

**Paper Reference(s) 1SC0/1PH**

**Pearson Edexcel Level 1/Level 2 GCSE (9–1)**

**Combined Science**

**Paper 3: Physics 1**

**Higher Tier**

**Wednesday 22 May 2019 – Afternoon**

**Time: 1 hour 10 minutes plus your additional  
time allowance**

**INSTRUCTIONS TO CANDIDATES**

**Write your centre number, candidate number,  
surname, other names and your signature in  
the boxes below. Check that you have the  
correct question paper.**

<b>Centre No.</b>					
<b>Candidate No.</b>					
<b>Surname</b>					
<b>Other names</b>					
<b>Signature</b>					
<b>Paper Reference</b>	1	S	C	0	/ 1 P H



- **Use BLACK ink or ball-point pen.**
- **Answer ALL questions.**
- **Answer the questions in the spaces provided – there may be more space than you need.**
- **Calculators may be used.**
- **Any diagrams may NOT be accurately drawn, unless otherwise indicated.**
- **You must show all your working out with your answer clearly identified at the end of your solution.**

**MATERIALS REQUIRED FOR EXAMINATION**

**Calculator, ruler**

**ITEMS INCLUDED WITH QUESTION PAPERS**

**Equations booklet**

**(Continues on next page)**

**(Turn over)**

## **INFORMATION FOR CANDIDATES**

- The total mark for this paper is 60.
- The marks for EACH question are shown in brackets
  - use this as a guide as to how much time to spend on each question.
- In questions marked with an **ASTERISK (\*)**, marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

## **ADVICE TO CANDIDATES**

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

**(Turn over)**

**Answer ALL questions. Write your answers in the spaces provided.**

**Some questions must be answered with a cross in a box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.**

**1 (a) Which colour of visible light has the longest wavelength? (1 mark)**

☐ **A blue**

☐ **B green**

☐ **C red**

☐ **D yellow**

**(Question continues on next page)**

**(Turn over)**

- (b) Some television remote controls use infrared radiation and other remote controls use radio waves.**

**Explain why an infrared remote control may not switch on the television from behind an armchair but a radio wave remote control always will. (2 marks)**

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**(Question continues on next page)**

**(Turn over)**

(c) Figure 1 is a diagram of a water wave.

A cork is floating on the water.

