DRAFT SPECIMEN MATERIAL

GCSE
COMBINED SCIENCE: TRILOGY

F

Foundation Tier   Paper 6: Physics 2F

Specimen 2018   Time allowed: 1 hour 15 minutes

Materials
For this paper you must have:
- a ruler
- a calculator
- the Physics Equation Sheet (enclosed).

Instructions
- 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.

Information
- There are 70 marks available on this paper.
- 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.
- When answering questions 02.3 and 06.6 you need make to sure that your answer:
  - is clear, logical, sensibly structured
  - fully meets the requirements of the question
  - shows that each separate point or step supports the overall answer.

Advice
- In all calculations, show clearly how you work out your answer.

Please write clearly, in block capitals, to allow character computer recognition.

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

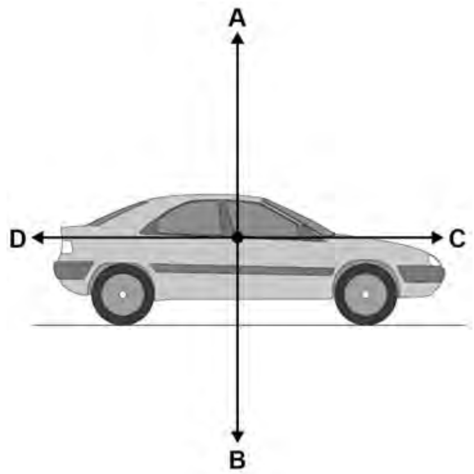
Surname

Forename(s)

Candidate signature ______________________

0 1 **Figure 1** shows the forces acting on a car moving at a constant speed.

Figure 1



0 1 . 1 Which force would have to increase to make the car accelerate?

[1 mark]

Tick **one** box.

A ☐

B ☐

C ☐

D ☐

0 1 . 2 The car travels a distance of 2040 metres in 2 minutes.

Use the following equation to calculate the mean speed of the car.

$$\textbf{mean speed} = \frac{\textbf{distance}}{\textbf{time}}$$

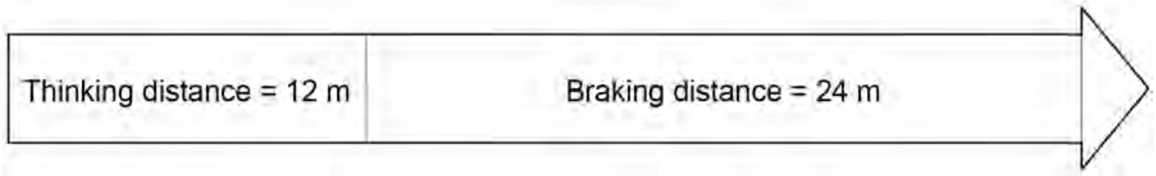
[2 marks]

Mean speed = ______________ m/s

0 1 . 3 The car makes an emergency stop.

Figure 2 shows the thinking distance and braking distance of the car.

Figure 2



What is the stopping distance?

[1 mark]

0 1 . 4 The person driving the car is tired.

What effect will this have on the thinking distance and braking distance?

Tick **one** box for thinking distance.

Tick **one** box for braking distance.

[2 marks]

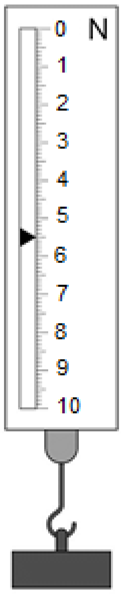
	decreases	increases	stays the same
thinking distance	☐	☐	☐
braking distance	☐	☐	☐

Turn over for the next question

0 2 A newtonmeter measures the weight of objects.

Look at **Figure 3**.

Figure 3



0 2 . 1 What is the weight of the object in **Figure 3**?

[1 mark]

Weight = ____________________ N

0 2 . 2 The spring inside the newtonmeter behaves elastically.

What happens to the length of the spring when the object is removed from the newtonmeter?

[1 mark]

Tick **one** box.

