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

Friday 14 June 2024 Afternoon 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.

Do not write outside the box

0 1 A group of stars is called a galaxy.

0 1 . 1 What is the name of our galaxy?

[1 mark]

Tick (✓) **one** box.

- Black Eye ☐
- Hockey Stick ☐
- Milky Way ☐
- Sculptor Dwarf ☐

0 1 . 2 The Sun is one of the stars in our galaxy.

What was the Sun originally formed from?

[1 mark]

Tick (✓) **one** box.

- Dust and gas ☐
- Heavy elements ☐
- Oxygen ☐

Do not write outside the box

0 1 . 3 Which of the following forces was involved in the formation of the Sun?

[1 mark]

Tick (✓) **one** box.

Electrostatic force ☐

Gravitational force ☐

Magnetic force ☐

0 1 . 4 Stars produce light because they release energy.

Complete the sentence.

Choose the answer from the box.

[1 mark]

combustion	**conduction**	**fusion**

The process which releases energy inside stars is _____.

0 1 . 5 Visible light and infrared radiation travel from the Sun to the Earth.

Which statement describes the time taken for visible light and infrared radiation to travel from the Sun to the Earth?

[1 mark]

Tick (✓) **one** box.

Visible light takes less time than infrared radiation ☐

Visible light takes the same time as infrared radiation ☐

Visible light takes more time than infrared radiation ☐

Do not write outside the box

0 1 . 6 Infrared radiation has a longer wavelength than visible light.

Complete the sentence.

Choose the answer from the box.

[1 mark]

smaller	**the same**	**greater**

Compared with the frequency of infrared radiation, the frequency of

visible light is _____.

0 1 . 7 The Sun and the Earth both emit infrared radiation.

How does the rate of infrared radiation emitted by the Sun compare with the rate of infrared radiation emitted by the Earth?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

Lower rate than the Earth ☐

Same rate as the Earth ☐

Greater rate than the Earth ☐

8

Reason _____

_____

Do not write outside the box

0 2 Some metals are magnetic and others are non-magnetic.

0 2 . 1 Which of the following metals is magnetic?

[1 mark]

Tick (✓) **one** box.

Aluminium ☐

Cobalt ☐

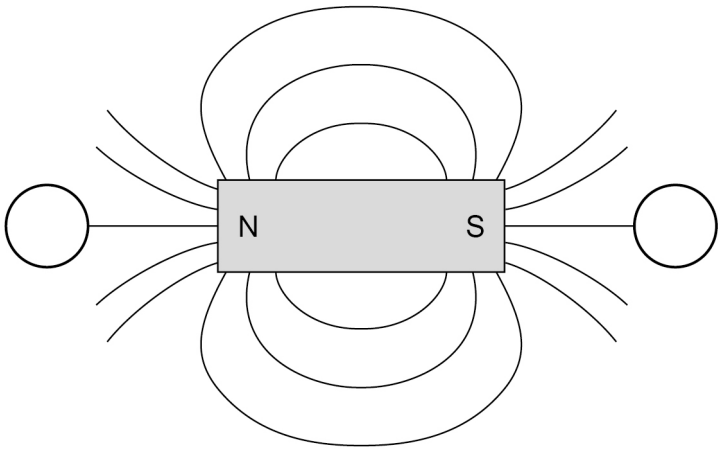
Copper ☐

Zinc ☐

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

The circles represent plotting compasses.

Figure 1



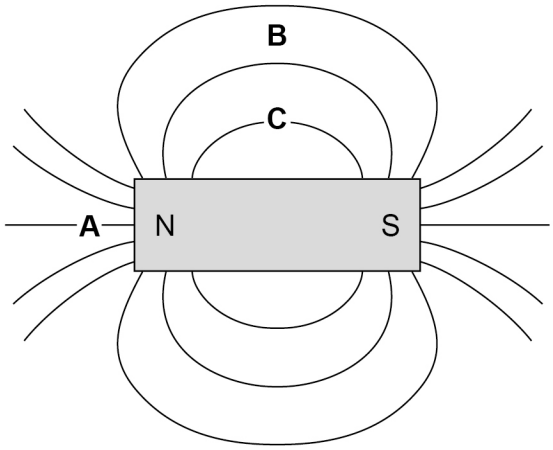
Draw **one** arrow in each circle on **Figure 1** to show the direction of the magnetic field at each place.

[2 marks]

Do not write outside the box

0 2 . 3 **Figure 2** shows magnetic field lines around a bar magnet.

Figure 2



Which letter shows where the magnetic field is strongest?

[1 mark]

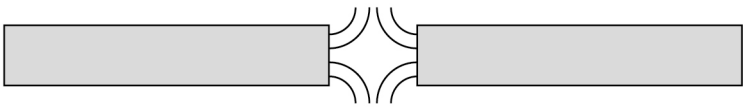
Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐

Do not write outside the box

0 2 . 4 **Figure 3** shows the magnetic field lines between two bar magnets.

