Please write clearly in block capitals.

Centre number | | | | | |

Candidate number | | | | |

Surname ______________________

Forename(s) ______________________

Candidate signature ______________________

I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

F

Foundation Tier
Physics Paper 2F

Time allowed: 1 hour 15 minutes

Materials
For this paper you must have:
- a protractor
- a ruler
- a scientific calculator
- 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.
- 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 maximum mark for this paper is 70.
- 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	
TOTAL	

Do not write outside the box

0 1 There are different types of electromagnetic waves.

0 1 . 1 What do all electromagnetic waves transfer?

[1 mark]

Tick (✓) **one** box.

Charge ☐

Energy ☐

Matter ☐

Sound ☐

0 1 . 2 Complete the sentence.

Choose answers from the box.

[2 marks]

charge	**frequency**	**speed**	**wavelength**

Different types of electromagnetic waves have a different ____________________

and a different ____________________ .

0 1 . 3 **Figure 1** shows the electromagnetic spectrum.

Figure 1

Radio waves	Microwaves	Infrared	**A**	Ultraviolet	X-rays	**B**

Give the names of parts **A** and **B** of the electromagnetic spectrum.

[2 marks]

A ____________________

B ____________________

0 1 . 4 Different types of electromagnetic waves have different uses.

Draw **one** line from each type of electromagnetic wave to its use.

[3 marks]

Type of electromagnetic wave	**Use**
	Electrical heaters
Microwaves	
	Energy efficient lamps
Ultraviolet	
	Imaging bones
X-rays	
	Satellite communications

8

Turn over for the next question

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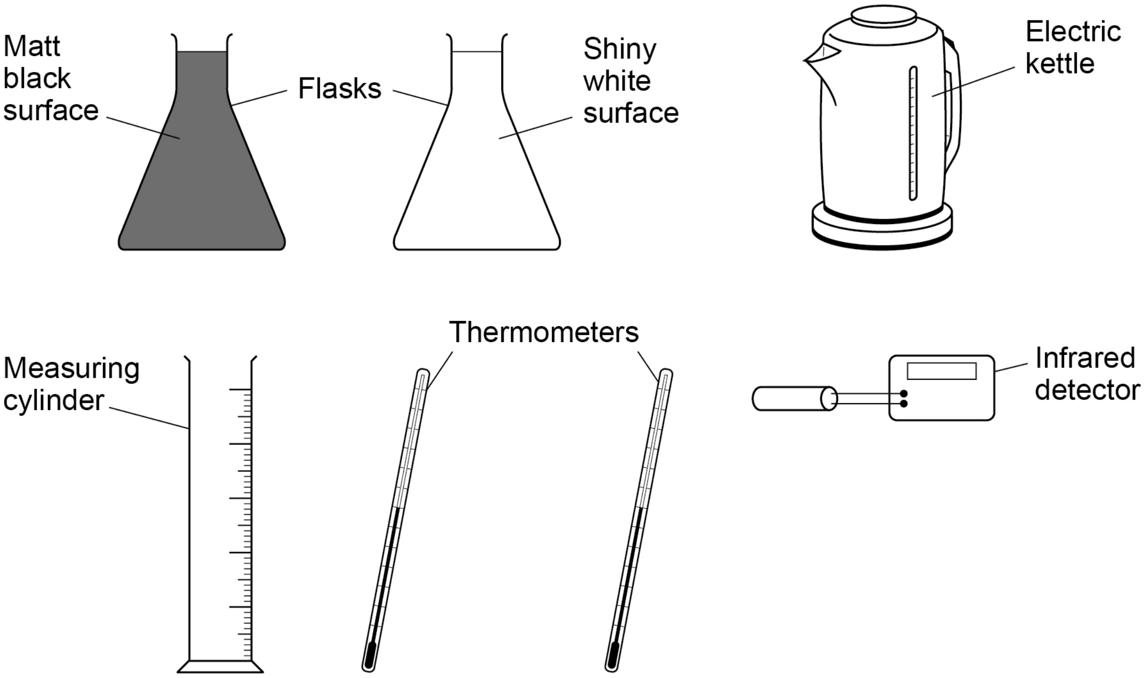
0 2 A student investigated how the colour of a surface affects the power of the infrared radiation emitted by the surface.

