9th Science Lesson 8 Questions in English

8] Sound

1. Which among the following statement is incorrect regarding sound?

a) Sound is a form of energy which produces sensation of hearing in our ears
b) All sounds are produced by vibrations of substances
c) Human ear can hear all range of frequency of sound
d) The vibrations travel as disturbances in a medium and reach our ears as sound

Explanation

Human ear can hear only a particular range of frequency of sound that too with a certain range of energy. We are not able to hear sound clearly if it is below certain intensity. The quality of sound also differs from one another.

2. Which among the following medium does sound wave propagate?

a) Air
b) Steel
c) Water
d) All the above

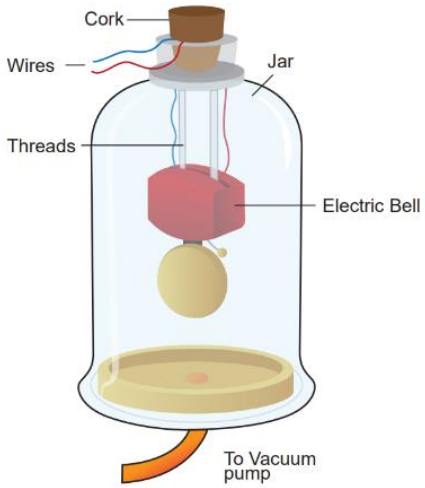
Explanation

Sound needs a material medium like air, water, steel etc., for its propagation. It cannot travel through vacuum.

3. Which among the following experiment demonstrate Sound needs a medium for propagation?

a) Light - sound experiment
b) Bell - jar experiment
c) Wave - light experiment
d) All the above

Explanation



An electric bell and an airtight glass jar are taken. The electric bell is suspended inside the airtight jar. The jar is connected to a vacuum pump. If the bell is made to ring, we will be able to hear the sound of the bell. Now, when the jar is evacuated with the vacuum pump, the air in the jar is pumped out gradually and the sound becomes feebler and feebler. We will not hear any sound, if the air is fully removed.

4. Which among the following statement is correct

1) Sound moves from the point of generation to the ear of the listener through a medium. When an object vibrates, it sets the particles of the medium around to vibrate. But the vibrating particles do not travel all the way from the vibrating object to the ear.
2) A particle of the medium in contact with the vibrating object is displaced from its equilibrium position. It then exerts a force on an adjacent particle. As a result of which the adjacent particle gets displaced from its position of rest. After displacing the adjacent particle, the first particle comes back to its original position.
3) This process continues in the medium till the sound reaches our ears. It is to be noted that both the disturbance created by a source of sound and the particles of the medium travels through the medium. All the particles of the medium carry themselves with a small to and fro motion called vibration which enables the disturbance to be carried forward.
    a) Only 2
    b) Both 1 and 2
    c) Both 1 and 3
    d) Both 2 and 3

Explanation

This process continues in the medium till the sound reaches our ears. It is to be noted that only the disturbance created by a source of sound travels through the medium not the particles of the medium. All the particles of the medium restrict themselves with only a small to and fro motion called vibration which enables the disturbance to be carried forward.

5. The sound disturbance which is carried forward in a medium is called _____

a) Particle
b) Alpha
c) Wave
d) Pitch

Explanation

The sound disturbance which is carried forward in a medium is called Wave.

6. The waves that propagates with compressions and rarefactions are _____

a) Longitudinal wave
b) Latitudinal wave
c) Both longitudinal wave
d) Isolated wave

Explanation

The waves that propagates with compressions and rarefactions are called longitudinal waves. In longitudinal waves the particles of the medium move to and fro along the direction of propagation of the wave.

7. Which among the following are the regions of low pressure where particles are spread apart?

a) Rarefaction
b) Compression
c) Convection
d) Conjunction

Explanation

Sound also is a longitudinal wave. Sound can travel only when there are particles which can be compressed and rarefied. Compressions are the regions where particles are crowded together. Rarefactions are the regions of low pressure where particles are spread apart. A sound wave is an example of a longitudinal mechanical wave.

8. Which among the following characteristic does not describe a sound wave?

a) Time period
b) Wavelength
c) Amplitude
d) Temperature

Explanation

A sound wave can be described completely by five characteristics namely amplitude, frequency, time period, wavelength and velocity or speed.

