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Mob: +974 55249797 / 55258711

E-mail: rashed.saba@gmail.com

**PHYSICS-1P**

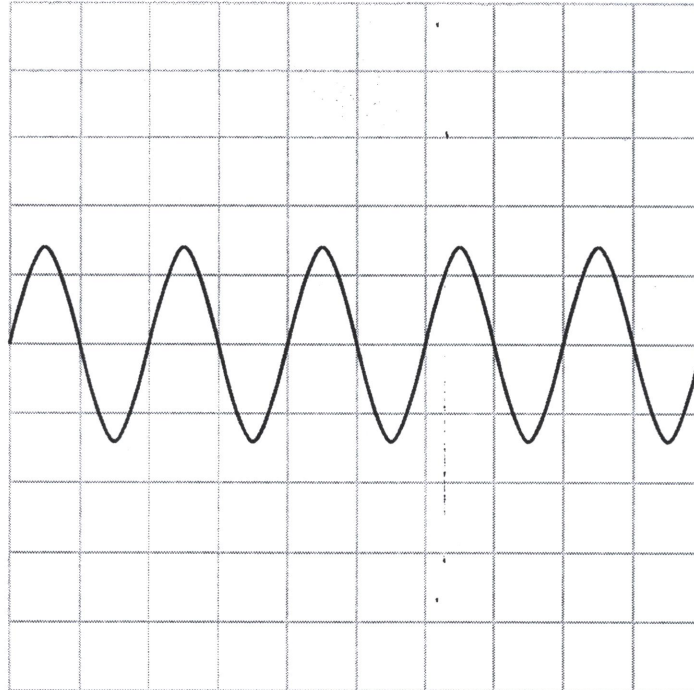
**TOPIC- Wave and Sounds**

# Wave and Sounds

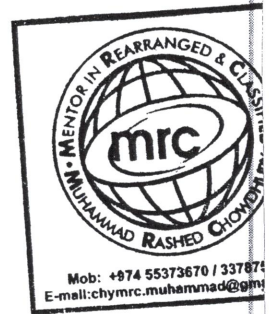
1 Waves can travel on water, through air or in a vacuum.

(a) The diagram shows the side-view of a wave on the surface of water.

Each square on the grid represents 1 cm x 1 cm.



9-1P-15-13



(i) State the wavelength of the wave shown.

(1)

wavelength = ..... cm

(ii) On the grid sketch the trace of a wave travelling at the same speed, but with a larger amplitude and a lower frequency.

(2)

# Wave and Sounds

(b) Two students investigate the speed of sound waves in air.

They use a stopwatch that shows times to the nearest 0.1 s.

They use an outdoor running track as their measure of distance.

The track is straight and 100 m long.

Describe what else they must do to obtain a value for the speed of sound.

(5)

8-1P-15-15

Area with horizontal dotted lines for writing the answer.



# Wave and Sounds

(c) (i) State the equation linking wave speed, frequency and wavelength.

(1)

(ii) The speed of radio waves is 300 000 000 m/s.

A radio wave has a frequency of 31 MHz.

Calculate the wavelength of this radio wave.

(3)

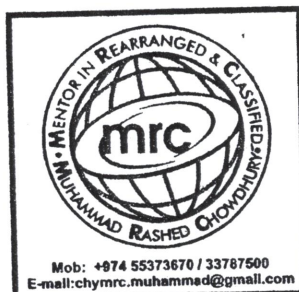
wavelength = ..... m

(d) A sound wave and a radio wave have the same wavelength.

State why they have different frequencies.

(1)

