

# **GCSE COMBINED SCIENCE: TRILOGY**



Higher Tier

Paper 6: Physics 2H

## Specimen 2018

## **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.

#### Advice

- In all calculations, show clearly how you work out your answer.
- When answering questions 01.6 and 06.3 you need to make 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.

Please write clearly, in block capita	lls, to allow character computer recognition.
Centre number	Candidate number
Surname	
Forename(s)	
Candidate signature	



Time allowed: 1 hour 15 minutes

**0** 1 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 1 shows their results.

Table 1

Student	Reaction time in s			Mean reaction	
Student	Test 1	Test 2	Test 3	time in s	
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 1 . 1	What is meant by 'reaction time' in this experiment?	[1 mark]
0 1 . 2	Boy 2 had an anomalous result in <b>Test 2</b> .  Suggest a reason why.	[1 mark]
0 1 . 3	Give <b>one</b> conclusion that can be made from the results in <b>Table 1</b> .	[1 mark]

0 1 . 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 2 shows the time taken by a boy to run different distances.

Table 2

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

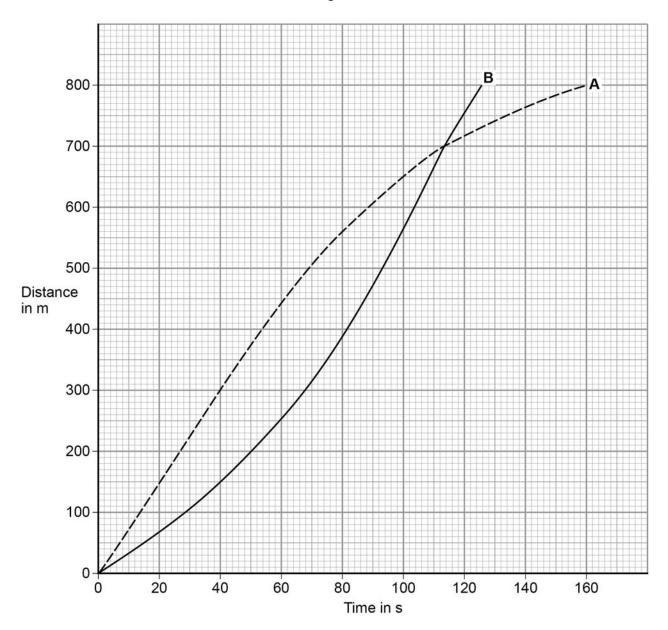
0 1 . 5	Reaction time is more important in a 100 m race than in an 800 m race.	
	Explain why.	[2 marks]

Question 1 continues on the next page

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

Figure 1 shows how the distance changed with time.

Figure 1



0 1 . 6	Compare the motion of runners <b>A</b> and <b>B</b> .	
	Include data from <b>Figure 11</b> .	[6 marks]
0 1 . 7	Use <b>Figure 1</b> to determine Girl <b>B</b> 's speed at 60 s.	
	Show how you use the graph to obtain your answer.	[2 marks]
		[3 marks]
	On a 2 d	/
	Speed =	m/s

Turn over for the next question

0 2	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.	3
0 2 . 1	Compare the properties of the waves that transmit images and noises from the monitor unit.	
	[4 marks	<b>s</b> ]

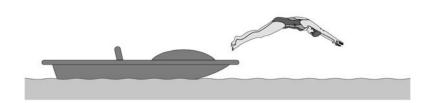
The sensor unit can detect infrared and visible light.  Suggest one advantage of being able to detect infrared.  Write down the equation that links frequency, wave speed and wavelengt Equation	[1 mark]
0 2 . 3 Write down the equation that links frequency, wave speed and wavelengt	th.
	th.
Equation	[1 mark]
Equation	
0 2 . 4 The signals for the monitor unit are transmitted as electromagnetic waves	s with a
wavelength of 0.125 m.	
Wave speed of electromagnetic waves = $3 \times 10^8$ m/s	
Calculate the frequency of the signal.	
	[3 marks]
Frequency =	Hz

Turn over for the next question

0 3 A swimmer dives off a boat.

Look at Figure 2.

Figure 2



0 3 . 1		ermine the momentum of the swimmer?	[2 marks]
0 3 . 2	What is the unit of mo	omentum?	[1 mark]
	J/s		
	kg m/s		
	N m		
	m/s <sup>2</sup>		

0 3.3	The boat was stationary.
	As the swimmer dives forwards, the boat moves backwards.
	Use the idea of conservation of momentum to explain why the boat moves backwards.
	[4 marks]
0 3 . 4	Explain what would happen to the motion of the boat if there were more people on the boat when the swimmer dived off.
	[2 marks]

Question 3 continues on the next page

0	3	5
•	_	•



The swimmer's speed increases as she swims away from the boat.

The swimmer has a top speed.

