

Please write clearly in block capitals.

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Centre number

Candidate
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Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Higher Tier Physics Paper 2

Practice Paper Series – Set 1

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- the Physics Equations Sheet (printed at the back of this booklet).

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.
- 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).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 70.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering question 02.4 you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully developed
 - shows how the points that you make are related or follow on from each other where appropriate.

For Examiner's Use

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

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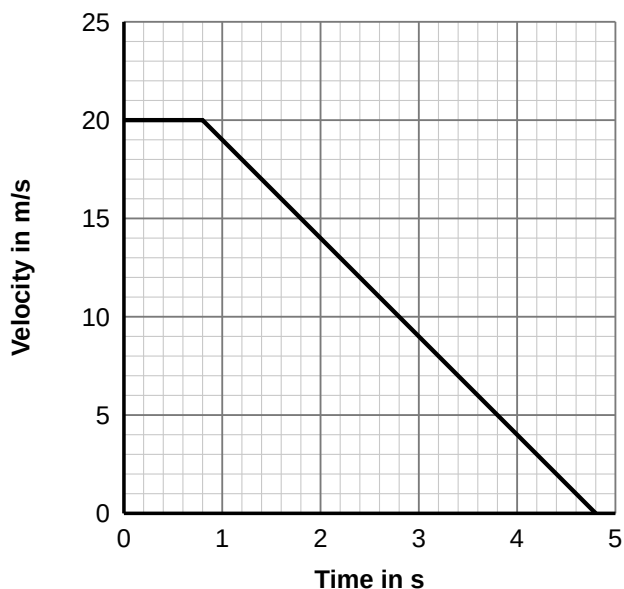
sciencegcse.co.uk | Practice Paper Series – Set 1 | SGC/S1/P/2H

01 A car is travelling along a straight, level road.

The driver sees a hazard and applies the brakes.

Figure 1 shows how the velocity of the car changes from the moment the driver sees the hazard until the car stops.

Figure 1



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01.1 Determine the reaction time of the driver.

[1 mark]

Use **Figure 1**.

Reaction time = ... s

01.2 The distance the car travels during the driver's reaction time is the thinking distance.

[2 marks]

Calculate the thinking distance.

Use **Figure 1** and your answer to **01.1**.

Thinking distance = ... m

01.3 Calculate the deceleration of the car while it is braking.

[2 marks]

Use **Figure 1**.

Deceleration = ... m/s^2

0 1 . 4 Give **two** factors that would increase the braking distance of the car. [2 marks]

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0 1 . 5 When the brakes are applied, the temperature of the brakes increases. [2 marks]
Explain why.

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0 2 A student investigated the motion of a trolley on a bench.

0 2 . 1 At the start of the investigation, the trolley was stationary on the bench. [1 mark]
Which statement is correct?

Tick (✓) **one** box.

There are no forces acting on the trolley.

☐

The resultant force on the trolley is zero.

☐

The trolley does not have any weight.

☐

The weight of the trolley is greater than the force from the bench.

☐

0 2 . 2 The trolley exerts a force of 4.9 N downwards on the bench. [2 marks]
Give the size **and** the direction of the force that the bench exerts on the trolley.

Size of force = ... N

Direction of force:

0 2 . 3 The student then used a string to pull the trolley along the bench. [2 marks]
The resultant force on the trolley was 1.2 N.
The mass of the trolley was 0.50 kg.
Calculate the acceleration of the trolley.

