AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE PHYSICS

F

Foundation Tier Paper 2

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.

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

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.

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

Do not write outside the box

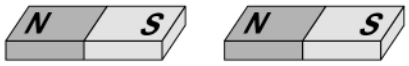
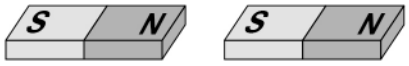
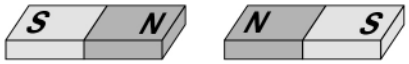
0 1 When two magnets are close together they exert a force on each other.

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
		
		
		
		

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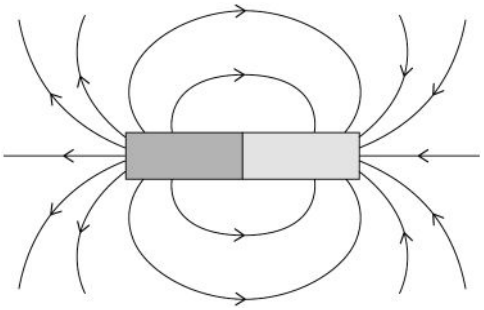
0 1 . 2 **Figure 1** shows the magnetic field around a bar magnet.

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

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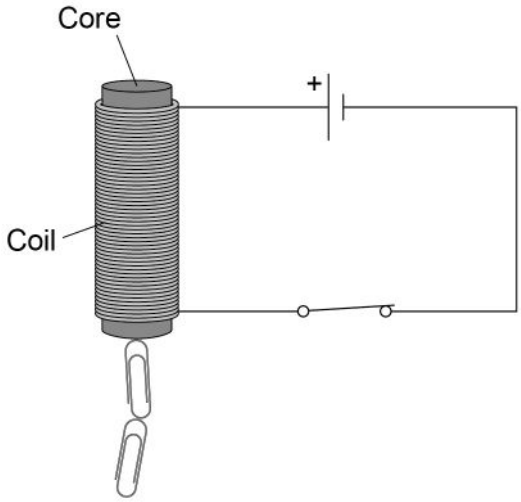
Figure 2 includes an electromagnet.

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 _____.