9. The SI unit of velocity of sound is _____

a) m s
b) m s^{-1}
c) m s^{-2}
d) m s^{2}

Explanation

The SI unit of velocity of sound is m $s^{-1.}$

10. Which among the following is the SI unit of time period?

a) m/s
b) s
c) m s
d) m s^{2}

Explanation

The time required to produce one complete vibration (wave or cycle) is called time period of the wave. It is denoted as T. The SI unit of time period is second (s). Frequency and time period are reciprocal to each other (T = 1 / n).

11. The distance travelled by the sound wave in one second is called ____

a) Wavelength
b) Time Period
c) Velocity
d) Frequency

Explanation

The distance travelled by the sound wave in one second is called velocity of the sound.

12. The minimum distance in which a sound wave repeats itself is called its _____

a) Amplitude
b) Wavelength
c) Frequency
d) Speed

Explanation

The minimum distance in which a sound wave repeats itself is called its wavelength. In a sound wave, the distance between the centres of two consecutive compressions or two consecutive rarefactions is also called wavelength.

13. The SI unit of wavelength is _____

a) m
b) m s
c) m s^{-1}
d) s

Explanation

The wavelength is usually denoted as λ (Greek letter, lambda). The SI unit of wavelength is metre (m).

14. The number of vibrations (complete waves or cycles) produced in one second is called ___

a) Amplitude
b) Frequency
c) Module
d) Speed

Explanation

The number of vibrations (complete waves or cycles) produced in one second is called frequency of the wave. It is denoted as n.

15. The SI unit of frequency is ____

a) Hertz
b) Joule
c) Newton
d) Pascal

Explanation

The SI unit of frequency is s^{-1} (or) hertz (Hz).

16. The maximum displacement of the particles of the medium from their original undisturbed positions, when a wave passes through the medium is called _____

a) Wavelength
b) Frequency
c) Amplitude
d) Speed

Explanation

The maximum displacement of the particles of the medium from their original undisturbed positions, when a wave passes through the medium is called amplitude of the wave. If the vibration of a particle has large amplitude, the sound will be loud and if the vibration has small amplitude, the sound will be soft.

17. The SI unit of Amplitude is _____

a) m
b) s
c) s^{-1}
d) m^{-1}

Explanation

Amplitude is denoted as A. Its SI unit is meter (m).

18. What is the frequency up to which human ear can hear?

a) 10 Hz to 10,000 Hz
b) 20 Hz to 20,000 Hz
c) 10Hz to 20,000 Hz
d) 15Hz to 25,000 Hz

Explanation

Human ear can hear sound of frequency from 20 Hz to 20,000 Hz. Sound with frequency less than 20 Hz is called infrasonic sound. Sound with frequency greater than 20,000 Hz is called ultrasonic sound. Human beings cannot hear infrasonic and ultrasonic sounds.

19. What are the factors that can distinguish sound from one another in terms of the how many factors?

a) Loudness
b) Pitch
c) Timber
d) All the above

Explanation

Sounds can be distinguished from one another in terms of the following three different factors. 1. Loudness 2. Pitch 3. Timbre (or quality).

20. Which is one of the characteristics of sound by which we can distinguish whether a sound is shrill or base?

a) Loudness
b) Intensity
c) Pitch
d) Timbre

Explanation

Pitch is one of the characteristics of sound by which we can distinguish whether a sound is shrill or base. High pitch sound is shrill and low pitch sound is flat. Two music sounds produced by the same instrument with same amplitude, will differ when their vibrations are of different frequencies.

21. A sound of single frequency is called ____

a) Tone
b) Note
c) Chorus
d) All the above

Explanation

Timbre is the characteristic which distinguishes two sounds of same loudness and pitch emitted by two different instruments. A sound of single frequency is called a tone and a collection of tones is called a note. Timbre is then a general term for the distinguishable characteristics of a tone.

