SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

SOUND

Class 09 - Science

Time Allowed: 3 hours **Maximum Marks: 121**

Section A

1. In the experiment for determining the velocity of a pulse propagating along the length of string, we prefer a long thick cotton string: **[1]**

   a) because pulse cannot be formed in a thin short string
   b) so that pulse may move through it easily
   c) because cotton string is cheap and easily available
   d) So that time taken by pulse to move from one end to string to other may be accurately determined.

2. On which of the following factor the speed of propagation of pulse in a slinky does not depend? **[1]**

   a) Room temperature
   b) Dimensions of slinky
   c) Length of slinky
   d) Material of slinky

3. The penetrating power of ultrasonic waves and other audible sounds are given as f_1 and f_2 respectively. Then **[1]**

   a) $f_1 > f_2$
   b) $f_1 = 2f_2$
   c) $f_1 < f_2$
   d) $f_1 = f_2$

4. A pulse is formed **[1]**

   a) in a small part of the medium
   b) in vacuum
   c) in a large part of the medium
   d) in all of the these

5. Sound travels in air if **[1]**

   a) there is no moisture in the atmosphere
   b) both particles as well as disturbance travel from one place to another
   c) disturbance moves
   d) particles of medium travel from one place to another

6. The types of wave produced by sound in air: **[1]**

   a) Electro magnetic wave
   b) Transverse wave
   c) Longitudinal wave
   d) Radio waves

7. Which of the following is used in echocardiography? **[1]**

   a) X-Ray waves
   b) Infrasound waves
   c) Both Ultrasound waves and X-Ray waves
   d) Ultrasound waves

8. Light is a: **[1]**

a) Transverse wave
b) Longitudinal wave
c) None
d) Both

9. SI unit of frequency is: **[1]**

a) $(second)^2$
b) second
c) $(second)^{-2}$
d) hertz

10. In compression, the density of the particles: **[1]**

a) Decreases
b) May be increased or decrease depending upon disturbance
c) Remains the same
d) Increases

11. Sound of crackers is heard during festival days, but the sound of supernova explosion in space is not heard on the surface of earth because of **[1]**

a) lesser gravity
b) the influence of the other planets
c) large distance
d) absence of medium

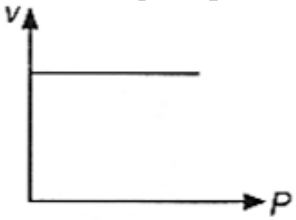
12. Speed of light or electromagnetic wave is higher than that of the speed of sound in air by **[1]**

a) 10^7 times
b) 10^6 times
c) 10^8 times
d) 10^5 times

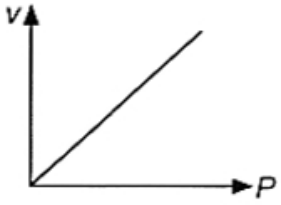
13. The distance between two consecutive compression of a sound wave is 5 cm. Then the wavelength of the wave is equal to **[1]**

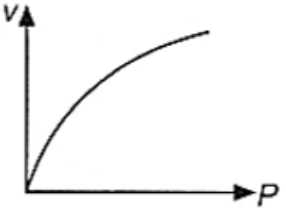
a) 2.5 cm
b) 20 cm
c) 10 cm
d) 5 cm

14. A student plotted the following four graphs representing the variation of velocity v of sound in a gas with the pressure P for a given temperature. Which one is correct? **[1]**

a) 

b) 

c) 

d) 

15. Frequency of ultrasonic wave is: **[1]**

a) Greater than 2 MHz
b) Greater than 20 Hz
c) Greater than 2 Hz
d) Greater than 20,000 Hz

16. The terms ultrasonic, supersonic and infrasonic mean **[1]**

a) increasing frequency

b) different parameters and so cannot be related

c) increasing loudness

d) decreasing frequency

17. A stone is dropped from the top of a tower of 125 m high into a pond which is at base of the tower. When will the splash be heard at the top? (Given g = 10 m s^{-2} and speed of sound = 340 m s^{-1}.) **[1]**

a) 5.36 s

b) 0.36 s

c) 5 s

d) 2 s

18. When a pulse is sent through slinky/string, the physical quantity that travels along its length is: **[1]**

a) speed

b) wavelength

c) frequency

d) energy

19. In the experiment of finding speed of a pulse propagated through a slinky, the pulse is produced. **[1]**

a) by giving a jerk to slinky in a direction Perpendicular to its length.

b) by giving a jerk to slinky in vertically upward direction.

c) by pushing the slinky so as to compress it.

d) by pulling the slinky towards us.