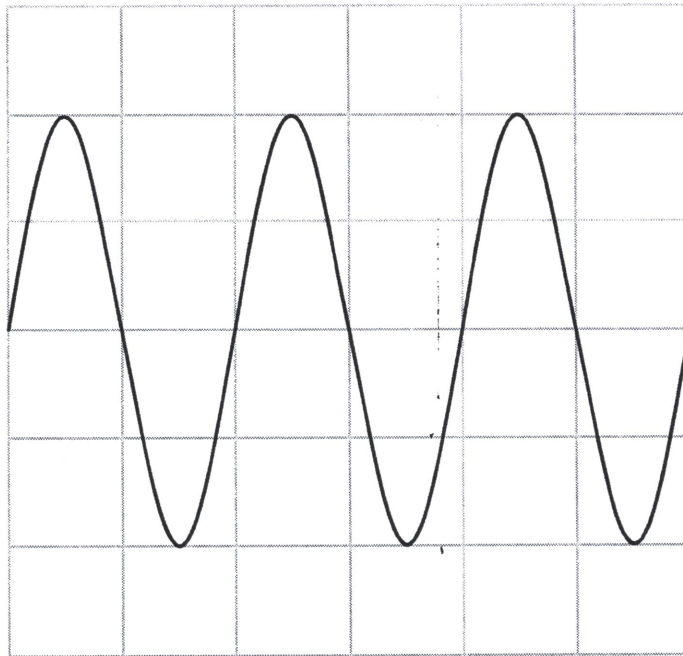
(Total for Question 13 = 13 marks)



# Wave and Sounds

2 A microphone is connected to an oscilloscope to display a sound wave.

The diagram shows the trace on the oscilloscope screen.



8-2P-12-2



The oscilloscope settings are:

Y direction: 1 square = 1 V

X direction: 1 square = 0.001 s

(a) (i) How many time periods are shown on the trace?

(1)

(ii) What is the frequency of the sound wave?

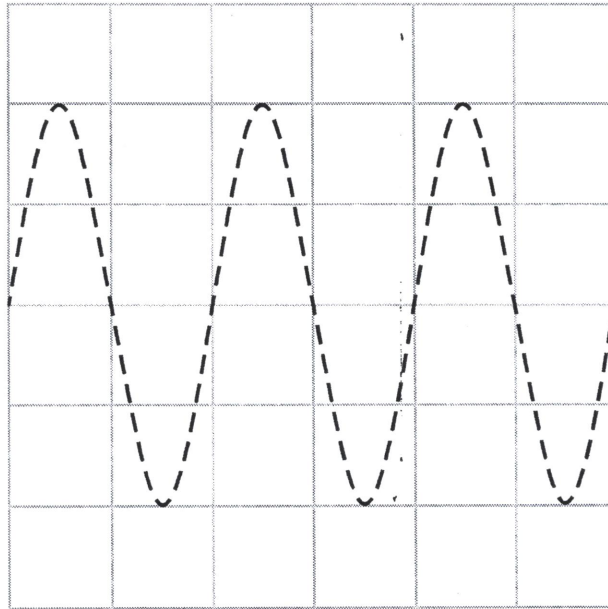
(2)

Frequency = ..... Hz

# Wave and Sounds

(b) On the grid below, sketch the trace of a sound wave with a smaller amplitude and a higher frequency than the wave shown by the dotted line.

(2)



9-12-2P-2

(Total for Question 2 = 5 marks)



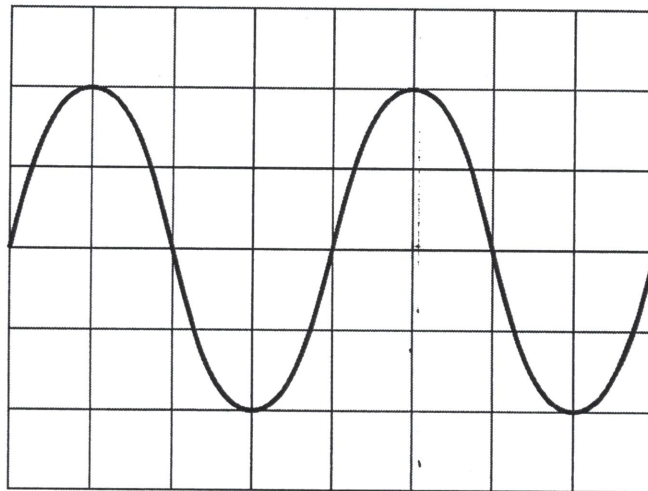
# Wave and Sounds

3 (a) Which statement about sound waves is correct?

