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

Monday 16 June 2025 Morning 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	
10	
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.

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There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

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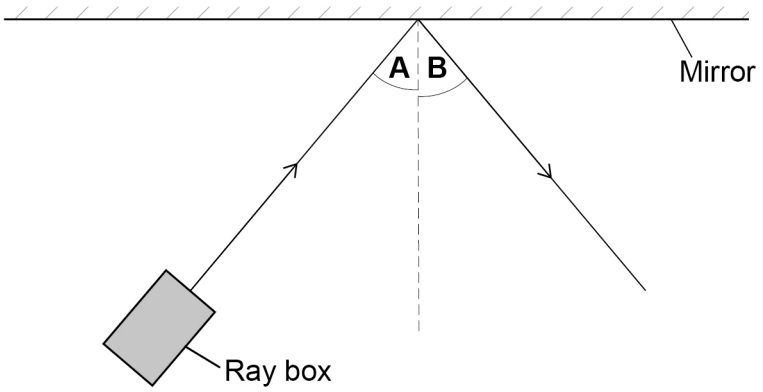
Answer **all** questions in the spaces provided.

0 1 Light waves and water waves can both be reflected.

A student used a ray box and a mirror to investigate the reflection of light.

Figure 1 shows some of the apparatus used.

Figure 1



0 1 . 1 The student measured angle **A** and angle **B**.

What equipment should the student have used to measure each angle?

[1 mark]

Question 1 continues on the next page

The student moved the ray box and changed the direction of the ray of light.

The student recorded different pairs of values of angle **A** and angle **B**.

Table 1 shows the results.

Table 1

Angle A in degrees	Angle B in degrees
0	0
5	5
11	11
20	20
29	29

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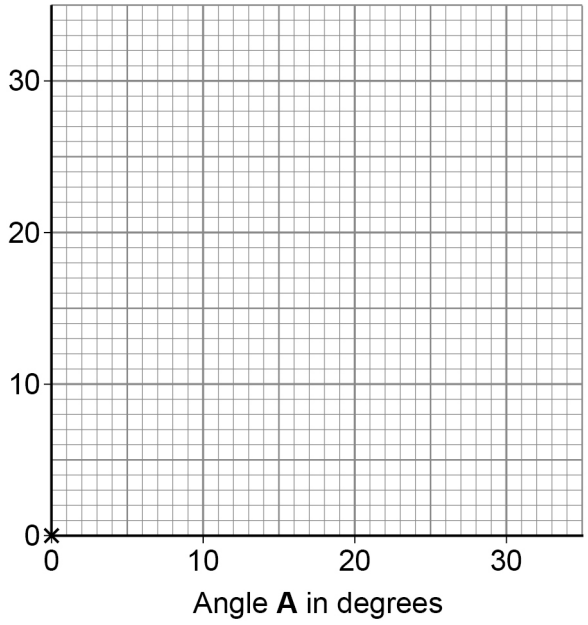
0 1 . 2 **Figure 2** shows an incomplete graph of the results.

Figure 2



Complete **Figure 2**.

You should:

- label the *y*-axis
- plot the remaining data from **Table 1**
- draw a line of best fit.

[4 marks]

0 1 . 3 What is the relationship between angle **A** and angle **B**?

[1 mark]

Tick (✓) **one** box.

Angle **A** is directly proportional to angle **B**. ☐

There is a negative correlation between angle **A** and angle **B**. ☐

The relationship between angle **A** and angle **B** is non-linear. ☐

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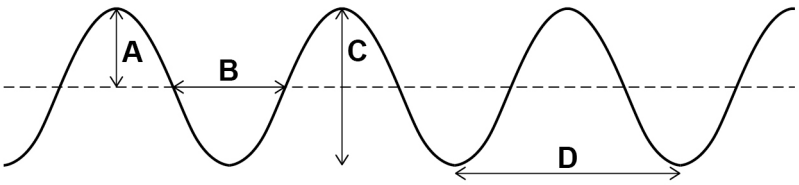
Figure 3 represents a water wave.

Figure 3



0 1 . 4 Which letter represents the amplitude of the water wave in **Figure 3**?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 1 . 5 Which letter represents the wavelength of the water wave in **Figure 3**?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Do not write outside the box

0 1 . 6 A water wave in a ripple tank has a wave speed of 0.125 m/s.

The wave has a frequency of 2.5 Hz.

Calculate the wavelength of the wave.

Use the equation:

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

Choose the unit from the box.

[3 marks]

m	**Pa**	**kg / m**

Wavelength = _____ Unit _____

0 1 . 7 The wave has a frequency of 2.5 Hz.

Calculate the period of the wave.

Use the equation:

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

[2 marks]

Period = _____ s

13

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0 2 Very long trains can be pulled by more than one engine.

A train is made up of four engines pulling trucks filled with coal.

0 2 . 1 The coal in one truck has a mass of 75 000 kg.

gravitational field strength = 9.8 N/kg

Calculate the weight of the coal in **one** truck.

