slow down.

☐

The mass of the hailstones increases.

☐

The resultant force on the hailstones is zero.

☐

Question 2 continues on the next page

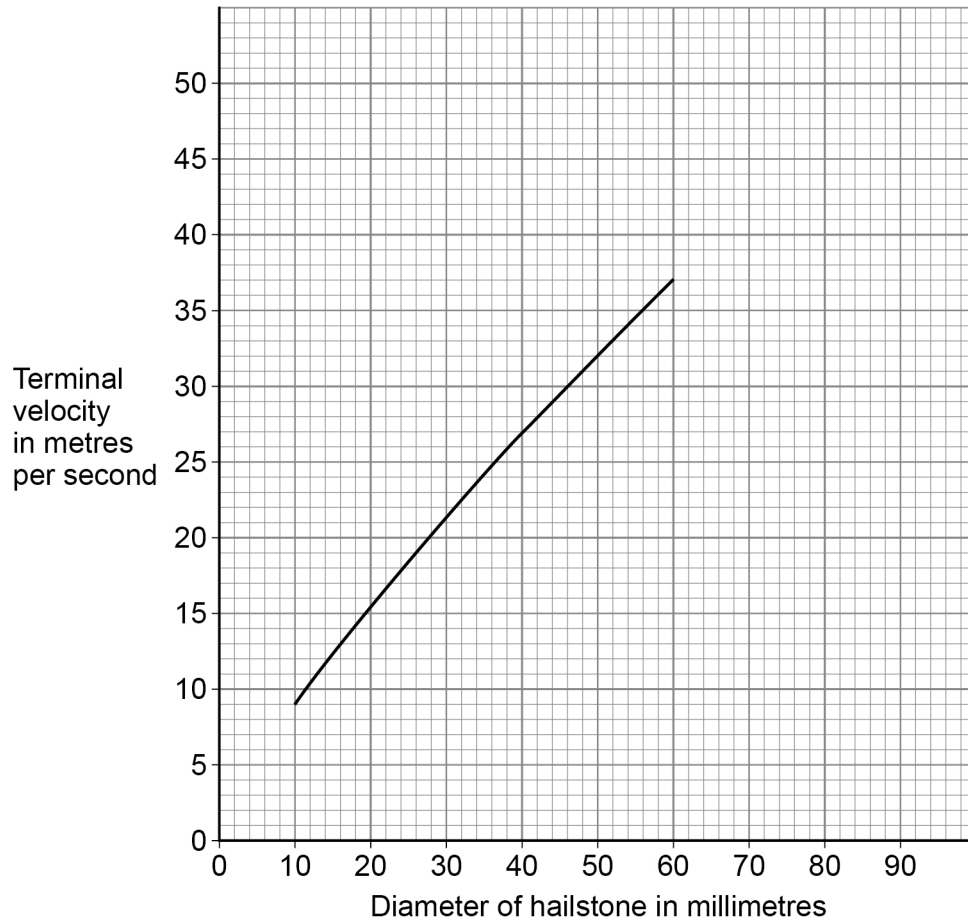
Turn over ►



A scientist investigated how the terminal velocity of hailstones varies with their diameter.

Figure 4 shows the results.

Figure 4



0 2 . 4 Estimate the terminal velocity for a hailstone with a diameter of 80 mm.

Show how you obtain your answer.

[2 marks]

Terminal velocity = _____ m/s



0 2 . 5

Give **one** reason why a hailstone with a large diameter has a greater terminal velocity than a hailstone with a smaller diameter.

[1 mark]

Tick (✓) **one** box.

It has a greater power.

☐

It has a greater pressure.

☐

It has a greater temperature.

☐

It has a greater weight.

☐

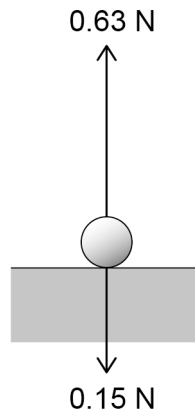
Question 2 continues on the next page

Turn over ►

After falling, the hailstone hits the ground.

