QB365

Important Questions - Sound

9th Standard CBSE

Science

Reg.No. : | | | | | | |

Time : 01:00:00 Hrs

Total Marks : 50

Section-A

1) During a thunderstorm, one observes lighting first and then hears the thunder, through both occur simultaneously. This is because **1**

(a) light travels slower than sound (b) light travels faster than sound

(c) eyes are more sensitive than ears (d) none of the above

2) In a slinky (i.e., a long spring) which of the following type of waves can be generated? **1**

(a) Longitudinal only (b) Transverse only (c) Both longitudinal and transverse (d) Standing only

3) Which of the following is carried by the waves from one place to another? **1**

(a) Mass (b) Velocity (c) Wavelength (d) Energy

4) In gases a sound wave is **1**

(a) transverse only (b) longitudinal only (c) both transverse and longitudinal

(d) neither transverse nor longitudinal

5) If a wave completes 20 vibrations in 2.5 s, then its frequency is **1**

(a) 8 Hz (b) 20 Hz (c) 50 Hz (d) 200 Hz

6) What is the nature of the ocean waves in deep water? **1**

(a) transverse (b) Longitudinal (c) Both transverse and longitudinal (d) None of these

7) When we pluck the wire of a sitar, the waves produced in its wire are **1**

(a) transwerse (b) longitudinal (c) both transverse and longitudinal

(d) neither transverse nor longitudinal

8) The product of time period and frequency is **1**

(a) zero (b) unity (c) infinity (d) none of these

9) A tuning fork is vibrating in air. The number of compressions going past a given point per second is the **1**

(a) wavelength (b) time-period (c) frequency (d) amplitude

10) A boat at anchor is rocked by waves whose crests are 100 m apart and whose velocity is 25 m/s/ How often do the crests reach the boat? **1**

(a) 2500 s (b) 75 s (c) 4 s (d) 0.25 s

Section-B

11) Can a motion be periodic but not oscillatory? **2**

12) Define oscillatory motion. Give examples. **2**

13) Define the terms time period and frequency of an oscillating body. Give their units and write the relation between them. **2**

14) State some important characteristics of wave motion. **2**

15) What are electromagnetic waves? Give examples. **2**

16) Name the type of wave **2**

(i) which requires medium for propagation.

(ii) which does not require medium for its propagation?

17) Distinguish between mechanical and electromagnetic waves. **2**

18) Write two points of difference between sound wave and light wave. **2**

19) When the wire of a sitar is plucked, what type of waves are produced in (i) the wire, and (ii) air? **2**

20) How does the sound produced by a vibrating object in a medium reach your ear? **2**

Section-C

21) Distinguish between particle velocity and wave velocity? **5**

22) Calculate the wavelength of a wave whose frequency is 220 Hz and speed is 440m/s in a given medium. **5**

23) Distinguish between loudness and intensity of sound. **5**

24) A person has a hearing range from 20 Hz to 20 kHz.What are typical wavelengths of sound wave in air corresponding to theses two frequencies?Take the speed of sound in air as 344m s^{-1} **5**

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Section-A

1) (b) light travels faster than sound **1**

2) (c) Both longitudinal and transverse **1**

3) (d) Energy **1**

4) (b) longitudinal only **1**

5) (a) 8 Hz **1**

6) (c) Both transverse and longitudinal **1**

7) (a) transwerse **1**

8) (b) unity **1**

9) (c) frequency **1**

10) (c) 4 s **1**

Section-B

11) Yes. For example, uniform circular motion is periodic but not oscillatory. **2**

12) **2**

Oscillatory or vibratory motion. If a body moves to and fro repeatedly about a fixed position (called mean position), its motion is said to be oscillatory or vibratory motion.

Examples of oscillatory motion:

(i) Motion of the pendulum of a wall clock.

(ii) Motion of a mass attached to a spring.

(iii) Motion of a swing.

13) **2**

Time period. The time taken by an oscillating body to complete one oscillation is called its time period. It is denoted by T. Its SI unit is second (s).

