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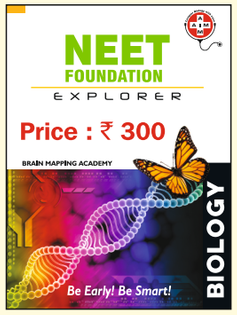

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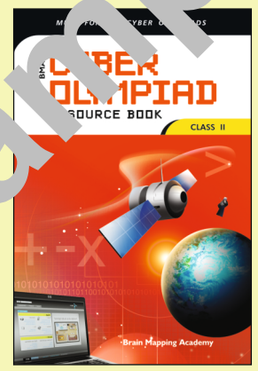

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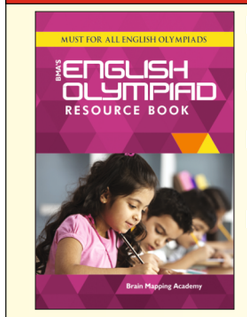

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Publisher's Note

Sometimes the understanding of fundamental concepts alone does not help the students to crack the competitive exams as most of them are objective in structure. Students need rigorous training to familiarize themselves to the style of the exams they are attempting. The board exams which are of qualifying, but not competitive nature do not completely address the needs of students in testing them in objective type format.

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This book will cater all the requirements of the students who are approaching national/state level talent search examinations and also Olympiad exams. This book also complements the additional preparation needs of the students for the regular board exams.

We took utmost care to make this the best resource book available for the talent /olympiad exams aspirants. We welcome criticism from the students, teacher community and educators, especially concerning any errors and deficiencies which may have remained in this edition and the suggestions for improvement for the next edition.

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Aim of these examinations

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For Classes 6 to 10

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Critical Thinking	:	05 mark

UIMO

For Classes 1 & 2

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Logical Reasoning	:	Marks

For Classes 3 to

Mathematics	:	35 marks
Logical Reasoning	:	10 Marks
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CHAPTER 03

Sound

Synopsis

- Sound is a form of energy that produces sensation of hearing in our ears.
- Sound is produced when a body vibrates.
- Sound needs a medium to travel. It cannot travel in vacuum.
- Sound travels faster in solid medium (like wood) as compared to water and air.
- All musical instruments have vibrating parts, which produce sound.
- In human beings, sound is produced by the voice box or the larynx.
- We hear through the vibration of our eardrum, whenever sound reaches our ears.
- The number of oscillations per second is called the frequency of oscillation (f) and is expressed in hertz (Hz). A frequency of 1 Hz is one oscillation per second.
- The time needed to complete one oscillation is called the period (T). Hence, the number of oscillations per unit time is the frequency of wave = 1/T.
- The maximum displacement of the wave from the central position on either side is called its amplitude.
- We differentiate sounds on the basis of their amplitudes and frequencies.
- A human being can hear sound waves within a range of 20 Hz to 20,000 Hz. Some animals like dogs can hear sounds higher than 20,000 Hz.
- The larger the amplitude of vibration, the louder is the sound.
- Loudness of sound is proportional to the square of the amplitude of the vibration producing the sound. The loudness is expressed in a unit called decibel (dB).
- Shrillness of the pitch of a sound depends upon its frequency. Higher the frequency, higher is the pitch and vice-versa.
- Unwanted, unpleasant sound is noise. Loud noise produces noise pollution, which is harmful and may cause hearing impairment.
- The velocity of sound in air is approx. 330 m s^{-1} under standard temperature and pressure conditions. It varies with temperature, pressure, humidity and density of medium.

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Level - 1

[Each question has only one correct option]

01 What happens when sound travels in a medium ?

(A) The particles of the medium travel.

(B) The source travels.

(C) The disturbance travels.

(D) The medium travels.

02 In human beings sound is produced by

(A) larynx. (B) wind pipe.

(C) eardrum. (D) lungs.

03 Sound travels the fastest in

(A) air. (B) water.

(C) steel. (D) vacuum.

04 The difference in the voices of men, women and children is due to difference in

(A) larynx. (B) lung.

