Please write clearly in block capitals.

F

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Foundation Tier Physics Paper 2

Practice Paper Series – Set 2

Time allowed: 1 hour 15 minutes

For Examiner's Use

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

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 08.1 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.

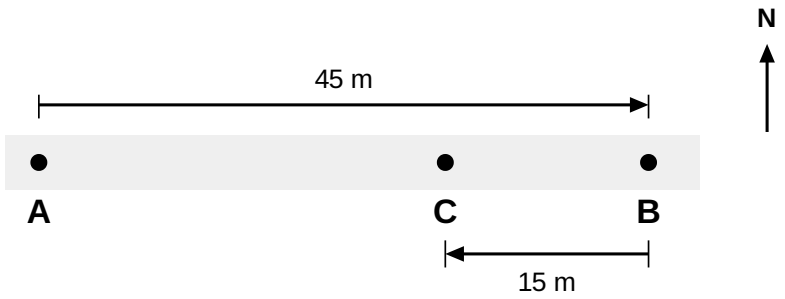
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0 1 A student walks along a straight path from point **A** to point **B**.

She then turns round and walks back to point **C**.

Figure 1 shows the route.

Figure 1



0 1 . 1 Which quantity is a vector quantity? [1 mark]

Tick (✓) **one** box.

- Distance ☐
- Mass ☐
- Speed ☐
- Velocity ☐

0 1 . 2 What is the total distance the student walks from **A** to **B** and then to **C**? [1 mark]

Distance = ... m

0 1 . 3 Determine the displacement of the student from **A** when she reaches **C**. [2 marks]

Give the size and the direction of the displacement.

Size of displacement = ... m

Direction .....

0 1 . 4 The walk from **A** to **B** and then to **C** takes 40 s [2 marks]

Calculate the average speed of the student.

Use your answer to question 01.2

Average speed = ... m/s

Question 1 continues on the next page

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0 1 . 5 Which is a typical speed for a person running? [1 mark]

Tick (✓) **one** box.

- 0.3 m/s ☐
- 3 m/s ☐
- 30 m/s ☐
- 300 m/s ☐

0 1 . 6 The student then walks from **C** back to **A**. [1 mark]

Another student says her average speed for the whole walk is zero because she finishes where she started.

Explain why this is incorrect.

.....

.....

0 2 A student investigated the deformation of two strips, **A** and **B**, made from different materials.

0 2 . 1 Explain why more than one force must act on a strip to stretch it. [2 marks]

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Question 2 continues on the next page

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Each strip was 100 mm long. The student:

- hung a weight of 4.0 N from each strip
- measured the length of each strip with the weight attached
- removed the weight and measured the length again.

Table 1 shows the results.

Table 1

Strip	Length with the weight attached in mm	Length after the weight was removed in mm
A	140	100
B	150	120

0 2 . 2 Which strip was deformed elastically? [2 marks]

Give a reason for your answer.

Strip .....

Reason

.....

.....

0 2 . 3 Calculate the extension of strip **B** when the weight was attached. [2 marks]

Give your answer in metres.

Extension = ... m

0 2 . 4 The extension of strip **A** was directly proportional to the force on it. [2 marks]

Calculate the spring constant of strip **A**.

Spring constant = ... N/m

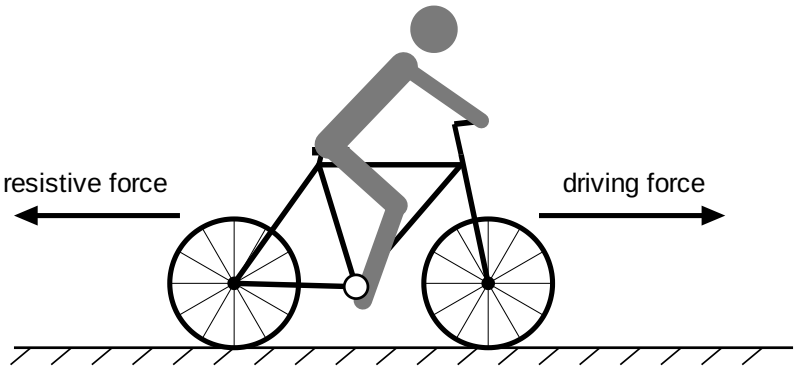
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0 3 **Figure 2** shows the horizontal forces acting on a cyclist.