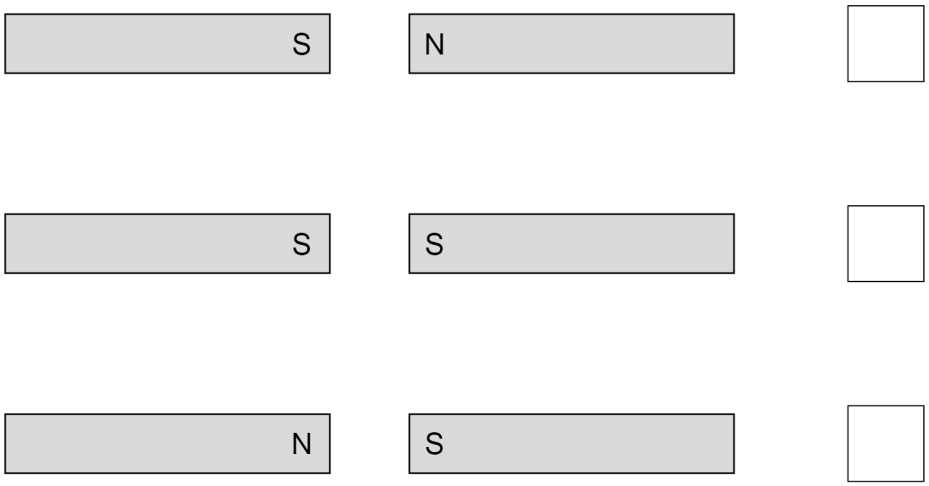
Figure 3



Which diagram shows how the magnets are arranged in **Figure 3**?

[1 mark]

Tick (✓) **one** box.



Question 2 continues on the next page

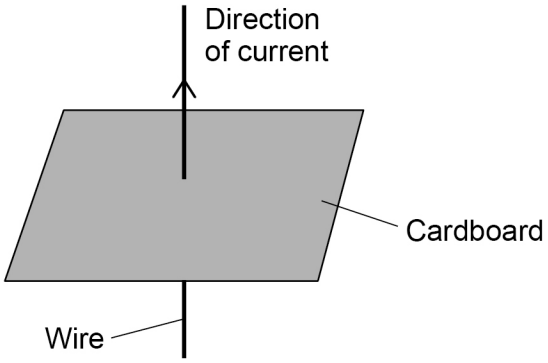
Do not write outside the box

A teacher demonstrates how a current in a wire creates a magnetic field around the wire.

Figure 4 shows the wire passing through a piece of cardboard.

The current can be switched on and off.

Figure 4



0 2 . 5 Describe how the teacher can use a plotting compass to demonstrate the magnetic effect of the current in the wire.

[2 marks]

Do not write outside the box

0 2 . 6 The teacher decreases the current in the wire.

How does the strength of the magnetic field around the wire change?

[1 mark]

Tick (✓) **one** box.

Decreases ☐

Stays the same ☐

Increases ☐

0 2 . 7 The teacher reverses the direction of the current in the wire.

What happens to the magnetic field around the wire?

[1 mark]

_____

9

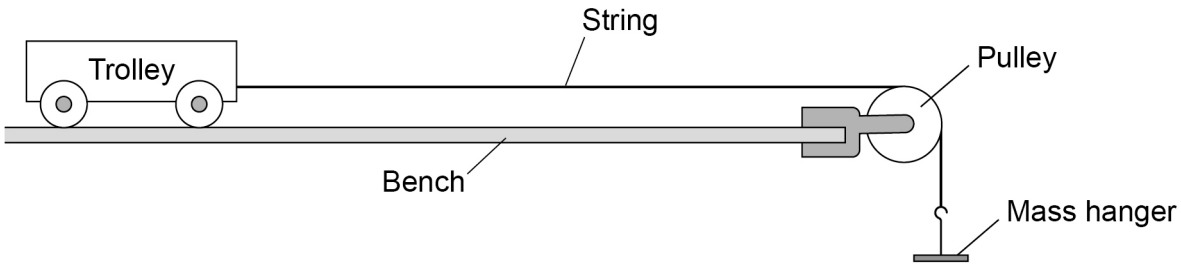
Turn over for the next question

Do not write outside the box

0 3 A student investigated how changing the mass of a trolley affects the acceleration of the trolley.

Figure 5 shows some of the equipment used.

Figure 5



0 3 . 1 The trolley in **Figure 5** is not moving.

Which force prevents the trolley from moving?

[1 mark]

Tick (✓) **one** box.

Friction ☐

Tension ☐

Weight ☐

Do not write outside the box

The force pulling on the trolley was increased so that the trolley accelerated.

The force was then kept constant and different masses were put on the trolley.

For each different mass the acceleration of the trolley was measured.

0 3 . 2 Draw **one** line from each variable to the correct quantity.

[2 marks]

Variable	Quantity
	Acceleration of the trolley
Independent variable	Length of the bench
	Total mass of the trolley
Dependent variable	Force pulling on the trolley

0 3 . 3 For one of the masses put on the trolley, the student recorded three values of acceleration.

