A

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

PHYSICS

F

Foundation Tier Paper 2

8463/2F

Time allowed: 1 hour 45 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

JUN228463 2F01

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.**
- **Answer ALL questions in the spaces provided.**
- **Do not write 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.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions in the spaces provided.

0 1

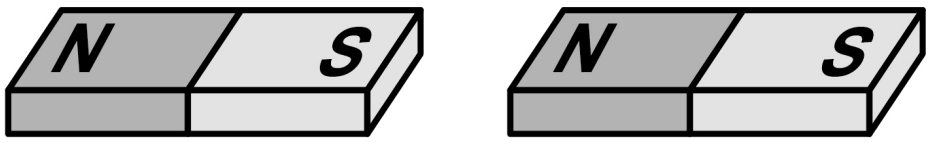
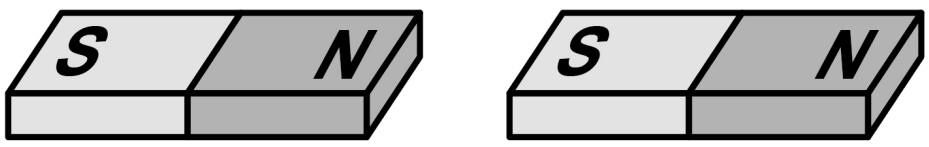
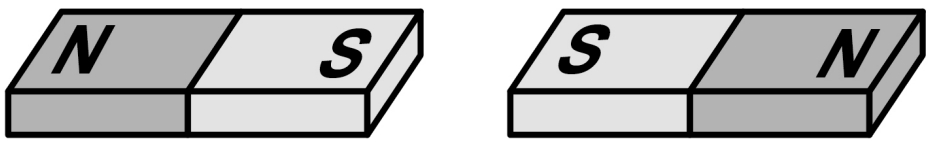
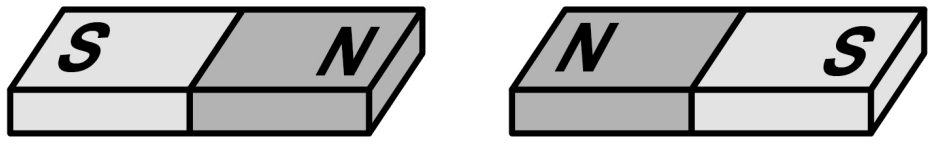
When two magnets are close together they exert a force on each other.

0 1 . 1

Complete TABLE 1, on the opposite page, to show if the magnets would attract or repel. [2 marks]

Tick (✓) ONE box in EACH row.

TABLE 1

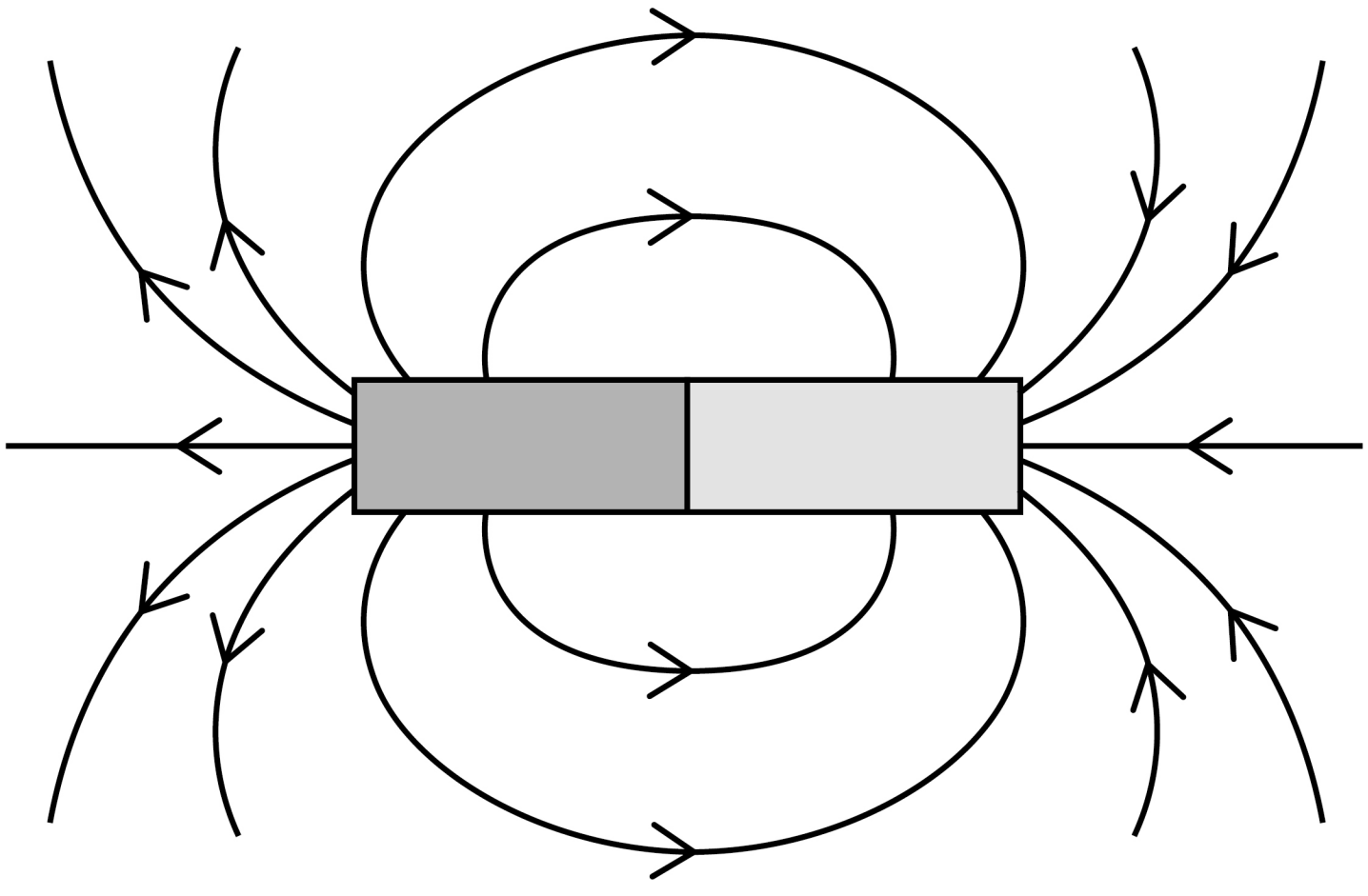
	ATTRACT	REPEL
		
		
		
		

[Turn over]

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, on the opposite page? [2 marks]

