1. Two sounds are emitted at the same time with frequencies 512Hz and 518Hz. Calculate the beat frequency.

Solution

2.

Given that the beat frequency is 4Hz. One of the sound waves has a frequency of 20Hz. Calculate the possible values of the frequencies of the other sound wave.

Question

A 256Hz turning work produces sound at the same time with a, 249Hz. What is the beat frequency?

(a) (i) Distinguish between longitudinal and transverse waves. **(1 mark)**

(ii) Explain how beats are formed. **(2 marks)**

(b) A light wave is refracted into an optically less dense medium. What change will occur in:

(i) the frequency **(1 mark)**

(ii) the speed **(1 mark)**

(iii) the wavelength. **(1 mark)**

(c) (i) What is an echo? **(1 mark)**

(ii) A sound is sent out from the ship and its reflection from the floor of the ocean returns one second later. Assuming that the velocity of sound in water is 1500 m/s, how deep is the ocean? **(3 marks)**

(a) (i) Define electromagnetic field. **(1 mark)**

(ii) Show electromagnetic field lines pattern due to a solenoid. **(1 mark)**

(b) With the aid of a well labeled diagram, explain how an electric bell operates. **(4 marks)**

(c) How can you make a galvanometer read

(i) higher current values? **(2 marks)**

(ii) higher voltage values? **(2 marks)**

7. (a) (i) What is meant by the terms solenoid and electromagnetic induction? **(1 mark)**

(ii) List down two applications of electromagnetics. **(1 mark)**

(b) Describe the structure and mode of action of a simple d.c. motor. **(3 marks)**

(c) (i) Draw a diagram of an electric bell showing the polarity of the electromagnet, the direction of the current, the core, the yoke, spring and the armature. **(3 marks)**

(ii) Explain what will happen to the mode of action of the electric bell if the core and yoke are made of steel instead of soft iron. **(2 marks)**

1 **(a)** Two students are measuring the speed of sound.

The students are provided with a starting pistol, a stopwatch and a long measuring tape. The starting pistol, when fired, produces a loud sound and a puff of smoke at the same instant.

Describe how the students use the apparatus and how they calculate the speed. You may draw a diagram.

(b) A device at the bottom of the sea emits a sound wave of frequency 200 Hz.

(i) The speed of sound in sea-water is 1500 m / s.

Calculate the wavelength of the sound in sea-water.

wavelength = ... [2]

(ii) The sound wave passes from the sea-water into the air.

State what happens, if anything, to

- the frequency of the sound,.....

.....

- the speed of the sound.....

.....

[2]

2 **(a)** Fig. 6.1 represents the waveform of a sound wave. The wave is travelling at constant speed.

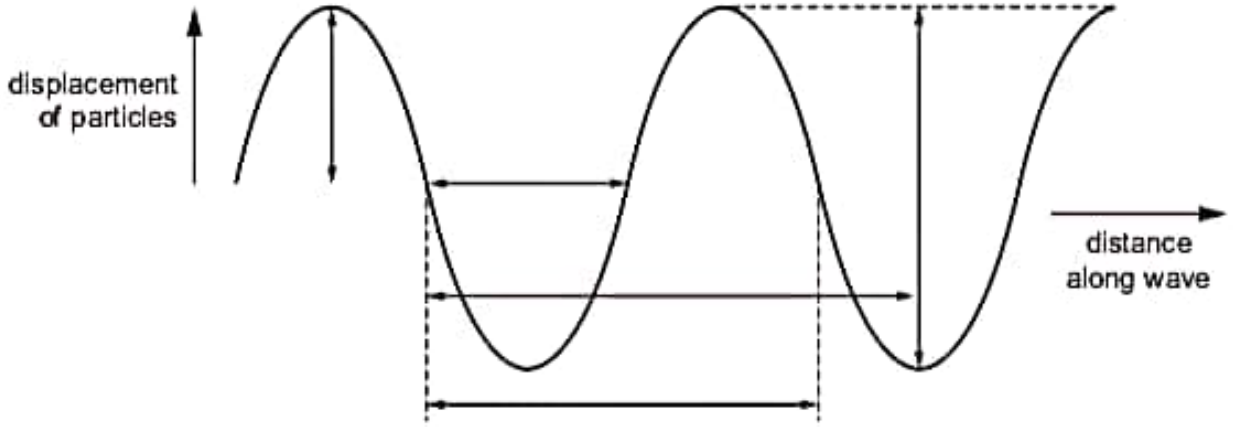

Fig. 6.1

(i) On Fig. 6.1,

1. label with the letter X the marked distance corresponding to the amplitude of the wave, [1]

2. label with the letter Y the marked distance corresponding to the wavelength of the wave. [1]

(ii) State what happens to the amplitude and the wavelength of the wave if

1. the loudness of the sound is increased at constant pitch,

amplitude .....

wavelength .....

[1]

2. the pitch of the sound is increased at constant loudness.

amplitude .....

wavelength .....

[1]

[1]

(b) A ship uses pulses of sound to measure the depth of the sea beneath the ship. A sound pulse is transmitted into the sea and the echo from the sea-bed is received after 54 ms. The speed of sound in seawater is 1500 m / s.

Calculate the depth of the sea beneath the ship.

depth = ...[3]

3 **(a)** A sound wave in air consists of alternate compressions and rarefactions along its path.

(I) Explain how a compression differs from a rarefaction.

.....

.....[1]

(II) Explain, in terms of compressions, what is meant by

1. the wavelength of the sound,

.....

.....[1]

2. the frequency of the sound.

.....

.....[1]

(b) At night, bats emit pulses of sound to detect obstacles and prey. The speed of sound in air is 340 m / s.

(I) A bat emits a pulse of sound of wavelength 0.0085 m.

Calculate the frequency of the sound.

frequency = ...[2]

(II) State why this sound cannot be heard by human beings.

.....

.....[1]

(III) The pulse of sound hits a stationary object and is reflected back to the bat. The pulse is received by the bat 0.12 s after it was emitted.

Calculate the distance travelled by the pulse of sound during this time.