1.58 m/s^2 1.53 m/s^2 1.54 m/s^2

Calculate the mean acceleration of the trolley.

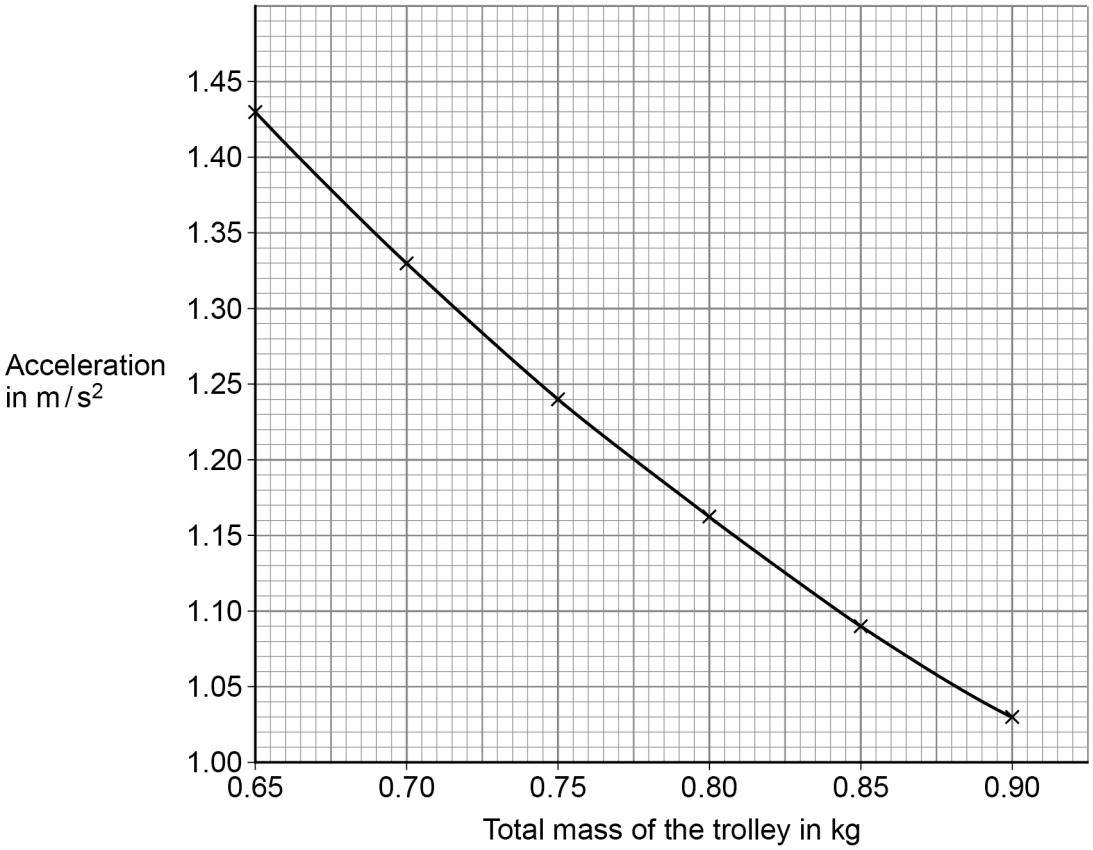
[2 marks]

Mean acceleration = _____ m/s^2

Do not write outside the box

Figure 6 shows some of the results.

Figure 6



0 3 . 4 Describe the relationship shown in **Figure 6**.

[1 mark]

Do not write outside the box

0 3 . 5 When the total mass of the trolley was 1.5 kg, the acceleration of the trolley was 0.62 m/s^2.

Calculate the resultant force acting on the trolley.

Use the equation:

resultant force = mass × acceleration

[2 marks]

Resultant force = _____ N

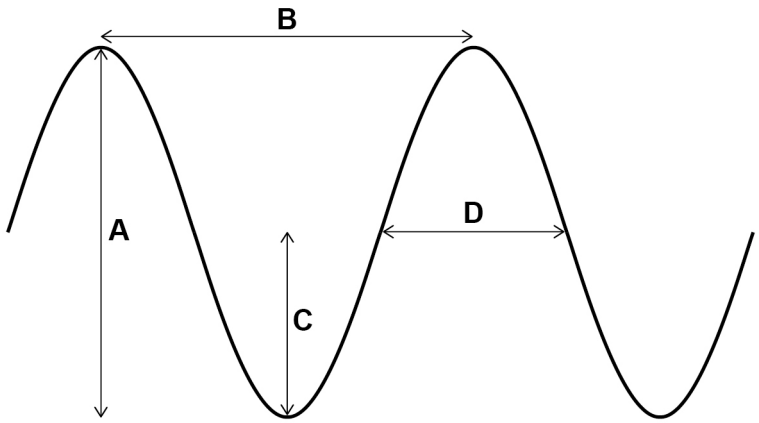
8

Turn over for the next question

Do not write outside the box

0 4 **Figure 7** represents a transverse wave.

