CBSE

WAVES WS 6

Class 11 - Physics

Section A

1. A tuning fork makes 256 vibrations per sec in air. When the velocity of sound is 330 m/s, then wavelength of the tone emitted is **[1]**

   a) 1.29 m
   b) 0.56 m
   c) 0.89 m
   d) 1.11 m

2. Two trains move towards each other with the same speed. The speed of sound is 340 m/s. If the height of the tone of the whistle of one of them heard by the other changes 9/8 times, then the speed of each train should be: **[1]**

   a) 2 m/s
   b) 20 m/s
   c) 200 m/s
   d) 2000 m/s

3. The frequency of a tuning fork is 256. It will not resonate with a fork of frequency: **[1]**

   a) 738 Hz
   b) 256 Hz
   c) 512 Hz
   d) 768 Hz

4. Following two wave trains are approaching each other. **[1]**

   y_1 = a sin 2000 πt

   y_2- a sin 2008 πt

   The number of beats heard per second is

   a) 8
   b) 1
   c) zero
   d) 4

5. Two waves of lengths 50 cm and 51 cm produce 12 beats per sec. The velocity of sound is **[1]**

   a) 360 m/s
   b) 306 m/s
   c) 340 m/s
   d) 331 m/s

6. A tuning fork A produces 4 beat/s with another tuning fork B of frequency 320 Hz. On filing one of the prongs of A 4 beat/s are again heard when sounded with the same fork B. Then, the frequency of fork A before filing is **[1]**

   a) 316 Hz
   b) 320 Hz
   c) 324 Hz
   d) 328 Hz

7. A fork of unknown frequency, when sounded with another fork of frequency 256 Hz, produces 4 beats/sec. The first fork is loaded with wax. It again produces 4 beats/sec. When sounded together with the fork of 256 Hz frequency, then the frequency of the first tuning fork is: **[1]**

   a) 260 Hz
   b) 252 or 260 Hz
   c) 258 Hz
   d) 252 Hz

8. A source of sound gives 5 beats per second when sounded with another source of frequency 100 second^{-1}. The second harmonic of the source, together with a source of frequency 205 sec^{-1} gives 5 beats per second. What is the frequency of the source? **[1]**

a) 100 second^{-1} b) 105 second $^{-1}$

c) 205 second^{-1} d) 95 second^{-1}

9. A tuning fork produces 4 beats/sec. with 50 cm and 40 cm of a stretched wire, of a sonometer. The frequency of fork is: **[1]**

a) 90 Hz b) 36 Hz

c) 110 Hz d) 50 Hz

10. Two waves of wavelengths 99 cm and 100 cm both travelling with velocity 396 m/s are made to interfere. The number of beats produced by them per second are **[1]**

a) 8 b) 1

c) 4 d) 2

11. What is the minimum length of a tube, open at both ends, that resonates with a tuning fork of frequency 350 Hz? [velocity of sound in air = 350 m/s] **[1]**

a) 100 cm b) 50 cm

c) 25 cm d) 75 cm

12. Two waves of wavelength 1m & 1.01 m produce 10 beats in 3 sec. The velocity of sound in a gas is about: **[1]**

a) 1120 m/sec b) 300 m/s

c) 337 m/sec d) 33 m/s

13. A tuning fork when sounded along with a standard source of frequency 300 Hz produces 5 beat/s. The tuning fork, when loaded by some wax, is again found to give 5 beats/s with the standard source. The frequency of the fork originally was? **[1]**

a) 310 Hz b) 290 Hz

c) 305 Hz d) 295 Hz

14. Two tuning forks of frequency 250 Hz and 256Hz produce beats. If a maximum is produced just now, after how much time the minimum is produced at the same place: **[1]**

a) $\frac{1}{6}s$ b) $\frac{1}{12}s$

c) $\frac{1}{24}$s d) 0.25 s

15. 50 tunning forks are arranged in increasing order of their frequencies such that each gives 4 beats/sec with its previous tuning fork. If the frequency of the last fork is the octave of the first, then the frequency of the first tuning fork is **[1]**

a) 196 Hz b) 200 Hz

c) 204 Hz d) 208 Hz

16. A tuning fork of frequency 500 Hz is sounded on a resonance tube. The first & second resonances are obtained at 17 cm and 34 cm. The velocity of sound in m/s is: **[1]**

a) 520
b) 170
c) 850
d) 350.0

17. There are 26 tuning forks arranged in the decreasing order of their frequencies. Each tuning fork gives 3 beats with the next. The first one is octave of the last. What is the frequency of 18th tuning fork? **[1]**

a) 103 Hz
b) 96 Hz
c) 100 Hz
d) 99 Hz

18. For production of beats the two sources must have **[1]**

a) different frequencies
b) different frequencies and same amplitude
c) different frequencies and same phase
d) different frequencies, same amplitude and same phase

