DRAFT SPECIMEN MATERIAL

AQA

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 8055

Surname GOODONE-LOOKSLIKE

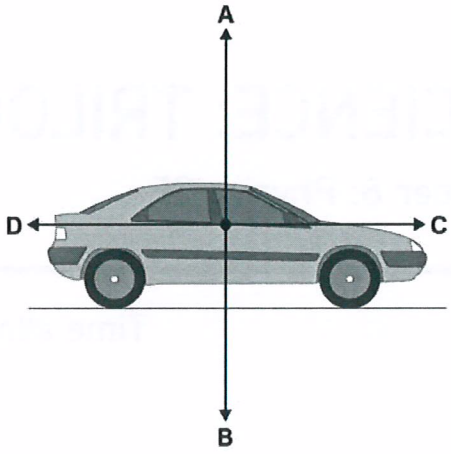
Forename(s) WHATTA

Candidate signature _____

This draft qualification has not yet been accredited by Ofqual. It is published to enable teachers to have early sight of our proposed approach to GCSE Combined Science: Trilogy. Further changes may be required and no assurance can be given that this proposed qualification will be made available in its current form, or that it will be accredited in time for first teaching in September 2016 and first award in August 2018.

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.

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

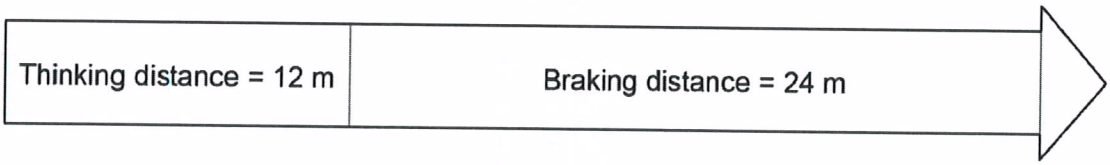
[2 marks]

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]

STOPPING = THINKING + BREAKING = 12 + 24 = 36 m

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]

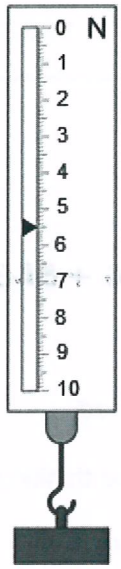
	decreases	increases	stays the same
thinking distance	☐	☑	☐
braking distance	☐	☐	☑

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 = 5.5 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 ☐

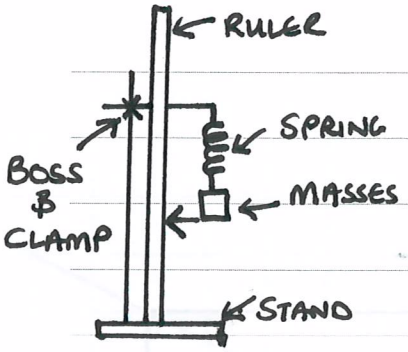
The spring gets shorter ☑

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]



- SET UP APPERATUS AS SHOWN
- RECORD THE READING OFF THE RULE FOR THE BOTTOM OF THE SPRING (UNSTRETCHED)
- ADD 100g TO THE SPRING
- TAKE A NEW READING AND WORK OUT THE EXTENSION
- ADD A FURTHER 100g AND REPEAT UNTIL YOU HAVE 500g ADDED MASS.
- PLOT A GRAPH OF ADDED MASS AGAINST EXTENSION TO WORK OUT THE RELATIONSHIP

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

[2 marks]