22. Which among the following statement is correct?

1) Loudness is a quantity by virtue of which a sound can be distinguished from another one, both having the same frequency. Loudness or softness of sound depends on the amplitude of the wave.
2) If we strike a table lightly, we hear a soft sound because we produce a sound wave of less amplitude. If we hit the table hard, we hear a louder sound. Loud sound can travel a longer distance as loudness is associated with higher energy. A sound wave spreads out from its source. As it moves away from the source its amplitude decreases and thus its loudness decreases
3) The loudness of a sound depends on the intensity of sound wave. Intensity is defined as the amount of energy crossing per unit area per unit time parallel to the direction of propagation of the wave.
    a) Both 1 and 2
    b) Both 1 and 3
    c) Both 2 and 3
    d) All 1, 2 and 3

Explanation

The loudness of a sound depends on the intensity of sound wave. Intensity is defined as the amount of energy crossing per unit area per unit time perpendicular to the direction of propagation of the wave.

23. Which among the following equation defines speed of sound?

a) Distance × Time
b) Distance / Time
c) Time / Distance
d) None of the above

Explanation

The speed of sound is defined as the distance travelled by a sound wave per unit time as it propagates through an elastic medium.

Speed (v) = Distance / Time.

24. If the distance travelled by one wave is taken as one wavelength (λ), and the time taken for this propagation is one time period (T), then speed is ___

a) v = T / λ
b) v = λ / T
c) v = T λ
d) v = 1 / λ T

Explanation

If the distance traveled by one wave is taken as one wavelength (λ), and the time taken for this propagation is one time period (T), then

Speed (v) = One wavelength (λ) / One time period (T) (or) v = λ / T

As, T = 1 n, the speed (v) of sound is also written as, v = n λ.

25. A sound wave has a frequency of 2 kHz and wavelength of 15 cm. How much time will it take to travel 1.5 km?

a) t = 10 s
b) t = 5 s
c) t = 20 s
d) t = 15 s

Explanation

Speed, v = n λ

Here, n = 2 kHz = 2000Hz

λ = 15 cm = 0.15 m

v = 0.15 × 2000 = 300 m s^{-1}

Time (t) = Distance (d) / Velocity (v)

t = 1500 300 = 5 s

The sound will take 5 s to travel a distance of 1.5 km.

26. Which among the following statement is correct

a) **Sound travels with a speed which is much less than the speed of light**
b) Sound travels with a speed which is much more than the speed of light
c) Both sound and light travel at the same speed
d) None of the above

Explanation

Sound propagates through a medium at a finite speed. The sound of thunder is heard a little later than the flash of light is seen. So, we can make out that sound travels with a speed which is much less than the speed of light. The speed of sound depends on the properties of the medium through which it travels.

27. Which among the following statement is correct

1) The speed of sound is less in gaseous medium compared to solid medium.
2) The speed of sound is more in gaseous medium compared to solid medium.
3) In any medium the speed of sound increases if we decrease the temperature of the medium.
4) In any medium the speed of sound increases if we increase the temperature of the medium.

a) Both 1 and 3
b) Both 2 and 3
c) **Both 1 and 4**
d) Both 2 and 4

Explanation

The speed of sound is less in gaseous medium compared to solid medium. In any medium the speed of sound increases if we increase the temperature of the medium. For example, the speed of sound in air is 330 ms^{-1} at 0 °C and 340 ms^{-1} at 25 °C. The speed of sound at a particular temperature.

State	Medium	Speed in ms^{-1}
Solids	Aluminum	6420
	Nickel	6040
	Steel	5960
	Iron	5950
	Brass	4700
	Glass	3980
Liquids	Water (Sea)	1531
	Water (distilled)	1498
	Ethanol	1207
	Methanol	1103
Gases	Hydrogen	1284
	Helium	965
	Air	340
	Oxygen	316
	Sulphur dioxide	213

28. When the speed of any object exceeds the speed of sound in air (330 ms^{-1}) it is said to be travelling at what?

a) Sonic speed
b) Supersonic speed
c) Mega sonic
d) Sonic mass

Explanation

When the speed of any object exceeds the speed of sound in air (330 ms^{-1}) it is said to be travelling at supersonic speed. Bullets, jet, aircrafts etc., can travel at supersonic speeds.

29. When an object travels at a speed higher than that of sound in air, it produces shock waves. The air pressure variations associated with this type of shock waves produce a very sharp and loud sound called _____

a) Sonic mass
b) Sonic velocity
c) Sonic crust
d) Sonic boom

Explanation

When an object travels at a speed higher than that of sound in air, it produces shock waves. These shock waves carry a large amount of energy. The air pressure variations associated with this type

of shock waves produce a very sharp and loud sound called the 'sonic boom'. The shock waves produced by an aircraft have energy to shatter glass and even damage buildings.