Figure 7



0 4 . 1 Which arrow represents the amplitude of the wave?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 4 . 2 Which arrow represents the wavelength of the wave?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Do not write outside the box

0 4 . 3 A wave has a frequency of 5000 Hz.

Calculate the period of the wave.

Use the equation:

$$\text{period} = \frac{1}{\text{frequency}}$$

[2 marks]

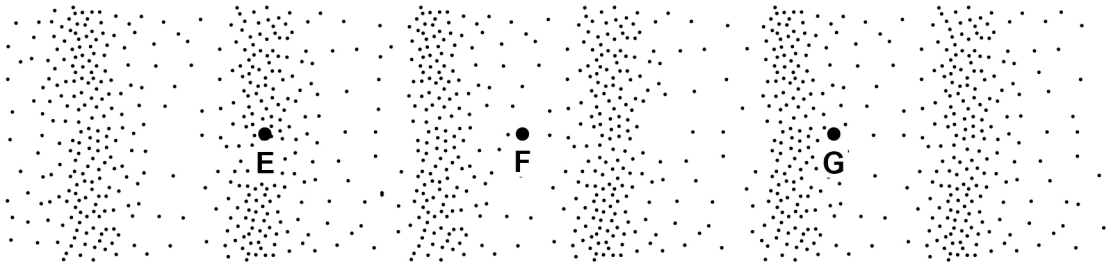
Period = _____ s

0 4 . 4 Give **one** example of a transverse wave that can travel through a vacuum.

[1 mark]

0 4 . 5 **Figure 8** represents a longitudinal wave.

Figure 8



Which point is at the centre of a rarefaction?

[1 mark]

Tick (✓) **one** box.

E ☐ **F** ☐ **G** ☐

Do not write outside the box

0 4 . 6 A sound wave has a frequency of 750 Hz.

speed of sound in air = 330 m/s

Calculate the wavelength of the sound wave.

Use the equation:

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

[2 marks]

Wavelength = _____ m

0 4 . 7 Describe a method that could be used to determine the speed of sound in air.

[4 marks]

Do not write outside the box

0 4 . 8 When a sound wave moves from air into water, the speed of the wave increases.

The frequency of the sound wave does **not** change.

Complete the sentence.

Choose the answer from the box.

[1 mark]

decreases	**stays the same**	**increases**

When a sound wave moves from air into water its

wavelength _____.

13

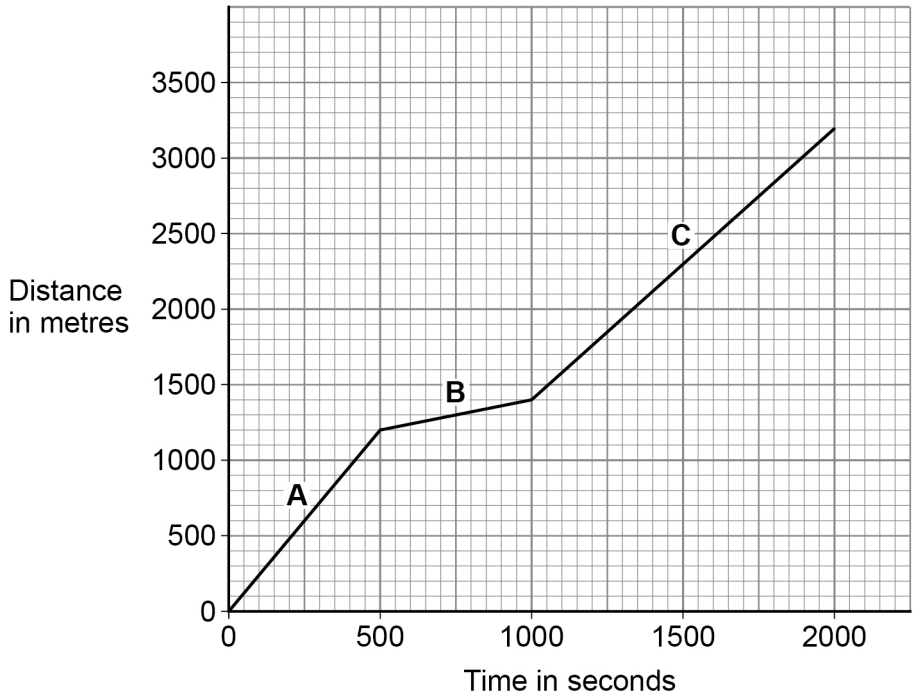
Turn over for the next question

Do not write outside the box

0 5 A person has been for a walk.

Figure 9 shows the distance–time graph for the walk.

Figure 9



0 5 . 1 Some quantities are scalar quantities and others are vector quantities.

Which of the following are scalar quantities?

[2 marks]

Tick (✓) **two** boxes.

Displacement ☐

Distance ☐

Force ☐

Speed ☐

Velocity ☐

Do not write outside the box

0 5 . 2 What was the total distance walked by the person in 2000 seconds?

[1 mark]

Total distance = _____ m

0 5 . 3 Calculate the average speed of the person during the 2000 seconds.