Figure 5 shows the forces acting on the hailstone at the moment it hits the ground.

Figure 5



0 2 . 6 What is the magnitude of the resultant force on the hailstone in **Figure 5**? [1 mark]

Tick (✓) **one** box.

0.15 N

☐

0.48 N

☐

0.63 N

☐

0.78 N

☐

0 2 . 7 What is the direction of the resultant force on the hailstone in **Figure 5**? [1 mark]



Turn over for the next question

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ANSWER IN THE SPACES PROVIDED**

Turn over ►



0 3

The Sun is at the centre of our solar system.

0 3 . 1

What type of object is the Sun?

[1 mark]

0 3 . 2

What is the name of the galaxy our solar system is part of?

[1 mark]Tick (✓) **one** box.

Andromeda

☐

Milky Way

☐

Sombrero

☐

Tadpole

☐

Table 2 gives information about some of the moons in our solar system.

Table 2

Moon	Radius in kilometres
Ganymede	2630
Titan	2570
Europa	1560
Charon	606

0 3 . 3 What is a moon?

[1 mark]

0 3 . 4 A student researched the radius of some planets in the solar system.

radius of largest dwarf planet = 1190 km

radius of smallest planet = 2440 km

The student made the following conclusions:

1. dwarf planets are always smaller than moons
2. planets are always bigger than moons.

Give **one** reason why each of the student's conclusions is wrong.

Use the data given above and in **Table 2**.

[2 marks]

1 _____

2 _____

Question 3 continues on the next page

Turn over ►



The Earth's Moon and the International Space Station both orbit the Earth.

0 3 . 5

Give **one other** similarity and **one** difference between the orbit of the Earth's Moon and the orbit of the International Space Station.

[2 marks]

Similarity _____

Difference _____

0 3 . 6

Very few people have been to the International Space Station.

Suggest **one** reason why very few people have been to the International Space Station.

[1 mark]

8



Turn over for the next question

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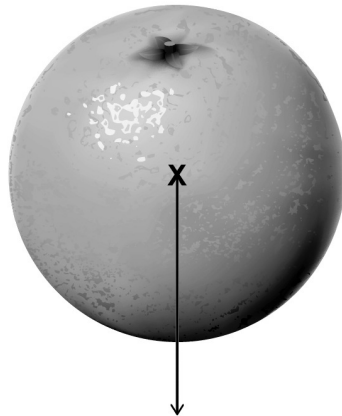
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0 4

Figure 6 shows the weight of an orange acting from a point labelled **X**.

Figure 6



0 4 . 1

What name is given to point **X** in **Figure 6**?

[1 mark]

Tick (✓) **one** box.

Centre of force

☐

Centre of mass

☐

Centre of balance

☐

Centre of weight

☐

0 4 . 2

Weight and mass are not the same.

The relationship between weight and mass for an object can be written as:

$$\text{weight} \propto \text{mass}$$

Which sentence describes the relationship between weight and mass?

[1 mark]

Tick (✓) **one** box.

Weight is approximately equal to mass.

☐

Weight is directly proportional to mass.

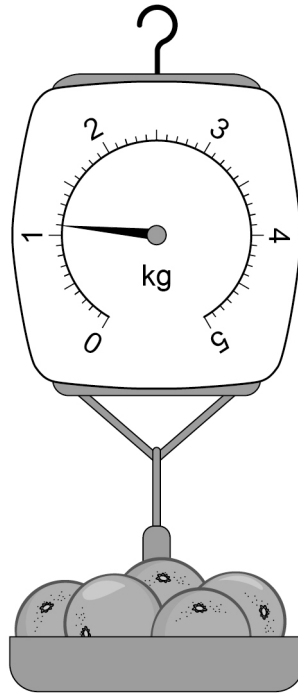
☐

Weight is less than mass.