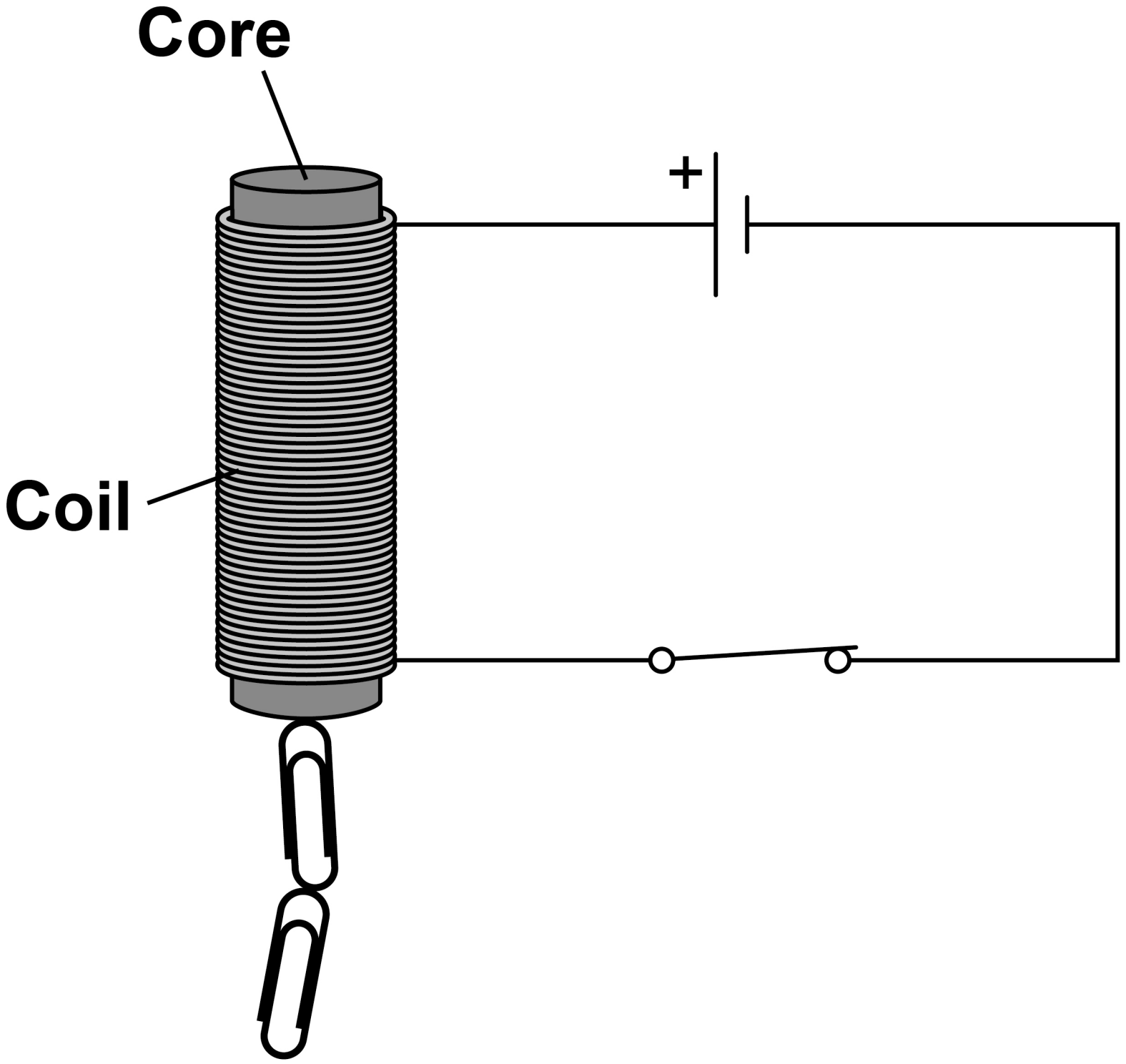
Tick (✓) TWO boxes.

- ☐ **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.**

[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**

[Turn over]

0 1 . 4

Complete the sentence.

Choose the answer from the list.
[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.**

[Turn over]

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

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[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**

[Turn over]

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.**

[Turn over]

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

FIGURE 4, on the opposite page, shows the results.

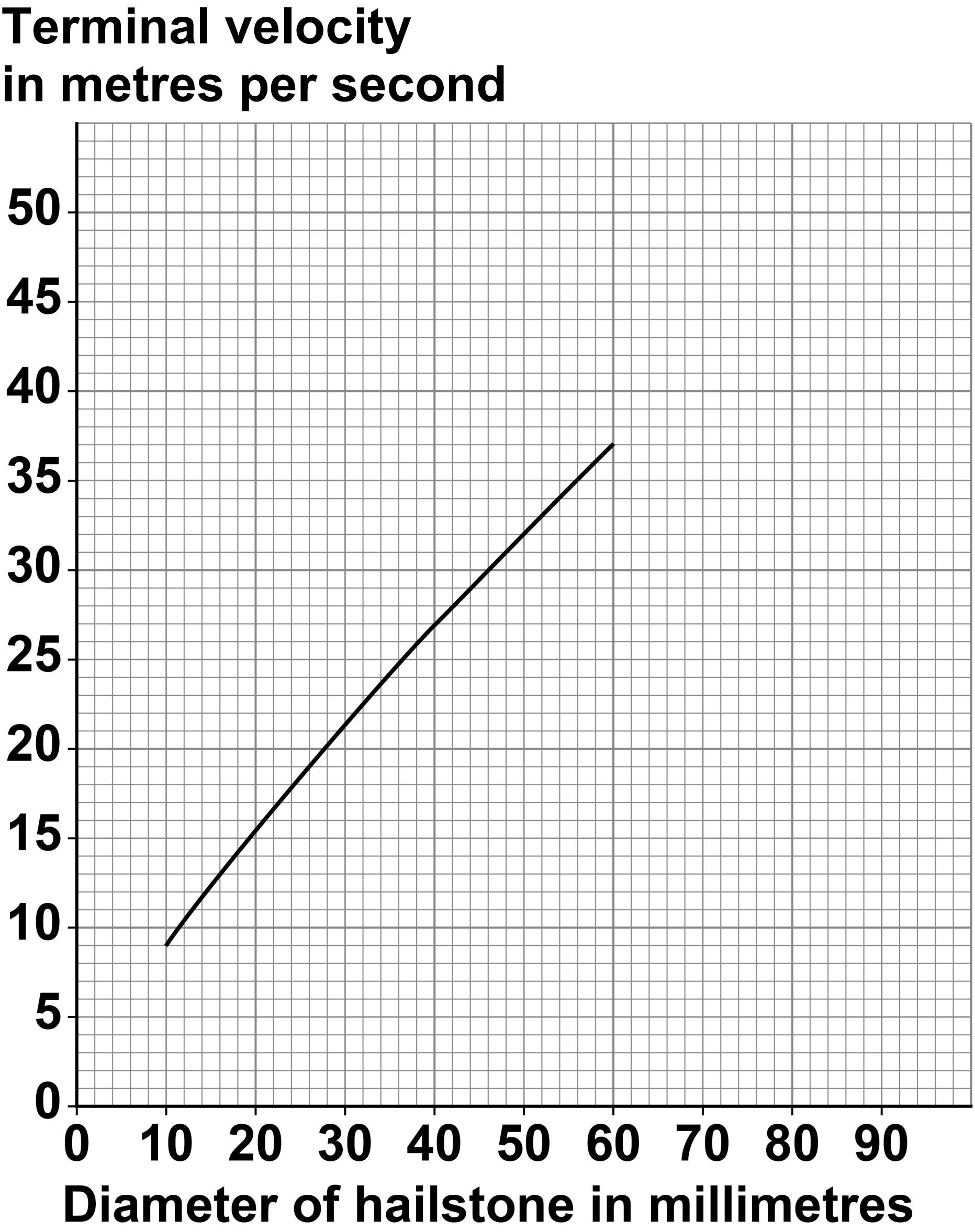
0 2 . 4

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

FIGURE 4



[Turn over]

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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.**