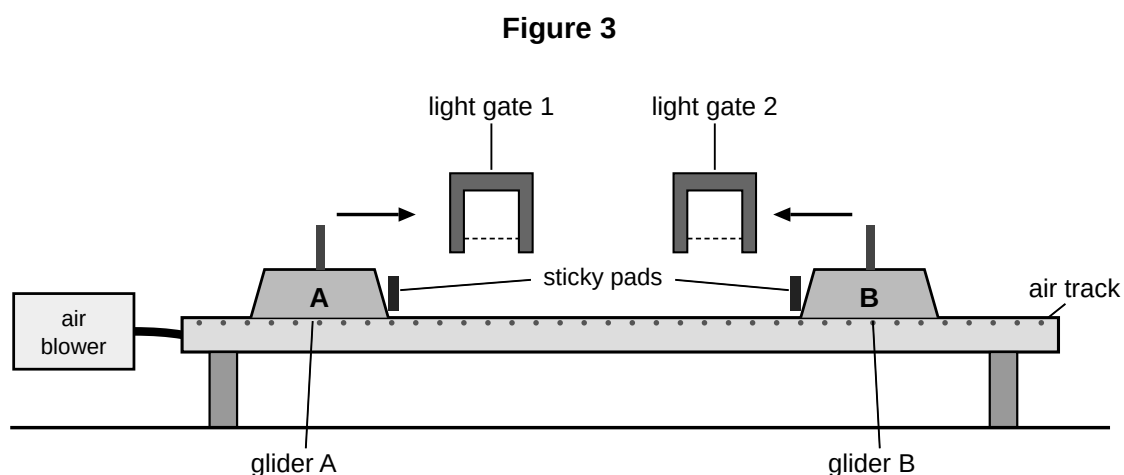
Acceleration = ... m/s^2

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The diagram illustrates an experimental setup for measuring acceleration. A trolley is placed on a horizontal bench. A card is attached to the trolley. A string is connected to the trolley and passes over a pulley at the edge of the bench. Hanging masses are attached to the other end of the string. A light gate is positioned above the trolley's path, connected to a data logger. The light gate is shown as a rectangular frame with a vertical post. The data logger is a rectangular box. The labels in the diagram are: bench, trolley, card, light gate, data logger, string, pulley, and hanging masses.

[illegible]

- 0 3** A student investigated collisions between two gliders on an air track.
Air blown through small holes in the track lifts the gliders, so the friction on them is very small.
Figure 3 shows the equipment. The light gates are connected to a data logger.



- 0 3 . 1** State the law of conservation of momentum. [1 mark]

0 3 . 2 Each glider carries a card of known length. [2 marks]

Explain how light gate 1 and the data logger are used to determine the velocity of glider **A** before the collision.

0 3 . 3 Glider **A** has a mass of 0.30 kg and moves to the right at 0.50 m/s. [3 marks]

Glider **B** has a mass of 0.20 kg and moves to the left at 0.20 m/s.

The gliders collide and stick together.

Calculate the velocity of the gliders after the collision.

Give the direction of their velocity.

Velocity = ... m/s

Direction

0 3 . 4 Explain why it is important in this investigation that the friction on the gliders is very small. [2 marks]

Turn over for the next question

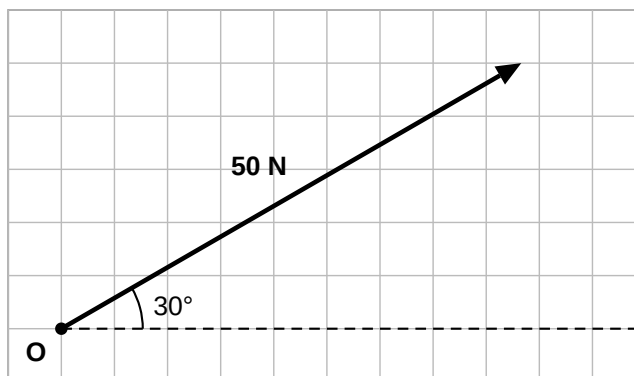
0 4

A child pulls a sledge across flat, horizontal snow.

The rope pulls on the sledge with a force of 50 N at an angle of 30° to the horizontal.

Figure 4 is a scale drawing of this force. The side of each square on the grid represents 5 N.

Figure 4



0 4 . 1

Determine the horizontal component of the force.

[3 marks]

Show on **Figure 4** how you work out your answer.

Horizontal component = ... N

0 4 . 2

The sledge moves in a straight line at a constant speed.

[2 marks]

Explain why the horizontal component of the force from the rope must be equal to the friction force on the sledge.

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0 4 . 3

The child pulls the sledge a distance of 15 m.

[2 marks]

Calculate the work done on the sledge by the force from the rope.

Use your answer to **04.1**.