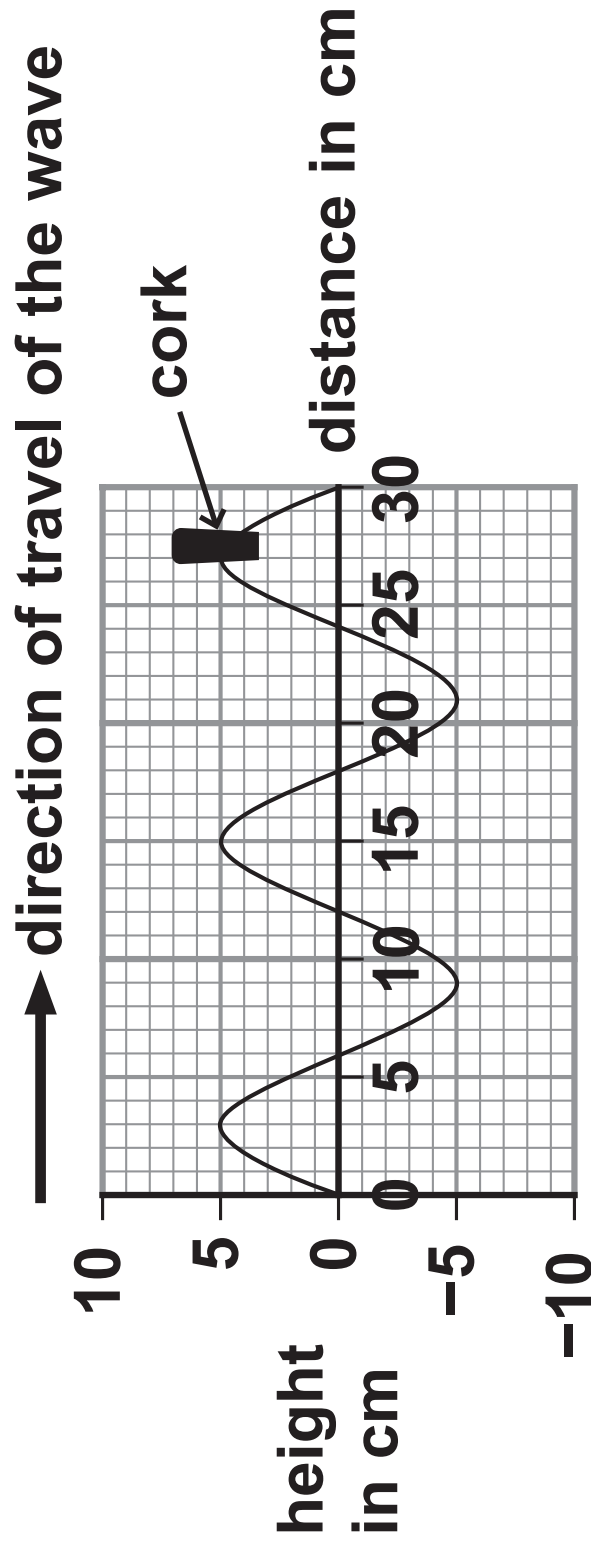


Figure 1

- (i) Use the scale on the diagram to measure the wavelength of the wave. (2 marks)

wavelength = \_\_\_\_\_ cm

(Question continues on next page)

(Turn over)

**(ii) Describe the motion of the cork.**

**You should include how the cork moves relative to the direction of travel of the wave. (2 marks)**

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**(Question continues on next page)**

**(Turn over)**

- (d) A different water wave has a wavelength of 0.25m and a frequency of 1.5 Hz.

Calculate the wave speed. (2 marks)

wave speed = \_\_\_\_\_ m/s

**(TOTAL FOR QUESTION 1 = 9 MARKS)**

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(Questions continue on next page)

(Turn over)



- 2 (a) Carbon-13 and carbon-14 are isotopes of carbon.

Nuclei of carbon-13 and carbon-14 can be represented by these symbols



Complete the table for an atom of carbon-13 and an atom of carbon-14.  
(2 marks)

	number of neutrons in the nucleus	number of electrons in orbit around the nucleus
carbon-13		
carbon-14		

(Question continues on next page)

(Turn over)

**(b) (i) State the name of an instrument that can be used to measure radioactivity. (1 mark)**

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**(ii) State TWO sources of background radiation. (2 marks)**

**1** \_\_\_\_\_

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**2** \_\_\_\_\_

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**(Question continues on next page)**

**(Turn over)**

- (c) Carbon-14 is radioactive and has a half-life of 5 700 years.**

**The number of radioactive carbon-14 atoms in a very old piece of wood is found to have decreased from 1 000 000 to 125 000.**

**Determine the age of the piece of wood. (2 marks)**

**age of wood = \_\_\_\_\_ years**

**(Question continues on next page)**

**(Turn over)**

**(d) Carbon-14 decays into nitrogen-14.**

**The symbol for nitrogen-14 is  $^{14}_7\text{N}$**

**Explain what happens in a carbon-14 nucleus when it decays to a nitrogen-14 nucleus. (2 marks)**

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**(TOTAL FOR QUESTION 2 = 9 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