Figure 2



0 3 . 1 Name **one** force that contributes to the resistive force on the cyclist. [1 mark]

.....

0 3 . 2 The cyclist is moving at a constant speed along a straight, level road. [1 mark]

What is the resultant force on the cyclist?

Resultant force = ... N

0 3 . 3 The cyclist increases the driving force to 110 N [2 marks]

The resistive force is 20 N

Determine the size and the direction of the resultant force on the cyclist.

Size of resultant force = ... N

Direction .....

0 3 . 4 The total mass of the cyclist and the bicycle is 75 kg [2 marks]

Calculate the acceleration of the cyclist.

Use your answer to question 03.3

Acceleration = ... m/s^2

Question 3 continues on the next page

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0 3 . 5 The driving force and the resistive force eventually become equal. [3 marks]

State Newton's First Law and use it to describe the motion of the cyclist.

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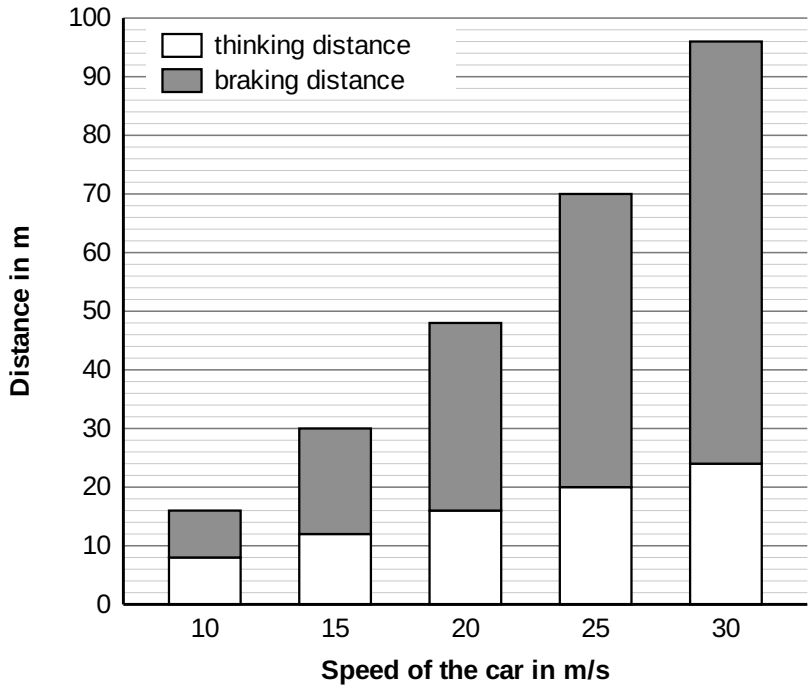
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0 4 The stopping distance of a car is the sum of the thinking distance and the braking distance.

Figure 3 shows the thinking distance and the braking distance of a car at different speeds.

Figure 3



0 4 . 1 Determine the stopping distance of the car at a speed of 20 m/s [1 mark]

Stopping distance = ... m

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Question 4 continues on the next page

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0 4 . 2 Describe how the thinking distance depends on the speed of the car. [2 marks]

Use data from **Figure 3**.

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0 4 . 3 Calculate how many times as long the braking distance is at 30 m/s as at 15 m/s [1 mark]

..... times

0 4 . 4 The driver of the car in **Figure 3** has a reaction time of 0.8 s [2 marks]

A different driver is talking on a mobile phone. This driver has a reaction time of 1.2 s

Calculate the thinking distance for this driver at a speed of 25 m/s

Thinking distance = ... m

0 4 . 5 Give **one** other factor that can increase the reaction time of a driver. [1 mark]

.....