Use your answer to Question **05.2**

Use the equation:

$$\text{average speed} = \frac{\text{total distance}}{\text{total time}}$$

[2 marks]

_____

_____

_____

Average speed = _____ m/s

0 5 . 4 Which section of **Figure 9** shows the person walking the slowest?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐

Reason _____

_____

Do not write outside the box

0 5 . 5 The person walked slowest when going up some steps.

Complete the sentence.

Choose the answer from the box.

[1 mark]

air resistance	**friction**	**gravity**

When walking up the steps, the person did more work against the

force of _____.

0 5 . 6 On another day, the person ran the same route.

What is a typical speed for a person running?

[1 mark]

Tick (✓) **one** box.

0.3 m/s ☐

3.0 m/s ☐

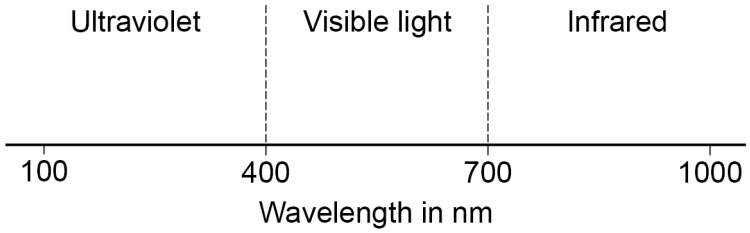
30 m/s ☐

9

Do not write outside the box

0 6 **Figure 10** shows the wavelengths of some types of electromagnetic radiation.

Figure 10



0 6 . 1 Suggest **one** piece of equipment that can be used to detect infrared radiation.

[1 mark]

0 6 . 2 Which of the following values is a wavelength of red light?

[1 mark]

Tick (✓) **one** box.

320 nm ☐

410 nm ☐

690 nm ☐

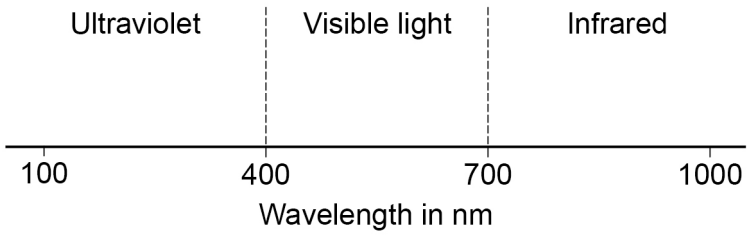
750 nm ☐

Question 6 continues on the next page

Do not write outside the box

Figure 10 is repeated below.

Figure 10



0 6 . 3 The eyes of a bee can detect electromagnetic radiation with wavelengths between 300 nm and 600 nm.

Give **two** ways the radiation detected by the eyes of a bee is different from the radiation detected by human eyes.

[2 marks]

1 _____

_____

2 _____

_____

0 6 . 4 Complete the sentences.

Choose the answers from the box.

[2 marks]

absorbed	**emitted**	**reflected**	**refracted**

When sunlight shines on a red flower, the red light

is _____.

All other colours of light shining on the red flower

are _____.

Do not write outside the box

0 6 . 5 A gardener looks at a red flower through a green filter.

How does the flower appear to the gardener?

[1 mark]

Tick (✓) **one** box.

Black ☐

Green ☐

Red ☐

White ☐

0 6 . 6 The leaves of the plant reflect light.

The leaves have a rough surface.

What type of reflection happens at the leaf surface?

[1 mark]

_____

8

Turn over for the next question

Do not write outside the box

0 7 A swimming pool is being filled with water.

0 7 . 1 Calculate the weight of the water in the swimming pool when the mass of the water is 25 000 kg.

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

0 7 . 2 When the swimming pool is full, the weight of the water is 1 960 000 N.

The bottom of the swimming pool has an area of 49 m^2.

Calculate the pressure at the bottom of the swimming pool when it is full.

Use the equation:

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

Choose the unit from the box.

[3 marks]

m^2	**m^3**	**N**	**Pa**

Pressure = _____ Unit _____

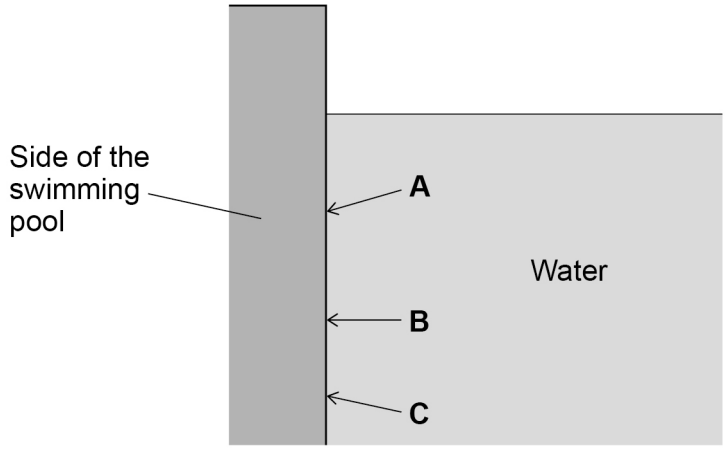
Question 7 continues on the next page

Do not write outside the box

0 7 . 3 There is a force acting on the side of the swimming pool because of the water pressure.