Use the equation:

weight = mass × gravitational field strength

[2 marks]

Weight = _____ N

0 2 . 2 **One** engine exerts a forward force of 850 000 N.

Calculate the work done by **one** engine when the train moves a distance of 80 m.

Use the equation:

work done = force × distance moved

[2 marks]

Work done = _____ J

Do not write outside the box

0 2 . 3 Each of the four engines exerts a forward force of 850 000 N on the trucks.

Calculate the total forward force on the trucks.

[2 marks]

Total forward force = _____ N

0 2 . 4 The force exerted by the engines on the trucks is a contact force.

Which of the following is also a contact force?

[1 mark]

Tick (✓) **one** box.

Electrostatic force ☐

Frictional force ☐

Gravitational force ☐

Question 2 continues on the next page

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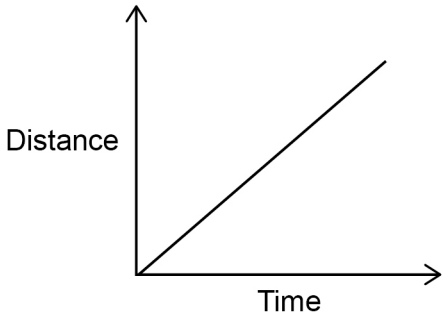
0 2 . 5 Which sketch graph represents the train moving at a constant speed?

[1 mark]

Tick (✓) **one** box.



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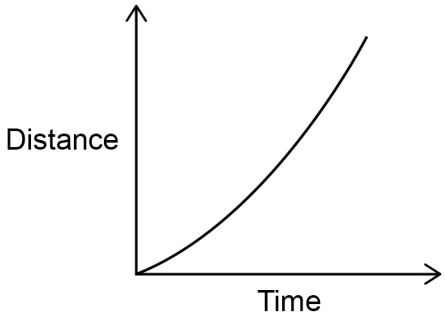

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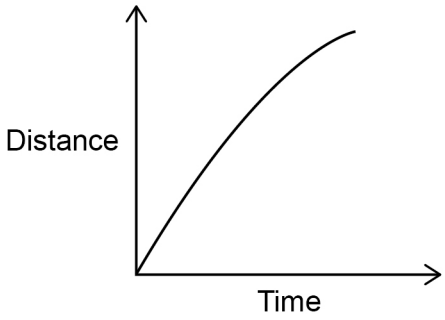

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0 2 . 6 The train accelerates for 150 s.

The velocity of the train changes from 16 m/s to 25 m/s.

Calculate the acceleration of the train.

Use the equation:

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

[3 marks]

Acceleration = _____ m/s^2

11

Turn over for the next question

Do not write outside the box

0 3 Telescopes are used to observe distant objects.

0 3 . 1 Complete the sentences.

Choose answers from the box.

[2 marks]

galaxy	**moon**	**nebula**	**star**	**universe**

A natural satellite of a planet is called a _____.

A planet orbits a _____.

0 3 . 2 What is the name of our galaxy?

[1 mark]

Tick (✓) **one** box.

Andromeda ☐

Centaurus ☐

Milky Way ☐

Whirlpool ☐

Do not write outside the box

0 3 . 3 The Sun is our nearest star.

What will happen to the Sun at the end of its life cycle?

[1 mark]

Tick (✓) **one** box.

It will become a black dwarf. ☐

It will become a black hole. ☐

It will become a neutron star. ☐

The James Webb Space Telescope is the most powerful telescope ever launched into space.

0 3 . 4 Very distant galaxies can be observed using the James Webb Space Telescope.

How does the speed of a very distant galaxy compare to the speed of a much nearer galaxy?

[1 mark]

Tick (✓) **one** box.

A very distant galaxy moves faster. ☐

The speeds are the same. ☐

A very distant galaxy moves slower. ☐

Question 3 continues on the next page

Do not write outside the box

0 3 . 5 There is an observed increase in the wavelength of light from most distant galaxies.

What name is given to this increase in the wavelength of light?

[1 mark]

Tick (✓) **one** box.

Blue-shift ☐

Green-shift ☐

Red-shift ☐

0 3 . 6 Observations from the James Webb Space Telescope support the Big Bang theory.

Complete the sentence.

Choose the answer from the box.

[1 mark]

cold	**hot**	**large**

The Big Bang theory suggests that the universe began from a region that

was extremely _____.

0 3 . 7 What does the Big Bang theory suggest is happening to the size of the universe?

[1 mark]

Tick (✓) **one** box.

The universe is getting smaller. ☐

The size of the universe is constant. ☐

The universe is getting bigger. ☐

8

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0 4 Car **X** and car **Y** have engines that produce the same maximum forward force.

The cars are the same shape, but car **X** has a greater mass than car **Y**.

0 4 . 1 How does the maximum acceleration of car **X** and car **Y** compare?