Do not write outside the box

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

Do not write outside the box

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 ☐

Do not write outside the box

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. ☐

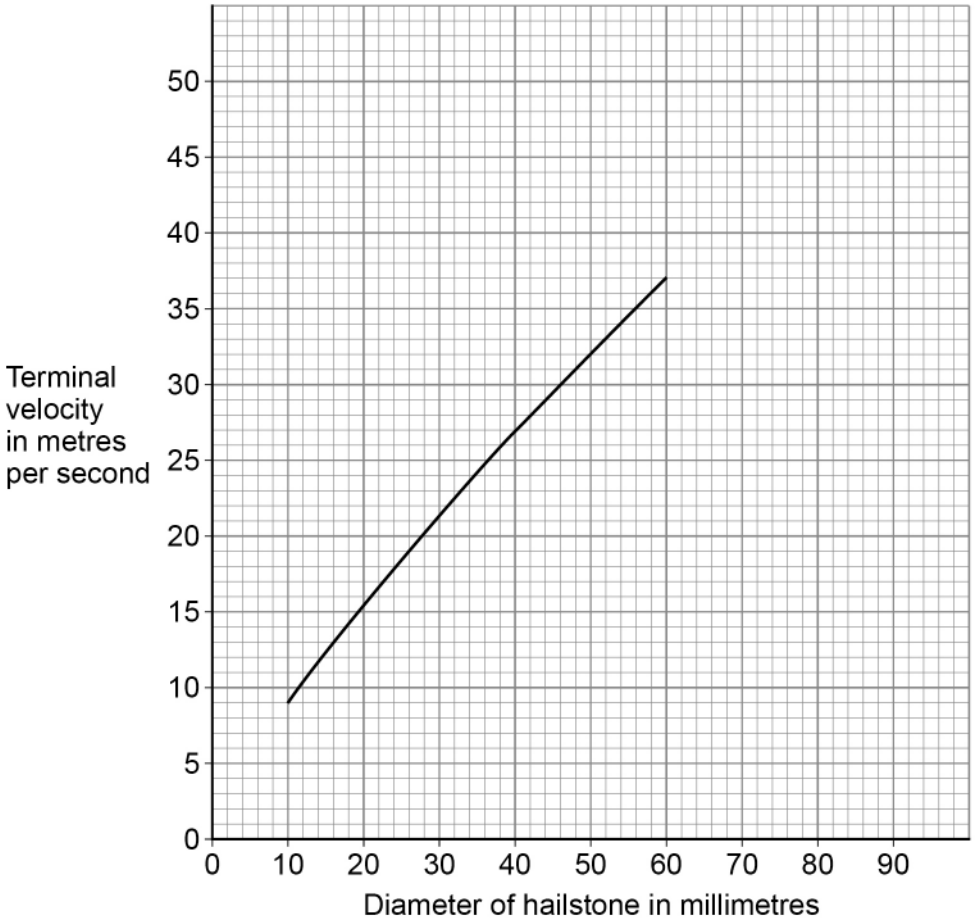
Question 2 continues on the next page

Do not write outside the box

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

Do not write outside the box

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. ☐

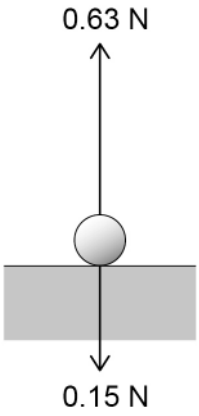
Question 2 continues on the next page

Do not write outside the box

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]

_____

8

Turn over for the next question

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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 ☐

Do not write outside the box

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

Do not write outside the box

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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ANSWER IN THE SPACES PROVIDED

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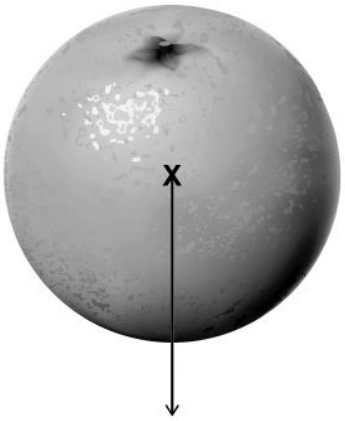
0 4 **Figure 6** shows the weight of an orange acting from a point labelled **X**.

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. ☐

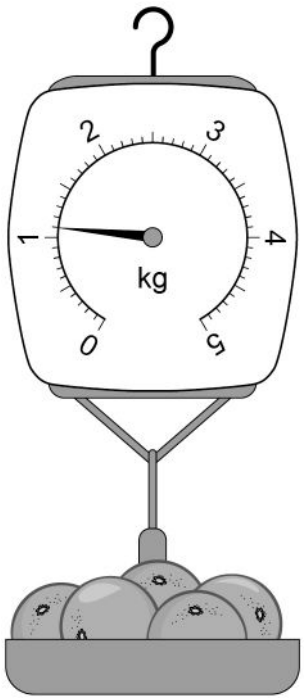
Weight is directly proportional to mass. ☐

Weight is less than mass. ☐

Do not write outside the box

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:

weight = mass × gravitational field strength

[2 marks]

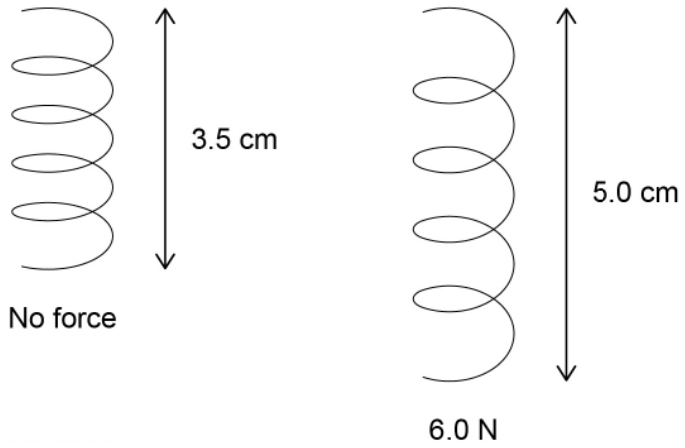
Weight = _____ N

Do not write outside the box

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

Do not write outside the box

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 _____

Do not write outside the box

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

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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