☐


Figure 7 shows a balance used to measure the mass of 5 oranges.

Figure 7



0 4 . 3 All 5 of the oranges have the same mass.

Determine the mass of 1 orange.

[2 marks]

Mass = _____ kg

0 4 . 4 Calculate the weight of 1 orange.

gravitational field strength = 9.8 N/kg

Use the equation:

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

[2 marks]

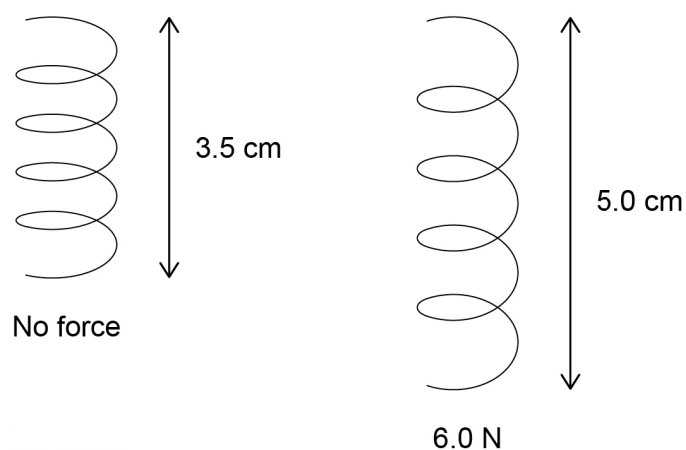
Weight = _____ N



The balance shown in **Figure 7** contains a spring.

Figure 8 shows the spring with no force acting on it and with a force of 6.0 N acting on it.

Figure 8



0 4 . 5 What is the extension of the spring when a force of 6.0 N acts on it?

[1 mark]

Tick (✓) **one** box.

0.015 m

☐

0.035 m

☐

0.050 m

☐

0.085 m

☐

0 4 . 6 Calculate the spring constant of the spring.

Use the equation:

$$\text{spring constant} = \frac{\text{force}}{\text{extension}}$$

[2 marks]

Spring constant = _____ N/m



0 4 . 7

What will happen to the spring when the force is removed?

[1 mark]*Do not write
outside the
box***10****Turn over for the next question**

0 5

Ultraviolet and visible light are both parts of the electromagnetic spectrum.

0 5 . 1

How does the speed of ultraviolet in a vacuum compare to the speed of visible light in a vacuum?

[1 mark]Tick (✓) **one** box.

Ultraviolet travels at a faster speed than visible light.

☐

Ultraviolet travels at a slower speed than visible light.

☐

Ultraviolet travels at the same speed as visible light.

☐**0 5 . 2****Figure 9** shows parts of the electromagnetic spectrum.**Figure 9**

Radio waves	A	B	C	D	X-rays	Gamma rays
--------------------	----------	----------	----------	----------	---------------	-------------------

Which letters represent the positions of ultraviolet and visible light in the electromagnetic spectrum?

[2 marks]

Ultraviolet _____

Visible light _____



0 5 . 3 **Table 3** shows the range of wavelengths for different types of ultraviolet.

Table 3

Type	Range of wavelength in nanometres
Ultraviolet A (UVA)	315–400
Ultraviolet B (UVB)	280–315
Ultraviolet C (UVC)	100–280

Determine which type of ultraviolet shown in **Table 3** has the largest range of wavelengths.

To gain full marks you must calculate the range of wavelengths for each type of ultraviolet.

[3 marks]

Type of ultraviolet with the largest range of wavelengths _____

Question 5 continues on the next page

Turn over ►



Figure 10 shows how different types of ultraviolet are absorbed by the ozone layer in the Earth's atmosphere.

Table 4 shows the relative ionising power from each type of ultraviolet.