[1 mark]

Tick (✓) **one** box.

Car **X** has a greater maximum acceleration. ☐

Car **X** and car **Y** have the same maximum acceleration. ☐

Car **X** has a smaller maximum acceleration. ☐

0 4 . 2 Car **Y** has a mass of 900 kg.

Car **Y** accelerates at 2.5 m/s^2.

Calculate the resultant force on car **Y**.

Use the equation:

resultant force = mass × acceleration

[2 marks]

Resultant force = _____ N

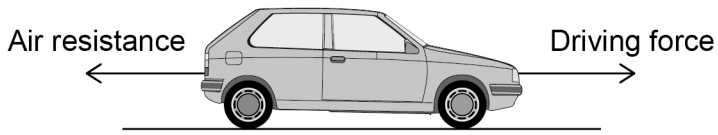
Question 4 continues on the next page

Do not write outside the box

0 4 . 3 A car moves at a constant speed on a level road.

Figure 4 shows the horizontal forces on the car.

Figure 4



The driver makes the car accelerate until the car reaches its maximum speed.

Explain how the horizontal forces on the car change as the car accelerates to its maximum speed.

[4 marks]

Do not write outside the box

To pass a driving test, drivers need to understand the difference between thinking distance and braking distance.

0 4 . 4 Complete the sentence.

Choose the answer from the box.

[1 mark]

force	**length**	**time**

The thinking distance is affected by the driver's reaction _____.

0 4 . 5 Complete the sentence.

Choose the answer from the box.

[1 mark]

force	**length**	**time**

The braking distance is the distance travelled by the car under the braking

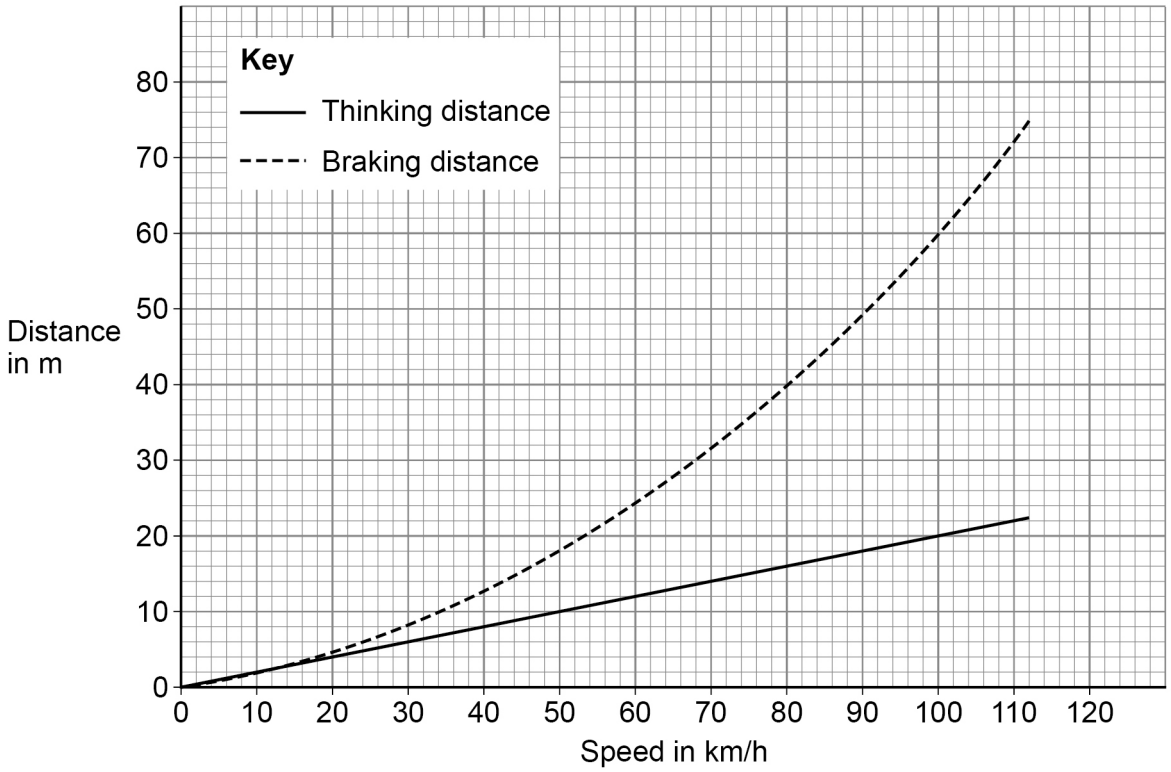
_____.

Question 4 continues on the next page

Do not write outside the box

0 4 . 6 **Figure 5** shows how speed affects the thinking distance and braking distance of a car.

Figure 5



The car is moving at a speed of 100 km/h.

Calculate the stopping distance of the car.

Use **Figure 5**.