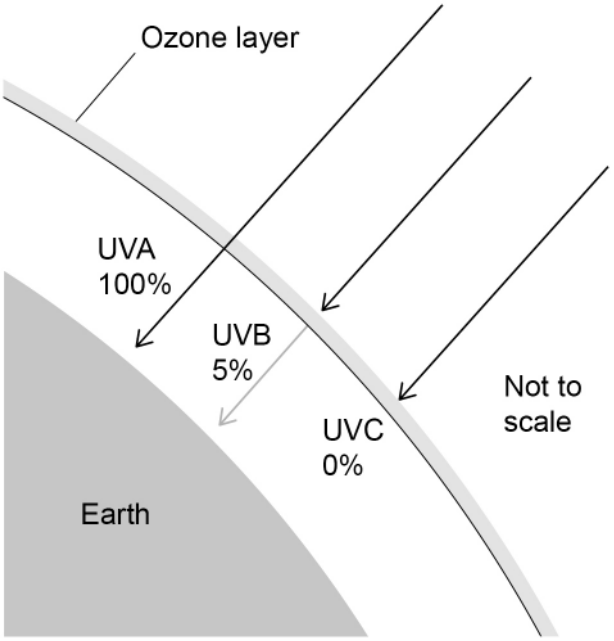


Table 4

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]

Do not write outside the box

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.

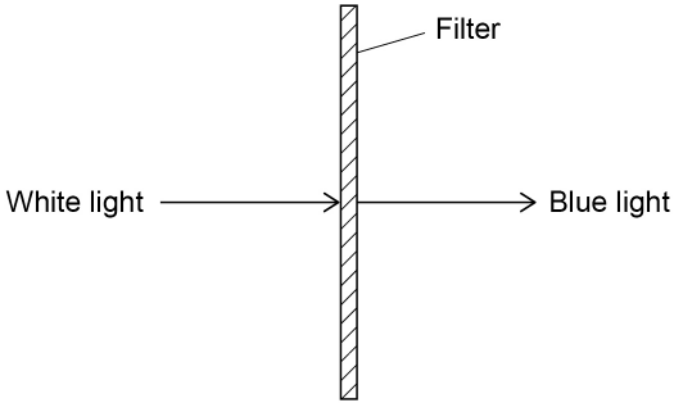
[1 mark]

_____

_____

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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ANSWER IN THE SPACES PROVIDED

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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

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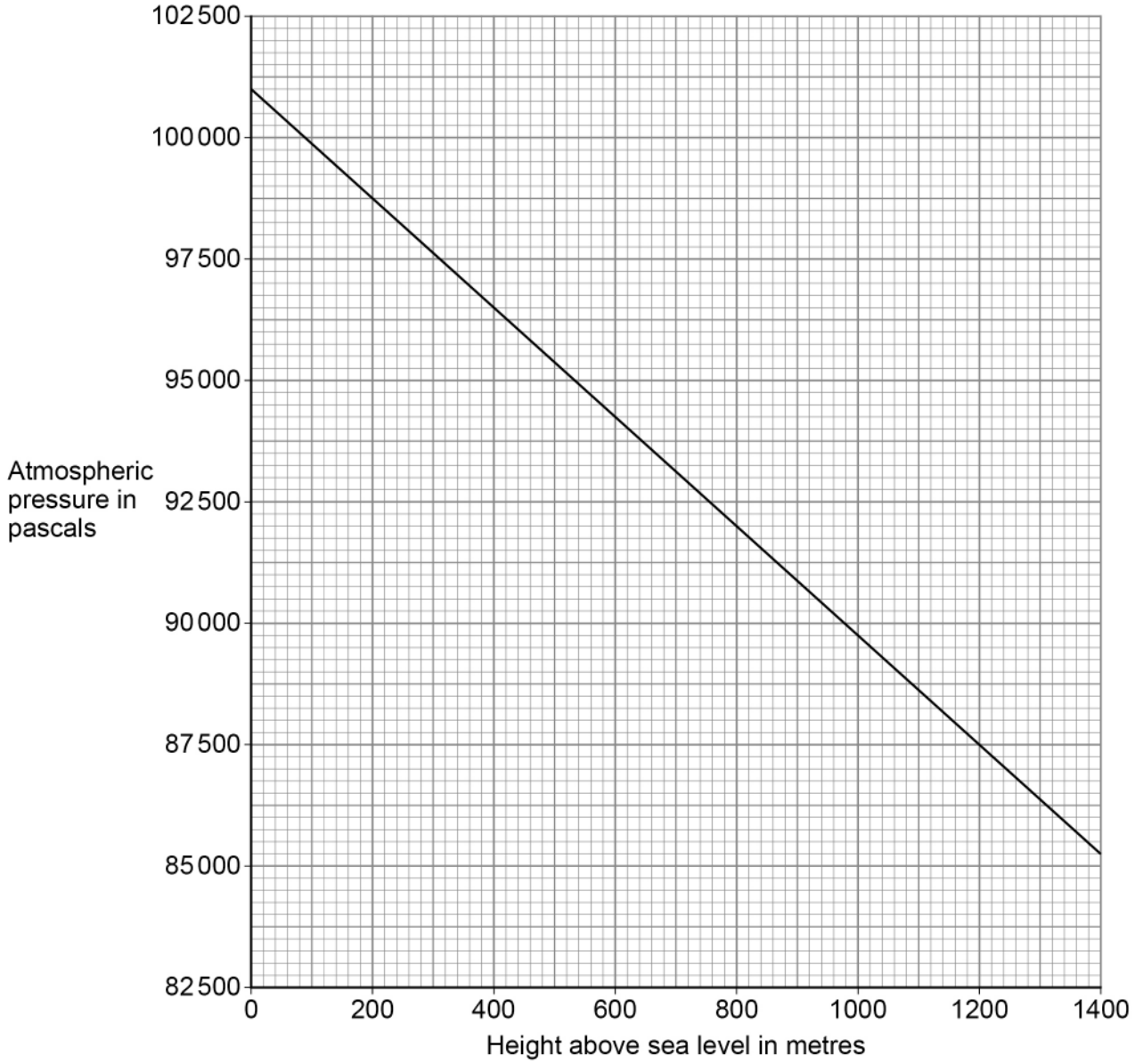
Figure 12 shows how atmospheric pressure varies with height above sea level.