Figure 10

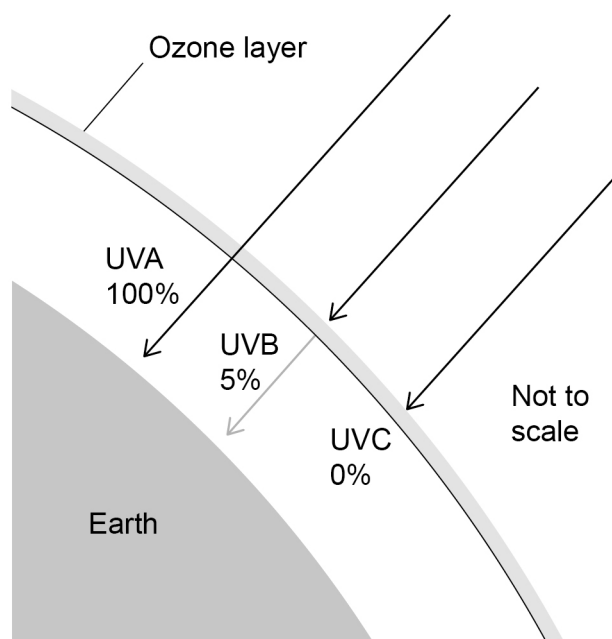


Table 4

Type	Relative ionising power
UVA	Low
UVB	Medium
UVC	High

0 5 . 4

Explain the importance of the ozone layer in reducing the risk to people from all types of ultraviolet.

Use **Figure 10** and **Table 4**.

[4 marks]



0 5 . 5 The Sun emits visible light.

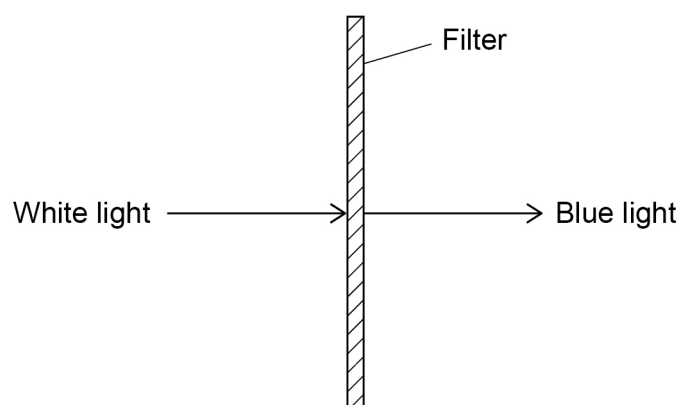
A student concludes that visible light is **not** absorbed by the ozone layer.

Give **one** piece of evidence that shows the student's conclusion is correct.

[1 mark]

0 5 . 6 Figure 11 shows white light incident on a colour filter.

Figure 11



Complete the sentence.

Choose the answers from the box.

[2 marks]

absorbed	radiated	reflected	refracted	transmitted
-----------------	-----------------	------------------	------------------	--------------------

When white light is incident on the filter, only blue light is _____

and all other colours of light are _____ .

13



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0 6

The Earth is surrounded by an atmosphere.

0 6 . 1

The radius of the Earth is 6400 km.

Which of the following could be an approximate depth of the Earth's atmosphere?

[1 mark]Tick (✓) **one** box.

100 km

☐

6400 km

☐

100 000 km

☐

640 000 km

☐**0 6 . 2**

What state of matter is most of the Earth's atmosphere?

[1 mark]Tick (✓) **one** box.