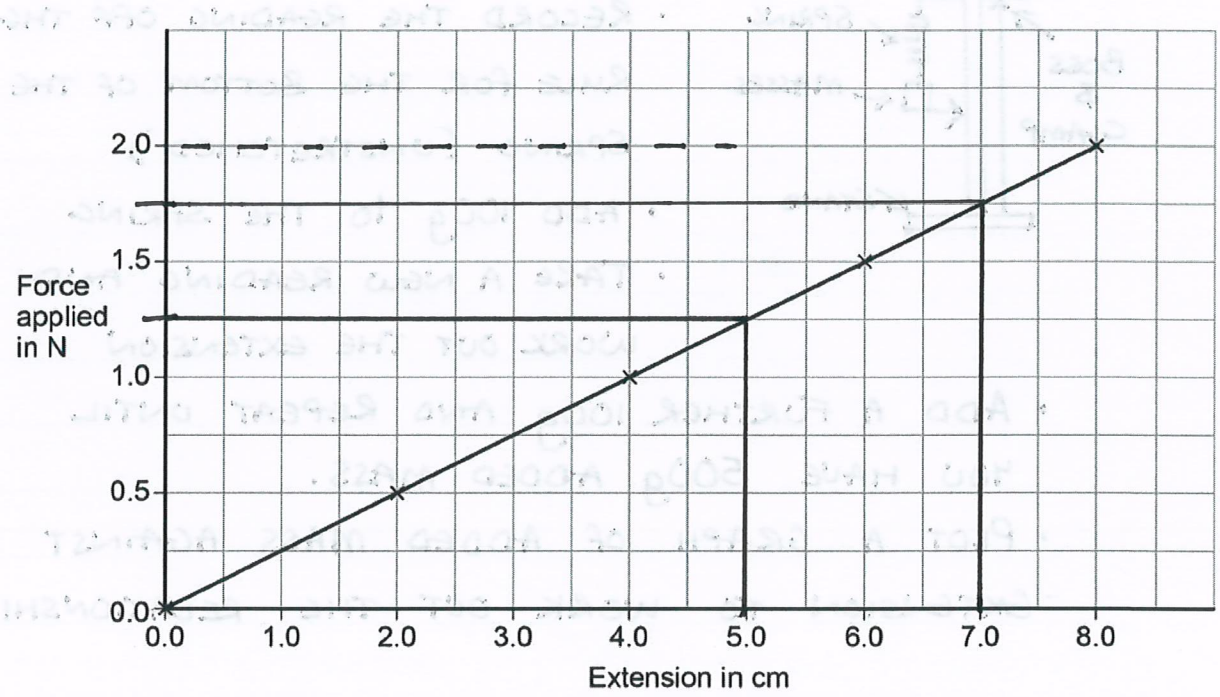
Tick **two** boxes.

- 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



1.75

1.25

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 = 0.5 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

LOOK FOR THE PATTERN

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 = ENERGY TRANSFERRED = $E_e = \frac{1}{2} ke^2$

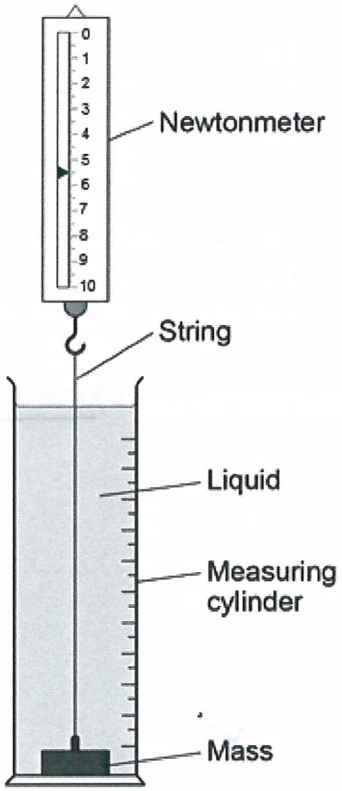
$= \frac{1}{2} \times 20 \times 0.050^2 =$

Work done = 0.025 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
Control	Distance the mass was lifted
Dependent	Value of force on the newtonmeter
Independent	Mass
	Type of liquid

Table 2 shows the student's results.

Table 2

NAMES = CATEGORIC DATA = BAR CHART

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

SMALLEST SCALE

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]

THE NAMES OF THE LIQUIDS IS CATEGORIC DATA

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

F m CONVERT TO METRES

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

Work done = force × distance

Choose the correct unit from the box.