[3 marks]

Stopping distance = _____ m

Do not write outside the box

0 4 . 7 Which **two** of the following would **increase** the stopping distance of a car?

[2 marks]

Tick (✓) **two** boxes.

Fitting new brakes to the car ☐

Fitting new tyres to the car ☐

The driver becoming tired ☐

Driving uphill ☐

Driving on a wet road ☐

14

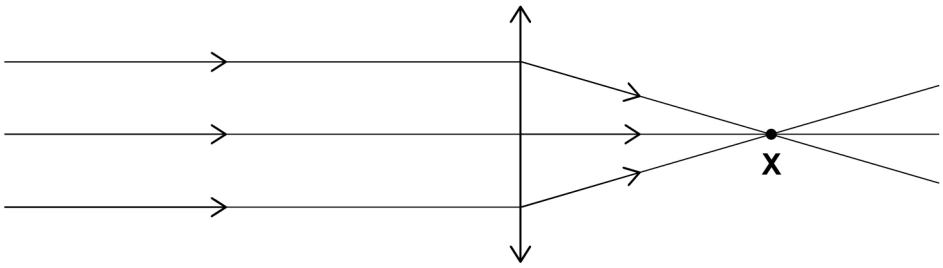
Turn over for the next question

Do not write outside the box

0 5 Some people wear glasses when they are reading.

Figure 6 shows parallel rays of light passing through a convex lens from a pair of reading glasses.

Figure 6



0 5 . 1 What name is given to point **X** in **Figure 6**?

[1 mark]

Tick (✓) **one** box.

Focal length ☐

Principal axis ☐

Principal focus ☐

0 5 . 2 Light changes direction as it enters the lens.

What is the name of this process?

[1 mark]

Tick (✓) **one** box.

Emission ☐

Reflection ☐

Refraction ☐

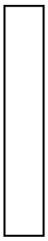
Do not write outside the box

0 5 . 3 Which of the following is the shape of a convex lens?

[1 mark]

Tick (✓) **one** box.

☐



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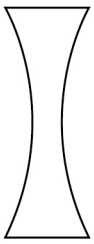

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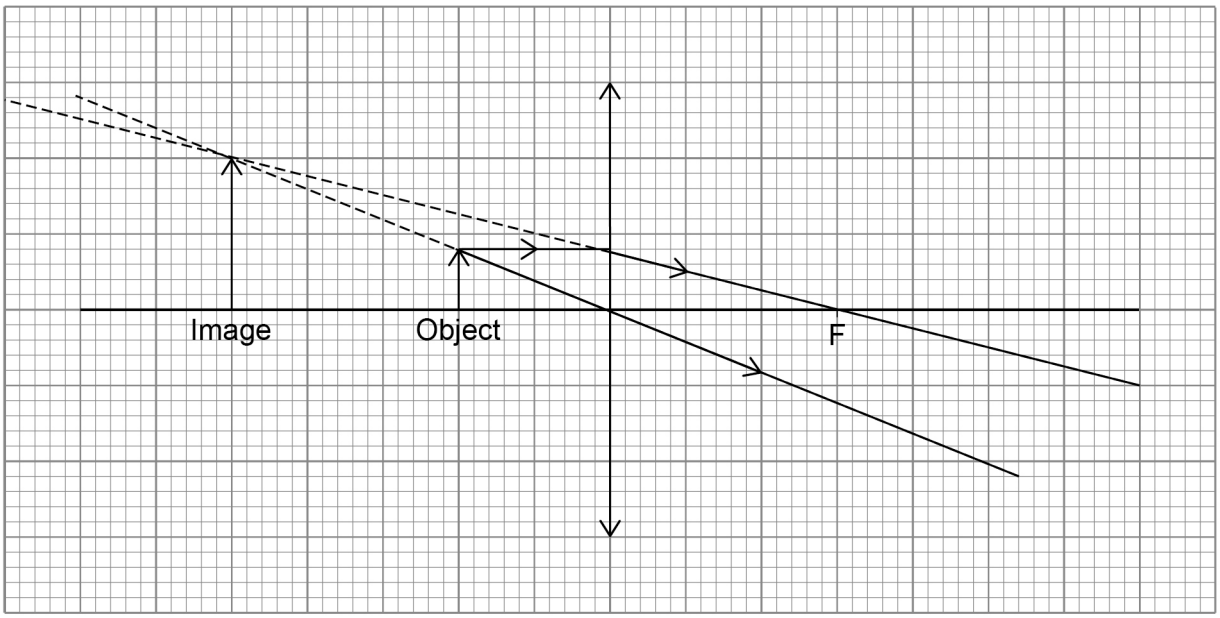
Question 5 continues on the next page

Do not write outside the box

Figure 7 shows a lens forming a magnified image of an object.

Figure 7



0 5 . 4 Measure the image height **and** the object height in **Figure 7**.

[1 mark]

Image height = _____ cm

Object height = _____ cm

0 5 . 5 Calculate the magnification produced by the lens.