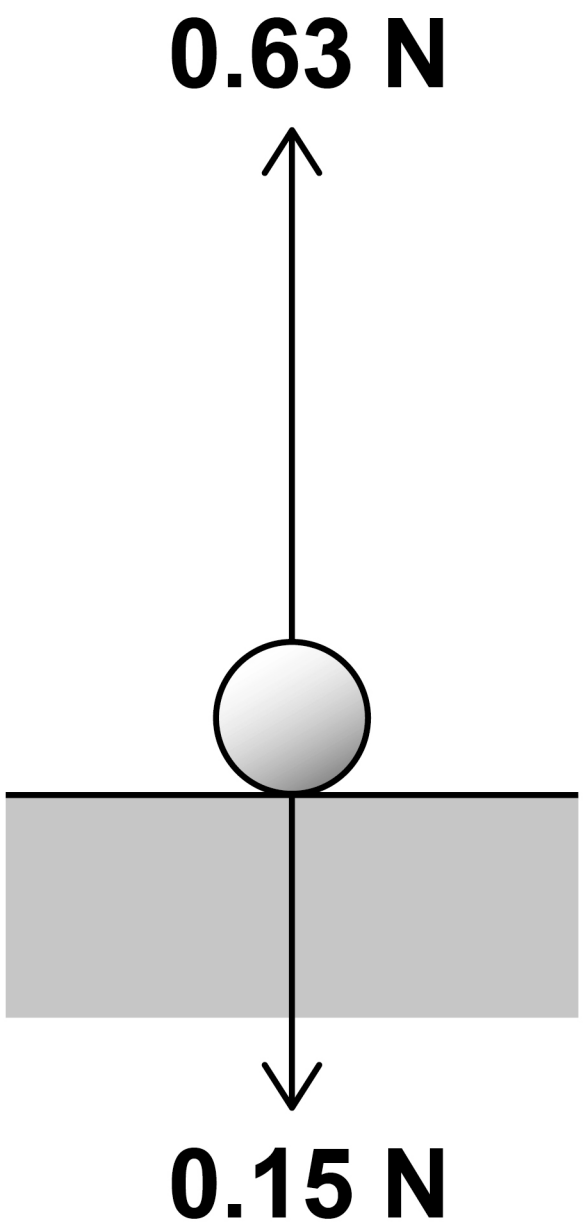
☐ **It has a greater weight.**

[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

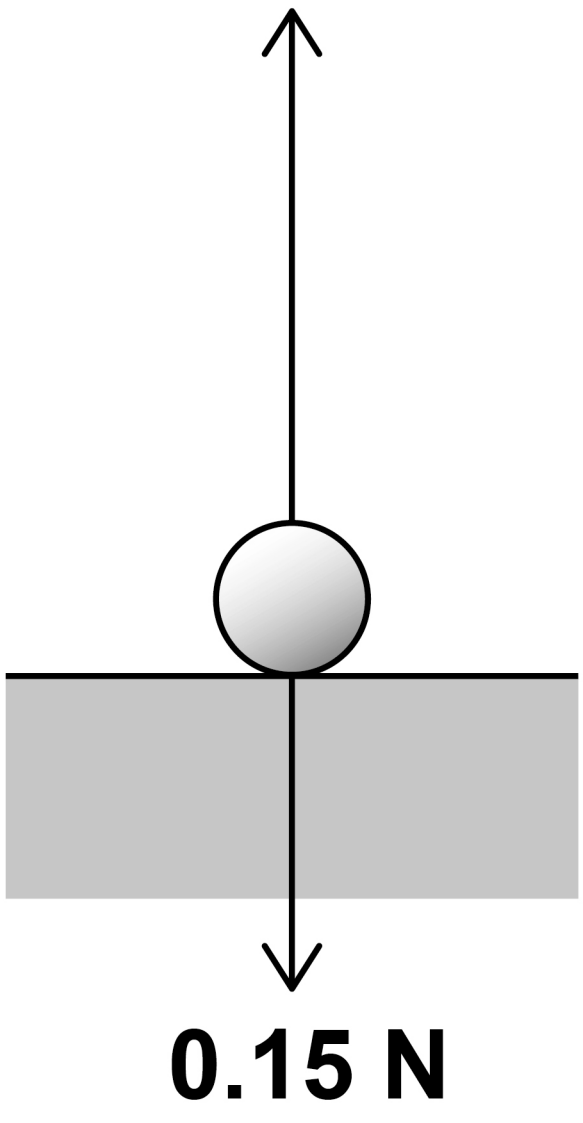
What is the magnitude of the resultant force on the hailstone in FIGURE 5?
[1 mark]

Tick (✓) ONE box.

- ☐ **0.15 N**
- ☐ **0.48 N**
- ☐ **0.63 N**
- ☐ **0.78 N**

[Turn over]

REPEAT OF FIGURE 5



0 2 . 7

What is the direction of the resultant force on the hailstone in FIGURE 5? [1 mark]

8

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]

_____

_____

[Turn over]

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.**

On the opposite page, give ONE reason why each of the student's conclusions is wrong.

Use the data given above and in TABLE 2, on page 27. [2 marks]

1 _____

_____

_____

2 _____

_____

[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]

_____

_____

_____

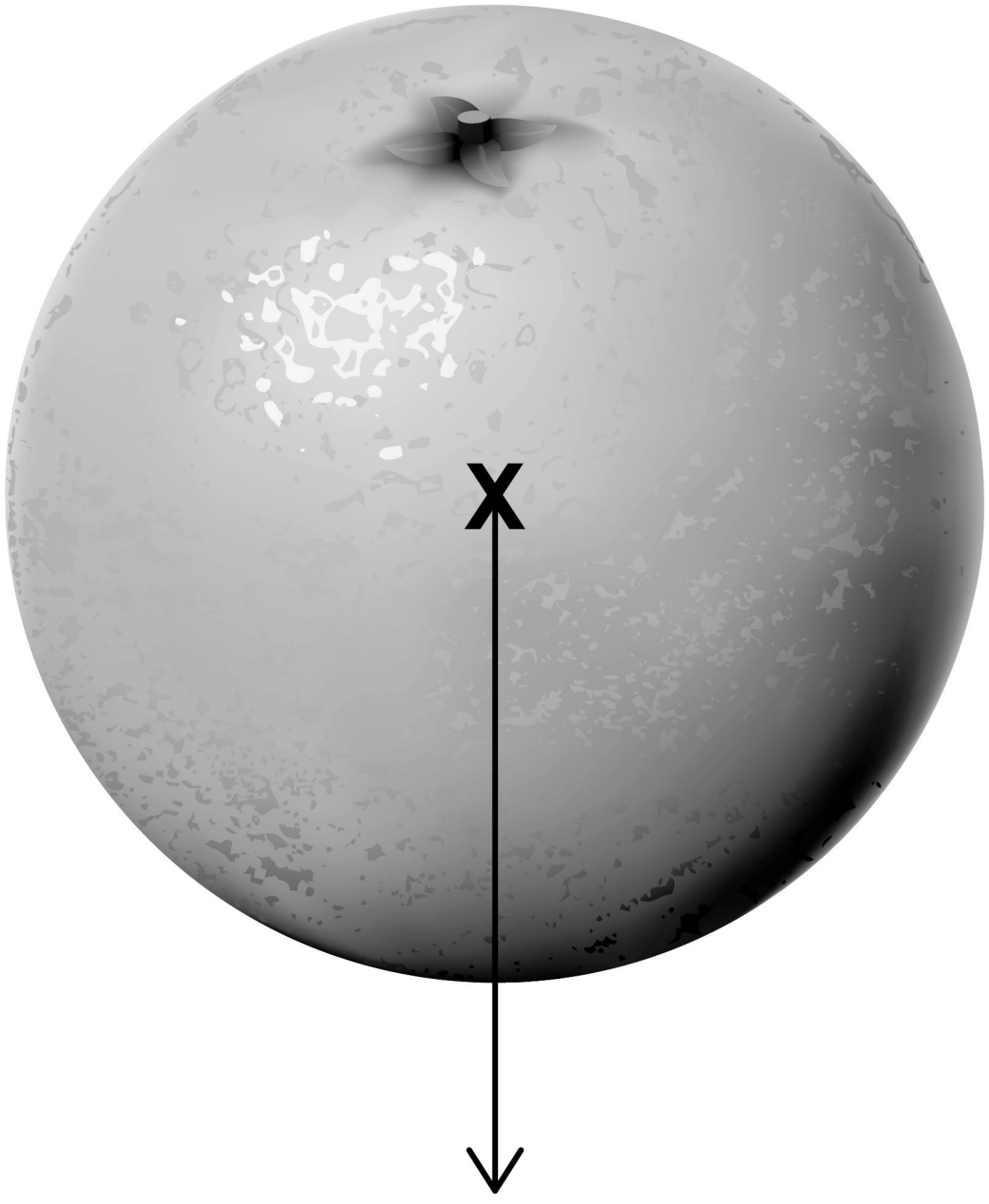
_____

8

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:

weight ∝ 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.**

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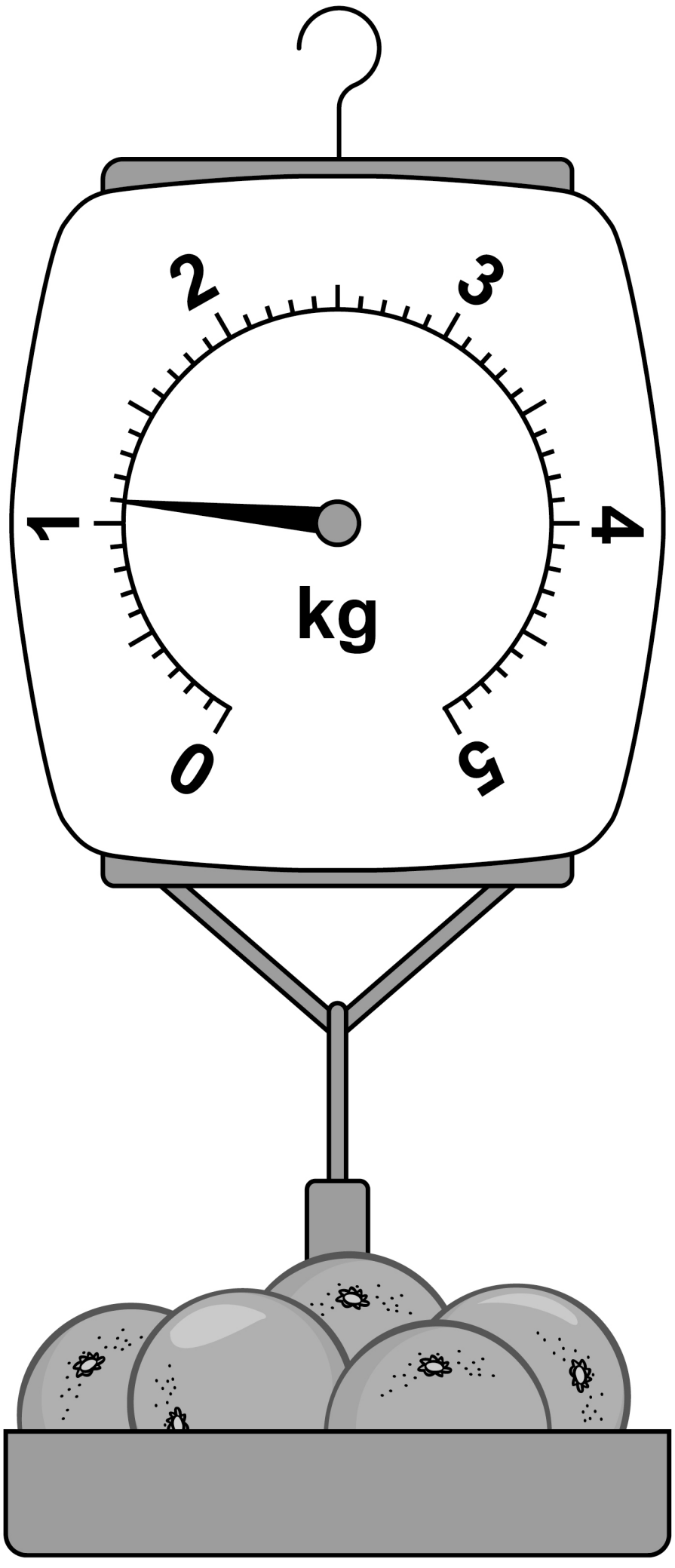
[Turn over]

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

[Turn over]

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

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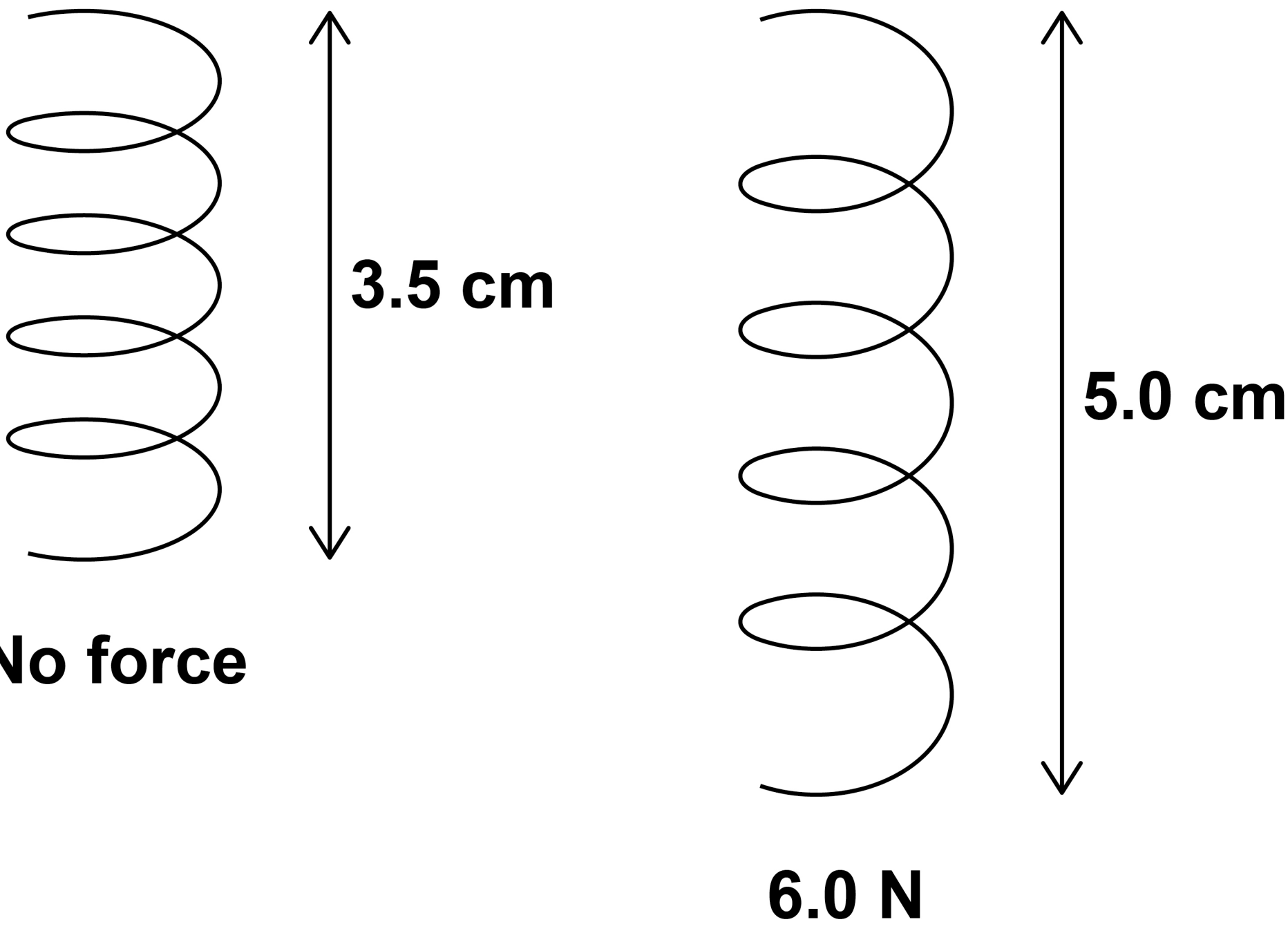
[Turn over]

The balance shown in FIGURE 7, on page 36, 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**

[Turn over]

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]

10

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 _____

[Turn over]

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, on the opposite page, 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 _____

[Turn over]

FIGURE 10, on the opposite page, shows how different types of ultraviolet are absorbed by the ozone layer in the Earth's atmosphere.

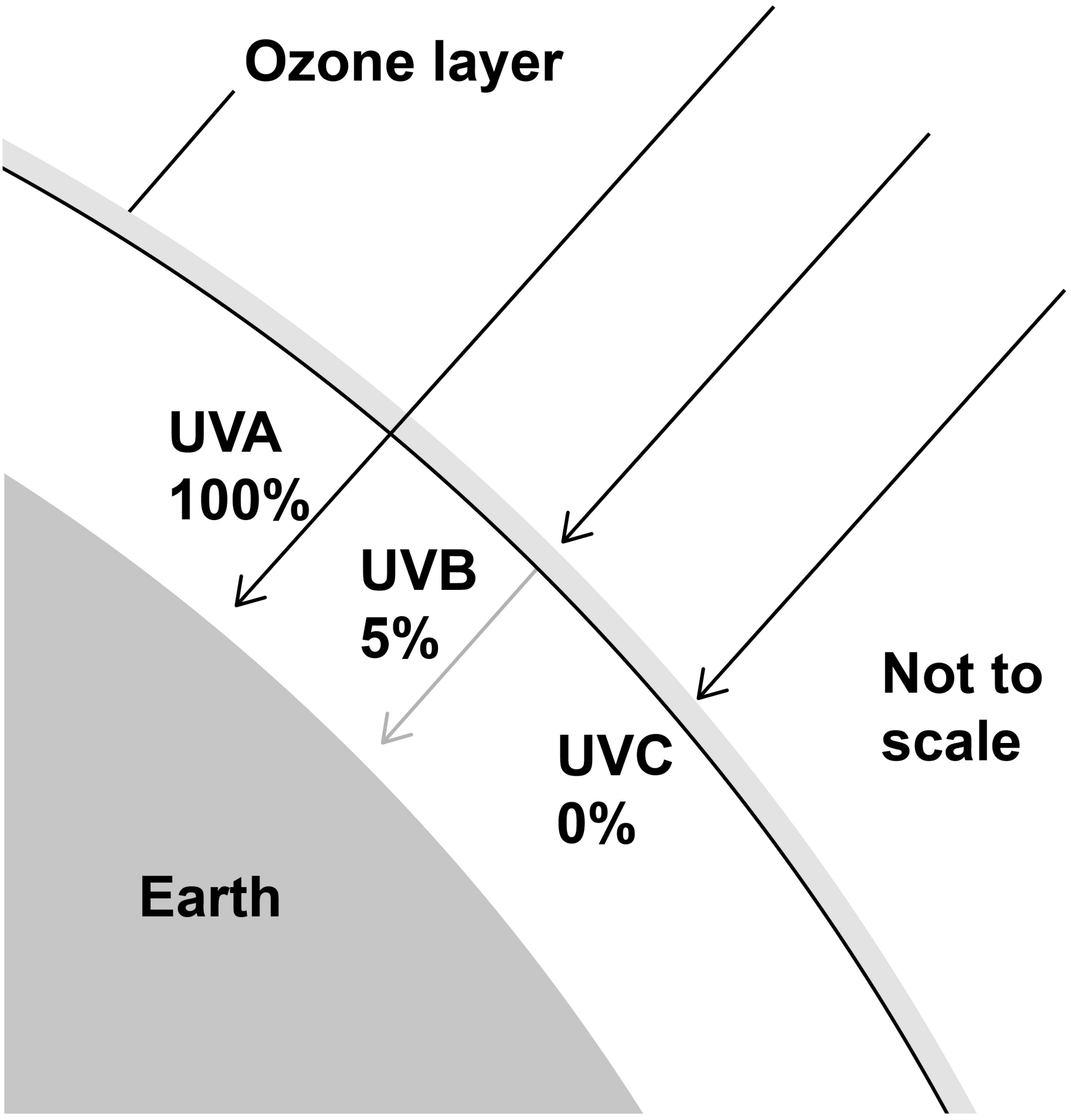
TABLE 4 shows the relative ionising power from each type of ultraviolet.