Figure 12



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0 6 . 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

0 6 . 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

0 6 . 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

Do not write outside the box

0 6 . 6 **Figure 13** shows a mountain lake.

Figure 13

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

Atmospheric pressure exerts a force of 188 000 000 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

Do not write outside the box

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

Do not write outside the box

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

Do not write outside the box

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**

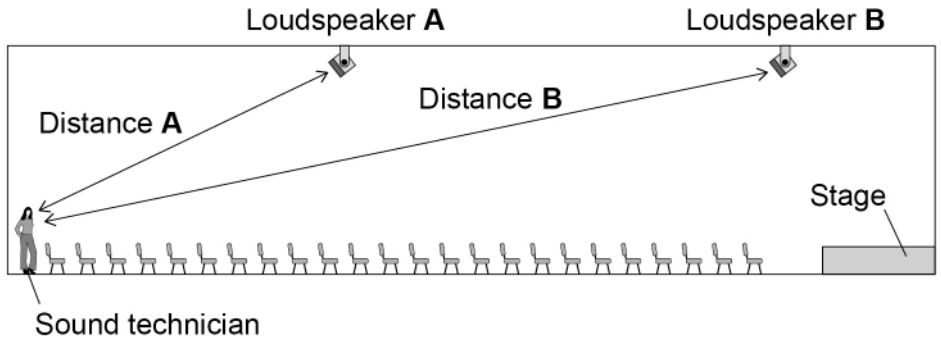
Wavelength = _____ Unit _____

Question 7 continues on the next page

Do not write outside the box

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**.

0 7 . 6 Write down the equation which links distance (*s*), speed (*v*) and time (*t*).

[1 mark]

0 7 . 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

Do not write outside the box

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

Do not write outside the box

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 _____

Do not write outside the box

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

Do not write outside the box

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

Do not write outside the box

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

0 8 . 5 Write down the equation which links distance (*s*), force (*F*) and work done (*W*).

[1 mark]

0 8 . 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

Do not write outside the box

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]