Gas

☐

Liquid

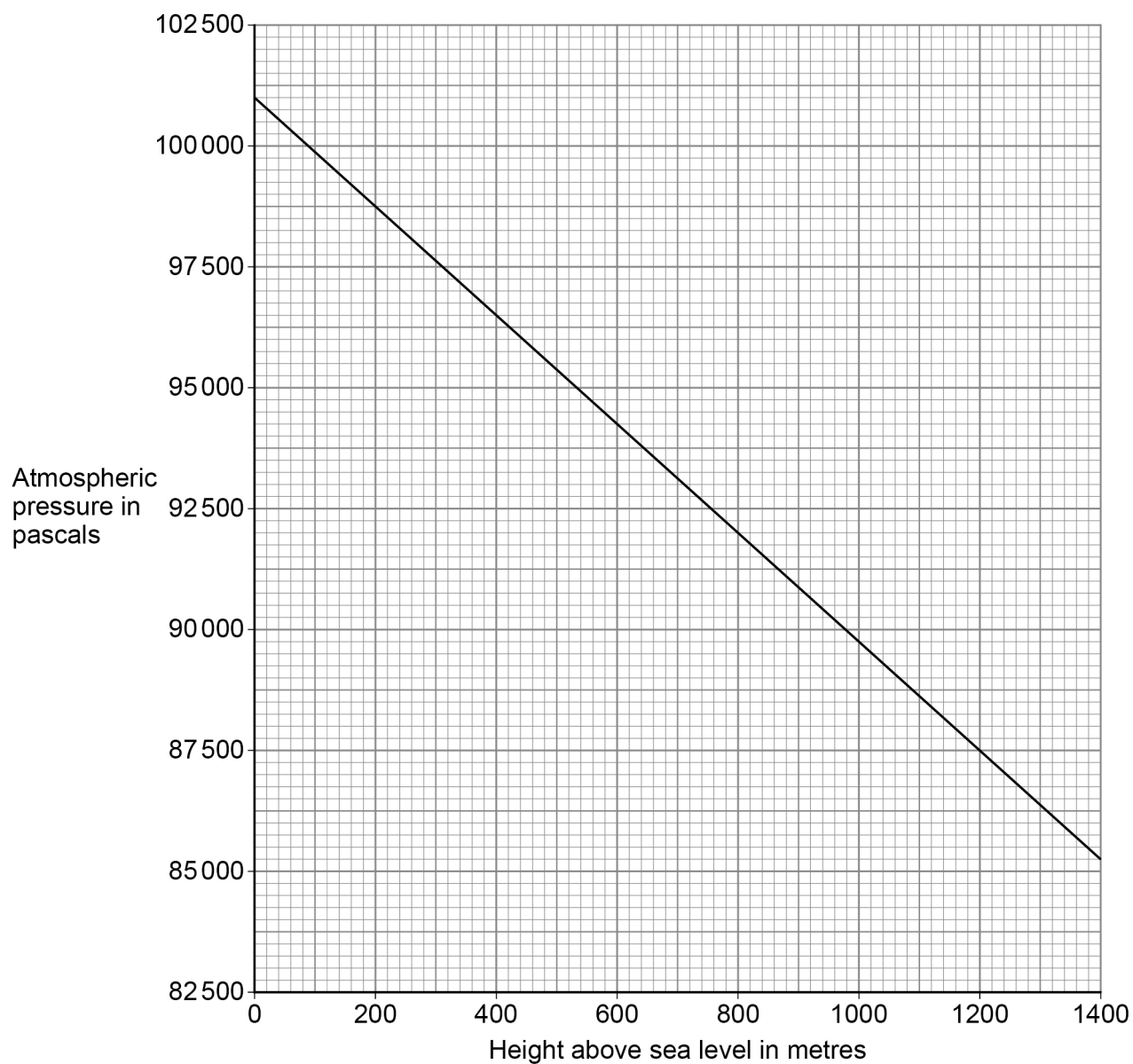
☐

Solid

☐**Question 6 continues on the next page****Turn over ►**

Figure 12 shows how atmospheric pressure varies with height above sea level.

Figure 12



06.3

The highest point above sea level in England is the top of a mountain called Scafell Pike.

The height above sea level of Scafell Pike is 978 m.

Determine the atmospheric pressure at the top of Scafell Pike.

Use **Figure 12**.

[1 mark]

Atmospheric pressure = _____ Pa

06.4

Determine the difference between the atmospheric pressure at sea level and at the top of Scafell Pike.