TABLE 4

Type	Relative ionising power
UVA	Low
UVB	Medium
UVC	High

FIGURE 10

The diagram is not drawn to scale.



[Turn over]

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0 5 . 4

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

Use FIGURE 10, on page 49, and TABLE 4, on page 48. [4 marks]

52

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]

_____

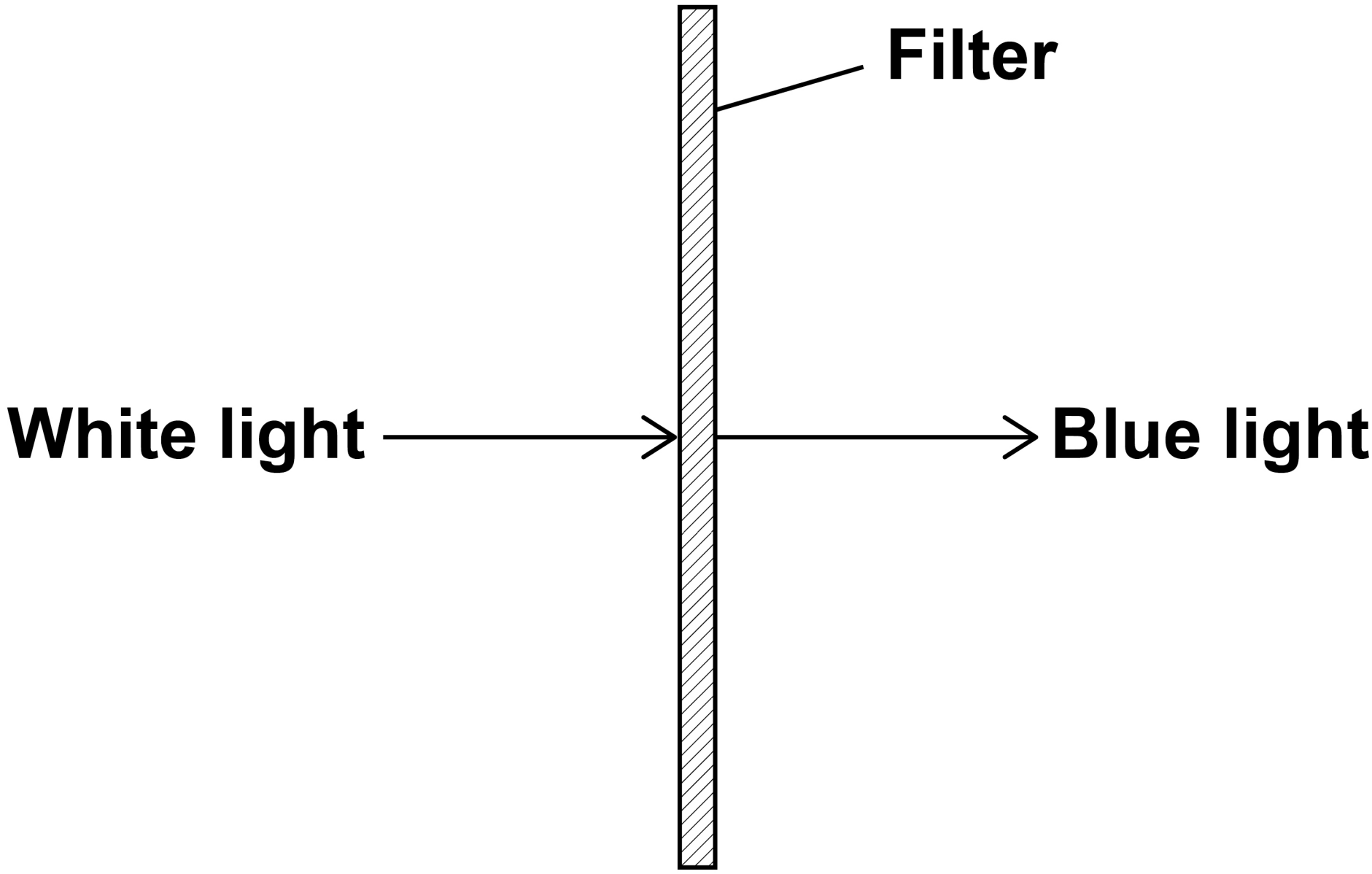
_____

_____

0 5 . 6

FIGURE 11 shows white light incident on a colour filter.

FIGURE 11



Complete the sentence.

Choose the answers from the list.
[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 _____.

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**

FIGURE 12, on the opposite page, shows how atmospheric pressure varies with height above sea level.

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.

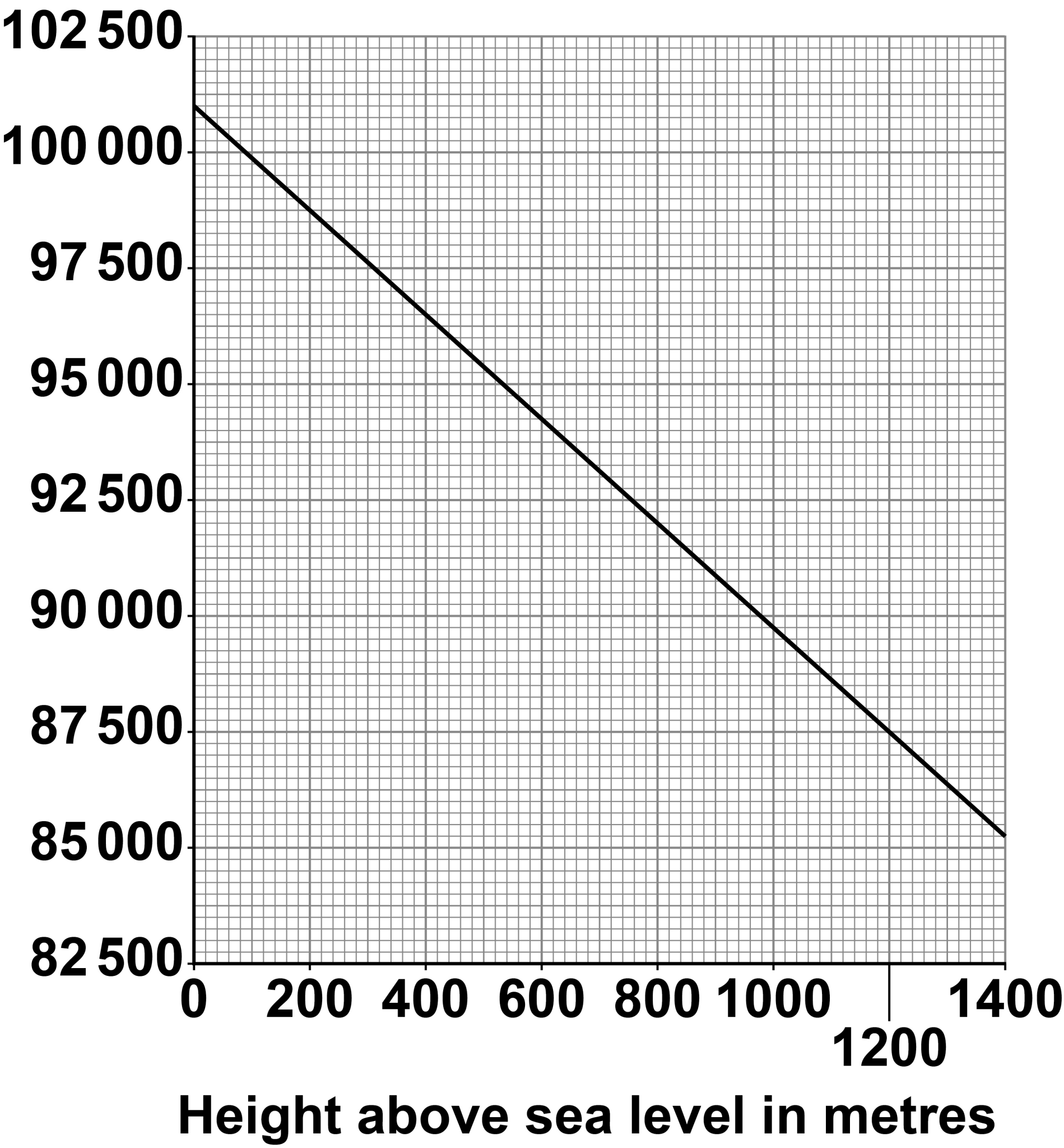
Determine the atmospheric pressure at the top of Scafell Pike.