3 Figure 2 shows a way of projecting a small trolley up a sloping track.

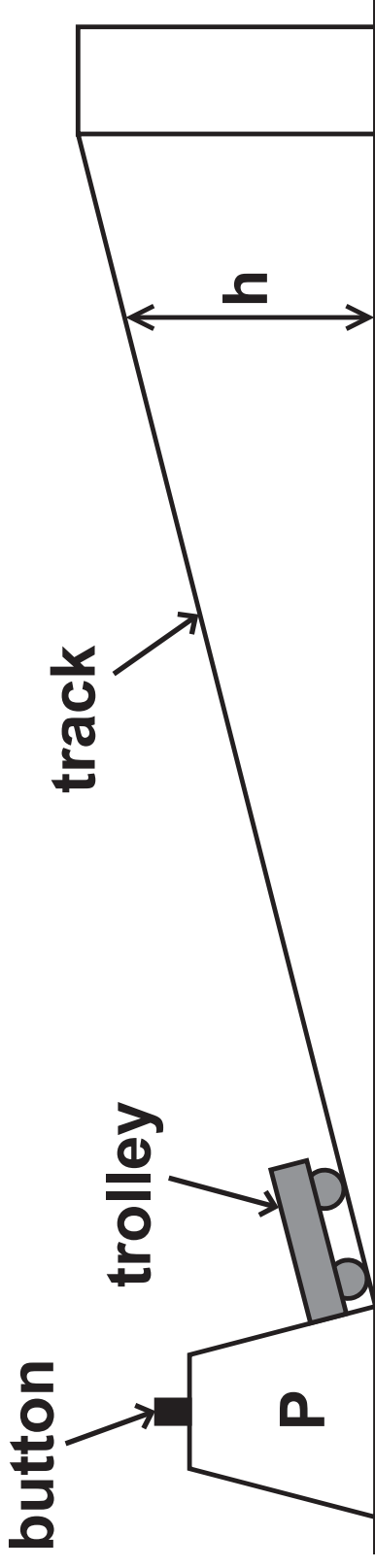


Figure 2

13

When the button is pressed, a spring is released in P that projects the trolley up the track.

The trolley travels up the track, stops and then rolls back down.

The spring in P always exerts the same force when projecting the trolley.

(Question continues on next page)

(Turn over)

- (a) A student investigates how the mass of the trolley affects the maximum vertical height,  $h$ , reached by the trolley.**

**State the measurements the student should make to complete the investigation.**

**You should make use of the equipment shown in Figure 2 and any other equipment that is needed.  
(4 marks)**

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**(Continue your answer on next page)**

**(Turn over)**

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**(Question continues on next page)**

**(Turn over)**

(b) Figure 3 is a graph of the student's results.