Use your answers to Question **05.4** and the equation:

$$\text{magnification} = \frac{\text{image height}}{\text{object height}}$$

[2 marks]

_____

_____

_____

Magnification = _____

Do not write outside the box

0 5 . 6 Why does magnification have no unit?

[1 mark]

Tick (✓) **one** box.

Magnification is a height. ☐

Magnification is a power. ☐

Magnification is a ratio. ☐

0 5 . 7 Some reading glasses contain lenses made from blue glass.

The blue glass acts as a filter.

Describe what happens to white light incident on colourless glass **and** white light incident on blue glass.

[3 marks]

Colourless glass _____

_____

_____

Blue glass _____

_____

_____

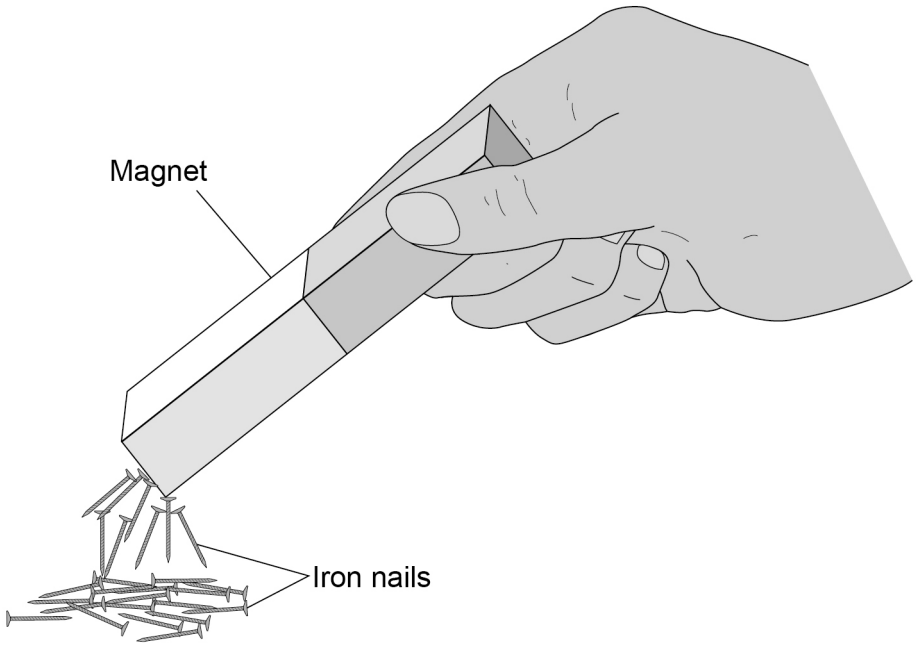
10

Turn over for the next question

Do not write outside the box

0 6 **Figure 8** shows iron nails being attracted to a magnet.

Figure 8



0 6 . 1 Iron is a magnetic material.

Which **two** of the following are also magnetic materials?

[2 marks]

Tick (✓) **two** boxes.

Cobalt ☐

Copper ☐

Gold ☐

Steel ☐

Zinc ☐

Do not write outside the box

0 6 . 2 The iron nails become magnets when they are attracted to the bar magnet.

Complete the sentence.

Choose the answer from the box.

[1 mark]

electromagnets	**induced magnets**	**permanent magnets**

The iron nails become _____.

0 6 . 3 **Figure 9** shows two bar magnets next to each other.

Figure 9

Which arrow shows the direction of the magnetic field between the magnets?

[1 mark]

Tick (✓) **one** box.

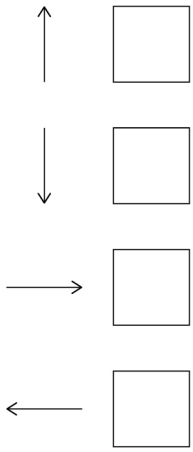


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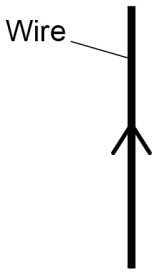
Figure 10 shows the direction of the current in a wire.

The current causes a magnetic field around the wire.

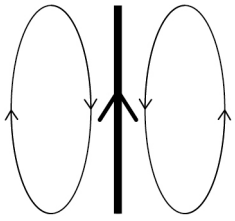
Figure 10



0 6 . 4 Which of the following shows the magnetic field pattern around the wire?

[1 mark]

Tick (✓) **one** box.



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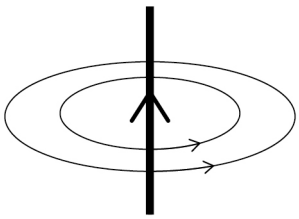

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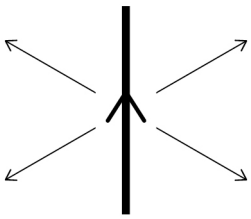

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Do not write outside the box

0 6 . 5 What **two** changes would increase the strength of the magnetic field around the wire?