Figure 2 shows the equipment used.

Figure 2



Do not write outside the box

The infrared detector measures the power of the infrared radiation emitted by the flasks.

0 2 . 1 The student poured hot water into each flask.

What should the student do to reduce the risk of burning herself with the hot water?

[1 mark]

0 2 . 2 Describe how the student should use the equipment in **Figure 2** to compare the power of the infrared radiation emitted by each surface.

[4 marks]

Question 2 continues on the next page

A student investigated how the power of the infrared radiation emitted from a flask changed with time.

Table 1 shows the results.

Table 1

Time in seconds	**Power in watts**
0	8.0
60	7.2
120	6.5
180	5.9
240	5.4
300	5.0
360	4.7
420	4.5

0 2 . 3 Describe the pattern shown by the data in **Table 1**.

[2 marks]

____

____

____

____

0 2 . 4 What is the most likely value for the power of the infrared radiation emitted after 480 seconds?

Use **Table 1**.

[1 mark]

Tick (✓) **one** box.

4.0 W ☐ 4.2 W ☐ 4.4 W ☐ 4.6 W ☐

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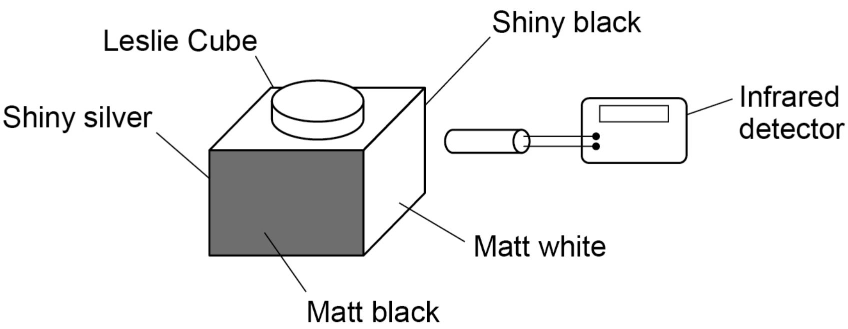
A Leslie Cube is used to demonstrate that different surfaces emit different amounts of infrared radiation.

Figure 3 shows an infrared detector and a Leslie Cube filled with hot water.

Figure 3



0 2 . 5 Give **one** advantage of using a Leslie Cube rather than the equipment in **Figure 2** on page 4.

[1 mark]

____

____

0 2 . 6 The teacher improved the demonstration by using four infrared detectors connected to a data logger and computer. Each detector was pointed at a different surface of the Leslie Cube.

The distance between the surface and the detector was the same in each case.

Give **two** reasons why this improved the demonstration.

[2 marks]

1 ____

____

____

2 ____

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____

11

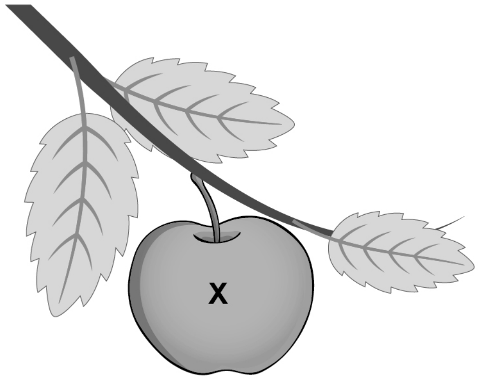
Turn over ►

Do not write outside the box

0 3 **Figure 4** shows an apple hanging from a tree.

The **X** marks the centre of mass of the apple.

Figure 4



0 3 . 1 Draw an arrow on **Figure 4** to represent the weight of the apple.

[1 mark]

0 3 . 2 The apple has a mass of 0.150 kg

gravitational field strength = 9.8 N/kg

Calculate the weight of the apple.

Use the equation:

weight = mass × gravitational field strength

[2 marks]

____

____

____

____

Weight = ____________________ N

0 3 . 3 The apple in **Figure 4** is stationary.