Use **Figure 12** and your answer from Question **06.3**

[1 mark]

Difference in atmospheric pressure = _____ Pa

06.5

A student climbs Scafell Pike.

Why does the atmospheric pressure decrease as the student climbs higher?

[2 marks]

Tick (✓) **two** boxes.

The air exerts a greater force on the student.

☐

The density of the air decreases.

☐

The mass of air above the student decreases.

☐

The temperature of the air increases.

☐

The volume of air above the student increases.

☐

Question 6 continues on the next page

Turn over ►



0 6 . 6

Figure 13 shows a mountain lake.

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Figure 13



The lake has a surface area of 2000 m^2 .

Atmospheric pressure exerts a force of $188\,000\,000 \text{ N}$ on the surface of the lake.

Calculate the atmospheric pressure at the surface of the lake.

Use the equation:

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

[2 marks]

Atmospheric pressure = _____ Pa

8



0 7

Sound travels as longitudinal waves.

0 7 . 1

Complete the sentences.

Choose the answers from the box.

[2 marks]**amplitude****frequency****speed****wavelength**

The distance between the centre of one compression of a sound wave and the centre of the next compression is called the _____.

The number of waves passing a point each second is called the

_____.

0 7 . 2

Complete the sentence.

Choose the answer from the box.

[1 mark]**opposite****perpendicular****parallel**

In a longitudinal wave, the oscillations are _____
to the direction of energy transfer.

Question 7 continues on the next page

0 7 . 3 A sound wave has a frequency of 8.0 kHz.

Which of the following is the same as 8.0 kHz?

[1 mark]

Tick (✓) **one** box.

0.0080 Hz

☐

8.0 Hz

☐

8000 Hz

☐

800 000 Hz

☐

0 7 . 4 Calculate the period of a sound wave with a frequency of 8.0 kHz.

Use the Physics Equations Sheet.

[2 marks]

Period = _____ s



0 7 . 5

Calculate the wavelength of a sound wave with a frequency of 6600 Hz.

speed of sound = 330 m/s

Use the equation:

$$\text{wavelength} = \frac{\text{speed}}{\text{frequency}}$$

Choose the unit from the box.

[3 marks]

kg

m

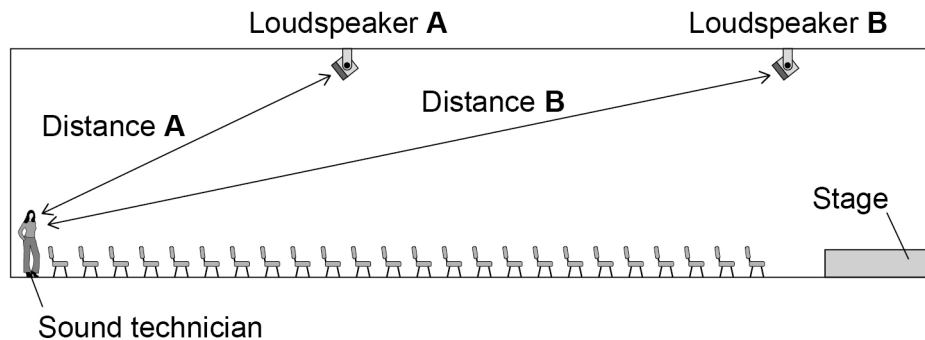
N

Wavelength = _____ Unit _____

Question 7 continues on the next page**Turn over ►**

Figure 14 shows the arrangement of two loudspeakers at a concert venue.

Figure 14



The loudspeakers in **Figure 14** are tested by playing the same song through both loudspeakers.

A sound technician listens to the song.

Use the Physics Equations Sheet to answer questions **07.6** and **07.7**.

07.6

Write down the equation which links distance (s), speed (v) and time (t).