[2 marks]

1 _____

_____

2 _____

_____

7

Turn over for the next question

Do not write outside the box

0 7 A 'number balance' is used to help children understand addition.

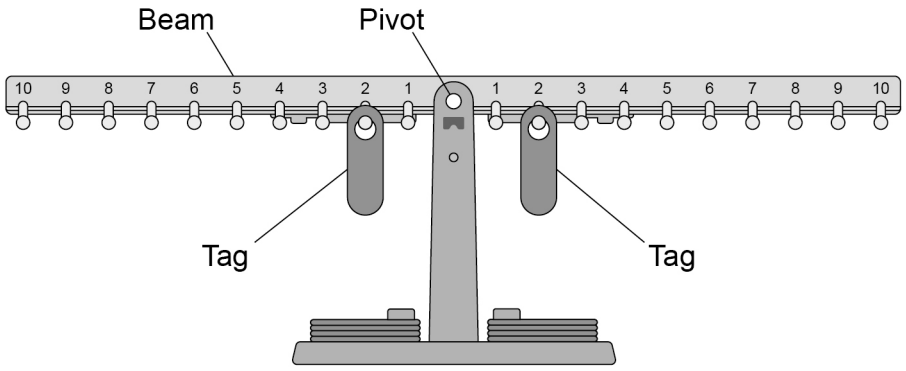
A number balance has a beam that can rotate around a pivot.

Small tags can be hung from the pegs on the beam.

Each tag has the same weight.

Figure 11 shows a number balance. The balance is in equilibrium.

Figure 11



0 7 . 1 The weight of each tag on the beam in **Figure 11** causes a moment about the pivot.

What is meant by the 'moment' of a force?

[1 mark]

Tick (✓) **one** box.

The direction of the force ☐

The magnitude of the force ☐

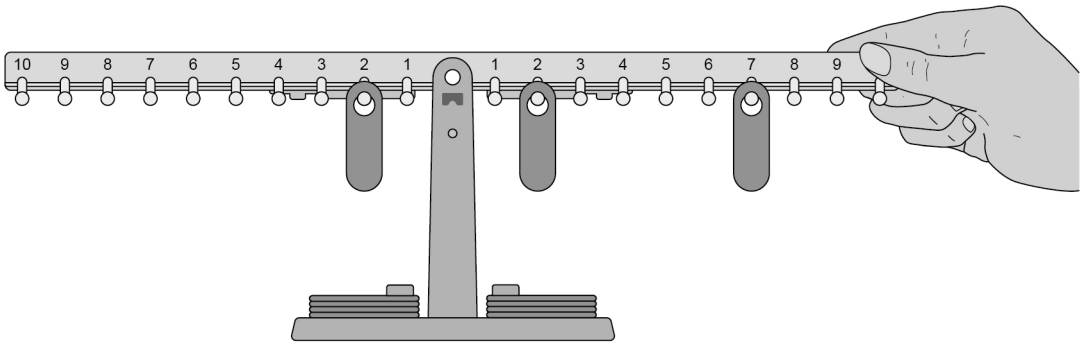
The turning effect of the force ☐

Do not write outside the box

A student holds the beam in a horizontal position and adds a tag to position 7 to the right of the pivot.

Figure 12 shows the new arrangement.

Figure 12



0 7 . 2 The student lets go of the beam.

Which of the following describes the resultant moment on the beam?

[1 mark]

Tick (✓) **one** box.

The resultant moment is anti-clockwise. ☐

The resultant moment is clockwise. ☐

The resultant moment is zero. ☐

0 7 . 3 Explain where the student should add another tag to make the beam in **Figure 12** balance.

[2 marks]

Do not write outside the box

Use the Physics Equations Sheet to answer questions **07.4** and **07.5**.

0 7 . 4 Write down the equation which links distance (*d*), force (*F*) and moment of a force (*M*).

[1 mark]

0 7 . 5 One tag causes a moment about the pivot of 1.8 N cm.

The weight of the tag is 0.15 N.

Calculate the distance between the pivot and the tag.

Give your answer in cm.

[3 marks]

Distance = _____ cm

8

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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0 8 In a thunderstorm, lightning produces visible light waves and sound waves.

0 8 . 1 Describe the similarities and differences between visible light waves and sound waves.

[6 marks]

Do not write outside the box

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

0 8 . 2 Which equation links distance (*s*), speed (*v*) and time (*t*)?

[1 mark]

Tick (✓) **one** box.

speed = distance × time ☐

speed = $\frac{\text{distance}}{\text{time}}$ ☐

speed = $\frac{\text{time}}{\text{distance}}$ ☐

0 8 . 3 Lightning strikes the ground 13 200 m from a student.

The speed of sound in air is 330 m/s.

Calculate the time taken for the sound created by the lightning strike to reach the student.