Why is the apple stationary?

[1 mark]

Tick (✓) **one** box.

The resultant force on the apple is downwards. ☐

The resultant force on the apple is upwards. ☐

The resultant force on the apple is zero. ☐

Question 3 continues on the next page

Do not write outside the box

When the apple is ripe it falls from the tree and accelerates towards the ground.

0 3 . 4 Why does the apple accelerate?

[1 mark]

Tick (✓) **one** box.

The resultant force on the apple is downwards. ☐

The resultant force on the apple is upwards. ☐

The resultant force on the apple is zero. ☐

0 3 . 5 The acceleration of the apple is 9.8 m/s^2

The velocity of the apple changes from 0 to 4.9 m/s

Calculate the time taken for the apple to fall to the ground.

Use the equation:

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

[2 marks]

___

___

___

___

Time taken = ____________________ s

7

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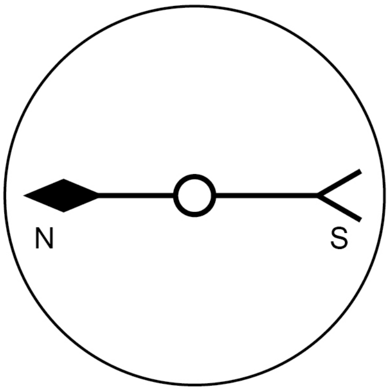
0 4 **Figure 5** shows a compass.

Figure 5



0 4 . 1 Why does the compass always point in the same direction when it is **not** near a magnet?

[1 mark]

Tick (✓) **one** box.

The compass is not magnetic. ☐

The Earth has a magnetic field. ☐

There is no force acting on the compass. ☐

0 4 . 2 What material could the needle of the compass be made from?

[1 mark]

Tick (✓) **one** box.

Aluminium ☐

Copper ☐

Plastic ☐

Steel ☐

Turn over ►

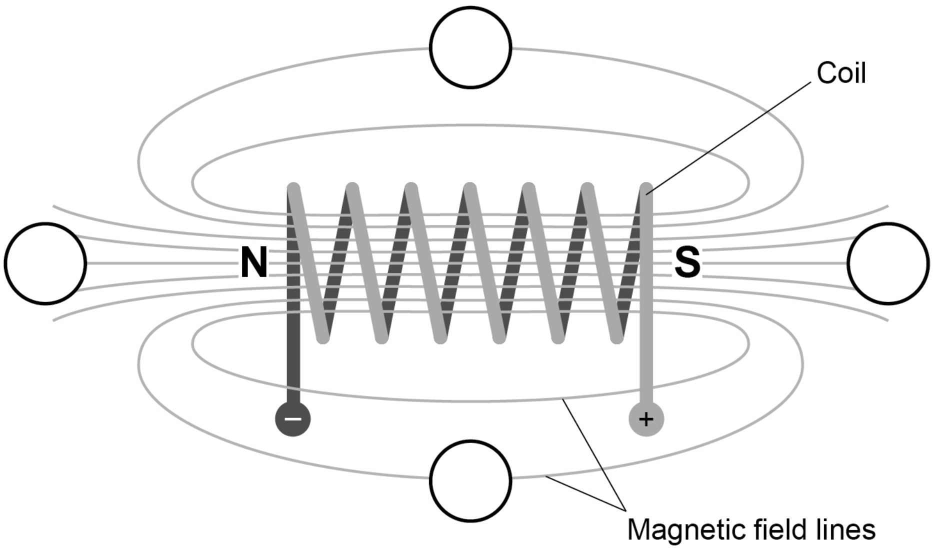
Do not write outside the box

Figure 6 shows a coil of wire.

There is a current in the coil.

The circles show the position of four compasses.

Figure 6



0 4 . 3 Which statement describes the magnetic field around the coil?

[1 mark]

Tick (✓) **one** box.

The field has the same strength at all points. ☐

The field is stronger further away from the coil. ☐

The field is strongest at the ends of the coil. ☐

0 4 . 4 Draw **one** arrow in **each** circle on **Figure 6** to show the direction of the magnetic field at that point.