[1 mark]

07.7

Distance **A** on **Figure 14** is 13.2 m.

speed of sound = 330 m/s

Calculate the time taken for the sound to travel from loudspeaker **A** to the technician.

[3 marks]

Time taken = _____ s



0	7	.	8
---	---	---	---

The sound from each loudspeaker travels at the same speed.

For the sound technician to hear the song clearly, the sound from loudspeaker **B** should be emitted slightly before the sound from loudspeaker **A**.

Explain why.

[3 marks]

16

Turn over for the next question

Turn over ►



0	8
---	---

Figure 15 shows an electric super-car.

Figure 15



0	8	.	1
---	---	---	---

The battery in an electric car needs to be recharged.

Suggest **two** factors that affect the distance an electric car can travel before the battery needs to be recharged.

[2 marks]

1 _____

2 _____

Use the Physics Equations Sheet to answer questions **08.2** and **08.3**.

0 8 . 2

Write down the equation which links acceleration (a), change in velocity (Δv) and time taken (t).

[1 mark]

0 8 . 3

The maximum acceleration of the car is 20 m/s^2 .

Calculate the time taken for the speed of the car to change from 0 m/s to 28 m/s at its maximum acceleration.

[3 marks]

Time taken = _____ s

Question 8 continues on the next page



0 8 . 4

In a trial run, the car accelerates at 10 m/s^2 until it reaches its final velocity.

distance travelled by the car = 605 m

initial velocity of the car = 0 m/s

Calculate the final velocity of the car.

Use the Physics Equations Sheet.

[3 marks]

Final velocity = _____ m/s



Use the Physics Equations Sheet to answer questions **08.5** and **08.6**.

08.5

Write down the equation which links distance (s), force (F) and work done (W).

[1 mark]

08.6

When travelling at its maximum speed the air resistance acting on the car is 4000 N.

Calculate the work done against air resistance when the car travels a distance of 7.5 km at its maximum speed.

[3 marks]

Work done = _____ J

13

Turn over for the next question

Turn over ►



0 9

A student used a ray box to shine a ray of light through air into a glass block.

The student investigated how the angle of refraction varied with the angle of incidence.

Table 5 shows the results.

Table 5

Angle of incidence in degrees	Angle of refraction in degrees
10	5
20	10
30	14
40	19
50	23
60	26
70	28
80	29

0 9**1**

Describe a method the student could have used to obtain the results in **Table 5**.

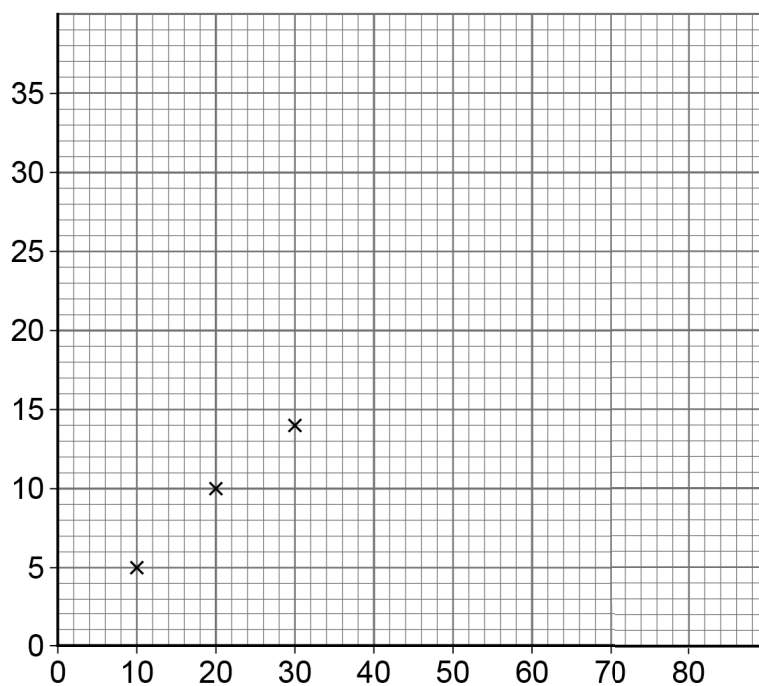
Your answer may include a labelled diagram.