(C) vocal cords. (D) wind pipe.

05 Which one represents hertz ?

(A) Second (B) Second^{-1}

(C) Metre (D) Metre^{-1}

06 On what factors does the loudness or intensity of sound depend ?

(A) The amplitude of a sound wave

(B) The area of a vibrating body

(C) Distance from the source of sound

(D) All of the

07 The pitch of sound depends on its

(A) frequency (B) amplitude.

(C) loudness. (D) distance.

08 Birds produce sound by

(A) vocal cords. (B) larynx.

(C) glottis. (D) syrinx.

09 Find the difference between a musical sound and noise.

(A) Amplitude (B) Loudness

(C) Vibrations (D) All of these

10 Identify the nerve that carries the signals from the ear to the brain.

(A) The auditory nerve

(B) The optic nerve

(C) The motor nerve

(D) The spinal cord

11 Which one produces sound in humans?

(A) The eardrum

(B) The auditory nerve

(C) The cochlear cortex

(D) The vocal cords

12 What happens to the pitch, when we tighten the strings of a guitar ?

(A) It increases

(B) It decreases

(C) It remains the same

(D) It may increase or decrease

13 What is the number of vibrations made by a body in one second called ?

(A) Frequency (B) Wavelength

(C) Loudness (D) Pitch

14 Which instrument always produces vibrations of the same frequency ?

(A) A speaker (B) A bell jar

(C) An electric bell (D) A tuning fork

15 How is a musical note characterised by ?

(A) Loudness (B) Pitch

(C) Timbre (D) All of these

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Level - 1

[Each question has only one correct option]

16 **On what factors does the frequency of sound depend in wind instruments ?**

(A) The length of the air column

(B) The breadth of the air column

(C) The force with which the wind is blown

(D) All of these

17 **A bomb explodes on the moon. How long will it take for the sound to reach the earth ?**

(A) 10 seconds

(B) 1000 seconds

(C) 1 day

(D) Sound will not be heard

18 **Which one is expressed in decibels**

(A) Loudness and amplitude of sound

(B) Loudness and pitch of sound

(C) Amplitude and pitch of sound

(D) Frequency of sound

19 **The brain interprets the frequency of a sound by**

(A) loudness of sound

(B) amplitude of sound

(C) pitch of sound

(D) both (A) and (B)

20 **A person can hear an approaching train when he presses his ear to the railway track faster than one who simply stands on the tracks due to**

(A) vibration of railway tracks.

(B) vibration of air.

(C) more speed in solids.

(D) hearing ability of the man.

21 **A person's voice can be identified by its**

(A) amplitude (B) pitch

(C) loudness (D) both (A) &(B)

22 **Noise pollution in human beings causes**

(A) insomnia.

(B) hypertension.

(C) hearing impairment.

(D) all of the above

23 **An object oscillates 10 times in one second. What is its frequency ?**

(A) 0.2 Hz (B) 0.02 Hz

(C) 0.002 Hz (D) 50 Hz

24 **Flash and thunder are produced simultaneously. But thunder is heard a few seconds after the flash is seen as the speed of**

(A) sound is greater than the speed of light.

(B) sound is equal to the speed of light.

(C) light is greater than the speed of sound.

(D) all of these

25 **Which frequency of sound cannot be heard by human beings ?**

(A) 1000 Hz (B) 10,000 Hz

(C) 100 Hz (D) 1,00,000 Hz

26 **The three delicate bones in the middle ear of humans are**

(A) pinna, anvil and cochlea.

(B) hammer, anvil and cochlea.

(C) pinna, eardrum and anvil.

(D) hammer, anvil and stirrup.

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Level - 2

[Each question has only one correct option]

27 **The sound of a girl's scream is of**

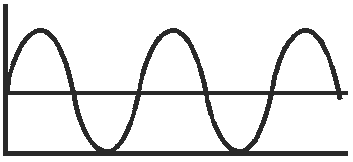
(A) low pitch, low frequency.

(B) low pitch, high frequency.

(C) high pitch, low frequency.

(D) high pitch, high frequency.