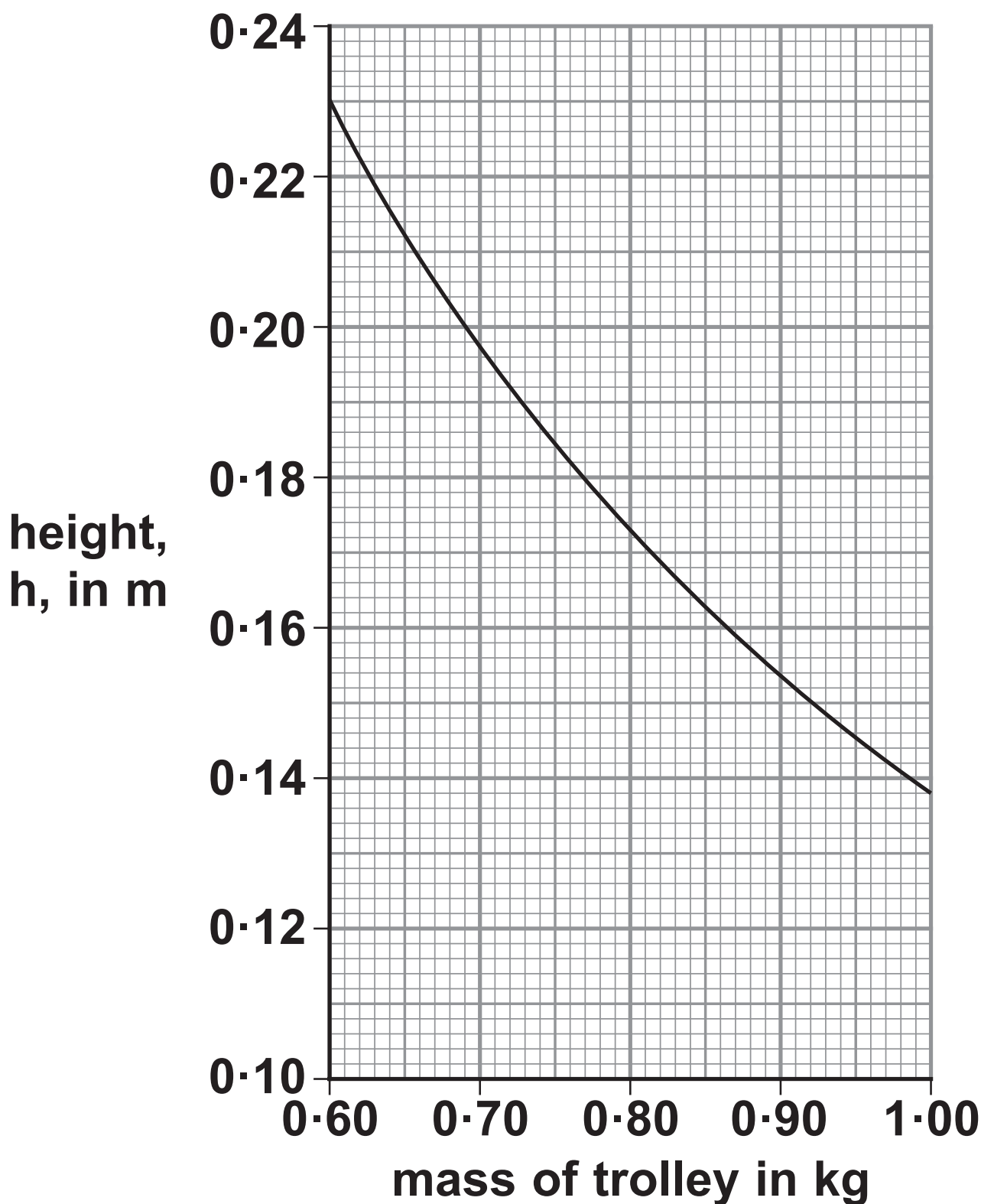


Figure 3

(Question continues on next page)

(Turn over)



**The student states that the energy transferred by the spring is the same each time it is used.**

**Use data from any two points on the graph in Figure 3 to support this statement. (3 marks)**

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**(Question continues on next page)**

**(Turn over)**

- (c) Describe how the student could extend the investigation to determine the average speed of the trolley as it rolls back down the track. (3 marks)**

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**(TOTAL FOR QUESTION 3 = 10 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 4 (a) The diagram in Figure 4 shows two students, P and Q, trying to measure the speed of sound in air.

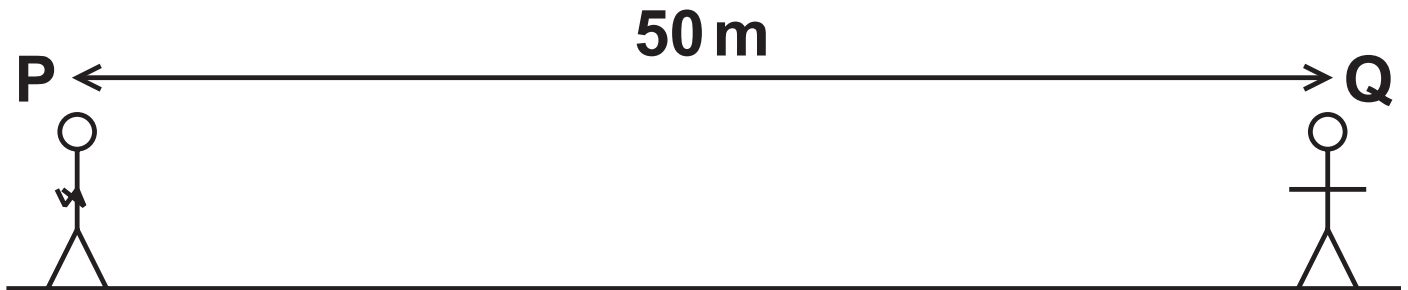


Figure 4

P will clap his hands together.

When Q sees P clap his hands, she will start a timer.

