AQA

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

Friday 12 June 2020 Morning 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.
- 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	
TOTAL	

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.

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0 1 **Figure 1** shows a girl bowling a ball along a ten-pin bowling lane.

Figure 1

The girl is trying to knock down the ten pins at the end of the bowling lane.

As the ball travels along the lane the velocity of the ball decreases.

0 1 . 1 Velocity is a vector.

Which statement describes a vector?

[1 mark]

Tick (✓) **one** box.

Vectors have direction only. ☐

Vectors have magnitude and direction. ☐

Vectors have magnitude only. ☐

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0 1 . 2 Why does the velocity of the ball decrease as the ball travels along the lane?

[1 mark]

Tick (✓) **one** box.

The force of gravity slows the ball down. ☐

There are no forces acting on the ball. ☐

There is a resultant force acting on the ball. ☐

0 1 . 3 The ball travels along the lane at an average speed of 4.5 m/s

It takes the ball 4.0 seconds to travel the length of the lane.

Calculate the length of the lane.

Use the equation:

distance travelled = speed × time

[2 marks]

Length of the lane = _____ m

Question 1 continues on the next page

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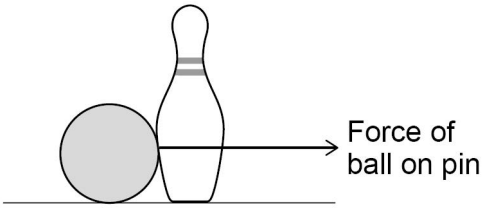
Figure 2 shows the ball hitting one of the pins.

Figure 2



0 1 . 4 Draw an arrow on **Figure 2** to show the force of the pin on the ball.

[2 marks]

0 1 . 5 The velocity of the pin changes from 0 to 12 m/s

It takes 0.15 seconds for the velocity to change.

Calculate the acceleration of the pin.

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

0 1 . 6 When the pin is struck it accelerates.

Complete the sentences.

Choose answers from the box.

Each answer can be used once, more than once, or not at all.

[3 marks]

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

The displacement of the pin from the girl _____ .

The mass of the pin _____ .

The kinetic energy of the pin _____ .

11

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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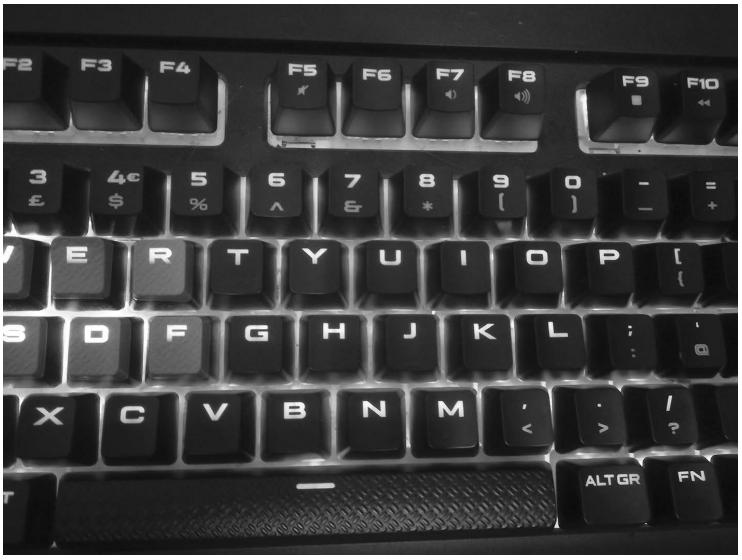
0 2 **Figure 3** shows a computer keyboard.

There is a spring under each key.

Figure 3



0 2 . 1 Why do the keys have springs under them?

[1 mark]

Tick (✓) **one** box.

Springs make the keys easier to press. ☐

Springs make the keys lighter. ☐

Springs push the keys back to their original position. ☐

0 2 . 2 Why does every spring used in the keyboard have the same spring constant?

[1 mark]

Tick (✓) **one** box.