28 **When a tuning fork was struck and brought near a bucket of water, a wave as shown in the figure was formed on its surface.**



If the fork is struck harder and brought near the surface, what will increase?

(A) Frequency (B) Wavelength

(C) Velocity (D) Amplitude

29 **When the length of the scale protruding out of table is changed and then vibrated, different frequencies of sound are produced due to change in**

(A) length (B) velocity

(C) amplitude (D) all of these

30 **Which one is true of a body vibrating with a higher frequency of 20,000 Hz ?**

(A) It does not always produce sound.

(B) Shrill sounds are produced, which human beings can hear.

(C) Dolphins can hear the sound.

(D) All of these

31 **Find the time period of a sound wave whose frequency is 400 Hz.**

(A) 0.0025 s (B) 0.0035 s

(C) 0.0045 s (D) 0.0055 s

32 **In a stethoscope, how does the sound of heart beat travel through its tube ?**

(A) By bending along the tube

(B) In a straight line

(C) By undergoing multiple reflections

(D) As ultrasonic frequency

33 **The frequency of a source is 15 kHz. What will be the frequency of the sound wave produced by it in water and air?**

(A) is the same as that of the source.

(B) Frequency in water will be more than that in air

(C) Frequency in air will be more than that in water.

(D) Depends upon the velocities of sound in these media.

34 **An object vibrates with a frequency of 15 Hz. Identify a true statement.**

(A) It produces sound which we can hear.

(B) It does not produce sound.

(C) It produces sound which we cannot hear.

(D) It produces sound which we can hear if we strain our ears.

35 **Time taken for 10 oscillations by a body is 20 seconds, then its time period is**

(A) 1 second. (B) 2 second.

(C) 3 second. (D) 4 second.

36 **Frequency of a sound is 10 Hz, then it is called _____ sound.**

(A) Ultrasonic (B) Infrasonic

(C) Audible (D) Supersonic

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Stimulating Questions

37 **If the frequency of the ultrasound is doubled, what is the effect, if any, on the speed ?**

38 **What is stereophonic hearing and how does it occur in our body ?**

39 **Identify the speed of sound in solids, liquids and gases in ascending order.**

(A) Gas > liquid > solid

(B) Liquid > gas > solid

(C) Liquid > solid > gas

(D) Gas > liquid > gas

40 **A child plays a note on a trumpet. She then plays a louder note of higher pitch. How do the amplitude and frequency of the second sound compare with the first ?**

	Amplitude of 2nd sound	Frequency of 2nd sound
(A)	Larger	Higher
(B)	Larger	Lower
(C)	Smaller	Higher
(D)	Smaller	Lower

41 **In an experiment to determine the speed of sound, a gun was fired and an observer at a distance away measured the time interval between seeing the flash of the gun and hearing the shot. Which quantity will not affect the result ?**

(A) The frequency of the gunshot.

(B) The loudness of the gunshot.

(C) The temperature of the environment.

(D) Both (A) and (B)

Previous Contest Questions

[Each question has only one correct option]

42 **Identify the correct speed of sound in ascending order.**

(A) Oxygen, mud, water

(B) Ice, stone, alcohol

(C) Fruit juice, iron, air

(D) Steam, ink, copper

43 **We can hear sound when a ball strikes the floor because the**

(A) air particles from the floor do not flow into our ears.

(B) air particles from the floor flow through the air into our ears.

(C) sound wave is not large enough to produce the vibrations.

(D) both (A) and (B)

44 **Identify the similarity and difference between a low-pitch sound and a high-pitch sound produced by the same instrument.**

	Similarity	Difference
(A)	Speed	Frequency
(B)	Wavelength	Frequency
(C)	Frequency	Wavelength
(D)	Frequency	Speed

45 **Identify an application of ultrasound.**

(A) To scan the womb

(B) To break kidney, gall stones.

(C) To detect flaws in metals.

(D) All the three.

46 **How does a whistle produce sound ?**

(A) The body of whistle stores air.

(B) The vibrations in air.

(C) The person produces vibrations.

(D) All of these

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