19. When the wavelength of sound changes from 1 m to 1.01 m, the number of beats heard per second are 4. The velocity of sound is **[1]**

a) 404 m/s
b) 4.04 m/s
c) 414 m/s
d) 400 m/s

20. A stretched string resonates with tuning fork frequency 512 Hz when the length of the string is 0.5 m. The length of the string required to vibrate resonantly with a tuning fork of frequency 256 Hz would be: **[1]**

a) 0.5 m
b) 0.25 m
c) 1 m
d) 2 m

21. Number of beats between A and B is 5 Hz and between B and C is 3 Hz. Beat frequency between A and C may be **[1]**

a) 3
b) 8
c) 1
d) 2

22. **Assertion (A):** To hear distinct beats, difference in frequencies of two sources should be less than 10. **[1]**
Reason (R): More the number of beats per sec more difficult to hear them.

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):** Both arms of a tuning fork vibrate with the same frequency. **[1]**
Reason (R): The two arms of a tuning fork vibrate in phase.

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):** Beats can also be observed by two light sources as in sound. **[1]**
Reason (R): Light sources have constant phase difference.

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) Both A and R are false.

25. **Assertion (A):** When two vibrating tuning forks having frequencies 240 Hz and 320 Hz are held near each other, beats cannot be heard by us. **[1]**

Reason (R): This is because beats cannot be distinctly heard due to the property of persistence of hearing.

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. **Fill in the blanks:** **[1]**

(a) A tuning fork of unknown frequency when sounded with another tuning fork of frequency 256 Hz produces 4 beats per second, and on loading with a little amount of wax, it again produces 4 beats per second. The unknown frequency is _____ Hz. **[1]**

27. As in sound, can beats be observed by two light-sources? **[1]**

28. A 50 cm long wire is in unison with a tuning fork of frequency 256, when stretched by a load of density 9 gcm^{-3} hanging vertically. The load is then immersed in water. By how much the length of the wire be reduced to bring it again in unison with the same tuning fork? **[1]**

29. What is the essential condition for the formation of beats? **[1]**

30. Two sound sources produce 12 beats in 4 seconds. By how much do their frequencies differ? **[1]**

31. If oil of density higher than the density of water is used in a resonance tube, how will the frequency change? **[1]**

32. Why is a sonometer box provided with holes? **[1]**

33. What is beat frequency? **[1]**

34. The beats are not heard, if the difference in frequencies of the two sounding notes is more than 10. Why? **[1]**

35. Briefly explain the principle underlying the tuning of a radio receiver. **[1]**

36. Can we hear beats when sounds from two different sources are heard together? **[1]**

37. A tuning fork is in resonance with a closed pipe. But the same tuning fork cannot be in resonance with an open pipe of the same length. Why? **[1]**

38. Fill in the blank: The frequencies of two tuning forks are 512 Hz and 516 Hz. The time interval between two consecutive beats produced by them will be _____. **[1]**

39. The frequencies of two tuning forks A and B are 250 Hz and 255 Hz respectively. Both are sounded together. How many beats will be heard in 5 seconds? **[1]**

40. Why do we not hear beats due to sound waves produced by the violins in the violin-section of an orchestra? **[1]**

41. If two sound waves of frequencies 480 H_z and 536 H_z superpose, will they produce beats? Would you hear the beats? **[1]**

42. Is it necessary for beat production that the two waves must have exactly equal amplitudes? **[1]**

43. Give one use of beat phenomenon. **[1]**

44. A violin note and a sitar note may have the same frequency and yet we can distinguish between the two notes. Explain, why it is so. **[1]**

45. If two sound waves of frequencies 500 Hz and 550 Hz superpose, will they produce beats? Would you hear the beats? **[1]**

Section B

46. A tuning fork A, marked 512 Hz, produces 5 beats per second, where sounded with another unmarked tuning fork B. If B is loaded with wax the number of beats is again 5 per second. What is the frequency of the tuning fork B when not loaded? **[2]**

47. Why is a tuning fork used as a standard oscillator? On what factors does the pitch of a tuning fork depend? **[2]**

48. When two tuning forks (fork 1 and fork 2) are sounded simultaneously, 4 beats per second are heard. Now some tape is attached on the prong of the fork 2. When the tuning forks are sounded again, 6 beats per second are heard. If the frequency of fork 1 is 200 Hz, then what was the original frequency of fork 2? **[2]**

49. How far does the sound travel in air when a tuning fork of frequency 256 Hz makes 64 vibrations? Velocity of sound in air = 320 ms^{-1}. **[2]**