Work done = ... J

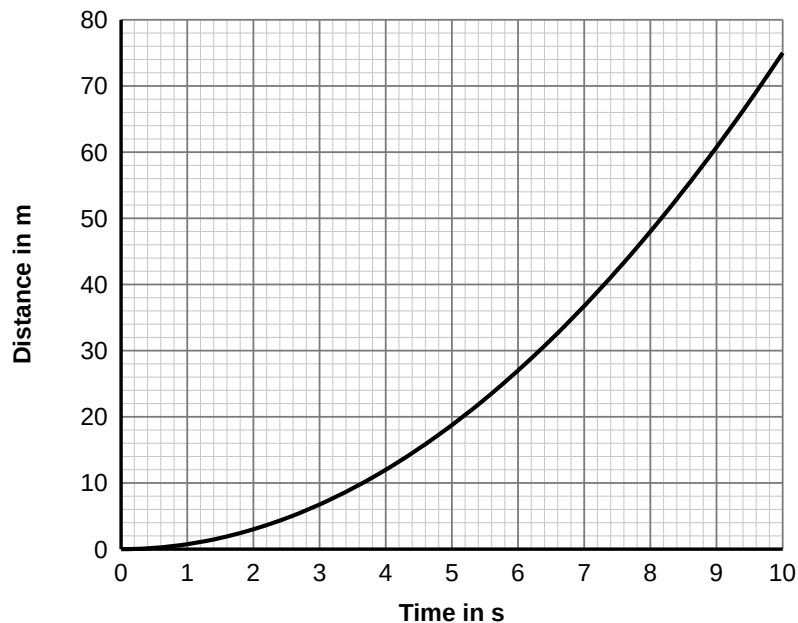
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05

A motorbike accelerates from rest along a straight road.

Figure 5 shows the distance–time graph for the first 10 seconds of its journey.

Figure 5



05.1

Determine the speed of the motorbike at 6.0 s.

[3 marks]

Show on **Figure 5** how you work out your answer.

Speed = ... m/s

05.2

Later in the journey the motorbike travels around a roundabout at a constant speed.

[2 marks]

Explain why the motorbike is accelerating as it travels around the roundabout.

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Question 5 continues on the next page

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- 0 5 . 3** After leaving the roundabout, the motorbike accelerates uniformly from 8.0 m/s to 20 m/s over a distance of 140 m. [4 marks]

The total mass of the motorbike and rider is 250 kg.

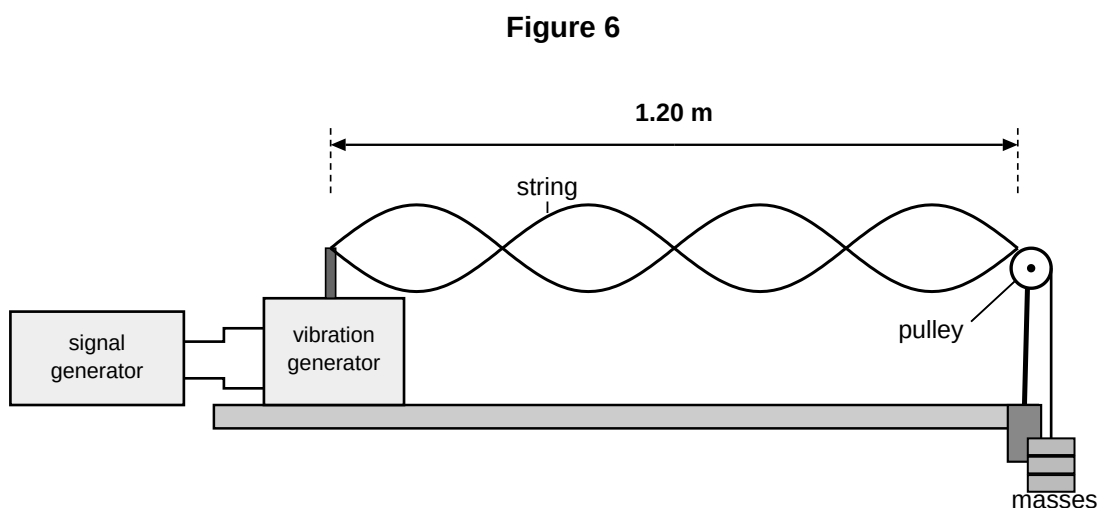
Calculate the resultant force on the motorbike and rider.

Resultant force = ... N

- 0 6** A student investigated waves on a stretched string.

Figure 6 shows the equipment.

The student adjusted the frequency of the signal generator until the string vibrated in the pattern shown.



- 0 6 . 1** Each loop of the pattern is half a wavelength. [2 marks]

Determine the wavelength of the waves on the string.

Use **Figure 6**.