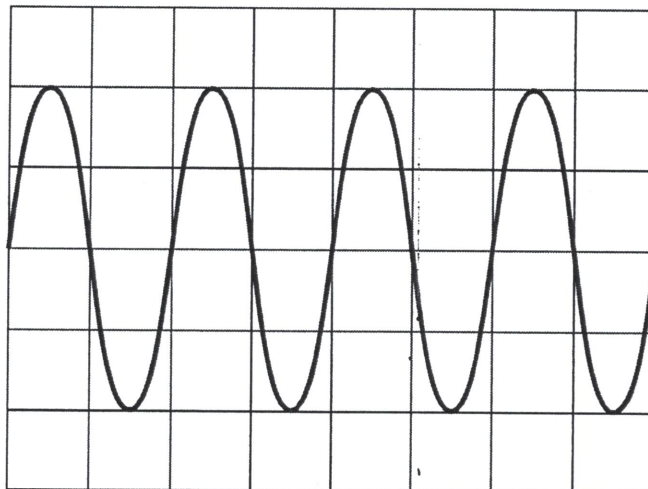
- A sound waves cannot be reflected
- B sound waves are electromagnetic
- C sound waves are longitudinal
- D sound waves are transverse

(b) A microphone is connected to a data logger, which displays each sound wave as a graph.

The diagrams show the graphs for two different sound waves.



Sound wave P



Sound wave Q

The graphs have the same scales.

In the horizontal direction: 1 square = 0.001 s

# Wave and Sounds

(i) The amplitude of sound wave Q is

(1)

- A larger than the amplitude of sound wave P
- B smaller than the amplitude of sound wave P
- C the same as the amplitude of sound wave P
- D zero

(ii) The frequency of sound wave P is 250 Hz.

Find the time period of sound wave P.

(1)

2-14-15-3

time period = ..... s

(iii) Find the frequency of sound wave Q.

(1)

frequency = ..... Hz

(Total for Question 3 = 4 marks)





# Wave and Sounds

4 A signal generator produces sounds from a loudspeaker.

(a) (i) Which property of the sound wave should be increased in order to make the sound louder?

- A amplitude
- B frequency
- C speed
- D wavelength

(1)

(ii) Which property of the sound wave should be increased in order to make a higher pitched sound?

- A amplitude
- B frequency
- C speed
- D wavelength

(1)

(b) Sound waves travel as longitudinal waves.

Other waves are transverse.

(i) Give an example of a transverse wave.

(1)

(ii) Describe how the vibrations of longitudinal waves and transverse waves differ.

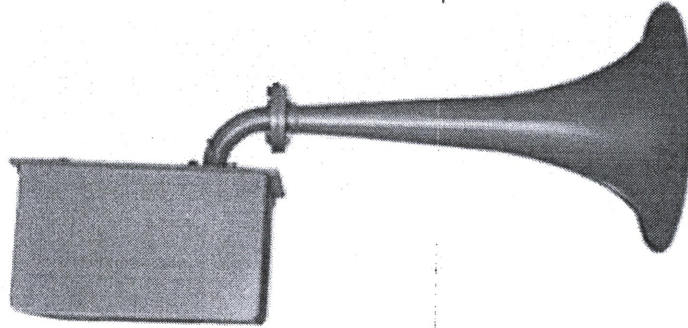
(2)

(Total for Question 5 = 5 marks)

28-July-14-5

# Wave and Sounds

- 5 A foghorn makes a loud, low-pitched warning sound when a ship is moving in fog.



- (a) What is the relationship between the frequency of a sound wave and the pitch of the sound?

(1)

- (b) The foghorn emits sound waves with a frequency of 160 Hz.

The speed of sound is 340 m/s.

- (i) State the equation linking wave speed, frequency and wavelength.

(1)

- (ii) Calculate the wavelength of these sound waves.