Figure 11 shows the side of the swimming pool.

Figure 11



Which arrow shows the direction of the force acting on the side of the swimming pool?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐

0 7 . 4 A child is swimming in the pool. The velocity of the child is 0.70 m/s.

The child then accelerates for 5.0 s, reaching a final velocity of 1.3 m/s.

Calculate the acceleration of the child.

Use the equation:

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

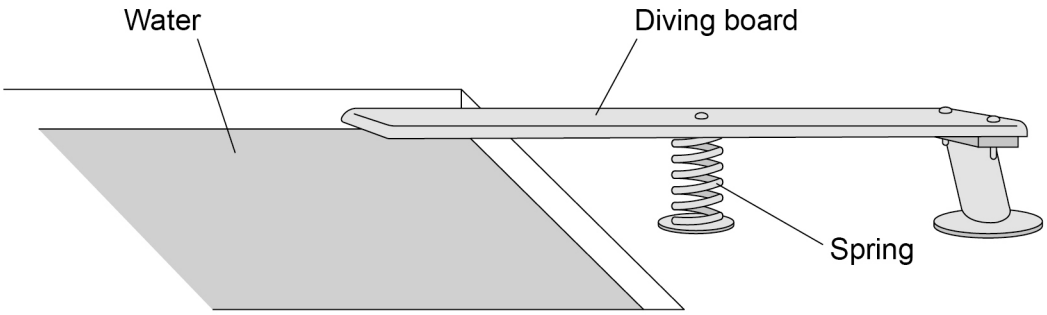
[2 marks]

Acceleration = _____ m/s^2

Do not write outside the box

Figure 12 shows a diving board at the side of the swimming pool.

Figure 12



0 7 . 5 The original length of the spring is 0.84 m.

When the child stands on the diving board, the length of the spring decreases by 0.21 m.

Calculate the percentage change in the length of the spring.

[2 marks]

Percentage change in length = _____ %

Question 7 continues on the next page

Do not write outside the box

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

0 7 . 6 Write down the equation which links extension (*e*), force applied to a spring (*F*) and spring constant (*k*).

[1 mark]

0 7 . 7 The force applied to the spring by the weight of the child is 336 N.

The change in length of the spring is 0.21 m.

Calculate the spring constant of the spring.

[3 marks]

Spring constant = _____ N/m

Do not write outside the box

0 7 . 8 The child steps off the diving board and falls into the swimming pool.

The initial velocity of the child is 0 m/s.

acceleration due to gravity = 9.8 m/s^2

Calculate the final velocity when the child has fallen a distance of 0.95 m through the air.

Give your answer to 2 significant figures.

Use the Physics Equations Sheet.

[4 marks]

Final velocity of child (2 significant figures) = _____ m/s

18

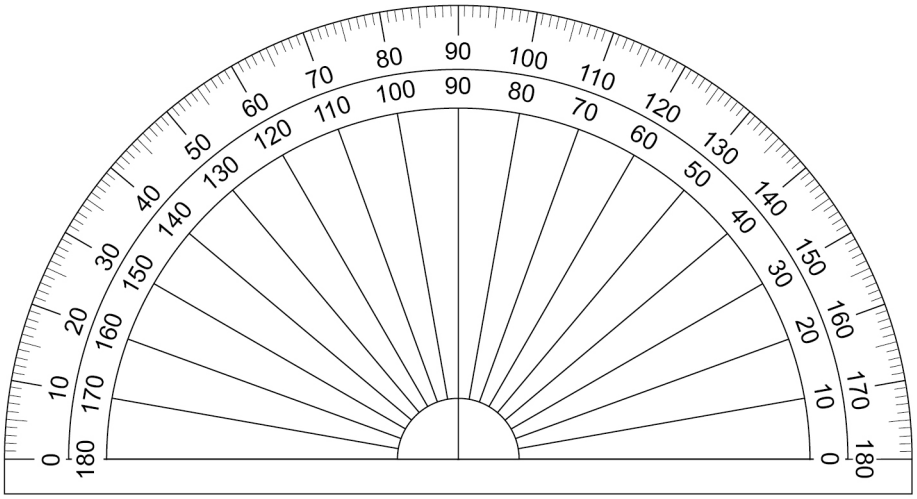
Turn over for the next question

Do not write outside the box

0 8 A student investigated the refraction of light by a glass block.

Figure 13 shows the protractor used to measure the angles of incidence and the angles of refraction.

Figure 13



0 8 . 1 What is the resolution of the protractor used to measure the angles?

[1 mark]

Resolution = _____ °

Table 1 shows the results.

Table 1

Angle of incidence in degrees	Angle of refraction in degrees
10	6
20	12
30	18
40	23
50	28
60	32

Do not write outside the box

0 8 . 2 Describe a method the student could have used to obtain the data in **Table 1**.