30. Which among the following factor the intensity of sound heard at a place doesn't depend on?

a) Amplitude of the source
b) Surface area of the source
c) Density of the medium
d) Temperature of the source

Explanation

The intensity of sound heard at a place depends on the following five factors. I) Amplitude of the source. ii) Distance of the observer from the source. iii) Surface area of the source. iv) Density of the medium and v) Frequency of the source.

31. Which among the following statement is correct

1) Sound travels about 5 times faster in water than in air. Since the speed of sound in sea water is very large (being about 1530ms^{-1} which is more than 5500km/h^{-1}), two whales in the sea which are even hundreds of kilometres away can talk to each other very easily through the sea water.
2) Sound bounces off a surface of solid or a liquid medium like a rubber ball that bounces off from a wall. An obstacle of large size which may be polished or rough is needed for the reflection of sound waves.
3) The laws of reflection are: • The angle in which the sound is incident is greater to the angle in which it is reflected. • Direction of incident sound, the reflected sound and the normal are in the perpendicular plane to each other.
    a) Both 1 and 2
    b) Both 1 and 2
    c) Both 2 and 3
    d) All 1, 2 and 3

Explanation

The laws of reflection are: • The angle in which the sound is incident is equal to the angle in which it is reflected. • Direction of incident sound, the reflected sound and the normal are in the same plane.

32. Which among the following statement is correct

1) Megaphones, loud speakers, horns, musical instruments such as nathaswaram, shehnai and trumpets are all designed to send sound in a particular direction without spreading it in all directions. In these instruments, a tube followed by a conical opening reflects sound

successively to guide most of the sound waves from the source in the forward direction towards the audience.

2) Stethoscope is a medical instrument used for listening to sounds produced in the body. In stethoscopes, these sounds reach doctor's ears by multiple reflections that happen in the connecting tube.
    a) Only 1
    b) Only 2
    c) Both 1 and 2
    d) None

33. The sensation of sound persists in our brain for about how many seconds?

a) 0.05 s
b) 0.1 s
c) 1.5 s
d) 0.5 s

Explanation

When we shout or clap near a suitable reflecting surface such as a tall building or a mountain, we will hear the same sound again a little later. This sound which we hear is called an echo. The sensation of sound persists in our brain for about 0.1 s. Hence, to hear a distinct echo the time interval between the original sound and the reflected sound must be at least 0.1s.

34. Let us consider the speed of sound to be 340 ms^{-1} at 25° C. The sound must go to the obstacle and return to the ear of the listener on reflection after 0.1s. The total distance covered by the sound from the point of generation to the reflecting surface and back should be at least what distance?

a) 34 m
b) 340 m
c) 0.34 m
d) 3.4 m

Explanation

The total distance covered by the sound from the point of generation to the reflecting surface and back should be at least 340 ms^{-1} × 0.1 s = 34 m.

Thus, for hearing distinct echoes, the minimum distance of the obstacle from the source of sound must be half of this distance i.e. 17 m. This distance will change with the temperature of air. Echoes may be heard more than once due to successive or multiple reflections. The roaring of thunder is due to the successive reflections of the sound from a number of reflecting surfaces, such as the clouds at different heights and the land.

35. What is the wavelength of a sound wave in air at 20° C with a frequency of 22 MHz?

a) 12.13 µm
b) 15.64 µm
c) 17.27 µm
d) 18.26 µm

Explanation

$\lambda = v/n$

Here, $v = 344\ ms^{-1}$.

$n = 22\ MHz = 22 \times 106\ Hz$

$\lambda = 344/22 \times 10^6 = 15.64 \times 10^{-6}\ m = 15.64\ \mu m$.

36. The repeated reflection that results in this persistence of sound is called ____

a) Vibration
b) Conjunction
c) Reverberation
d) Bi junction

Explanation

A sound created in a big hall will persist by repeated reflection from the walls until it is reduced to a value where it is no longer audible. The repeated reflection that results in this persistence of sound is called reverberation.