0 4 . 6 The road is wet. [2 marks]

Explain why the braking distance of the car is greater on a wet road.

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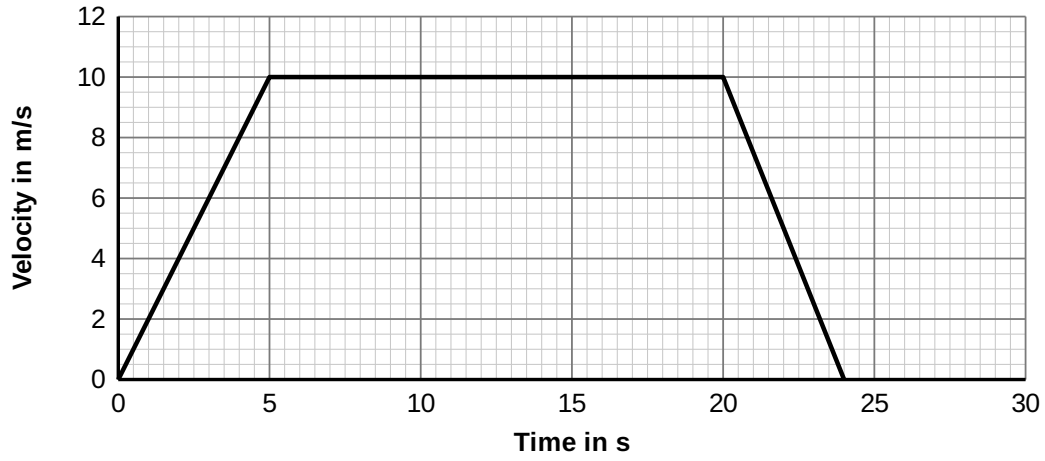
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0 5 **Figure 4** shows how the velocity of a bus changes as it travels between two bus stops.

Figure 4



0 5 . 1 Describe the motion of the bus between 5 s and 20 s [1 mark]

.....

0 5 . 2 Calculate the acceleration of the bus during the first 5 s [2 marks]

Acceleration = ... m/s^2

0 5 . 3 Calculate the distance travelled by the bus between 5 s and 20 s [2 marks]

Distance = ... m

0 5 . 4 Between which two times did the bus have the greatest size of acceleration? [1 mark]

Between ..... s and ..... s

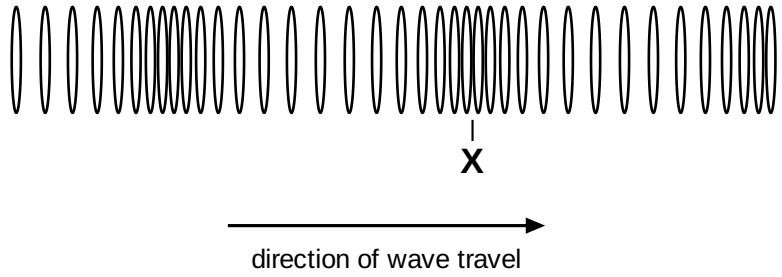
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0 6 **Figure 5** shows a longitudinal wave travelling along a slinky spring.

Figure 5



0 6 . 1 Name the part of the wave labelled **X**. [1 mark]

.....

0 6 . 2 Describe how one coil of the slinky spring moves as the wave passes. [2 marks]

.....

.....

.....

.....

0 6 . 3 Which type of wave is longitudinal? [1 mark]

Tick (✓) **one** box.

- Light ☐
- Microwave ☐
- Radio wave ☐
- Sound wave ☐

0 6 . 4 A loudspeaker produces a sound wave with a frequency of 250 Hz [2 marks]

The speed of sound in air is 340 m/s

Calculate the wavelength of the sound wave.