[2 marks]

Do not write outside the box

0 4 . 5 Give **two** ways the magnetic field around the coil could be made stronger.

[2 marks]

1 ____

____

2 ____

____

7

Turn over for the next question

0 5 The stopping distance of a car is the sum of the thinking distance and the braking distance.

0 5 . 1 Which factors affect the thinking distance?

[2 marks]

Tick (✓) **two** boxes.

Condition of the tyres ☐

Driving on wet roads ☐

Mass of the car ☐

Tiredness of the driver ☐

Using a mobile phone ☐

0 5 . 2 Explain why a person should **not** drink alcohol and then drive.

[3 marks]

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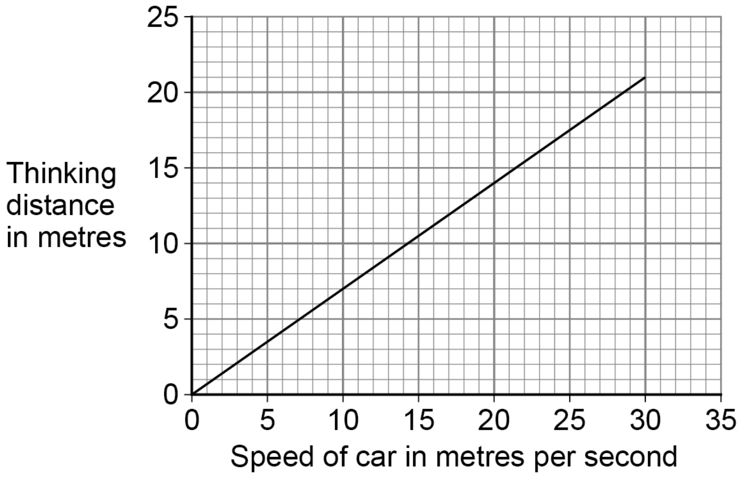
The Highway Code gives information on how thinking distance depends on the speed of a car.

Figure 7 shows the information as a graph.

Figure 7



0 5 . 3 What is the speed of a car if the thinking distance is 16 m?

[1 mark]

Speed of car = ____________________ m/s

0 5 . 4 Describe the relationship between speed and thinking distance.

[2 marks]

____

____

____

____

0 5 . 5 The Highway Code assumes the driver's reaction time is 0.70 seconds.

Draw a line on **Figure 7** to show the relationship for a driver with a reaction time of 1.4 seconds.

[2 marks]

Turn over ►

Do not write outside the box

0 5 . 6 A car accelerates at 5.0 m/s^2 over a distance of 45 m

initial velocity of the car = 0 m/s

Calculate the final velocity of the car.

Use the Physics Equations Sheet.

Give your answer to 2 significant figures.

[4 marks]

Final velocity (2 significant figures) = ____________________ m/s

14

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Turn over for the next question

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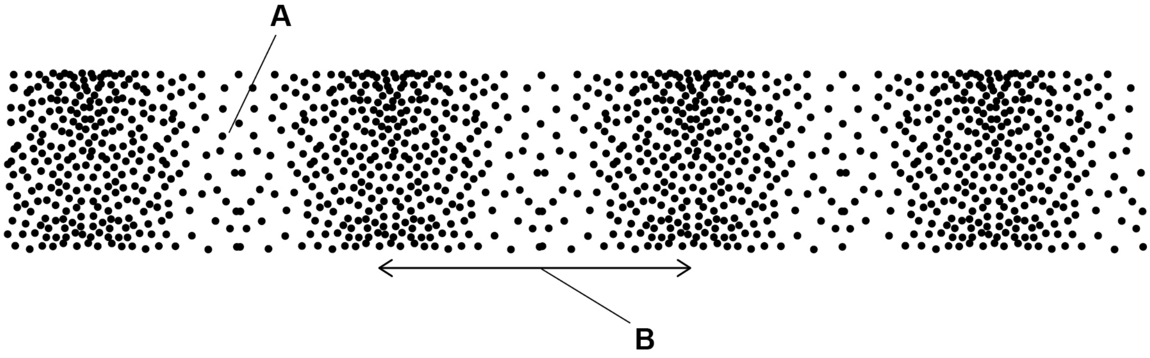
ANSWER IN THE SPACES PROVIDED

0 6 **Figure 8** shows a longitudinal wave.