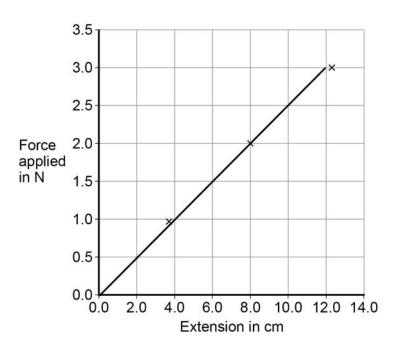
Explain why.	[5 marks]

0 4

A student changed the force applied to a spring by adding weights.

Figure 3 shows a graph of her results.

Figure 3



0 4 . 1 Write down the equation that links the force applied and extension for a spring.

[1 mark]

0 4 . 2 Identify the pattern shown in **Figure 3**.

Explain your answer.

[2 marks]

**0 4 . 3** Give **one** way the student could improve her investigation.

[1 mark]

0 4 . 4	Describe the relationship between work done and elastic potential energy in stretching a spring.	
		[2 marks]
0 4 . 5	Draw a line on <b>Figure 3</b> to show the results for a stiffer spring.	
	Explain the reason for the line you have drawn.	[3 marks]
046	Explain what would happen to the spring if the student kept adding weights?	>
0 4 . 0		[2 marks]

0 5

Figure 4 shows a skydiver training in an indoor wind tunnel.

Large fans below the skydiver blow air upwards.

Figure 4



0 5 . 1 The skydiver is in a stationary position.

Complete the free body diagram for the skydiver.

[2 marks]

Force from the air

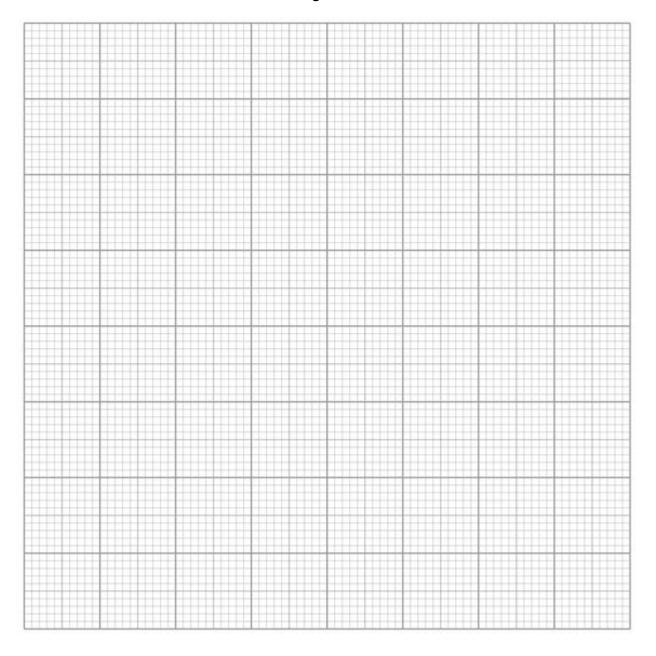


Question 5 continues on the next page

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0 5 . 2	The skydiver now straightens his legs to increase his surface area.  This causes the skydiver to accelerate upwards.  Explain why straightening his legs cause the skydiver to accelerate upwards.  [2 marks]
0 5 . 3	A small aeroplane used for skydiving moves along a runway.  The aeroplane accelerates at 2 m/s² from a velocity of 8 m/s.  After a distance of 209 m it reaches its take-off velocity.
	Calculate the take-off velocity of the aeroplane.  [3 marks]
	Take-off velocity = m/s
0 5 . 4	A skydiver jumps from an aeroplane.
	There is a resultant vertical force of 300 N on the skydiver.
	There is a horizontal force from the wind of 60 N.
	Draw a vector diagram on <b>Figure 5</b> to determine the magnitude and direction of the resultant force on the skydiver.  [4 marks]

Figure 5

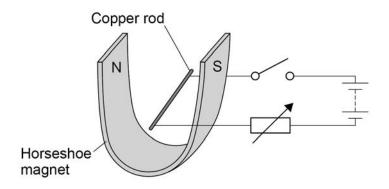


Magnitude of resultant force = N

Turn over for the next question

0 6 A teacher used the equipment shown in **Figure 6** to demonstrate the motor effect.

Figure 6



0 6 . 1	Describe how Fleming's left-hand rule can be used to determine the direction in which the rod will move when the switch is closed, and state the direction.		
	which are real will move when the evidence discount and clate are all educin.	[4 marks]	

0 6 . 2	Increasing the current can increase the force acting on the copper rod.
	Give <b>one</b> other way in which the size of the force acting on the copper rod could be increased.
	[1 mark]
0 6 . 3	The copper rod in <b>Figure 6</b> has a length of 7 cm and a mass of 4 ×10 <sup>-4</sup> kg.
	When there is a current of 1.12 A the resultant force on the copper rod is 0 N.
	Calculate the magnetic flux density.
	Gravitational field strength = 9.8 N/kg  [5 marks]
	Magnetic flux density = T

### **END OF QUESTIONS**

## There are no questions printed on this page

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