20. In a wave motion in string, every particle: **[1]**

a) displaces from one end to the other end

b) does not displace at all

c) oscillates

d) does not oscillate

21. **Assertion (A):** The amplitude of a wave is the same as the amplitude of the vibrating body producing the wave. **[1]**
Reason (R): The loudness or softness of a sound is determined by its amplitude.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

22. **Assertion (A):** Two persons on the surface of moon cannot talk to each other. **[1]**
Reason (R): There is no atmosphere on moon.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

23. **Assertion (A):** The flash of lightning is seen before the sound of thunder is heard. **[1]**
Reason (R): Speed of sound is greater than speed of light.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

24. **Assertion (A):** Waves produced by a motorboat sailing in water are both longitudinal and transverse in nature. **[1]**
Reason (B): The longitudinal and transverse waves cannot be produced simultaneously.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

25. **Assertion (A):** The quality of sound enables us to distinguish one sound from another having the same pitch and loudness. **[1]**

Reason (R): The sound which is more pleasant is said to be of a low quality.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

26. **Assertion (A):** Waves produced in a cylinder containing a liquid by moving its piston back and forth are longitudinal waves. **[1]**

Reason (R): In longitudinal waves, the particles of the medium oscillate parallel to the direction of propagation of the wave.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

27. **Assertion (A):** Sound needs a material medium for their propagation. **[1]**

Reason (R): Sound waves are mechanical waves.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

28. **Assertion (A):** A sound is a form of energy that travels in the form of waves. **[1]**

Reason (R): The disturbance which moves through a medium when the particles of the medium set the neighbouring particles into motion is known as a wave.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

29. **Assertion (A):** Echo is produced when sound is incident on hard and polished surface. **[1]**

Reason (R): Sound energy can be totally reflected by objects with soft and loose texture.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

30. **Assertion (A):** The speed of sound in solids is maximum though their density is large. **[1]**

Reason (R): The coefficient of elasticity of solid is large.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

31. The correct statement in the following is: **[1]**

A. Sound waves are longitudinal and light waves are transverse

B. Sound waves and light waves are both longitudinal waves

C. Sound waves are transverse and light waves are longitudinal

D. Both sound waves and light waves are transverse

a) (B) b) (A)

c) (C) d) (D)

32. Which of the following is incorrect- **[1]**

A. SI Unit of frequency is hertz

B. SI Unit of wavelength is ms^{-1}

C. SI Unit of velocity is ms^{-2}

D. SI unit of time period is sec

a) A and B are incorrect b) A, B and C are incorrect

c) B and C are incorrect d) All of these

33. Which of the following statement is true? **[1]**

A. The frequency of man's voice more than that of woman's voice.

B. Repeated claps of thunder in quick succession are called rolling of thunder.

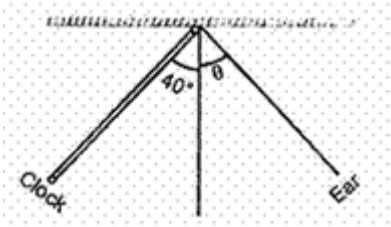
C. Timbre is a typical feature of a sound which enables us to distinguish between the sounds of same loudness and pitch.

a) Both statement (B) and (C) b) Only statement (B)

c) Only statement (C) d) Only statement (A)

34. A person clapped his hands near a cliff and heard the echo after 2s. What is the distance of the cliff from the person if the speed of the sound, v is taken as 346 ms^{-1}? **[1]**

35. In the experiment on studying the laws of reflection of sound, the tube facing the clock is placed as shown. The position of the second tube, at which the ear will get the best reflected sound, is obtained when θequals: **[1]**