Figure 8



0 6 . 1 What do the labels **A** and **B** on **Figure 8** represent?

Choose answers from the box.

[2 marks]

amplitude	**frequency**	**rarefaction**	**reflection**	**wavelength**

A ________________________________

B ________________________________

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0 6 . 2 The wave shown in **Figure 8** has a frequency of 4.0 kHz

Calculate the period of the wave.

Use the Physics Equations Sheet.

Give the unit.

[4 marks]

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____

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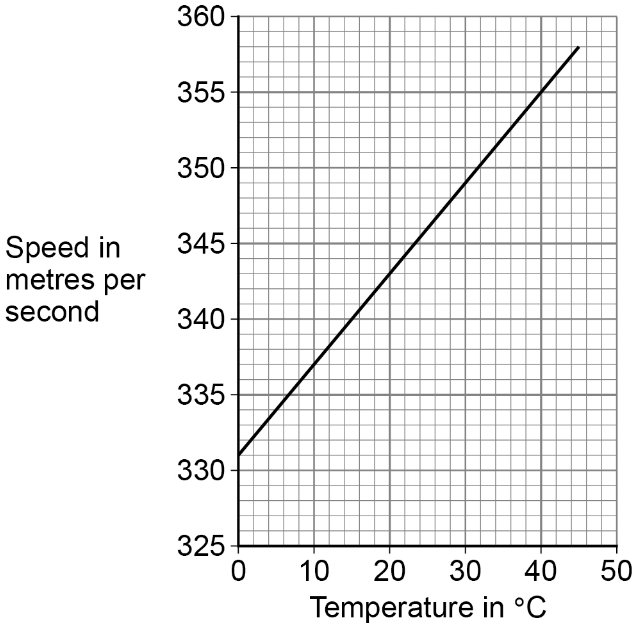
Period = ____________________ Unit ______________

Question 6 continues on the next page

Sound waves are longitudinal.

Figure 9 shows how the speed of sound varies with the temperature of the air.

Figure 9



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Use the Physics Equations Sheet to answer questions **06.3** and **06.4**.

0 6 . 3 Write down the equation that links frequency (f), wavelength (λ) and wave speed (v).

[1 mark]

___

0 6 . 4 A sound wave with a frequency of 300 Hz travels through the air.

The air has a temperature of 28.0 °C

Determine the wavelength of the sound wave.

Use **Figure 9**.

[4 marks]

___

___

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___

___

Wavelength = ____________________ m

11

Turn over for the next question

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0 7 **Figure 10** shows competitors in the wheelchair race at the London Marathon.

The distance of the London Marathon is 42 000 m

Figure 10

Use the Physics Equations Sheet to answer questions **07.1** and **07.2**.

0 7 . 1 Write down the equation that links distance (*s*), force (*F*) and work done (*W*).

[1 mark]

____

0 7 . 2 During the race competitors work against air resistance.

The work done against air resistance by the winner of the race was 3 360 000 J

Calculate the average air resistance acting on the winner of the race.

[3 marks]

____

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____

____

Average air resistance = ______________________ N

Question 7 continues on the next page

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Use the Physics Equations Sheet to answer questions **07.3** and **07.4**.

0 7 . 3 Which equation links distance travelled, speed and time?

[1 mark]

Tick (✓) **one** box.

distance travelled = speed × time ☐

time = distance travelled × speed ☐

speed = distance travelled × time ☐

0 7 . 4 The distance of the London Marathon is 42 000 m

The winning time for the race was 5600 seconds.

Calculate the average speed of the winner of the race.

[3 marks]

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____

____

____

Average speed = ____________________ m/s

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0 7 . 5 Explain why the speed of a competitor changes during the race.

[4 marks]

12

END OF QUESTIONS

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