Wavelength = ... m

Question 6 continues on the next page

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06.2

The frequency of the signal generator was 40 Hz.

[2 marks]

Calculate the speed of the waves on the string.

Use your answer to **06.1**.

Wave speed = ... m/s

06.3

The pattern in **Figure 6** had 4 loops on 1.20 m of string.

[3 marks]

The student then doubled the frequency of the signal generator. The speed of the waves on the string did not change.

Predict the number of loops the student would now see.

Explain your answer.

Number of loops = ...

.....

.....

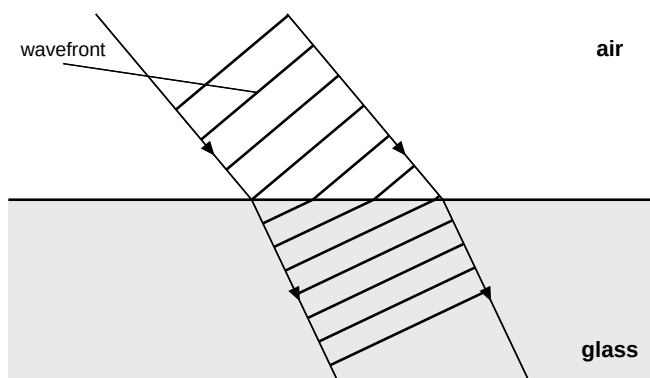
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07

This question is about electromagnetic waves.

Figure 7 shows wavefronts of light passing from air into a glass block.

Figure 7



07.1

Light travels more slowly in glass than in air.

[3 marks]

Use **Figure 7** to explain why the light changes direction as it enters the glass.

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0 7 . 2 Radio waves can be produced by oscillations in electrical circuits. [2 marks]

Describe what happens when radio waves are absorbed by the aerial of a radio receiver.

0 7 . 3 A radio station broadcasts radio waves with a frequency of 96 MHz. [3 marks]

The speed of radio waves is 3.0×10^8 m/s.

Calculate the wavelength of the radio waves.

Wavelength = _____ m

X-rays are used in medical imaging. X-rays are ionising and can increase the risk of cancer. **Table 1** shows the radiation dose, in millisieverts (mSv), from some sources.

Table 1

Source of radiation	Radiation dose in mSv
One chest X-ray	0.02
One CT scan of the abdomen	8.0
Background radiation in the UK in one year	2.7

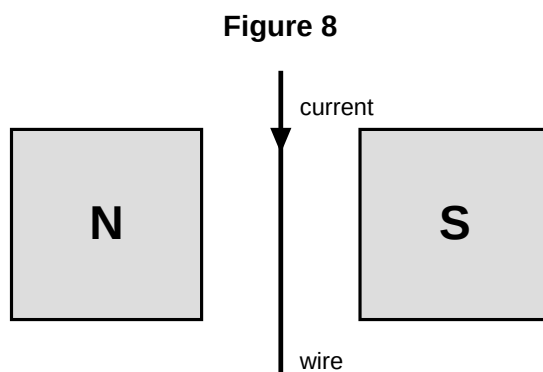
0 7 . 4 A patient is worried about the risk of having a CT scan of the abdomen. [2 marks]

Compare the dose from one CT scan with the other doses in **Table 1**.

Suggest why a doctor would still recommend the scan.

Turn over for the next question

- 0 8** **Figure 8** shows a wire between the poles of two magnets.
There is a current in the wire in the direction shown.



- 0 8 . 1** Use Fleming's left-hand rule to determine the direction of the force on the wire. [1 mark]

Tick (✓) **one** box.

Towards the N pole

☐

Towards the S pole

☐

Into the page

☐

Out of the page

☐

- 0 8 . 2** The length of the wire in the magnetic field is 5.0 cm. [4 marks]
The current in the wire is 2.4 A.
The force on the wire is 36 mN.
Calculate the magnetic flux density of the magnetic field.
Give the unit.

Magnetic flux density = ...