When Q hears the clap, she will stop the timer.

(Question continues on next page)

(Turn over)

**Explain ONE way the students could improve their method. (2 marks)**

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**(Question continues on next page)**

**(b) Figure 5 shows a long metal rod and a hammer. The rod is hit at one end by the hammer.**

**This causes a sound wave to travel along the inside of the metal rod.**



**Figure 5**

**(Question continues on next page)**

**(Turn over)**

**Describe how hitting the rod causes a sound wave to travel along the inside of the rod. (2 marks)**

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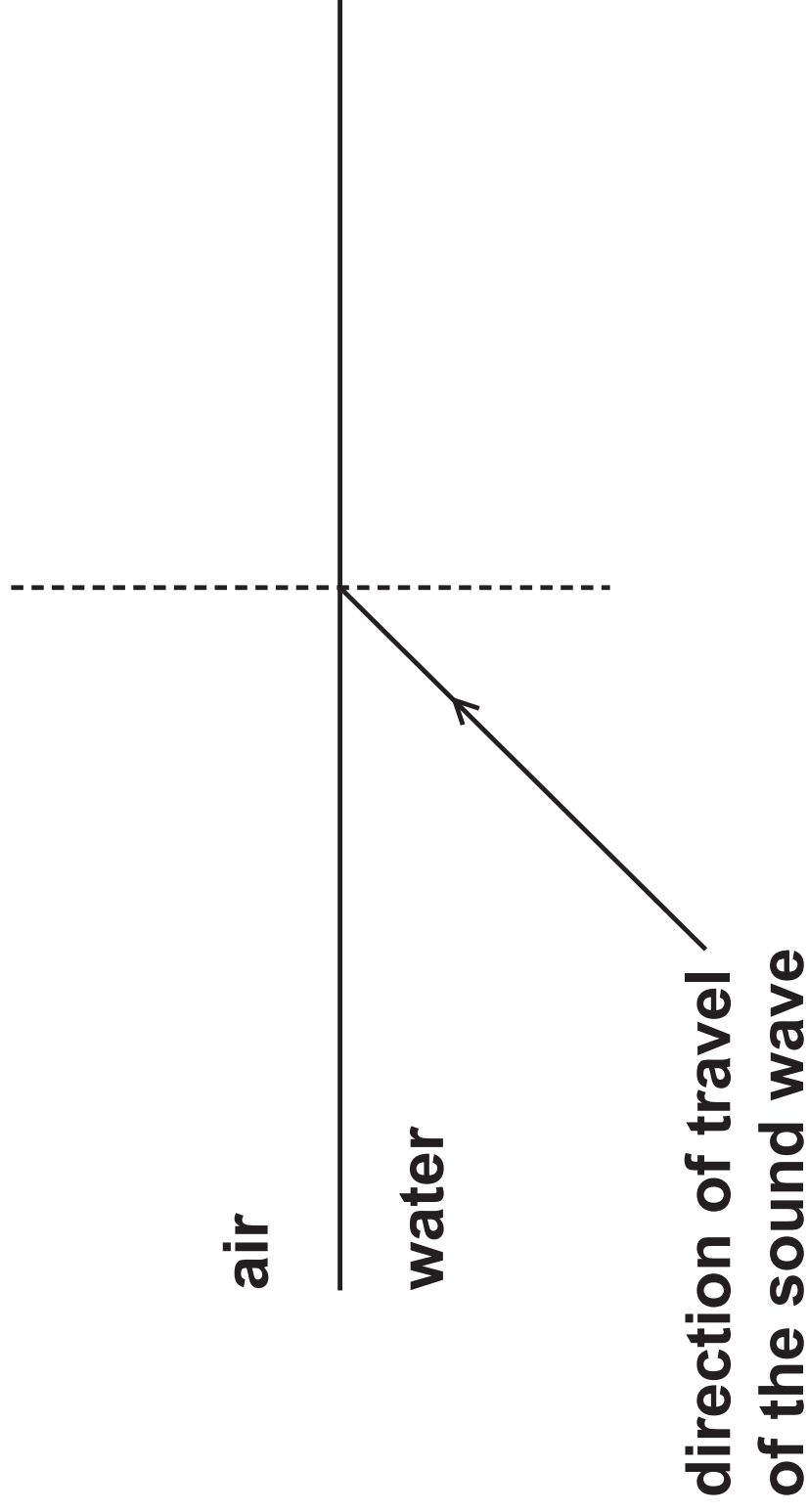
**(Question continues on next page)**