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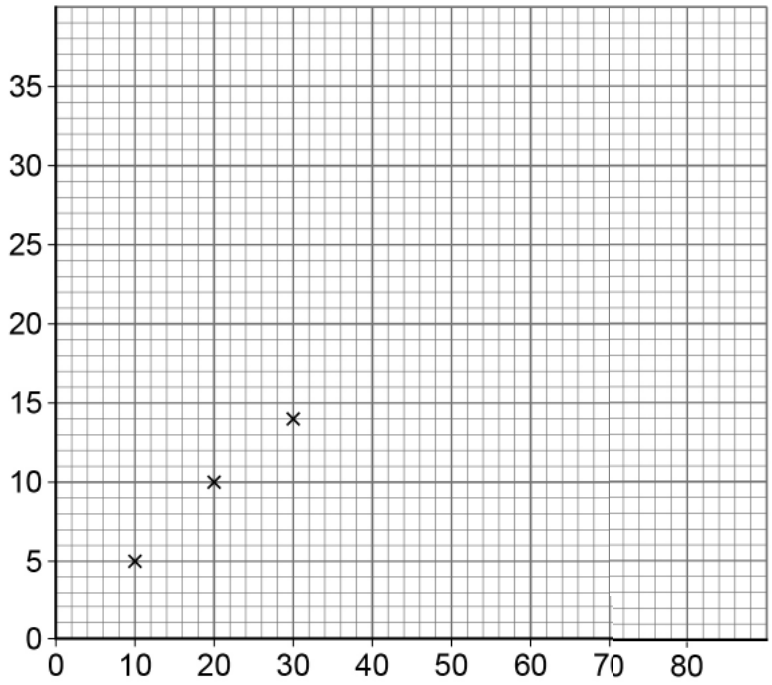
0 9 . 2 **Figure 16** is an incomplete graph of the results.

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

Do not write outside the box

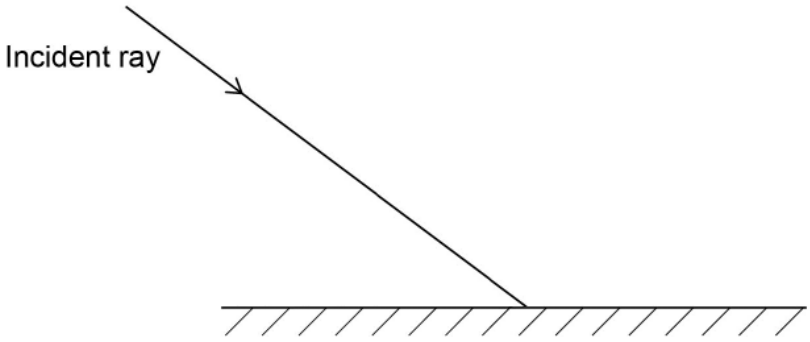
0 9 . 3 Complete the ray diagram in **Figure 17** to show the reflection of light from the surface of a plane mirror.

You should:

- draw the normal line
- draw the reflected ray.

[2 marks]

Figure 17



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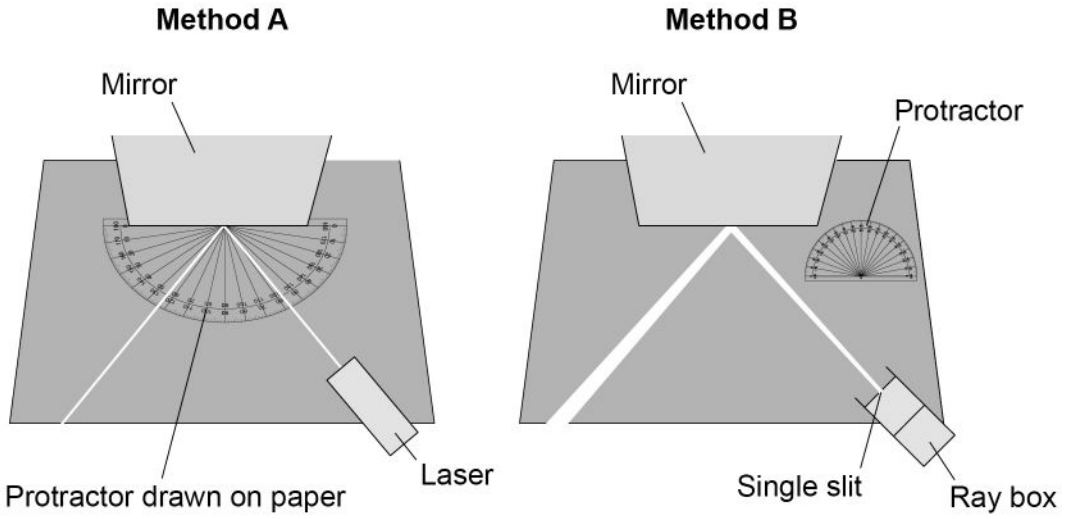
0 9 . 4 Two students investigated the reflection of light by a plane mirror.

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 _____

_____

_____

_____

16

END OF QUESTIONS

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