Frequency. The number of oscillations or vibrations completed by an oscillating body in one second is called its frequency. It is denoted by v (Greek letter nu).

SI unit of frequency=per second (s^{-1}) = cycles per second (cps)

= hertz (Hz).

Relation between time period and frequency:

Let T=time period of an oscillating body. Then number of oscillations completed in T second = 1

Number of oscillations completed in 1 second = $\frac{1}{T}$

But number of oscillations completed in 1 second = frequency (v)

$\therefore \quad v = \frac{1}{T}$

Hence frequency is equal to the reciprocal of time period.

14) **2**

Characteristics of wave motion:

(i) It is the disturbance which travels forward through the medium and not the particles of the medium, the particles of the medium merely vibrate about their mean positions.

(ii) Each particle receives vibrations a little later than its preceding particle.

(iii) The velocity with which wave travels is different from the velocity of the particles with which they vibrate about their mean positions.

(iv) The wave velocity remains constant in a given medium while the particle velocity changes continuously during its vibration about mean position.

15) **2**

Electromagnetic or non-mechanical waves. The waves which do not require a material medium for their propagation are called electromagnetic waves. Such waves travel through vacuum with a speed of $3 \times 10^8 \quad m/s$.

Examples of electromagnetic waves:

(i) Light waves (ii) X-rays (iii) Radiowaves (iv) Microwaves

16) (i) Mechanical **2**

(ii) Electromagnetic waves.

17) 2

Differences between mechanical and electromagnetic waves.

Mechanical waves	**Electromagnetic waves**
1. These waves require a material medium for their propagation.	1. These waves do not require a material medium for their propagation.
2. These are caused due to vibrations of the particles of the medium.	2. These are caused due to varying electric and magnetic fields.
3. These waves have low speeds, e.g. speed of sound in air is 332 m/s at 0°C.	3. These waves travel with a very speed of $3 \times 10^8 \quad m/s$ through vacuum.
4. These waves have usually low frequency and large wavelength.	4. These waves have usually high frequency and low wavelength.
5. These can be transverse or longitudinal.	5. These are only transverse waves

18) 2

Difference between sound wave and light wave:

Sound wave	**Light wave**
1. It travels in the form of longitudinal waves.	1. It travels in the form of transverse wave.
2. It requires a medium for its propagation.	2. It does not require a medium for its propagation.
3. It travels through air with a speed of 332 m/s at 0°C	3. It travels through air with a speed of nearly $3 \times 10^8 \quad m/s$.

19) 2

(i) Transverse waves in the wire.

(ii) Longitudinal waves in the air.

20) 2

When the school bell is hit by a hammer, it begins to vibrate. The vibrating bell produces compression and rarefaction pulses, one after the other in the air. These pulses travel one behind the other as a sound wave. When the sound wave reaches our ear, it forces the tympanic membrane to vibrate and thus causing the sensation of hearing.

Section-C

21) 5

The wave velocity is the distance travelled by a wave per unit time. It remains constant in a given medium $(v = v\lambda)$. The particle velocity continuously changes with time. It is maximum at the mean position and zero at the extreme position.

22) $Wavelength = \frac{Wave \quad speed}{Frequency} = \frac{440 \quad m \quad s^{-1}}{220 \quad s^{-1}} = 2 \quad m.$ 5

23) 5

The intensity of sound wave is the amount of sound energy passing each second through a unit area. Loudness is a physiological response of the ear. It depends both on the intensity of sound and the response of the ear towards that sound.

24) Speed of sound v=344m s^{-1}

Frequencies, v_1=20Hz and v_2=20kHz=20,000 Hz

Wavelength of sound waves corresponding to 20H

$\lambda_1 = \frac{v}{v_1} = \frac{344}{20} = 17.2m$

Wavelength of sound waves corresponding to kHz,

$\lambda_2 = \frac{v}{v_2} = \frac{344}{20,000} = 0.0172m$