- (c) Sound travels slower in air than it does in water.**

**Figure 6 on page 24 shows the direction of travel of a sound wave approaching a boundary between air and water.**

**The sound wave refracts at the boundary between air and water.**

**(Question continues on next page)**



**Figure 6**

**Complete the diagram in Figure 6 to show the direction the sound wave travels in the air. (2 marks)**

**(Question continues on next page)**

**(Turn over)**



- (d) Sound travels slower in cold air than it does in warm air.

The equation relating the speed of sound in air to the density of the air is

$$\text{speed of sound} = \frac{K}{\sqrt{(\text{density})}}$$

where K is a constant.

The table in Figure 7 gives some data about the speed of sound in air and the density of air.

	speed of sound in m/s	density of air in kg / m <sup>3</sup>
in cold air	331	1.29
in warm air		1.16

Figure 7

(Question continues on next page)

(Turn over)

**Use the equation and the data in the table in Figure 7 to calculate the speed of sound in warm air.**

**Give your answer to an appropriate number of significant figures.  
(3 marks)**

**speed of sound  
in warm air = \_\_\_\_\_ m/s**

**(TOTAL FOR QUESTION 4 = 9 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

**5 (a) The force that keeps an object moving in a circular path is known as the (1 mark)**

☐ **A balancing force**

☐ **B centripetal force**

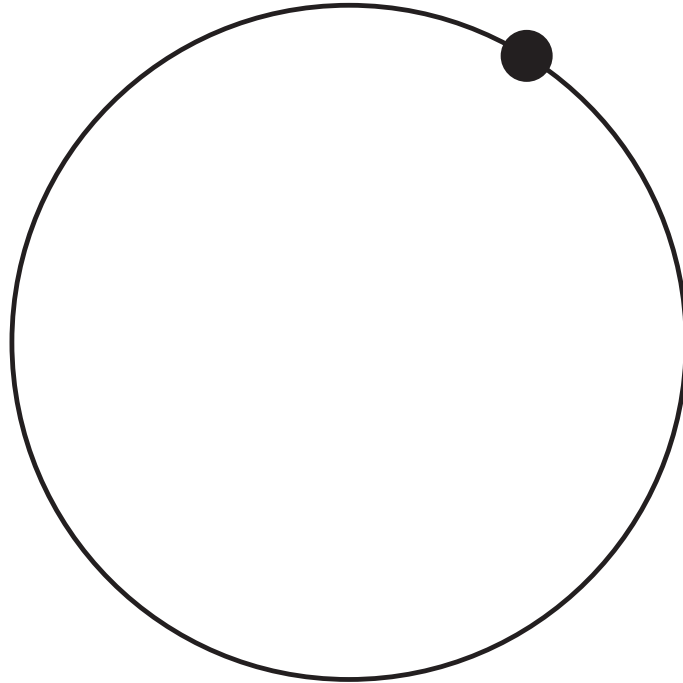
☐ **C reaction force**

☐ **D resistance force**

**(Question continues on next page)**

**(Turn over)**

**(b) Figure 8 shows an object moving in a circular path.**



**Figure 8**

- (i) Draw an arrow on Figure 8 to show the direction of the force that keeps the object moving in a circular path. (1 mark)**

**(Question continues on next page)**

**(Turn over)**

- (ii) The object in Figure 8 is moving at constant speed.