So that more than one key can be pressed at the same time. ☐

So that the same force is needed to press each key. ☐

So that the springs are all the same length. ☐

Turn over ►

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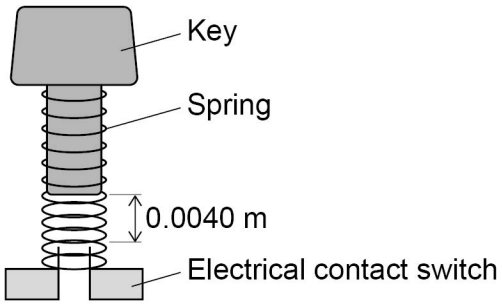
Figure 4 shows one of the keys and its spring.

Figure 4



0 2 . 3 What happens to the length of the spring when the key is pressed?

[1 mark]

0 2 . 4 How far must the key move before it touches the switch?

[1 mark]

Tick (✓) **one** box.

4.0 mm ☐ 4.0 cm ☐ 4.0 μm ☐

0 2 . 5 If a key is not pressed with enough force, no signal is sent to the computer.

Explain why.

[2 marks]

Do not write outside the box

0 2 . 6 The spring in **Figure 4** has a spring constant of 200 N/m

Calculate the force on the spring when the key moves a distance of 0.0040 m

Use the equation:

force = spring constant × compression

[2 marks]

Force = _____ N

0 2 . 7 Suggest **two** ways the spring in the key in **Figure 4** could be changed so that the switch can be closed more quickly.

[2 marks]

1 _____

2 _____

10

Turn over for the next question

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0 3 X-rays and gamma rays are types of electromagnetic waves.

X-rays are used for medical imaging.

0 3 . 1 Which substance will **not** absorb X-rays?

[1 mark]

Tick (✓) **one** box.

Bone ☐ Metal ☐ Skin ☐

Table 1 shows the effect of exposure to different doses of radiation.

Table 1

Dose in mSv	Effect on the human body
100	slightly increased risk of cancer
1000	5% increased risk of cancer
5000	high risk of death

0 3 . 2 During one X-ray a person receives a dose of 0.100 mSv

Why is this dose unlikely to harm the person?

[1 mark]

0 3 . 3 A doctor takes an X-ray photograph of a person.

When taking the X-ray photograph, the doctor stands behind a screen.

Suggest why.

[1 mark]

Do not write outside the box

0 3 . 4 Which of the following are gamma rays used for?

[1 mark]

Tick (✓) **one** box.

Cooking food ☐

Energy-efficient lamps ☐

Sterilising medical equipment ☐

0 3 . 5 Why are gamma rays and X-rays harmful to humans?

[1 mark]

Tick (✓) **one** box.

They are ionising ☐

They are radioactive ☐

They travel at the speed of light ☐

0 3 . 6 Electromagnetic waves are also used in communications.

Describe how microwaves and visible light are used in communications.

[4 marks]

Microwaves _____

_____

_____

_____

Visible light _____

_____

_____

_____

9

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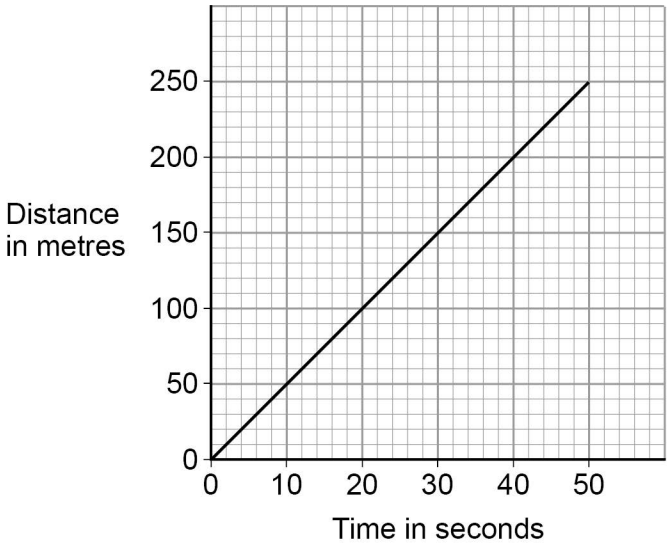
0 4 **Figure 5** shows a distance-time graph for 50 seconds of a bicycle ride.