The spring gets longer ☐

The spring gets shorter ☐

The spring stays the same length ☐

0 2 . 3 A student carried out a practical to investigate the extension of a spring.

Write a method the student could have used.

[4 marks]

0 2 . 4 What could be done to improve the accuracy in this investigation?

[2 marks]

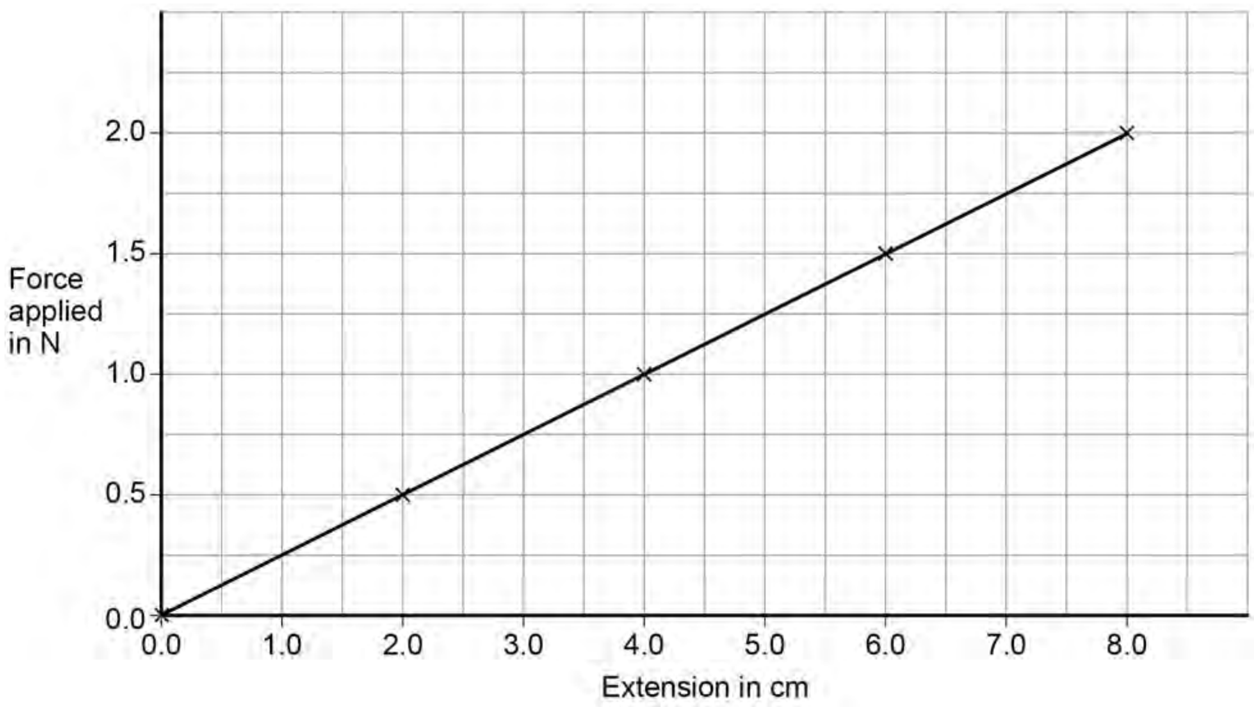
Tick **two** boxes.

Use a pointer from the spring to measure the length.	☐
Use a stronger spring in the practical.	☐
Use a new spring between each reading.	☐
Make sure the spring is stationary before measuring length.	☐
Use a longer rule when measuring length.	☐

The student added weights to a spring and measured the extension of the spring.

Figure 4 shows his results.

Figure 4



0 2 . 5 What is the relationship between force applied and extension?

[1 mark]

Tick **one** box.

Extension is inversely proportional to force ☐

Extension increases by smaller values as force increases ☐

Extension is directly proportional to force ☐

0 2 . 6 Use **Figure 4** to determine the additional force needed to increase the extension in the spring from 5.0 cm to 7.0 cm.