[6 marks]



0 9 . 2 Figure 16 is an incomplete graph of the results.

Figure 16



Complete **Figure 16** using data from **Table 5**.

- Label the axes.
- Plot the remaining data.
- Draw a line of best fit.

[4 marks]

Question 9 continues on the next page

Turn over ►



0 9 . 3

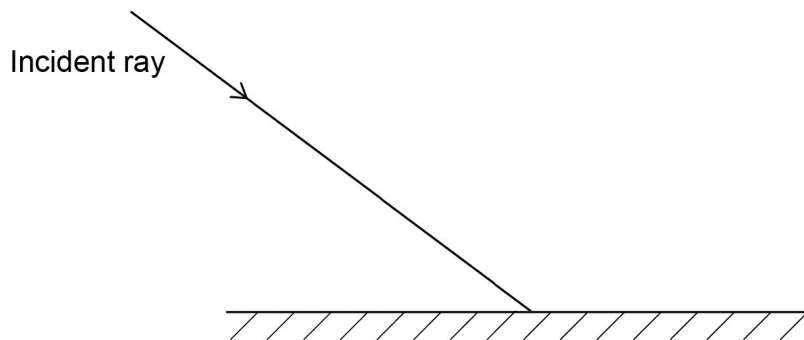
Complete the ray diagram in **Figure 17** to show the reflection of light from the surface of a plane mirror.

You should:

- draw the normal line
- draw the reflected ray.

[2 marks]

Figure 17

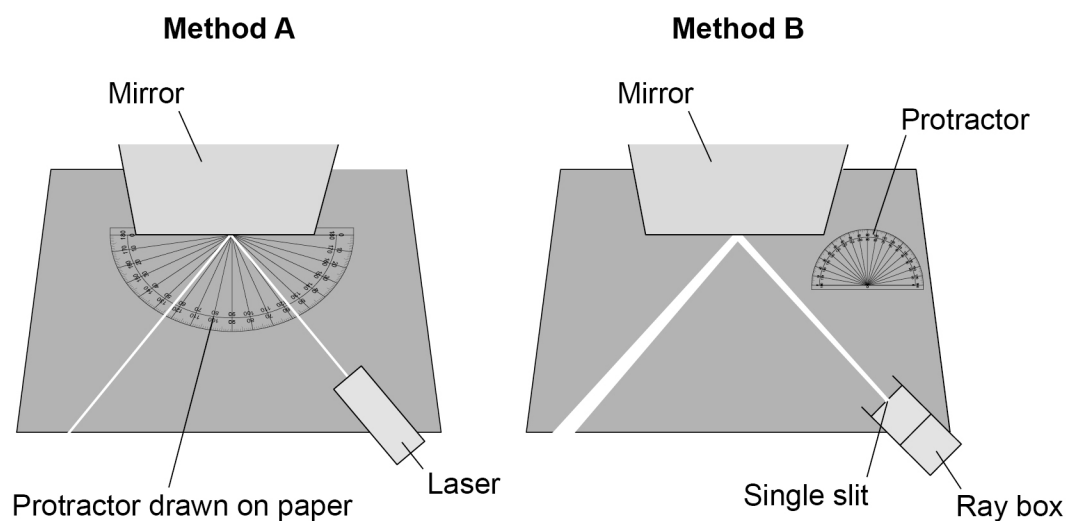


0 9 . 4

Two students investigated the reflection of light by a plane mirror.

Figure 18 shows the different equipment the students used.

Figure 18



Explain **two** ways that **Method A** is better than **Method B**.

[4 marks]

- 1 _____
- _____
- _____
- _____
- 2 _____
- _____
- _____
- _____

END OF QUESTIONS



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