Figure 5



0 4 . 1 The gradient of the distance-time graph gives the speed of the bicycle.

Determine the speed of the bicycle.

[2 marks]

Speed = _____ m/s

Do not write outside the box

0 4 . 2 Which force acting on the moving bicycle is a non-contact force?

[1 mark]

Tick (✓) **one** box.

Air resistance ☐

Friction ☐

Gravitational force ☐

Normal contact force ☐

0 4 . 3 The bicycle travels a distance of 250 m

The bicycle exerts a constant horizontal force of 30 N on the ground.

Calculate the work done.

Use the equation:

work done = force × distance

Choose the unit from the box.

[3 marks]

J	**kg**	**m**

Work done = _____ Unit _____

Do not write outside the box

0 4 . 4 The bicycle travels at a constant speed.

Complete the sentences.

Choose answers from the box.

[3 marks]

chemical	**frictional**	**kinetic**
magnetic		**tension**

As the bicycle moves, work is done against _____ forces.

There is no change in the cyclist's _____ store of energy.

There is a decrease in the cyclist's _____ store of energy.

9

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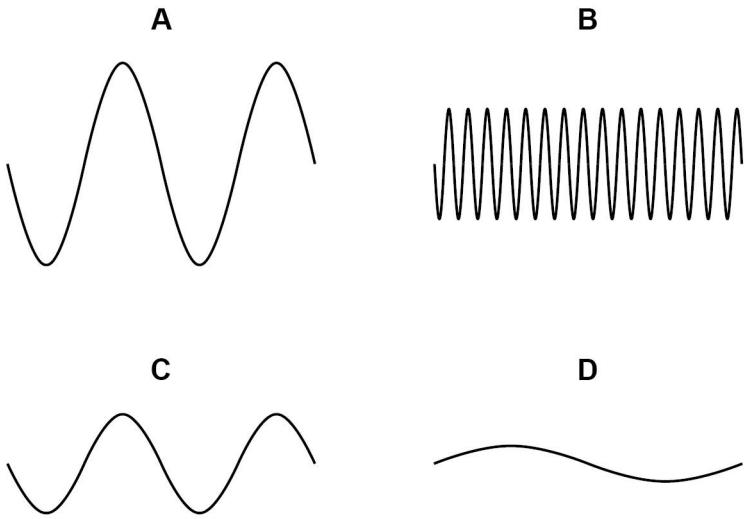
0 5 **Figure 6** shows four waves.

The waves are drawn to the same scale.

Figure 6



0 5 . 1 Which wave has the greatest amplitude?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 5 . 2 Which wave has the greatest frequency?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 5 . 3 Which wave has the greatest wavelength?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Turn over ►

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0 5 . 4 A wave has a frequency of 1650 Hz and a wavelength of 0.200 m

Calculate the wave speed.

Use the equation:

wave speed = frequency × wavelength

[2 marks]

Wave speed = _____ m/s

A student uses a mobile phone app that displays sound waves.

Figure 7 shows the student holding the mobile phone close to a loudspeaker.