36. A stone is thrown in a pond. 12 Full ripples are produced in 1 second. If the distance between a crest and a trough is 10 cm, calculate the wavelength and velocity of the wave. **[1]**

37. Calculate the wavelength of a sound wave whose frequency is 220 Hz and speed is 440 m/s in a given medium. **[1]**

38. An echo is heard in 3 s. What is the distance of the reflecting surface from the source, given that the speed of sound is 342 m s^{-1}? **[1]**

39. What is one complete oscillation? **[1]**

40. If a freely suspended vertical spring is pulled in downward direction and then released, which type of waves are produced in the spring? **[1]**

41. Guess which sound has a higher pitch: guitar or car horn? **[1]**

42. The sound produced by a thunderstorm is heard 10 s after the lightning is seen. Calculate the approximate distance of the thunder cloud. (Given the speed of sound = 340 ms^{-1}) **[1]**

43. What do you mean by a wave? **[1]**

44. Among air, water and steel, in which medium, the sound wave will travel faster? **[1]**

45. What is the audible range of the average human ear? **[1]**

46. What is intensity of sound? **[1]**

47. What is the range of frequencies associated with **[1]**

    a. Infrasound?

    b. Ultrasound?

48. Which characteristic of the sound helps you to identify your friend by his voice while sitting with others in a dark room? **[1]**

Section B

49. A Sonar emits pulses on the surface of water which are detected after reflection from the bottom. If the time interval between the emission and detection of the pulse is 2 s find the depth of water. Take velocity of sound in water as 1531 ms^{-1}. **[2]**

50. A ship sends out an ultrasound that returns from the seabed and is detected after 3.42 s. If the speed of ultrasound through seawater is 1531 m/s, what is the distance of the seabed from the ship? **[2]**

51. A submarine emits a sonar pulse, which returns from an underwater cliff in 1.02 s. If the speed of sound in salt water is 1531 m/s, how far away is the cliff? **[2]**

52. A sound wave travels at a speed of 339 ms^{-1}. If its wavelength is 1.5 cm, what is the frequency of the wave? Will it be audible? **[2]**

53. A person has hearing range of 20 Hz to 20 kHz. Calculate the wave lengths of sound waves in air corresponding to above frequencies? Take speed of sound in air as 340 ms^{-1}. **[2]**

54. A sonar device on a submarine sends out a signal and receives an echo 5 s later. Calculate the speed of sound in water if the distance of the object from the submarine is 3625 m. **[2]**

55. The frequency of a source of sound is 100 Hz. How many times does it vibrate in a minute? **[2]**

56. Two children are at the opposite ends of a long iron pipe. One of them strikes the end of iron pipe with a stone. Find the ratio of time taken by the sound waves in air and in iron to reach the other child. (Speed of sound in air = 340 ms^{-1} and speed of sound in iron is 5130 ms^{-1}). **[2]**

57. Two children are at opposite ends of an aluminium rod. One strikes the end of the rod with a stone. Find the ratio of times taken by the sound wave in air and in aluminium to reach the second child. Given velocity of sound in air and aluminium are 346 ms^{-1} and 6420 ms^{-1} respectively. **[2]**

58. A person has a hearing range from 20 Hz to 20 kHz. What are the typical wavelengths of sound waves in air corresponding to these two frequencies? Take the speed of sound in air as 344 ms^{-1}. **[2]**

59. A stone is dropped from the top of a tower 500 m high into a pond of water at the base of the tower. When is the splash heard at the top? Given, g = 10 ms^{-2} and speed of sound = 340 ms^{-1}. **[2]**

60. A longitudinal wave is produced on a toy slinky, such that frequency of wave is 20 Hz and the speed of the wave is 30 cms^{-1}, What is the minimum separation between the consecutive compressions on the slinky? **[2]**

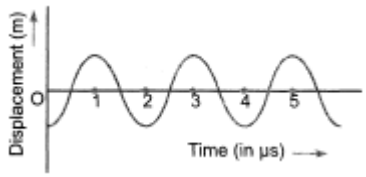
61. A Child hears an echo from a cliff 4 seconds after the sound from a powerful cracker is produced. How far away is the cliff from the child? (Take velocity of sound in air as 340 ms^{-1}) **[2]**

62. A boat at anchor is rocked by waves, whose consecutive crests are 100 m apart. If the wave velocity of moving crests is 20 ms^{-1}, calculate the frequency at which the boat will rock? **[2]**

63. A sound wave has a frequency 2 kHz and wavelength 40 cm. How long will it take to travel 1.6 km? **[2]**

[2]

64. The given graph shows the displacement versus time travelling with velocity of 1500 ms^{-1}. Calculate the wavelength of the disturbance.