Explain why it is not moving with constant velocity. (2 marks)

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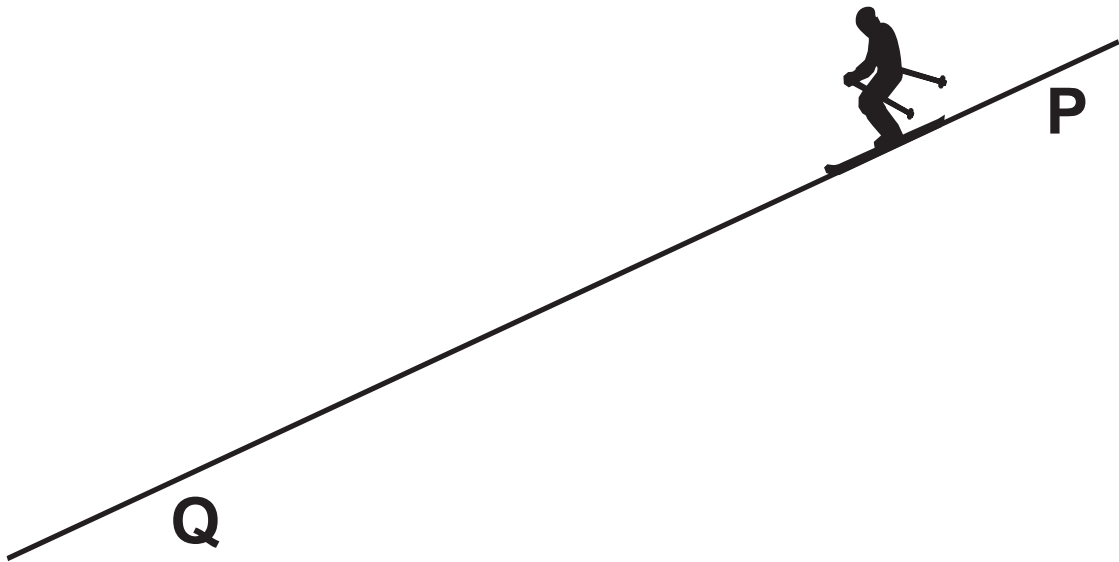
(Question continues on next page)

(Turn over)

**(c) Figure 9 shows a skier on a slope.**

**The skier travels down the slope with a constant acceleration.**

**The speed of the skier is measured at points P and Q.**



**Figure 9**

**(Question continues on next page)**

**(Turn over)**

The table in Figure 10 gives some data about the skier making one downhill run.

acceleration	$3.0 \text{ m/s}^2$
speed at P	$7.6 \text{ m/s}$
speed at Q	$24 \text{ m/s}$

Figure 10

(Question continues on next page)

(Turn over)

- (i) Calculate the distance from P to Q.

Use an equation selected from the Equations Booklet supplied with this paper. (3 marks)

distance from  
P to Q = \_\_\_\_\_ m

(Question continues on next page)

(Turn over)



- (ii) Calculate the time taken for the skier to travel from P to Q.  
(3 marks)

time from P to Q = \_\_\_\_\_ s

**(TOTAL FOR QUESTION 5 = 10 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 6 (a) Some sunglasses have photochromic lenses.**

**Photochromic lenses are clear when the lenses are indoors but they darken in bright sunlight to reduce the effects of the sunlight.**

**Photochromic lenses react to ultraviolet light.**

**Suggest a benefit of making the lenses go dark with ultraviolet light.  
(1 mark)**

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**(Question continues on next page)**

**(Turn over)**

**(b) Radio waves from Jupiter take 40 minutes to reach Earth.**

**Light waves from the Sun take 8 minutes to reach Earth.**

**Calculate how many times further it is from Earth to Jupiter than from Earth to the Sun.**

**State the property of electromagnetic radiation that is used in your answer.  
(2 marks)**

\_\_\_\_\_ times

**(Continue your answer on next page)**

**(Turn over)**

property \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**(Question continues on next page)**