Figure 7

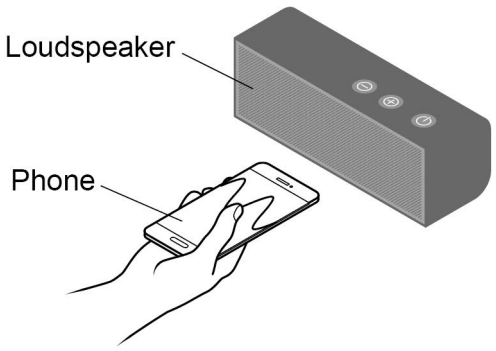

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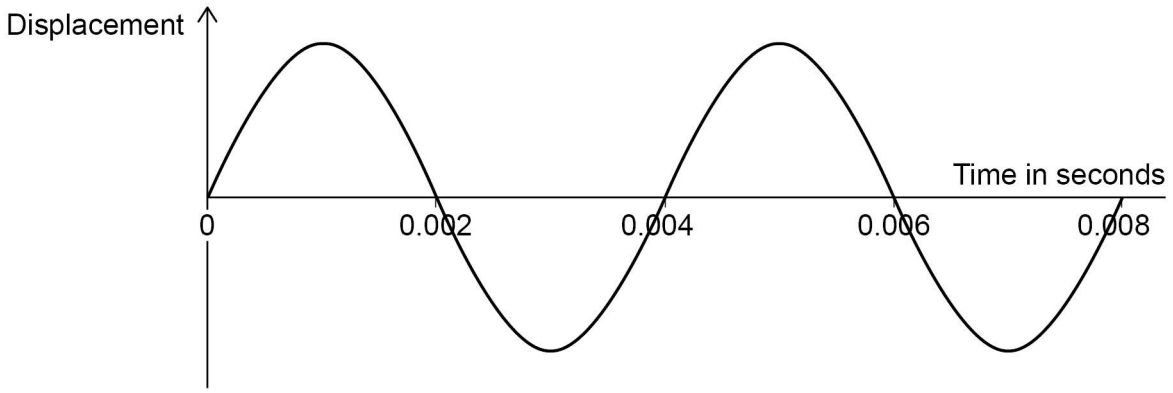
Figure 8 shows the wave pattern seen on the phone screen.

Figure 8



0 5 . 5 What is the period of the wave shown in **Figure 8**?

[1 mark]

Tick (✓) **one** box.

0.002 s ☐ 0.004 s ☐ 0.006 s ☐ 0.008 s ☐

0 5 . 6 Determine the frequency of the wave shown in **Figure 8**.

Use the Physics Equations Sheet.

[3 marks]

Frequency = _____ Hz

9

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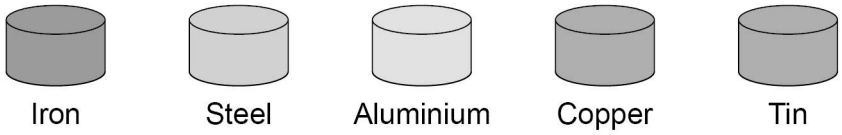
0 6 **Figure 9** shows five different metal samples.

Figure 9



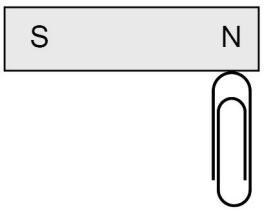
0 6 . 1 A student placed a magnet close to each metal sample.

Describe what happened.

[2 marks]

Figure 10 shows a paper clip being attracted to a permanent magnet.

Figure 10



0 6 . 2 The paper clip in **Figure 10** is not a permanent magnet.

Explain what would happen if the paper clip was removed and brought close to the south pole of the permanent magnet.

[2 marks]

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0 6 . 3 Write down the equation that links gravitational field strength (g), mass (m) and weight (W).

[1 mark]

0 6 . 4 The student added more paperclips to one end of the magnet.

The maximum number of paperclips the magnet could hold was 20

Each paper clip had a mass of 1.0 g

gravitational field strength = 9.8 N/kg

Calculate the maximum force the magnet can exert.

[3 marks]

Force = _____ N

8

Turn over for the next question

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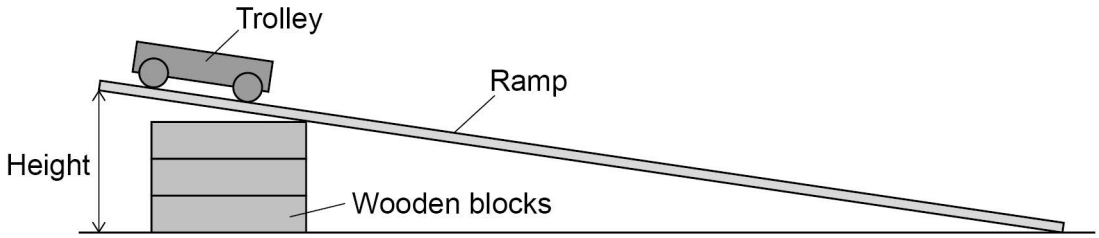
0 7 A student investigated how the height of a ramp affects the acceleration of a trolley down the ramp.