65. Establish the relationship between the speed of sound, its wavelength, and frequency. If the velocity of sound in air is 340 ms^{-1}. Calculate **[2]**

i. wavelength when the frequency is 256 Hz.

ii. frequency when the wavelength is 0.85 m.

66. A sound wave has a frequency of 2 kHz and wave length 35 cm. How long will it take to travel 1.5 km? **[2]**

67. A stone is dropped in a well 44.1 m deep. The sound of splash is heard, 3.13 s after the stone is dropped. Find the velocity of the sound in air. (Take g = 9.8 ms^{-2}) **[2]**

68. A sound wave of wavelength 0.332 m has a time period of 10^{-3}s. If the time period is decreased to 10^{-4}s, calculate the wavelength and frequency of new wave. **[2]**

Section C

69. **Read the following text carefully and answer the questions that follow:** **[4]**

Echo is the repetition of sound due to the reflection of original sound by a large and hard obstacle at a certain distance from the source of sound. Echoes are used to determine the distance of a cliff or a submarine under water from the source of sound.

i. Echo is heard after 5 s, the signal is sent towards the submarine at depth 3625 m. Find the speed of sound in water? (1)

ii. An echo is heard after time t on a day when temperature is 22^{o} C. If the temperature is increased to 40^{o} C, the echo will be heard after time (1)

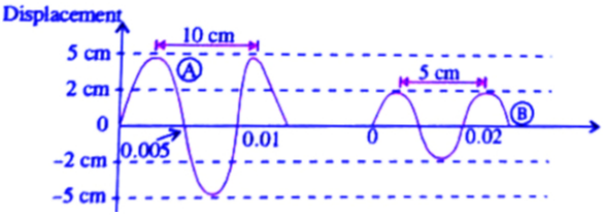
iii. Which instrument is used to measure the depth of the ocean? (2)

OR

What are the waves used in SONAR (sound navigation and ranging) known as? (2)

70. **Read the following text carefully and answer the questions that follow:** **[4]**

The physical quantities used to describe a wave are amplitude, wavelength and frequency. The amplitude and wavelength are measured in metre and frequency is measured in hertz (Hz). Two waves A and B are shown in figure.



i. What is the amplitude of wave A? (1)

ii. What is the wavelength of wave A? (1)

iii. What is the wavelength of wave B? (2)

OR

What is the velocity of wave A if its frequency is 100 Hz? (2)

Section D

71. A person standing between two vertical cliffs and 640 m away from the nearest cliff shouted. He heard the first echo after 4 seconds and the second echo 3 seconds later. Calculate **[5]**

i. the velocity of sound in air, and

ii. the distance between the cliffs.

72. i. Which characteristic of sound helps to identify your friend by his voice while sitting with others in a dark room? **[5]**

ii. State the relationship between frequency and time period of a wave. The wavelength of vibrations produced on the surface of the water is 4 cm. If the wave velocity is 20 m/s find the frequency and Time period.

73. i. Sound is produced when your school bell is struck with a hammer. Why? **[5]**

ii. A powerful sound signal sent from a ship is received again after 4.8 seconds. How deep is the ocean bottom? (Speed of sound in water = 1500 m/s).

74. i. How will you determine the depth of a sea using echo ranging in SONAR method? **[5]**

ii. A SONAR device on a submarine sends out a signal and receives an echo 5s later. Calculate the speed of sound in water if the distance of the object from the submarine in 2625 m.

75. i. What is echo ranging? State any one application of this technique. **[5]**

ii. The wavelength of waves produced on the surface of the water is 20 cm. If the wave velocity is 36 m/s. Calculate

a. The number of waves produced in one second.

b. The time required to produce one wave?