Use FIGURE 12. [1 mark]

Atmospheric pressure =

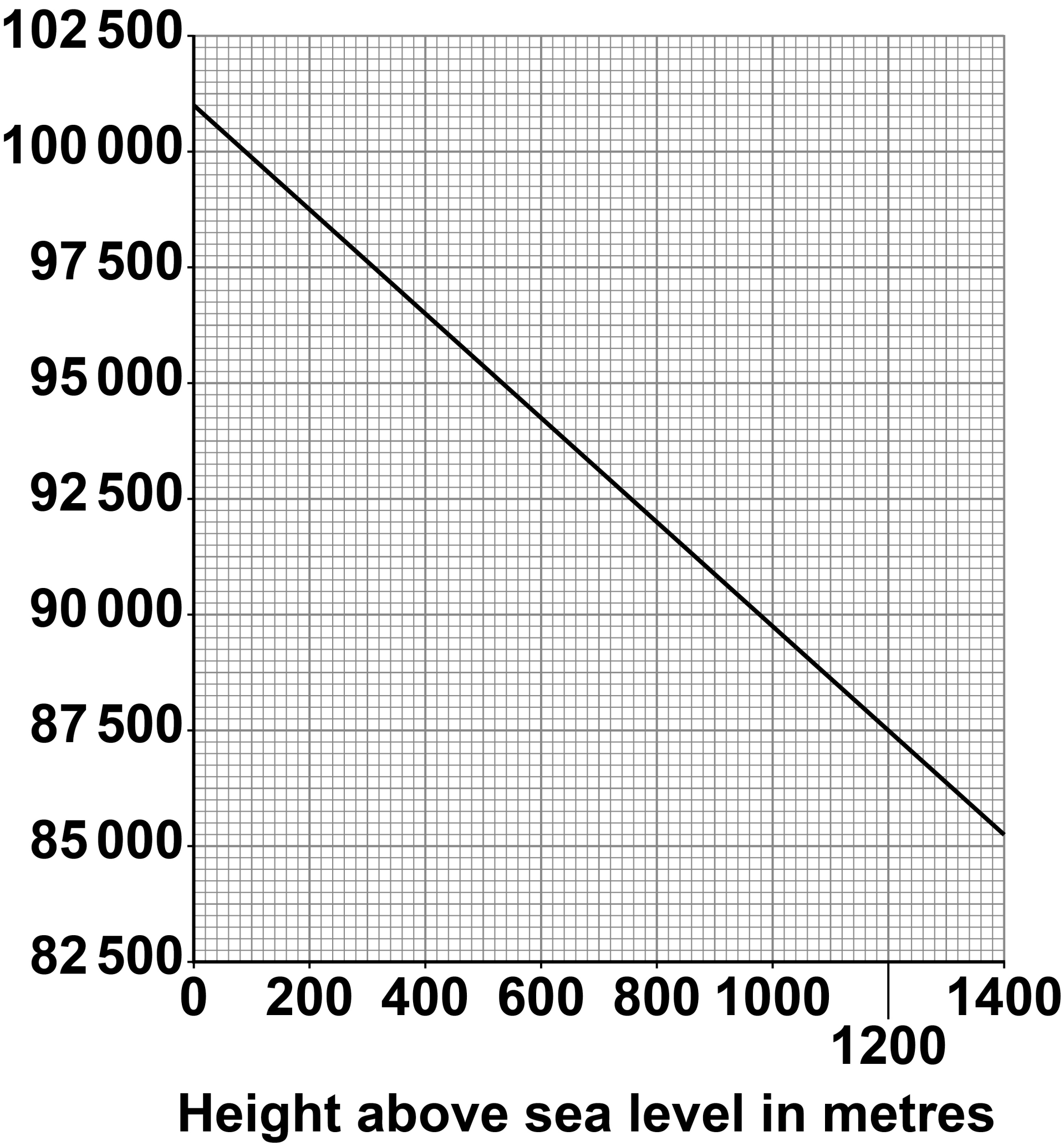
_____ Pa

FIGURE 12



[Turn over]

REPEAT OF FIGURE 12



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, on page 58. [1 mark]

Difference in atmospheric pressure =

_____ Pa

[Turn over]

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.**

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[Turn over]

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

[Turn over]

0 7

Sound travels as longitudinal waves.

0 7 . 1

Complete the sentences, on the opposite page.

Choose the answers from the list.
[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 _____ .

[Turn over]

0 7 . 2

Complete the sentence.

Choose the answer from the list.
[1 mark]

- **opposite**
- **perpendicular**
- **parallel**

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

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**

[Turn over]

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

On the opposite page, 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 list. [3 marks]

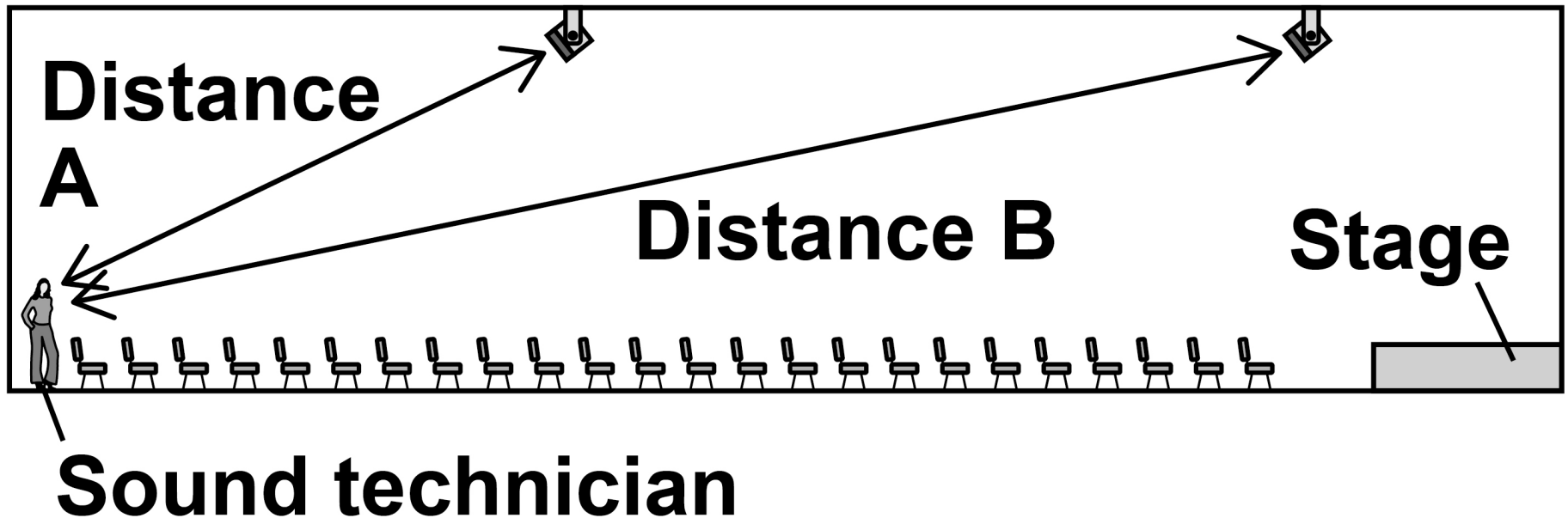
- **kg**
- **m**
- **N**

Wavelength = _____ Unit _____

[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.