37. Which among the following sound absorbing material used to reduce reverberation in roof and walls?

a) Compressed fibreboard
b) Rough plaster
c) Draperies
d) All the above

Explanation

In an auditorium or big hall excessive reverberation is highly undesirable. To reduce reverberation, the roof and walls of the auditorium are generally covered with sound absorbing materials like compressed fibreboard, flannel cloths, rough plaster and draperies. The seat materials are also selected on the basis of their sound absorbing properties.

38. Which branch of the physics takes the aspects of sound in to account while designing auditoria, opera halls, theatres etc?

a) Optics

b) Acoustic
c) Relativity
d) All the above

Explanation

There is a separate branch in physics called acoustics which takes the aspects of sound in to account while designing auditoria, opera halls, theatres etc.

39. Which among the following animals doesn't use echolocation to identify and locate objects?

a) Rats
b) Hyena
c) Bats
d) Dolphins

Explanation

Animals, such as bats, dolphins, rats, whales and oil birds, use echolocation, an ultrasound technique that uses echoes to identify and locate objects. Echolocation allows bats to navigate through dark caves and find insects for food. Dolphins and whales emit a rapid series of underwater clicks in ultrasonic frequencies to locate their prey and navigate through water.

40. A man fires a gun and hears its echo after 5 s. The man then moves 310 m towards the hill and fires his gun again. If he hears the echo after 3 s, calculate the speed of sound?

a) 155 ms^{-1}
b) 310 ms^{-1}
c) 620 ms^{-1}
d) 775 ms^{-1}

Explanation

Distance (d) = velocity (v) × time (t)

Distance travelled by sound when gun fires first time, $2d = v \times 5$ ------ (1)

Distance travelled by sound when gun fires second time, $2d - 620 = v \times 3$ -------- (2)

Rewriting equation (2) as,

$2d = (v \times 3) + 620$ ------- (3)

Equating (1) and (3), $5v = 3v + 620$

$2v = 620$

Velocity of sound, v = 310 ms^{-1}

41. Ultrasonic sound is the term used for sound waves with frequencies greater than what?

a) 10,000 Hz
b) 15,000 Hz
c) 20,000 Hz
d) 25,000 Hz

Explanation

Ultrasonic sound is the term used for sound waves with frequencies greater than 20,000Hz. These waves cannot be heard by the human ear, but the audible frequency range for other animals includes ultrasound frequencies. For example, dogs can hear ultrasonic sound. Ultrasonic whistles are used in cars to alert deer to oncoming traffic so that they will not leap across the road in front of cars.

42. Which among the following statement is incorrect

1) An important use of ultrasound is in examining inner parts of the body. The ultrasonic waves allow different tissues such as organs and bones to be 'seen' or distinguished by bouncing of ultrasonic waves by the objects examined.
2) The waves are detected, analysed and stored in a computer. A sonogram is an image obtained by the use of reflected ultrasonic waves. It is used as a medical diagnostic tool. Ultrasonic sound is having application in marine surveying also.
    a) Only 1
    b) Only 2
    c) Both 1 and 2
    d) None

Explanation

The waves are detected, analysed and stored in a computer. An echogram is an image obtained by the use of reflected ultrasonic waves. It is used as a medical diagnostic tool. Ultrasonic sound is having application in marine surveying also.

43. Which among the following statement is correct

1) Ultrasounds can be used in cleaning technology. Minute foreign particles can be removed from objects placed in a liquid bath through which ultrasound is passed. Ultrasounds can also be used to detect cracks and flaws in metal blocks.
2) Ultrasonic waves are made to reflect from various parts of the heart and form the image of the heart. This technique is called 'sonogram'. Ultrasound may be employed to break small 'stones' formed in the kidney into fine grains. These grains later get flushed out with urine.
    a) Only 1
    b) Only 2
    c) Both 1 and 2

d) None

Explanation

Ultrasonic waves are made to reflect from various parts of the heart and form the image of the heart. This technique is called 'echo cardiography'. Ultrasound may be employed to break small 'stones' formed in the kidney into fine grains. These grains later get flushed out with urine.

44. Which is a device that uses ultrasonic waves to measure the distance, direction and speed of underwater objects?

a) Quadrat
b) Megger
c) Sonar
d) Load cell

Explanation

SONAR stands for Sound Navigation and Ranging. Sonar is a device that uses ultrasonic waves to measure the distance, direction and speed of underwater objects.