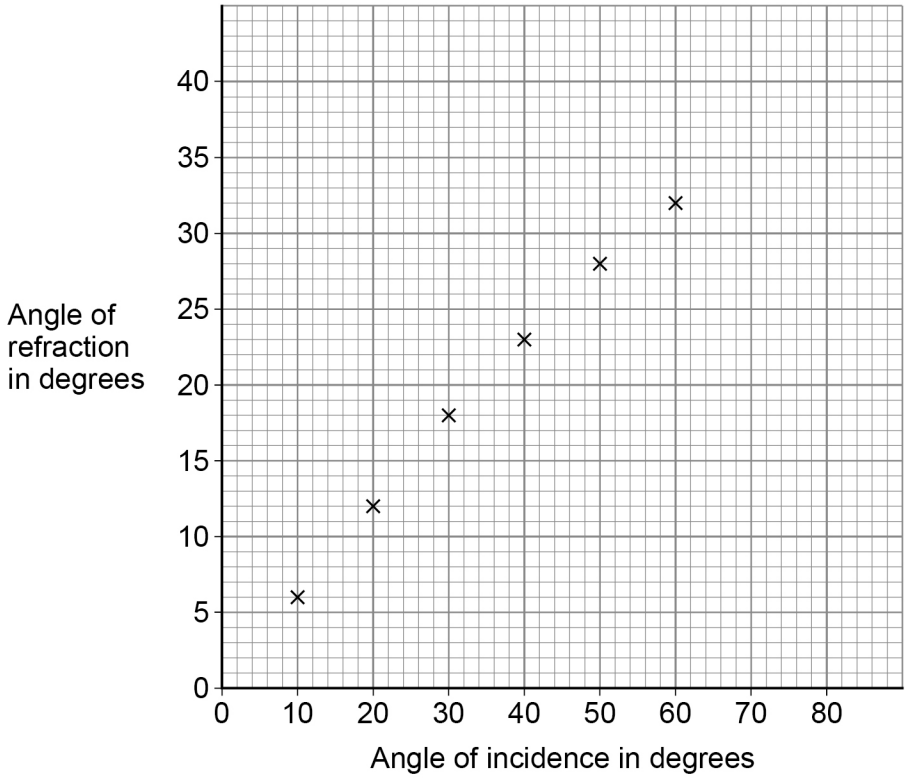
You may include a labelled diagram.

[6 marks]

Do not write outside the box

Figure 14 shows some of the results.

Figure 14



The student measured the angles of refraction for two additional angles of incidence.

Table 2 shows the additional results.

Table 2

Angle of incidence in degrees	Angle of refraction in degrees
70	35
80	37

Do not write outside the box

0 8 . 3 Complete **Figure 14**.

You should:

- plot the results from **Table 2**
- draw the line of best fit.

[2 marks]

0 8 . 4 How does **Figure 14** show that the angle of refraction is **not** directly proportional to the angle of incidence?

[1 mark]

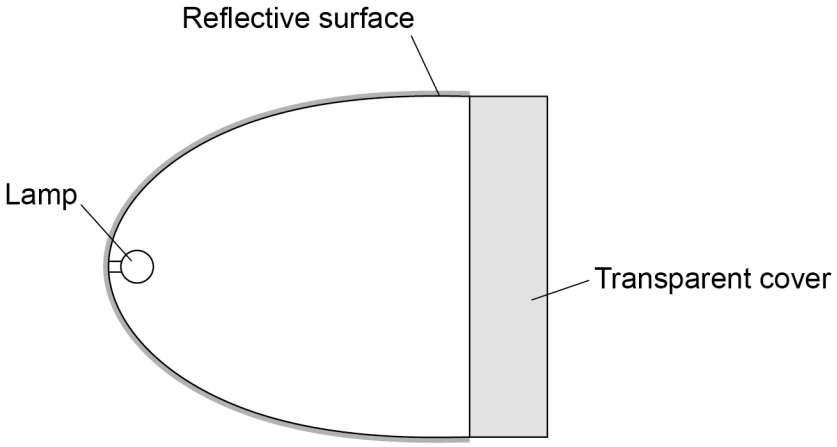
Question 8 continues on the next page

Do not write outside the box

Figure 15 shows a diagram of a car headlight.

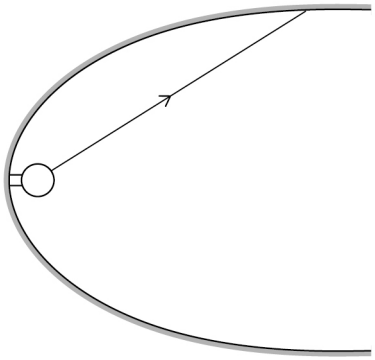
The headlight has a lamp, a reflective surface and a transparent cover.

Figure 15



0 8 . 5 **Figure 16** shows a ray of light incident on the reflective surface.

Figure 16



Complete **Figure 16** to show the reflected ray of light.