50. Calculate the speed of sound in a gas in which two sound waves of wavelengths 1.00 m and 1.01 m produce 24 beats in 6 seconds. **[2]**

51. A tuning fork of known frequency of 256 Hz makes 5 beat s^{-1} with the vibrating string of a piano. The beat frequency decreases to 2 beats s^{-1} when the tension in the piano string is slightly increased. What was the frequency of the piano string before increasing the tension? **[2]**

52. A sonometer wire resonates with a tuning fork. If the length of the wire bridges is made twice even then it can resonate with the same tuning fork. How? **[2]**

53. What are beats? When are beats formed? What is their frequency? **[2]**

54. In an experiment, it was found that a tuning fork and a sonometer wire gave 5 beats per second both when the length of the wire was 1 m and 1.05 m. Calculate the frequency of the fork. **[2]**

55. State few important uses of the phenomenon of beats. **[2]**

56. The fact that we have two ears enables us to sense the direction from which a sound is coming. It depends on the interference pattern. Briefly explain how. **[2]**

57. A tuning fork of frequency 300 Hz resonates with an air-column closed at one end at 27°C. How many beats will be heard in the vibrations of the fork and the air-column at 0°C? End-correction is negligible. **[2]**

58. Two tuning forks A and B produce 4 beats/second. On loading B with wax, 6 beats/second were heard. If the quantity of wax is reduced, the number of beats per second again becomes 4. Find the frequency of B if the frequency of A is 256 Hz. **[2]**

59. A set of 24 tuning forks is arranged in a series of increasing frequencies. If each fork gives 4 beats per second with the preceding one and the last sounds the octave of the first, find the frequencies of the first and the last forks. **[2]**

60. A tuning fork arrangement (pair) produces 4 beats s^{-1} with one fork of frequency 288 cps. A little wax is placed on the unknown fork and it then produces 2 beats s^{-1}. What is the frequency of the unknown fork? **[2]**

61. Two sitar strings A and B playing the note 'Dha' are slightly out of tune and produce beats of frequency 5 Hz. The tension of string B is slightly increased and the beat frequency is found to decrease to 3 Hz. What is the original frequency of B, if the frequency of A is 427 Hz? **[2]**

62. A metre-long tube open at one end, with a movable piston at the other end, shows resonance with a fixed frequency source (a tuning fork of frequency 340 Hz) when the tube length is 25.5cm or 79.3cm. Estimate the speed of sound in air at the temperature of the experiment. The edge effects may be neglected. **[2]**

63. A tuning fork of frequency 200 Hz is in unison with a sonometer wire. How many beats per second will be heard if the tension of the wire were increases by 2%? **[2]**

64. A tuning fork of unknown frequency vibrates in unison with a wire of certain length stretched under a tension of 5 kg f. It produces 6 beats per second with the same wire, when tension is changed to 4.5 kg f. Find the frequency of tuning fork. **[2]**

65. A tuning fork when vibrating along with a sonometer produces 6 beats per second when the length of the wire is either 20 cm or 21 cm. Find the frequency of the tuning fork. **[2]**

Section C

66. A sitar wire and a tabla, when sounded together, produce 5 beats per second. What can be concluded from this? If the tabla membrane is tightened, will the beat rate increase or decrease? **[3]**

67. The length of a sonometer wire is 0.75 mand density 9×10^3 kg m^{-3}. It can bear a stress of 8.1×10^8 N/m^2 without exceeding the elastic limit. What is the fundamental frequency that can be produced in the wire? **[3]**

68. Consider the two identical piano strings, each tuned exactly to the 420 Hz. The tension in any one of the strings is increased by 2.0%. If they are now struck, what is the beat frequency between the fundamentals of the two strings? Take length of the strings = 65 cm. **[3]**

Section D

69. **State True or False:** **[4]**

(a) The beat frequency is defined as the difference of frequencies of the two sources, $f = f_1 - f_2$. **[1]**

(b) It is necessary for beat production that the two waves must have exactly equal amplitudes. **[1]**

(c) Beats can also be observed with two light sources. **[1]**

(d) Beats can be heard with sound sources having a frequency difference of 20 Hz. **[1]**

Section E

70. At 16°C, two open end organ pipes, when sounded together produce 34 beats in 2 seconds. How many beats per second will be produced, if the temperature rises to 51° C? Neglect the increase in the length of the pipes. **[5]**

71. On a quiet day, two persons A and B, each sounding a note of frequency 580 Hz, are standing a few metres apart. Calculate the number of beats heard by each in one second when A moves towards B with a velocity of 4 ms^{-1}. (Speed of sound in air = 330 ms^{-1}.) **[5]**

72. Explain briefly the analytical method of formation of beats? **[5]**