[1 mark]

Force needed = ____________________ N

0 2 . 7 **Table 1** shows some results with a different spring.

Table 1

Force applied in N	**Extension in m**
0.0	0.000
0.5	0.025
1.0	0.050
1.5	0.075

What would the extension be with a force of 2.0 N?

[1 mark]

Tick **one** box.

0.080 m ☐

0.090 m ☐

0.095 m ☐

0.100 m ☐

0 2 . 8 The spring constant for the spring in **Table 1** is 20 N/m.

Calculate the work done in stretching the spring until the extension of the spring is 0.050m

Use the correct equation from the Physics Equation Sheet.

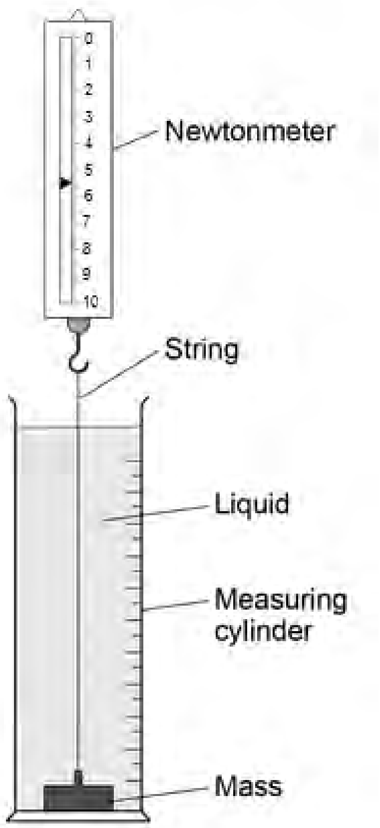
[2 marks]

Work done = ____________ J

0 3 A student investigated the force needed to raise a mass through different liquids at a constant speed.

She set up the apparatus shown in **Figure 5**.

Figure 5



0 3 . 1 In the investigation there are several variables.

Draw **one** line from each variable to the correct description for this investigation.

[3 marks]

Variable	Description
	Distance the mass was lifted
Control	
	Value of force on the newtonmeter
Dependent	
	Mass
Independent	
	Type of liquid

Table 2 shows the student's results.

Table 2

Liquid	**Force in N**
Water	10.0
Washing up liquid	11.1
Glycerol	11.5
Syrup	13.8

0 3 . 2 What was the resolution of the newtonmeter?

Tick **one** box.

[1 mark]

0.1 N ☐

0.5 N ☐

1 N ☐

10 N ☐

Question 3 continues on the next page

0 3 . 3 The student wanted to display her results.

How should she display her results?

[1 mark]

Tick **one** box.

A bar chart ☐

A line graph ☐

A pie chart ☐

0 3 . 4 Give a reason for your answer to part **03.3**.

[1 mark]

____

____

0 3 . 5 A force of 13.8 N was used to lift the mass 30 cm vertically through the liquid.

Use the following equation to calculate the work done in lifting the mass.

$$\text{Work done} = \text{force} \times \text{distance}$$

Choose the correct unit from the box.

[3 marks]

J	**m/s**	**N**

____

____

____

Work done = ____________________

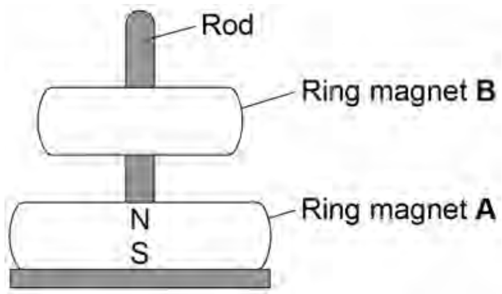
Unit = ____________________

0 4 A magnetic toy uses ring-shaped magnets.

Look at **Figure 6**.

The magnets can move up and down the rod. Ring magnet **B** appears to float.

Figure 6



0 4 . 1 The magnetic poles are labelled on ring magnet **A**.

Label the magnetic poles on ring magnet **B**.