You should include the normal line at the point where the incident ray meets the reflecting surface.

[2 marks]

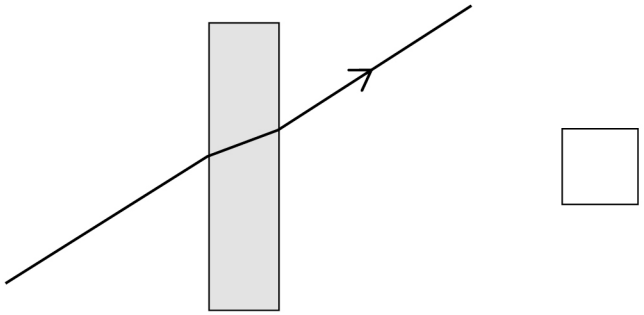
Do not write outside the box

0 8 . 6 Rays of light pass through the transparent cover of the headlight.

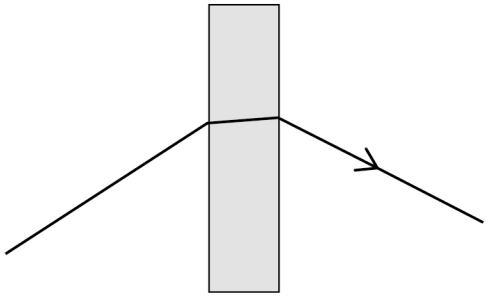
Which diagram shows how a ray of light passes through the transparent cover?

[1 mark]

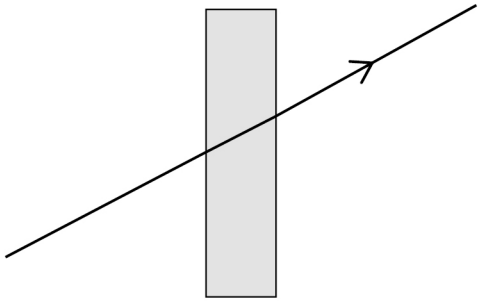
Tick (✓) **one** box.



☐



☐



☐

13

Turn over for the next question

Do not write outside the box

0 9 **Figure 17** shows a young child using a baby walker.

Figure 17



0 9 . 1 The child is standing still.

What is the resultant **vertical** force on the child?

Give a reason for your answer.

[2 marks]

Resultant vertical force = _____ N

Reason _____

_____

Do not write outside the box

Use the Physics Equations Sheet to answer questions **09.2** and **09.3**.

0 9 . 2 Write down the equation which links distance (*s*), force (*F*) and work done (*W*).

[1 mark]

0 9 . 3 The child pushed the baby walker 2.8 m across a horizontal floor.

The work done by the child was 35 J.

Calculate the horizontal force the child applied to the baby walker.

[3 marks]

Horizontal force = _____ N

0 9 . 4 The child pushed the baby walker from a carpet onto a hard floor.

The child applied the same horizontal force to the baby walker.

Explain why the speed of the baby walker increased.

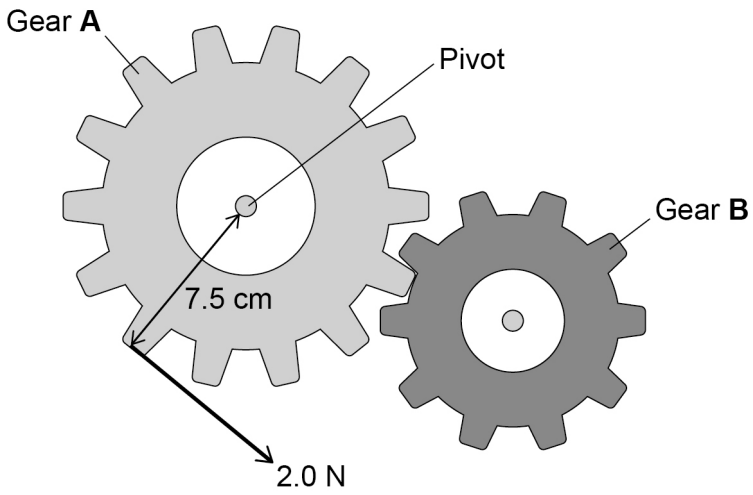
[2 marks]

Do not write outside the box

There are some toy gears on the front of the baby walker.

Figure 18 shows the gears.

Figure 18



The child applies a force to gear **A**.

This causes a moment about the pivot, so gear **A** rotates.

Do not write outside the box

Use the Physics Equations Sheet to answer questions **09.5** and **09.6**.

0 9 . 5 Write down the equation which links distance (*d*), force (*F*) and moment of a force (*M*).

[1 mark]

0 9 . 6 The child applies a force of 2.0 N on gear **A**.

The perpendicular distance between the force and the pivot is 7.5 cm.

Calculate the moment of the force about the pivot.

[3 marks]

Moment of force = _____ N m

0 9 . 7 Explain what happens to gear **B** when the child applies the force to gear **A**.

[2 marks]

14

END OF QUESTIONS

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