0 7 . 6

Write down the equation which links distance (*s*), speed (*v*) and time (*t*).
[1 mark]

_____

_____

[Turn over]

0 7 . 7

Distance A on FIGURE 14, on page 72, 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]

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.

On the opposite page, 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

[Turn over]

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

[Turn over]

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

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0 9

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

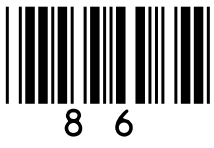
The student investigated how the angle of refraction varied with the angle of incidence.

TABLE 5, on page 86, shows the results.

[Turn over]

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, on the opposite page.

Your answer may include a labelled diagram. [6 marks]

88

BLANK PAGE

[Turn over]

0 9 . 2

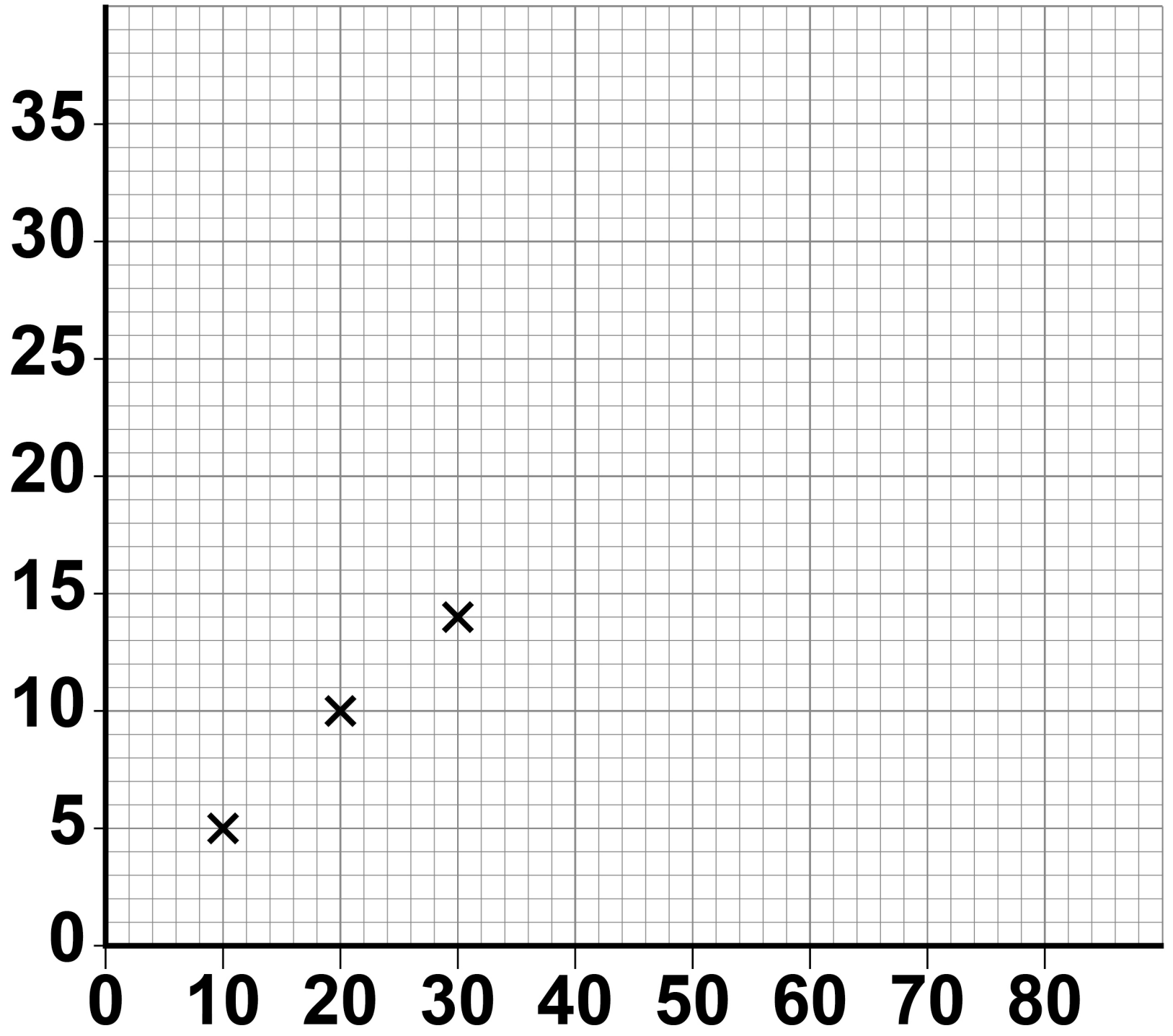
FIGURE 16, on the opposite page, is an incomplete graph of the results.

Complete FIGURE 16 using data from TABLE 5, on page 86.

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

[4 marks]

FIGURE 16



[Turn over]

0 9 . 3

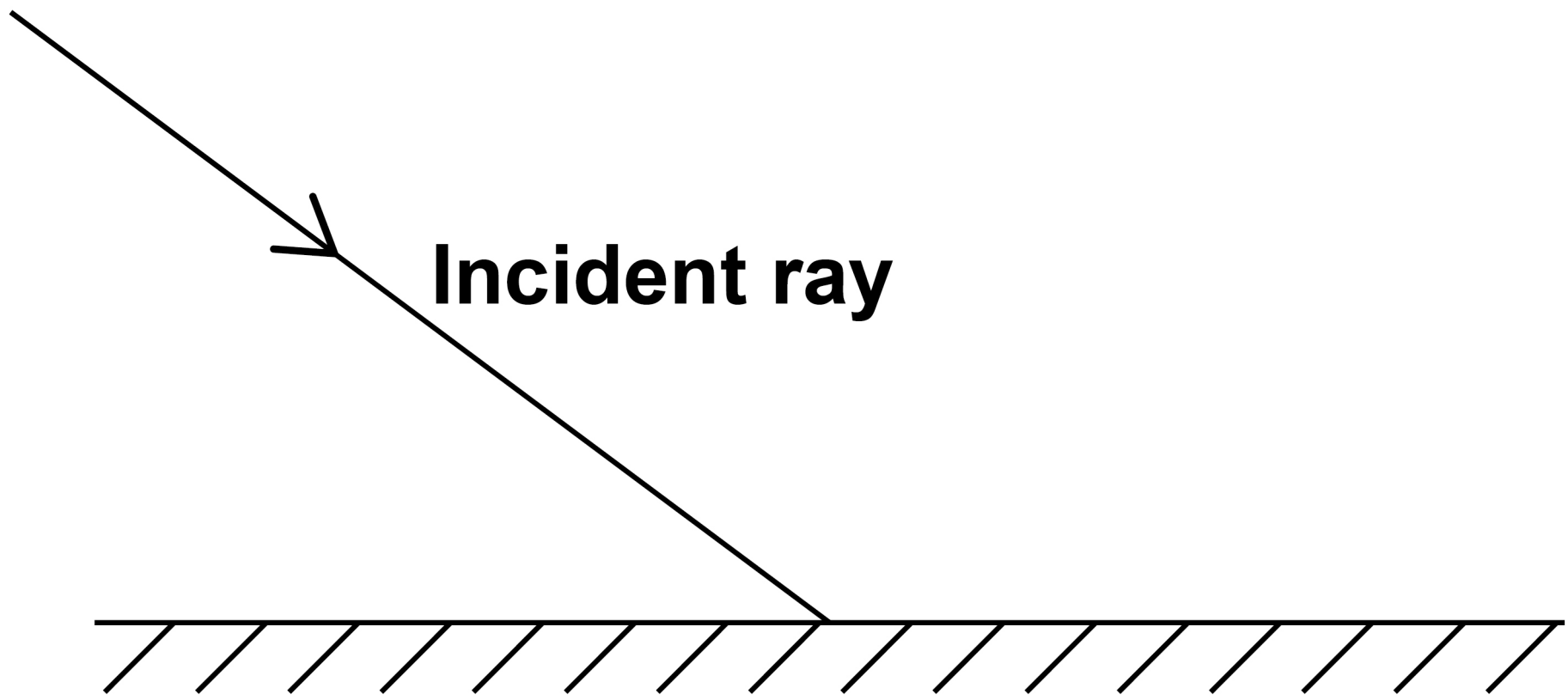
Complete the ray diagram in FIGURE 17 to show the reflection of light from the surface of a plane mirror.