[1 mark]

0 4 . 2 What would happen if ring magnet **B** was turned upside down?

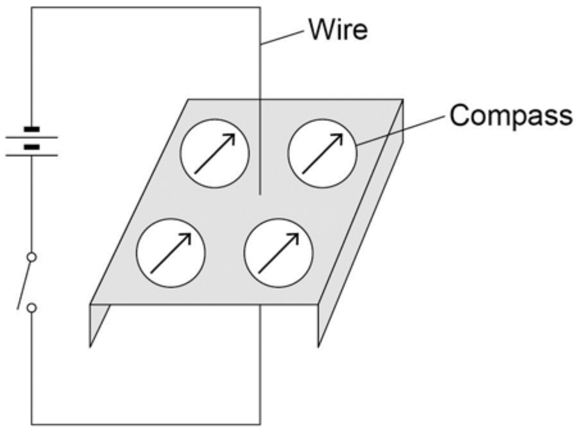
[1 mark]

Question 4 continues on the next page

Figure 7 shows four plotting compasses arranged around a wire.

The needle of a compass is a magnet.

Figure 7



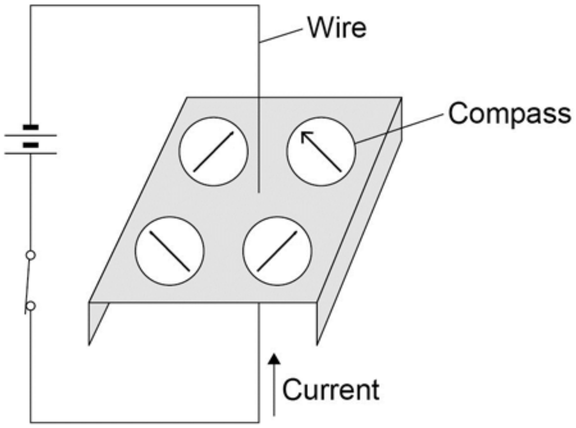
0 4 . 3 In **Figure 7** the switch is open and there is no current in the wire.

Explain why the compass needles all point in the same direction.

[2 marks]

Figure 8 shows the switch closed.

Figure 8



0 4 . 4 There is now a current in the wire.

The compass needles change direction.

On **Figure 8** draw arrowheads on the three incomplete compass needles to show their direction.

[1 mark]

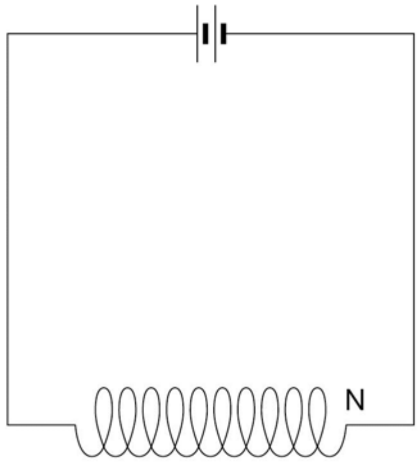
0 4 . 5 What would happen to the direction of the compass needles if the current was reversed?

[1 mark]

Question 4 continues on the next page

Figure 9 shows a coil of wire in a circuit.

Figure 9



0 4 . 6 On **Figure 9** draw the magnetic field due to the current in the coil.

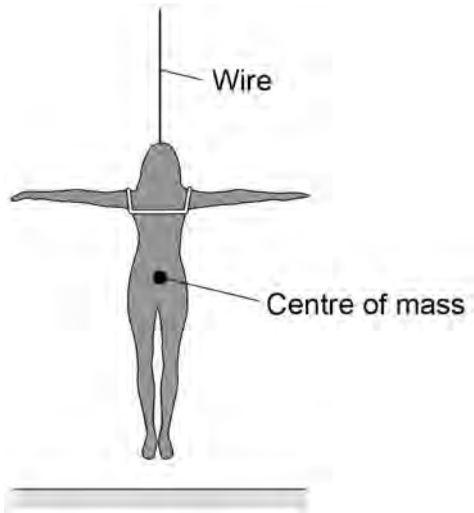
[3 marks]

Turn over for the next question

0 5 An actor is attached to a wire so that she can hang above the stage.