45. Which among the following statement is incorrect

1) Sonar consists of a transmitter and a detector and is installed at the bottom of boats and ships. The transmitter produces and transmits ultrasonic waves. These waves travel through water and after striking the object on the seabed, get reflected back and are sensed by the detector.
2) The detector converts the ultrasonic waves into electrical signals which are appropriately interpreted. The distance of the object that reflected the sound wave can be calculated by knowing the speed of sound in water and the time interval between transmission and reception of the ultrasound.
3) Let the time interval between transmission and reception of ultrasound signal be 't'. Then, the speed of sound through sea water is v /t = 2d. This method is called echo-ranging. Sonar technique is used to determine the depth of the sea and to locate underwater hills, valleys, submarine, icebergs etc.

a) Only 2
b) Only 3
c) Both 1 and 2
d) Both 1 and 3

Explanation

Let the time interval between transmission and reception of ultrasound signal be 't'. Then, the speed of sound through sea water is 2d /t = v. This method is called echo-ranging. Sonar technique

is used to determine the depth of the sea and to locate underwater hills, valleys, submarine, icebergs etc.

46. A ship sends out ultrasound that returns from the seabed and is detected after 3.42 s. If the speed of ultrasound through sea water is 1531ms^{-1}, what is the distance of the seabed from the ship?

a) 10476 m
b) 5236 m
c) 2618 m
d) 1309 m

Explanation

We know, distance = speed × time

2d = speed of ultrasound × time

2d = 1531 × 3.42

∴ d = 5236 / 2 = 2618 m

Thus, the distance of the seabed from the ship is 2618 m or 2.618 km.

47. Which among the following statement is correct

1) The electrocardiogram (ECG) is one of the simplest and oldest cardiac investigations available. It can provide a wealth of useful information and remains an essential part of the assessment of cardiac patients. In ECG, the sound variation produced by heart is converted into chemical signals.
2) Thus, an ECG is simply a representation of the chemical activity of the heart muscle as it changes with time. Usually it is printed on paper for easy analysis. The sum of this chemical activity, when amplified and recorded for just a few seconds is known as an ECG.
    a) Only 1
    b) Only 2
    c) Both 1 and 2
    d) None

Explanation

The electrocardiogram (ECG) is one of the simplest and oldest cardiac investigations available. It can provide a wealth of useful information and remains an essential part of the assessment of cardiac patients. Thus, an ECG is simply a representation of the electrical activity of the heart muscle as it changes with time. Usually it is printed on paper for easy analysis. The sum of this electrical activity, when amplified and recorded for just a few seconds is known as an ECG.

48. The outer ear is called _____

a) **Pinna**
b) Tympanic
c) Cochlea
d) Jaw

Explanation

The outer ear is called 'pinna'. It collects the sound from the surroundings. The collected sound passes through the auditory canal.

49. Ear allows us to convert pressure variations in air with audible frequencies into what signals that travel to the brain via the auditory nerve?

a) Chemical signal
b) Electric signal
c) Mechanical signal
d) None of the above

Explanation

We are able to hear with the help of an extremely sensitive device called the ear. It allows us to convert pressure variations in air with audible frequencies into electric signals that travel to the brain via the auditory nerve.

50. Which among the following is located at the end of the ear?

a) Helix
b) Earlobe
c) Eardrum
d) All the above

Explanation

At the end of the ear is eardrum or tympanic membrane. When a compression of the medium reaches the eardrum the pressure on the outside of the membrane increases and forces the eardrum inward. Similarly, the eardrum moves outward when a rarefaction reaches it. In this way the eardrum vibrates.

51. Which among the following is not the bone in the middle ear which amplifies the vibration?

a) Hammer
b) Phalange
c) Anvil
d) Stirrup

Explanation

The vibrations are amplified several times by three bones (the hammer, anvil and stirrup) in the middle ear. The middle ear transmits the amplified pressure variations received from the sound wave to the inner ear.

52. In the inner ear, the pressure variations are turned into electrical signals by what?

a) Helix
b) Earlobe
c) Cochlea
d) Phalange

Explanation

In the inner ear, the pressure variations are turned into electrical signals by the cochlea. These electrical signals are sent to the brain via the auditory nerve and the brain interrupts them as sound.