(2)

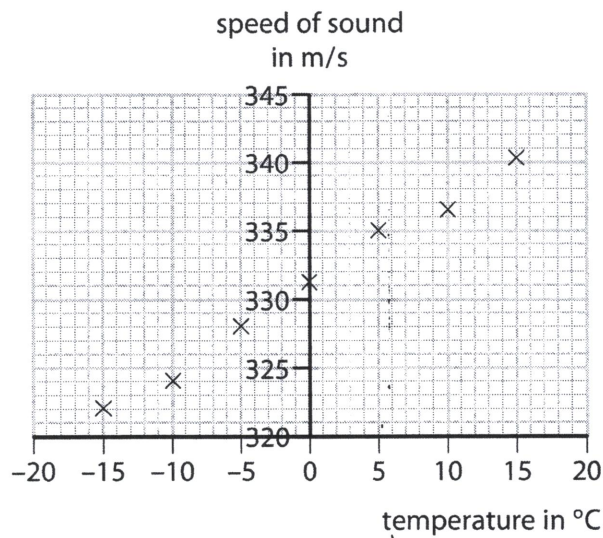
wavelength = ..... m

Jan-24-16-5

# Wave and Sounds

(c) A student investigates how the speed of sound in air varies with temperature.

The student's results are shown on the graph.



(i) Draw a straight line of best fit on the graph.

(1)

(ii) Use the graph to find the speed of sound when the air temperature is 20°C.

(2)

speed of sound = ..... m/s

(d) The air temperature decreases while the foghorn continues to emit sound waves with a frequency of 160 Hz.

Explain how this decrease in temperature affects the wavelength of the sound waves.

(2)

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**(Total for Question 5 = 9 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

57- 2 P- 16-5

# Wave and Sounds

6 Echo sounding is used to detect fish in the sea.

Sound waves are emitted from a fishing boat. Some of the sound waves are reflected by fish and detected back at the boat.

(a) The shortest time between the sound waves being emitted and detected is 0.26 s.

The speed of sound in water is 1.5 km/s.

Calculate the distance between the boat and the nearest fish.

(4)

571-1P-14-6

distance = ..... m

(b) Each sound wave is emitted for a very short time.

The reflected sound wave received at the boat lasts for a longer time.

Suggest a reason for this difference in time.

(2)

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(Total for Question 6 = 6 marks)



# Wave and Sounds

7 This question is about sound waves.

(a) Sound waves are

- A electromagnetic waves
- B ionising radiation
- C longitudinal waves
- D transverse waves

(1)

(b) Describe an experiment to measure the speed of sound in air.

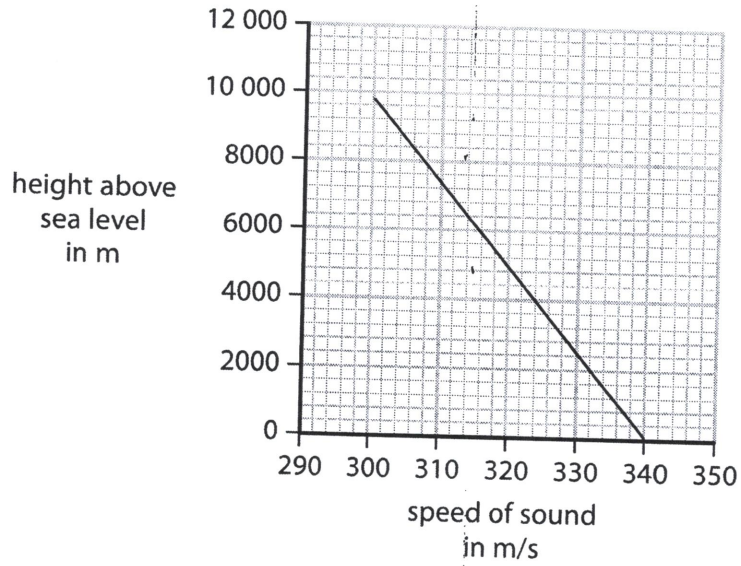
(5)

26  
57-12-1P-9

# Wave and Sounds

(c) The speed of sound in air is different for different heights above sea level.

The graph shows how the speed of sound varies with height.



(i) Use the graph to estimate the speed of sound in air 6000 m above sea level.

(1)

Speed = ..... m/s

(ii) Describe the pattern shown by the graph.

(2)

# Wave and Sounds

(iii) Some aeroplanes can travel faster than the speed of sound.

When an aeroplane travels faster than the speed of sound it causes a shock wave. People on the ground hear this shock wave as a sonic boom.

A student says



It is easier for an aeroplane to make a sonic boom when it travels higher up.

Do you agree with the student?

Explain why.

(2)

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(Total for Question 9 = 11 marks)