Look at **Figure 10.**

Figure 10



0 5 . 1 On **Figure 10** draw **two** arrows to show the forces acting on the actor.

[2 marks]

0 5 . 2 Which **two** forces are acting on the actor?

[2 marks]

Tick **two** boxes.

Air resistance force ☐

Electrostatic force ☐

Gravitational force ☐

Magnetic force ☐

Tension force ☐

0 5 . 3 The actor hangs above the stage in a stationary position.

What is the resultant force on the actor?

[1 mark]

Resultant force = ____________________ N

0 5 . 4 The actor has a mass of 70 kg.

Gravitational field strength = 9.8 N/kg

Use the following equation to calculate the weight of the actor.

Weight = mass × gravitational field strength

Give your answer to 2 significant figures.

[2 marks]

____

____

____

Weight of actor = ____________________ N

0 5 . 5 A motor pulls vertically upwards on the wire with a force of 720 N.

Calculate the resultant force on the actor.

[1 mark]

____

Resultant force = ____________________ N

Question 5 continues on the next page

Another actor has a mass of 65 kg.

This actor is attached to the wire and the motor pulls her vertically upwards.

The resultant force on the actor is 25 N.

0 5 . 6 Write down the equation that links acceleration, mass and resultant force.

[1 mark]

Equation ____________________

0 5 . 7 Calculate the acceleration of the actor.

[3 marks]

____

____

____

Acceleration of actor = ____________________ m/s^2

Turn over for the next question

0 6 Four students tested their reaction times using a computer program.

When a green light appeared on the screen the students had to press a key.

Table 3 shows their results.

Table 3

Student	Reaction time in s			Mean reaction time in s
	Test 1	Test 2	Test 3	
Boy 1	0.28	0.27	0.26	0.27
Boy 2	0.28	0.47	0.22	0.25
Girl 1	0.31	0.29	0.27	0.29
Girl 2	0.32	0.30	0.29	0.30

0 6 . 1 What is meant by 'reaction time' in this experiment?

[1 mark]

0 6 . 2 Boy 2 had an anomalous result in **Test 2**.

Suggest a reason why.

[1 mark]

0 6 . 3 Give **one** conclusion that can be made from the results in **Table 3**.

[1 mark]

0 6 . 4 Suggest further evidence that you could collect to support your conclusion.

[1 mark]

Reaction time is important at the start of a race.

Table 4 shows the time taken by a boy to run different distances.

Table 4

Distance in m	**Time in s**
100	12.74
200	25.63
800	139.46

0 6 . 5 Reaction time is more important in a 100 m race than in an 800 m race.

Explain why.