[3 marks]

J	m/s	N

$Wd = F \times d = 13.8 \times \frac{30}{100}$

Work done = 4.14

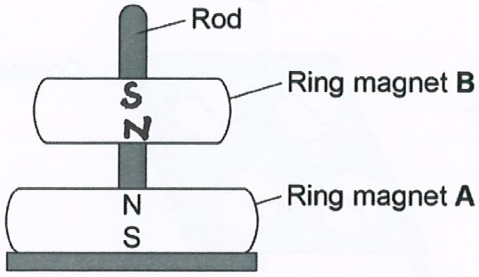
Unit = J

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]

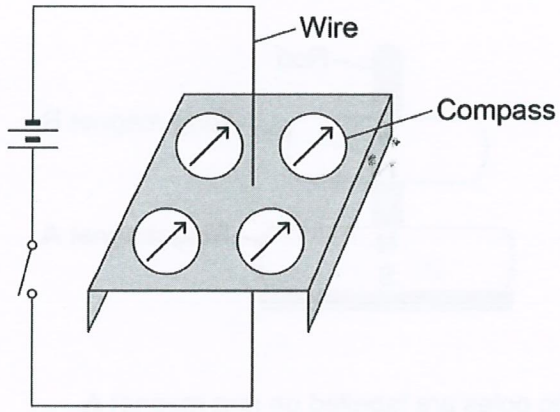
Ring magnet A would be attracted to ring magnet B.

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.

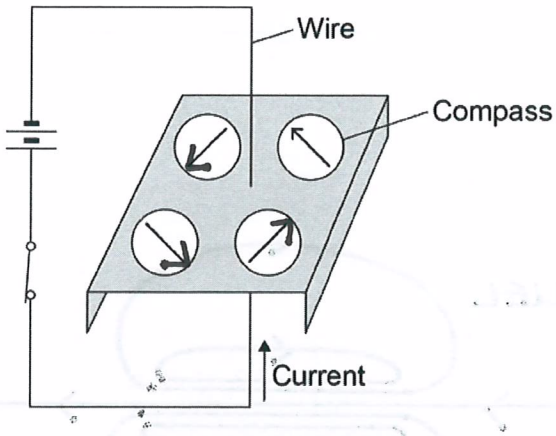
Explain why the compass needles all point in the same direction.

[2 marks]

THEY ALL POINT IN THE SAME DIRECTION BECAUSE THE COMPASS NEEDLES ALWAYS POINT TO A NORTH POLE AND THE EARTH HAS A MAGNETIC FIELD.

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]

THEY WOULD POINT IN THE OPPOSITE DIRECTION

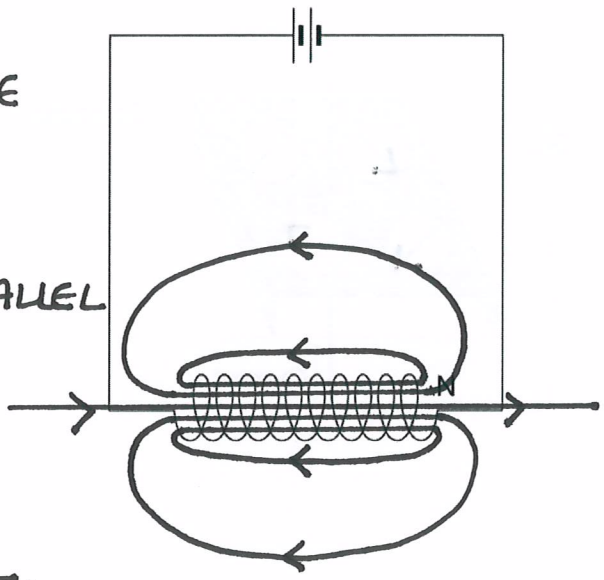
Question 4 continues on the next page

Figure 9 shows a coil of wire in a circuit.