Wavelength = ... m

Question 6 continues on the next page

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0 6 . 5 The frequency of the sound wave is 250 Hz [2 marks]

Calculate the period of the sound wave.

Give your answer in milliseconds (ms).

1 s = 1000 ms

Use the Physics Equations Sheet.

Period = ... ms

0 6 . 6 Microwaves are used to send signals between a satellite in space and the Earth. [2 marks]

Explain why sound waves could **not** be used to send these signals.

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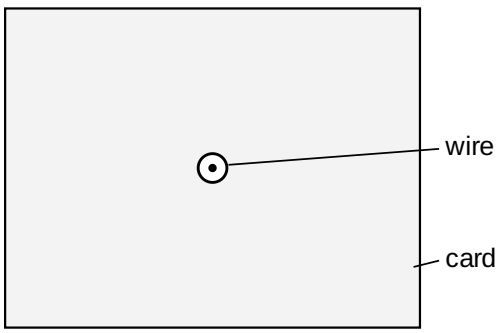
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0 7 A current in a wire produces a magnetic field around the wire.

Figure 6 shows a vertical wire passing through a horizontal piece of card. The view is from above.

The current in the wire is upwards, out of the page.

Figure 6



0 7 . 1 Draw the magnetic field pattern around the wire on **Figure 6**. [2 marks]

Show the direction of the magnetic field.

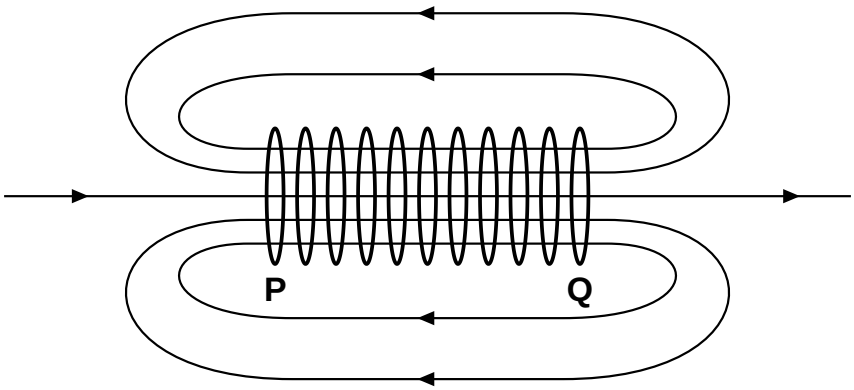
Question 7 continues on the next page

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Figure 7 shows the magnetic field of a solenoid. **P** and **Q** are the two ends of the solenoid.

Figure 7



0 7 . 2 Which end of the solenoid, **P** or **Q**, is the north pole? [2 marks]

Give a reason for your answer.

End .....

Reason

.....

.....

0 7 . 3 The magnetic field inside the solenoid is uniform. [2 marks]

How do the field lines in **Figure 7** show that the field inside the solenoid is uniform?

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Question 7 continues on the next page

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0 7 . 4 State the effect on the magnetic field of the solenoid of: [2 marks]

- putting an iron core inside the solenoid
- reversing the direction of the current.

Iron core

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Reversing the current

.....

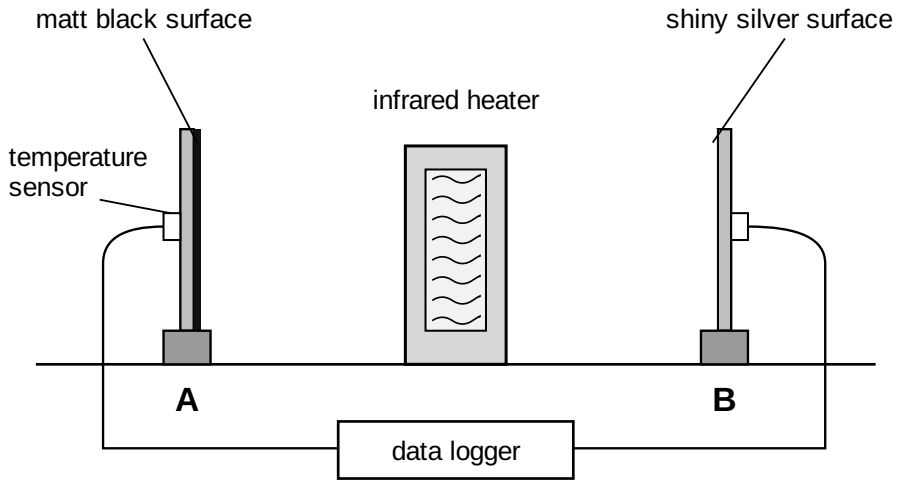
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0 8 A student investigated how the type of surface affects how much infrared radiation the surface absorbs.