You should:

- **draw the normal line**
- **draw the reflected ray.**

[2 marks]

FIGURE 17



0 9 . 4

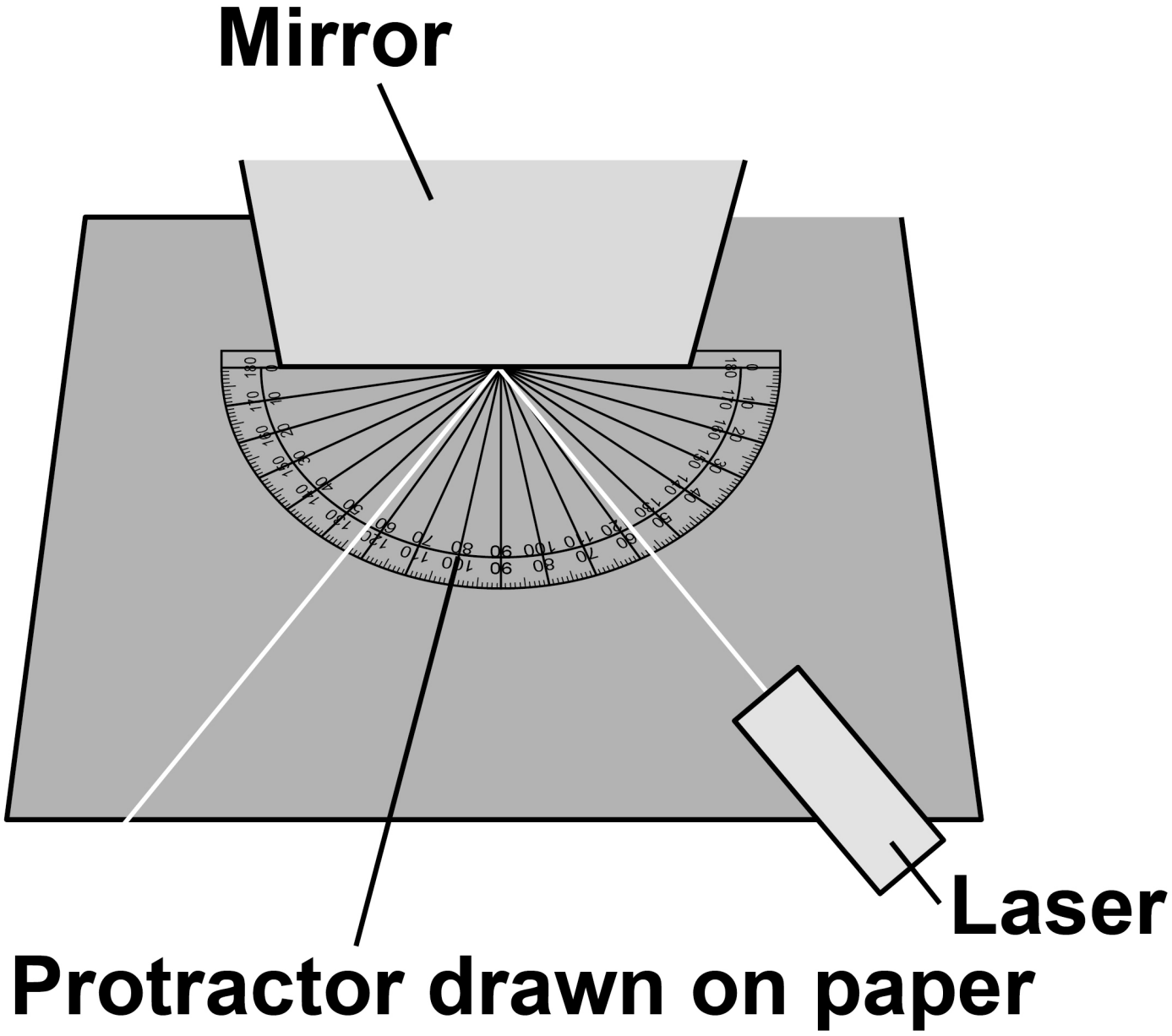
Two students investigated the reflection of light by a plane mirror.

FIGURE 18, on pages 94–95, shows the different equipment the students used.

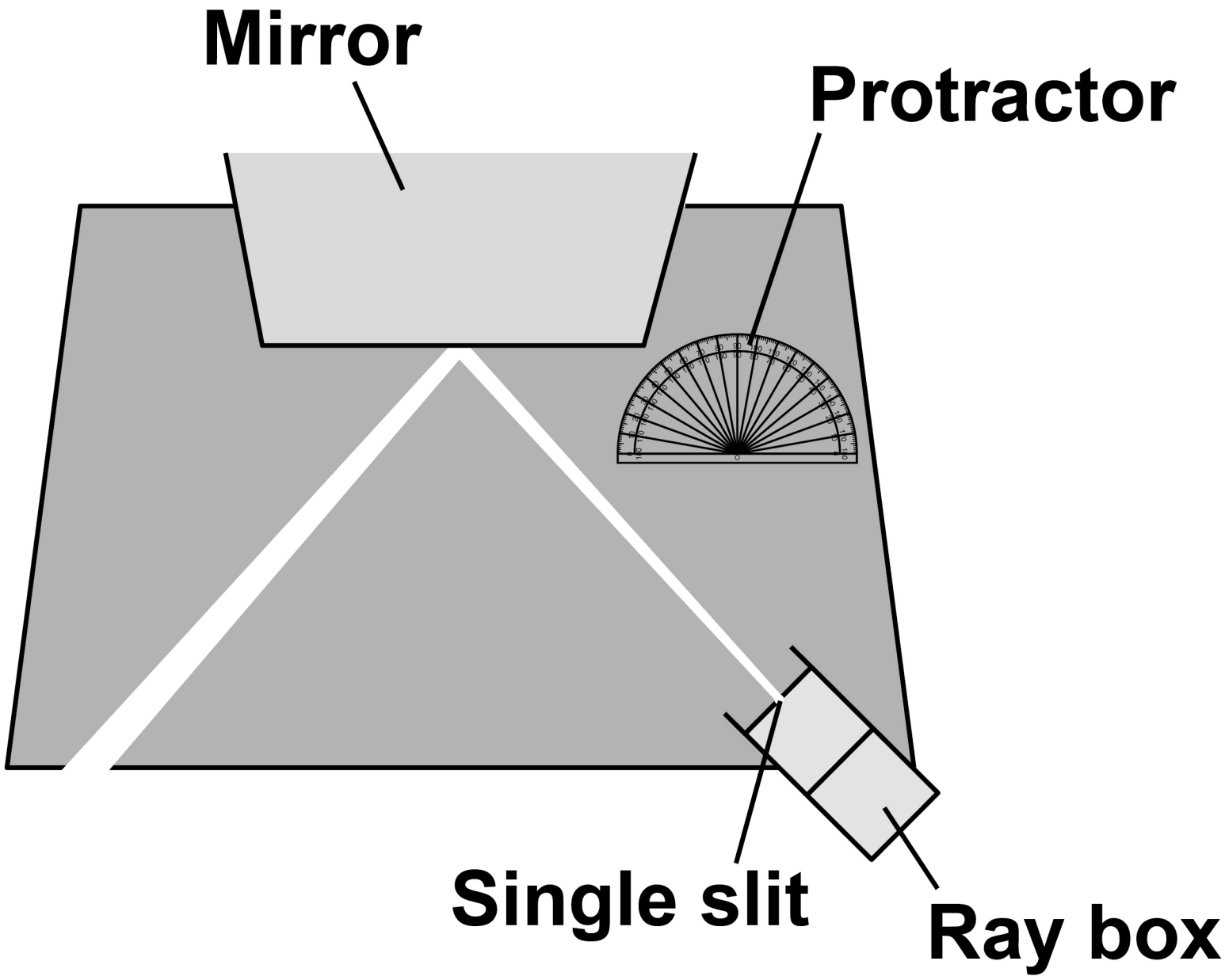
[Turn over]

FIGURE 18

METHOD A



METHOD B



[Turn over]

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Explain TWO ways that METHOD A is better than METHOD B. [4 marks]

1

2

END OF QUESTIONS

16

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
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