[3 marks]

Time = _____ s

10

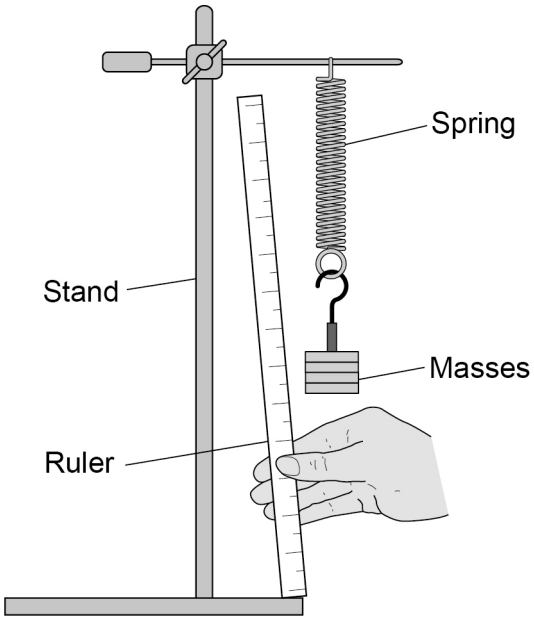
Turn over for the next question

Do not write outside the box

0 9 A student investigated how the force applied to a spring affects the length of the spring.

Figure 13 shows the apparatus used.

Figure 13



0 9 . 1 What is the independent variable in this investigation?

[1 mark]

_____

0 9 . 2 Describe **one** risk of harm in this investigation and a safety precaution to reduce the risk.

[2 marks]

Risk of harm _____

_____

Safety precaution _____

_____

Do not write outside the box

0 9 . 3 The student measured the length of the spring using the arrangement shown in **Figure 13**.

Give **two** ways the student could have changed the arrangement to improve the accuracy of the measurement.

[2 marks]

1 _____

_____

2 _____

_____

Question 9 continues on the next page

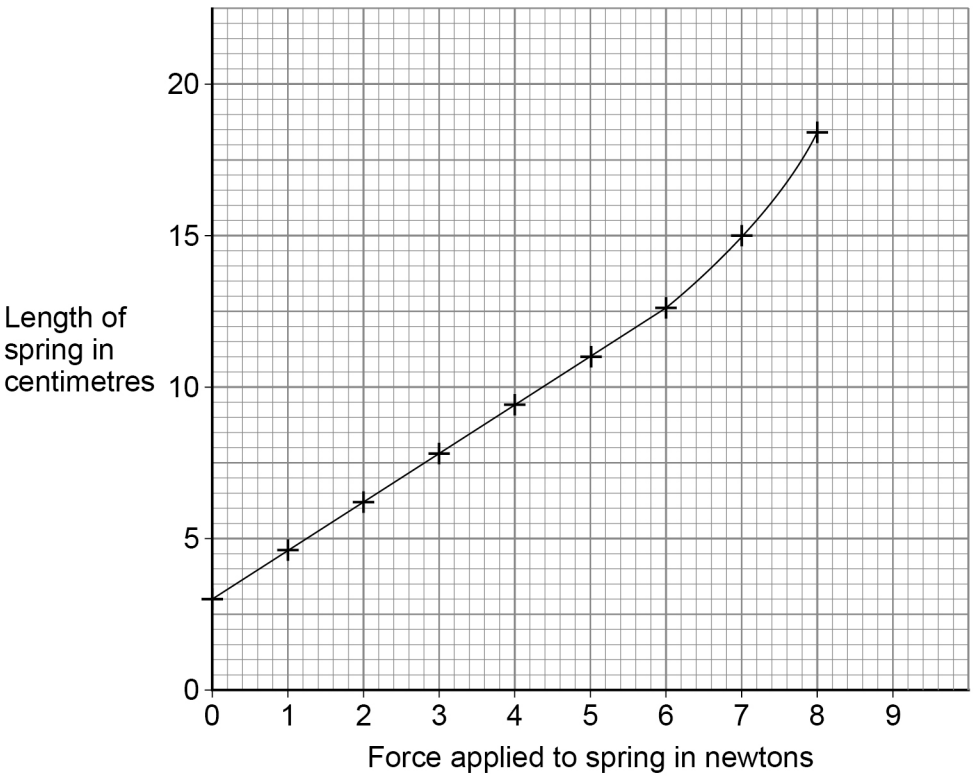
Do not write outside the box

The student recorded accurate values for the length of the spring as the mass on the spring increased.

The student calculated the force applied to the spring by each mass.

Figure 14 shows the results.

Figure 14



0 9 . 4 Why does the line on the graph **not** pass through the origin?

[1 mark]

Do not write outside the box

0 9 . 5 Above 6.0 N the line on **Figure 14** curves upwards.

Explain why.

[2 marks]

Use the Physics Equations Sheet to answer questions **09.6** and **09.7**.

0 9 . 6 Which equation links extension (*e*), force (*F*) and spring constant (*k*)?