Figure 9

EXAM TIP:

THE FIELD IS THE SAME SHAPE AS A BAR MAGNET + UNIFORM PARALLEL LINES THROUGH THE MIDDLE



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

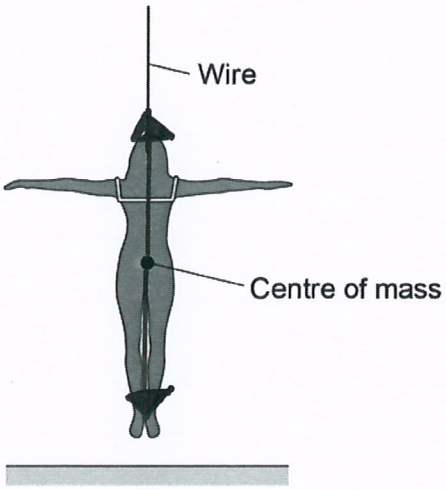
[3 marks]

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 = 0 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]

$W = m \times g = 70 \times 9.8$

$= 686$

Weight of actor = 690 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]

$\uparrow 720 + \downarrow 690 = 720 - 690$

Resultant force = 30 N

Question 5 continues on the next page

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]

THE TIME TAKEN BETWEEN SEEING THE LIGHT AND PRESSING THE KEY

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

Suggest a reason why.

[1 mark]

HE COULD HAVE BEEN DISTRACTED

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

[1 mark]

BOYS HAVE FASTER REACTION TIMES THAN GIRLS

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

[1 mark]

TEST MORE PEOPLE (LARGER DATA SET)

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]

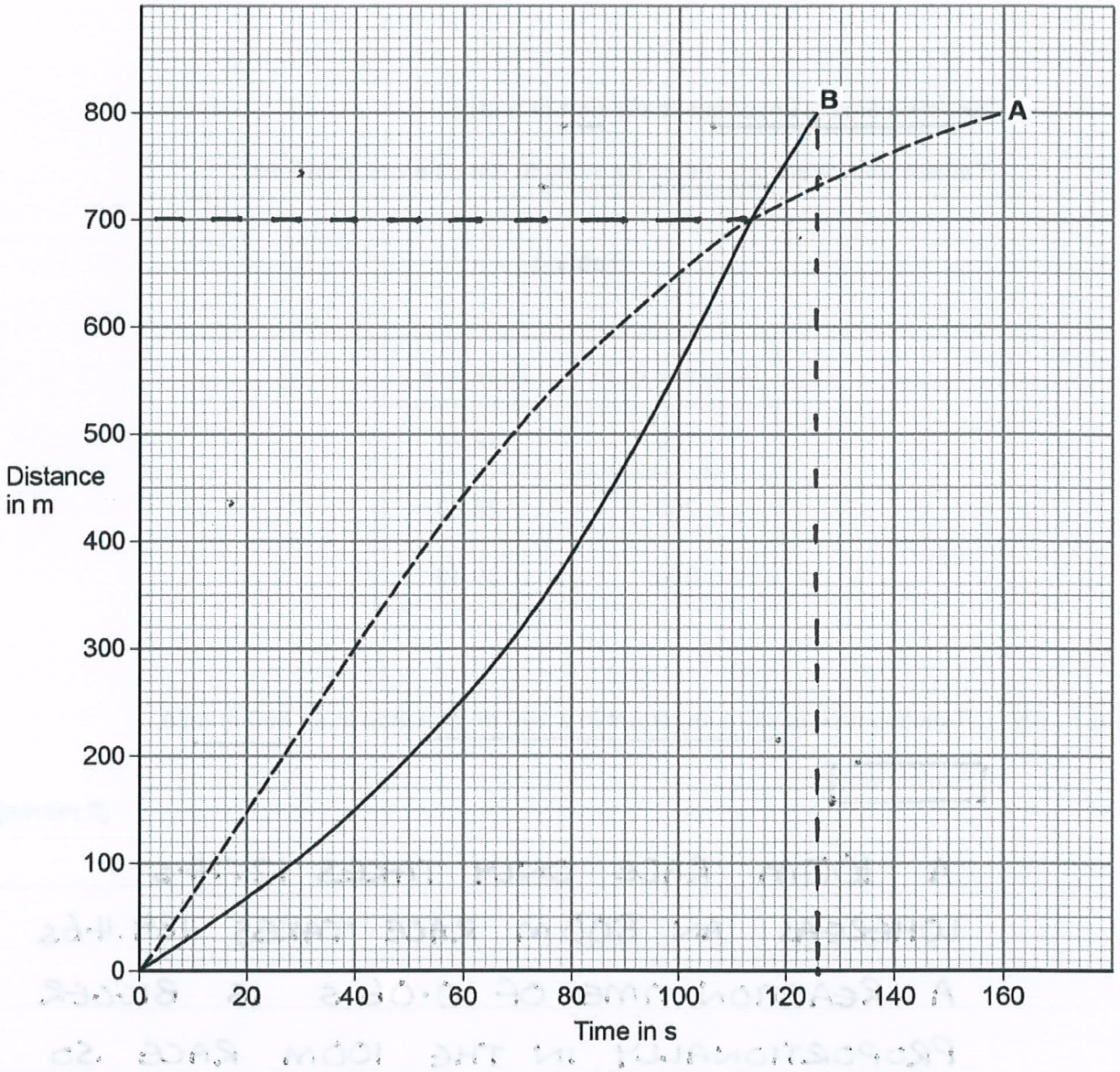
A 100m RACE ONLY TAKES 12.74s WHEREAS AN 800m RACE TAKES 139.46s A REACTION TIME OF 0.26s IS BIGGER PROPORTIONALLY IN THE 100m RACE SO WILL HAVE MORE OF AN EFFECT.