Figure 8 shows the equipment.

Plates **A** and **B** are identical metal plates. The surface of plate **A** facing the heater is matt black. The surface of plate **B** facing the heater is shiny silver.

Figure 8



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Question 8 continues on the next page

0 8 . 1 Describe a method the student could use to compare how well the two surfaces absorb infrared radiation. [6 marks]

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Table 2 shows the student's results.

Table 2

Time in minutes	0	1	2	3	4	5
Temperature of plate A in °C	20.0	23.4	26.5	29.2	31.8	34.0
Temperature of plate B in °C	20.0	21.0	21.9	22.8	23.6	24.4

0 8 . 2 Which surface is the better absorber of infrared radiation? [2 marks]

Give a reason for your answer.

Use data from **Table 2**.

Surface .....

Reason

.....

.....

0 8 . 3 The mass of plate **A** is 0.080 kg [3 marks]

The specific heat capacity of the metal is 900 J/kg °C

Calculate the mean rate at which energy was transferred to the thermal energy store of plate **A** during the 5 minutes

Use the Physics Equations Sheet.

Mean rate = ... W

0 8 . 4 The rate of temperature increase of plate **A** decreased during the investigation. [1 mark]

Suggest why.

.....

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END OF QUESTIONS

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Physics Equations Sheet

GCSE Combined Science: Trilogy – Practice Paper Series, Set 2

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 × mass × (speed)^2	$E_k = ½ m v^2$
2		elastic potential energy = 0.5 × spring constant × (extension)^2	$E_e = ½ k e^2$
3		gravitational potential energy = mass × gravitational field strength × height	$E_p = m g h$
4		change in thermal energy = mass × specific heat capacity × temperature change	$\Delta E = m c \Delta\theta$
5		power = energy transferred ÷ time	$P = E / t$
6		power = work done ÷ time	$P = W / t$
7		efficiency = useful output energy transfer ÷ total input energy transfer	
		efficiency = useful power output ÷ total power input	
8		charge flow = current × time	$Q = I t$
9		potential difference = current × resistance	$V = I R$
10		power = potential difference × current	$P = V I$
11		power = (current)^2 × resistance	$P = I^2 R$
12		energy transferred = power × time	$E = P t$
13		energy transferred = charge flow × potential difference	$E = Q V$
14	**HT**	potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil	$V_p I_p = V_s I_s$
15		density = mass ÷ volume	$\rho = m / V$
16		thermal energy for a change of state = mass × specific latent heat	$E = m L$
17		weight = mass × gravitational field strength	$W = m g$
18		work done = force × distance (along the line of action of the force)	$W = F s$
19		force applied to a spring = spring constant × extension	$F = k e$
20		distance travelled = speed × time	$s = v t$
21		acceleration = change in velocity ÷ time taken	$a = \Delta v / t$
22		(final velocity)^2 − (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2 a s$
23		resultant force = mass × acceleration	$F = m a$
24	**HT**	momentum = mass × velocity	$p = m v$
25		period = 1 ÷ frequency	$T = 1 / f$
26		wave speed = frequency × wavelength	$v = f \lambda$
27	**HT**	force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length	$F = B I l$