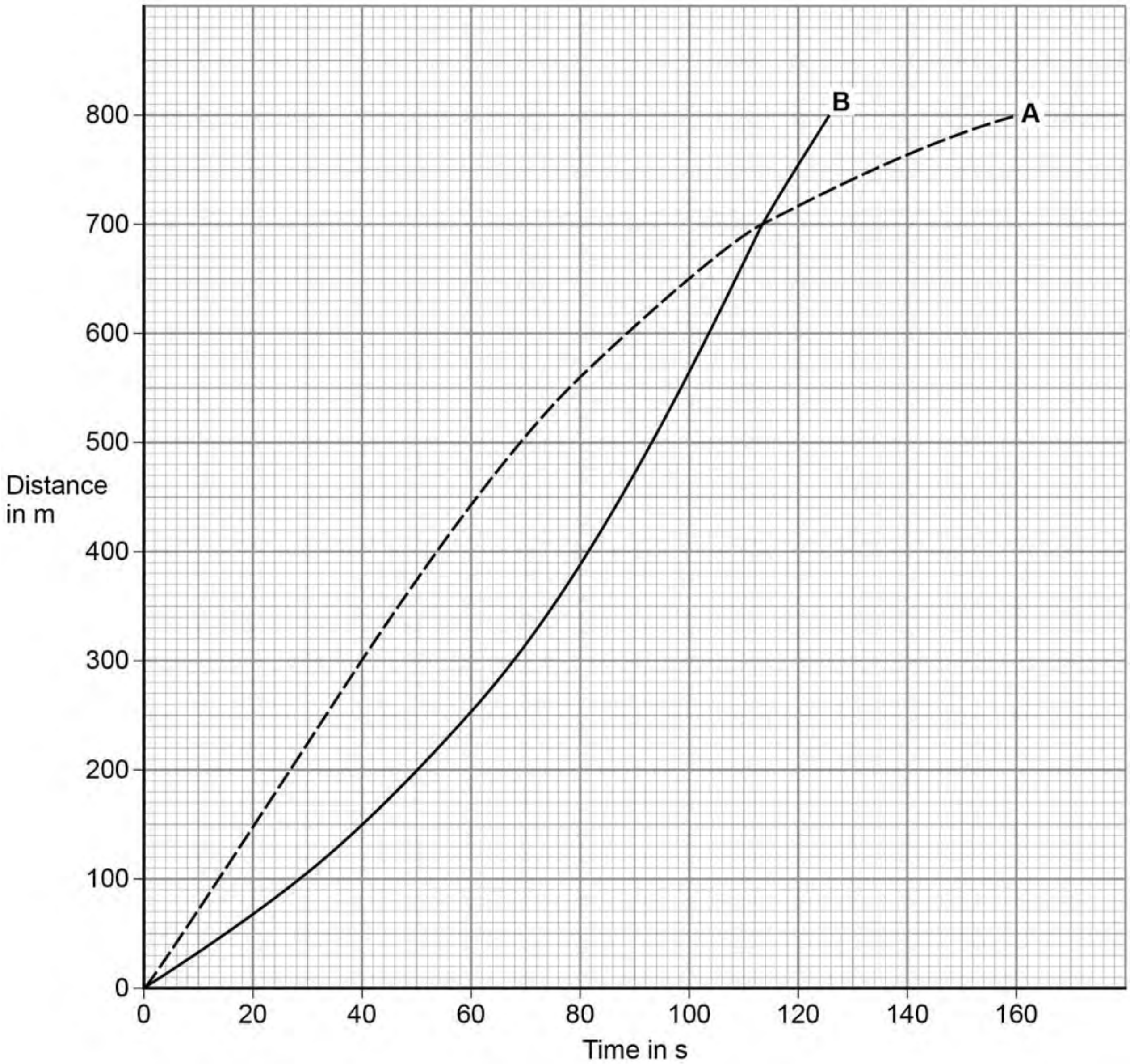
[2 marks]

Question 6 continues on the next page

Two girls, **A** and **B**, ran an 800 m race.

Figure 11 shows how the distance changed with time.

Figure 11



0 6 . 6 Compare the motion of runners **A** and **B**.

Include data from **Figure 11**.

[6 marks]

Turn over for the next question

0 7 A baby monitor has a sensor unit that transmits an image of the baby and the noises the baby makes to a monitor unit.

The monitor unit then displays an image of the baby and emits the noises the baby makes.

0 7 . 1 Compare the properties of the waves that transmit images and noises from the monitor unit.

[4 marks]

0 7 . 2 The sensor unit can detect infrared and visible light.

Suggest **one** advantage of being able to detect infrared.

[1 mark]

0 7 . 3 Write down the equation that links frequency, wave speed and wavelength.

[1 mark]

Equation

0 7 . 4 The signals for the monitor unit are transmitted as electromagnetic waves with a wavelength of 0.125 m.

Wave speed of electromagnetic waves = 3×10^8 m/s

Calculate the frequency of the signal.

[3 marks]

Frequency = Hz

END OF QUESTIONS

There are no questions printed on this page