Figure 11 shows some of the equipment used.

Figure 11



0 7 . 1 Plan an investigation to determine how the height of the ramp affects the acceleration of the trolley.

[6 marks]

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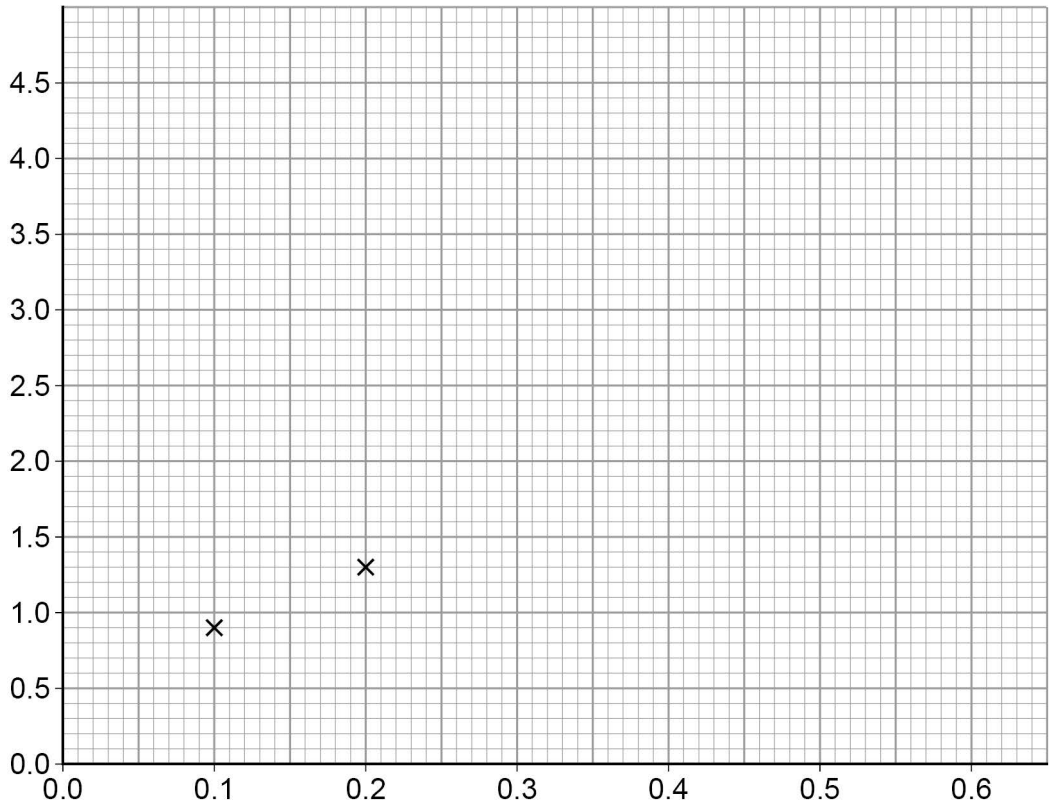
Table 2 shows the results.

Table 2

Height of ramp in metres	0.1	0.2	0.3	0.4	0.5	0.6
Acceleration in m/s^2	0.9	1.3	2.1	3.2	3.9	4.3

The first two results have been plotted on **Figure 12**.

Figure 12



0 7 . 2 Complete **Figure 12**.

You should:

- label the axes
- plot the remaining results from **Table 2**
- draw a line of best fit.

[4 marks]

Question 7 continues on the next page

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0 7 . 3 Write down the equation that links acceleration (*a*), mass (*m*) and resultant force (*F*).

[1 mark]

0 7 . 4 When the resultant force on the trolley was 0.63 N the acceleration of the trolley was 2.1 m/s^2

Calculate the mass of the trolley.

[3 marks]

Mass of trolley = _____ kg

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END OF QUESTIONS

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