[1 mark]

Tick (✓) **one** box.

force = spring constant × extension ☐

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

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

0 9 . 7 When the force on the spring is 4.0 N, the extension of the spring is 0.064 m.

Calculate the spring constant of the spring.

[3 marks]

Spring constant = _____ N/m

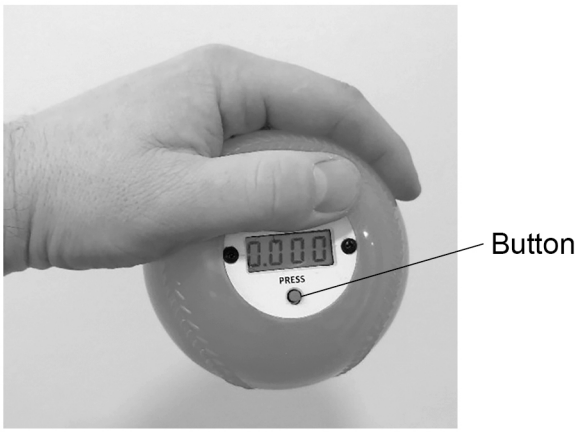
12

Do not write outside the box

1 0 A student investigated the acceleration of a ball dropped from different heights.

Figure 15 shows a 'gravity ball' that the student used.

Figure 15



The button on the gravity ball starts the stopwatch.

When the gravity ball hits the floor, the stopwatch stops.

This is the method used.

1. Measure a vertical height above the floor.
2. Hold the gravity ball at the measured height.
3. Start the stopwatch on the gravity ball and drop the gravity ball.
4. Record the time shown on the stopwatch.
5. Repeat steps 1 to 4 using the same height.
6. Repeat steps 1 to 5 using different heights.

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1 0 . 1 The student dropped the ball from the same height five times and recorded the following results.

0.49 s 0.51 s 0.58 s 0.56 s 0.61 s

Calculate the uncertainty in these measurements of time.

[2 marks]

Uncertainty = ± _____ s

1 0 . 2 What type of error caused the variation in the measurements of time?

[1 mark]

Tick (✓) **one** box.

Random error ☐

Systematic error ☐

Zero error ☐

1 0 . 3 Suggest **one** reason for the error that caused the variation in the measurements of time.

[1 mark]

Question 10 continues on the next page

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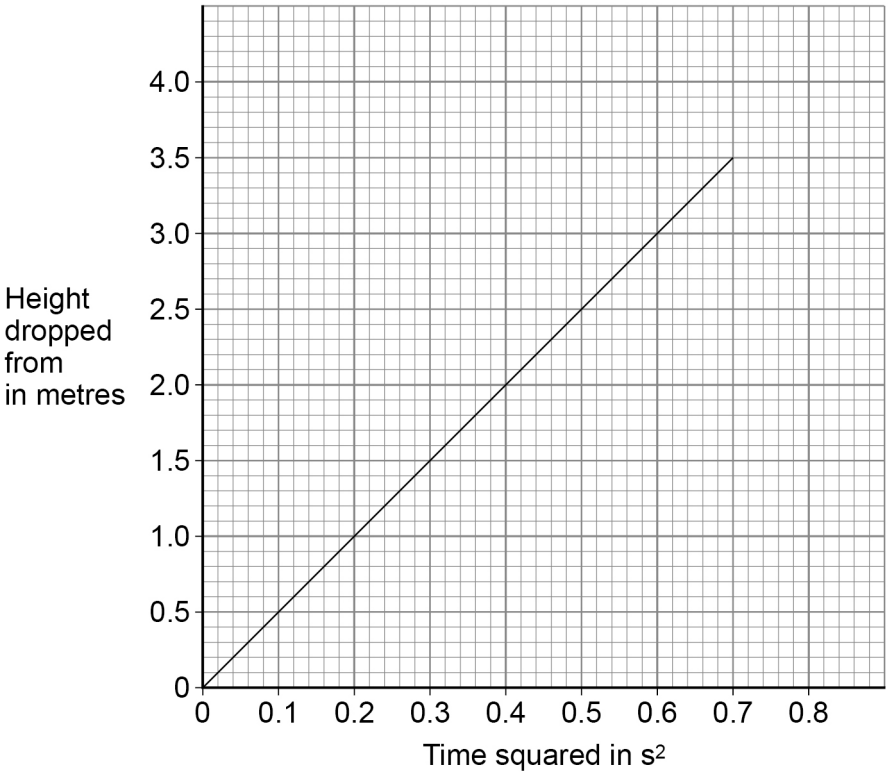
1 0 . 4 **Figure 16** shows a graph of the height the ball was dropped from against the time squared.

Figure 16



The acceleration of the ball can be calculated using the equation:

acceleration = 2 × (gradient of the graph)

Determine the acceleration of the ball.

[3 marks]

Acceleration of ball = _____ m/s²

7

END OF QUESTIONS

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