**(Turn over)**

**(c) Ultraviolet waves cover a range of frequencies.**

**Scientists divide this range into three types, UVA, UVB and UVC.**

**The table in Figure 11 shows the frequency range for each type.**

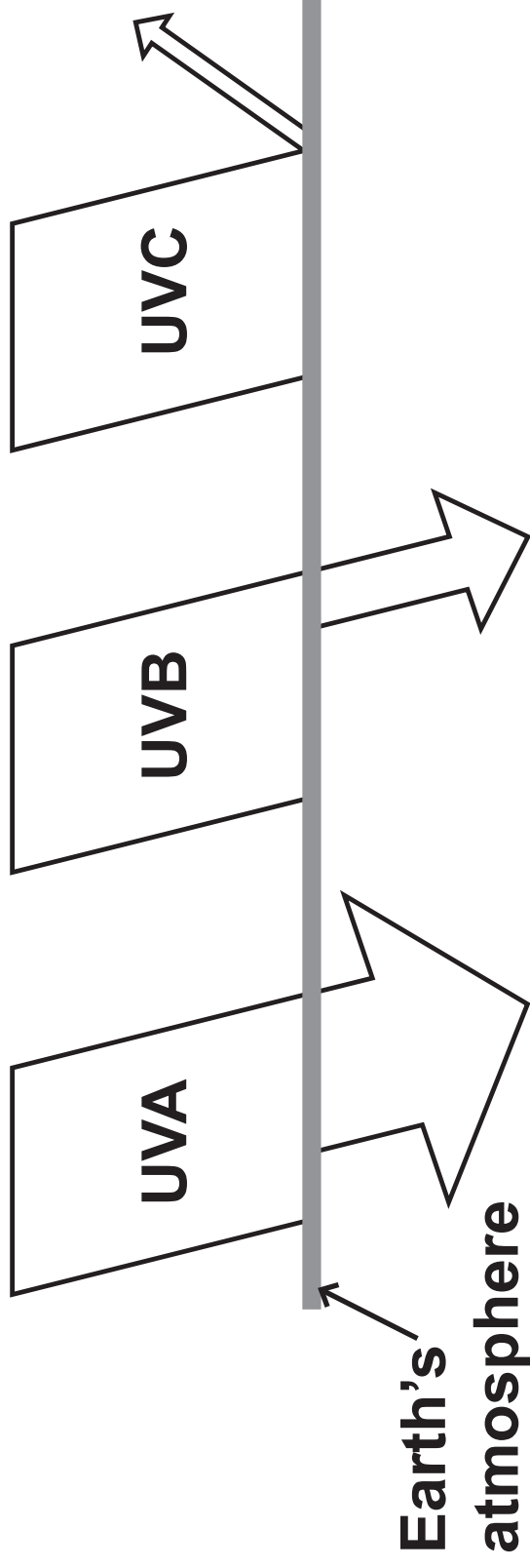
<b>type</b>	<b>frequency range in Hz</b>
<b>UVA</b>	<b><math>7.5 \times 10^{14}</math> to <math>9.4 \times 10^{14}</math></b>
<b>UVB</b>	<b><math>9.4 \times 10^{14}</math> to <math>10 \times 10^{14}</math></b>
<b>UVC</b>	<b><math>10 \times 10^{14}</math> to <math>30 \times 10^{14}</math></b>

**Figure 11**

**(Question continues on next page)**

**(Turn over)**

Figure 12 is a diagram about the effect that the Earth's atmosphere has on three types of ultraviolet radiation.



38

Figure 12

Describe how the effects change with **WAVELENGTH**, using information from Figure 11 and Figure 12.

(Question continues on next page)

(Turn over)

**The width of the arrows drawn indicates the amount of radiation that is involved.**

**Calculations are NOT required.  
(4 marks)**

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**(Continue your answer on next page)**

**(Turn over)**

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**(Question continues on next page)**

**(Turn over)**



**\*(d) Radio waves and gamma radiation are at opposite ends of the electromagnetic spectrum.**

**Compare how these two electromagnetic radiations are produced. (6 marks)**

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**(Continue your answer on next page)**

**(Turn over)**

**(Turn over)**

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**(TOTAL FOR QUESTION 6 = 13 MARKS)**

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**TOTAL FOR PAPER = 60 MARKS**  
**END**