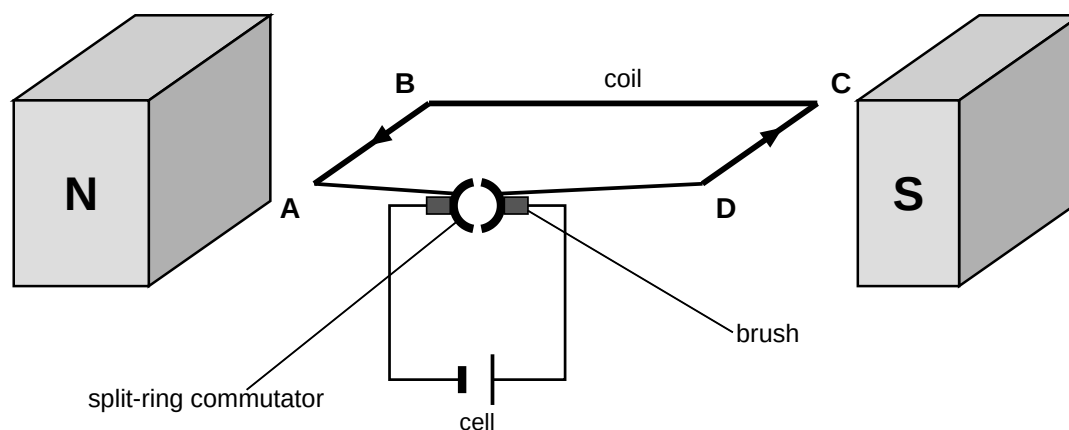
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Question 8 continues on the next page

Figure 9 shows a simple electric motor.

The coil **ABCD** is between the poles of two magnets. The arrows show the direction of the current in sides **AB** and **CD**.

Figure 9



08.3

Explain why the coil rotates when there is a current in it.

[4 marks]

END OF QUESTIONS

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Additional page, if required.

Write the question numbers in the left-hand margin.

[illegible]

Do not write outside the box

Write the question numbers in the left-hand margin.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

There are no more questions in this paper. Original practice paper © sciencegcse.co.uk – free to use for non-commercial education. Not an AQA paper.

Physics Equations Sheet

GCSE Combined Science: Trilogy – Practice Paper Series, Set 1

You may use these equations in your answers. HT = Higher Tier only equations. The equations are those listed in the AQA specification; this sheet is provided by sciencegcse.co.uk and is not an AQA document.

	Word equation	Symbol equation
1	kinetic energy = $0.5 \times \text{mass} \times (\text{speed})^2$	$E_k = \frac{1}{2} m v^2$
2	elastic potential energy = $0.5 \times \text{spring constant} \times (\text{extension})^2$	$E_e = \frac{1}{2} k e^2$
3	gravitational potential energy = mass $\times$ gravitational field strength $\times$ height	$E_p = m g h$
4	change in thermal energy = mass $\times$ specific heat capacity $\times$ temperature change	$\Delta E = m c \Delta \theta$
5	power = energy transferred $\div$ time	$P = E / t$
6	power = work done $\div$ time	$P = W / t$
7	efficiency = useful output energy transfer $\div$ total input energy transfer efficiency = useful power output $\div$ total power input	
8	charge flow = current $\times$ time	$Q = I t$
9	potential difference = current $\times$ resistance	$V = I R$
10	power = potential difference $\times$ current	$P = V I$
11	power = (current) $^2 \times$ resistance	$P = I^2 R$
12	energy transferred = power $\times$ time	$E = P t$
13	energy transferred = charge flow $\times$ potential difference	$E = Q V$
14 HT	potential difference across primary coil $\times$ current in primary coil = potential difference across secondary coil $\times$ current in secondary coil	$V_p I_p = V_s I_s$
15	density = mass $\div$ volume	$\rho = m / V$
16	thermal energy for a change of state = mass $\times$ specific latent heat	$E = m L$
17	weight = mass $\times$ gravitational field strength	$W = m g$
18	work done = force $\times$ distance (along the line of action of the force)	$W = F s$
19	force applied to a spring = spring constant $\times$ extension	$F = k e$
20	distance travelled = speed $\times$ time	$s = v t$
21	acceleration = change in velocity $\div$ time taken	$a = \Delta v / t$
22	(final velocity) ^{2} – (initial velocity) ^{2} = $2 \times$ acceleration $\times$ distance	$v^2 - u^2 = 2 a s$
23	resultant force = mass $\times$ acceleration	$F = m a$
24 HT	momentum = mass $\times$ velocity	$p = m v$
25	period = $1 \div$ frequency	$T = 1 / f$
26	wave speed = frequency $\times$ wavelength	$v = f \lambda$
27 HT	force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density $\times$ current $\times$ length	$F = B I l$