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]

GIRL A STARTS THE RACE RUNNING AT A CONSTANT SPEED FOR 60s (440m) AFTER THIS TIME SHE GRADUALLY SLOWS DOWN UNTIL THE END OF THE RACE AT 160s (800m).

GIRL B STARTS RUNNING SLOWER THAN GIRL A BUT HER SPEED INCREASES THROUGHOUT THE RACE. SHE OVERTAKES GIRL A AT A DISTANCE OF 700m AND FINISHES THE RACE AT 126 s SO BEATS GIRL A.

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.

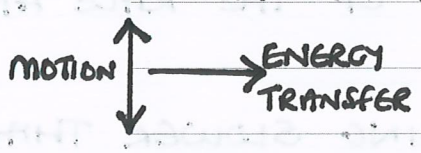
The monitor unit then displays an image of the baby and emits the noises the baby makes.

LIGHT SOUND

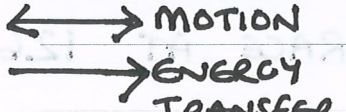
0 7 . 1 Compare the properties of the waves that transmit images and noises from the monitor unit.

[4 marks]

- LIGHT WAVES ARE TRANSVERSE WAVES.



- THE OSCILLATIONS ARE AT 90° TO THE DIRECTION OF ENERGY TRANSFER
- LIGHT WAVES TRAVEL MUCH FASTER THAN SOUND
- SOUND WAVES ARE LONGITUDIAL WAVES



- THE OSCILLATIONS ARE IN THE SAME PLANE / PARALLEL TO THE DIRECTION OF ENERGY TRANSFER

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

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

[1 mark]

THE BABY CAN BE SEEN IN THE DARK

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

[1 mark]

Equation SPEED = FREQUENCY x WAVELENGTH

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

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

Calculate the frequency of the signal. (f)

[3 marks]

$C = f\lambda$ RE-ARRANGING $f = \frac{C}{\lambda}$

$\therefore f = \frac{3 \times 10^8}{0.125}$

Frequency = 2.4×10^9 Hz

EXAM TIP:

MAKE SURE YOU USE YOUR CALCULATOR CORRECTLY USE BIDMAS.

END OF QUESTIONS

There are no questions printed on this page