OSCILLATIONS and WAVE

ASSIGNMENT

1. A sound wave is represented by y = a sin (1000 7 πt + 3x). the distance between two points having a phase difference of $\pi/2$ is
   a) Zero
   b) $\dfrac{\pi}{18}$
   c) $\dfrac{\pi}{9}$
   d) 5 $\pi/18$

2. A transverse wave is passing through a medium. The maximum speed of the vibrating particle occurs when the displacement of the particle from the mean position is:
   a) Zero
   b) Half of the amplitude
   c) Equal to the amplitude
   d) None of the above

3. The angle between particle velocity and wave velocity in a transverse wave is:
   a) Zero
   b) $\pi/4$
   c) Nil
   d) π

4. The extension in a string, obeying Hook's low, is x. the speed of sound in the stretched string is v. if the extension in the string is increased to 1.5x, the speed of sound will be
   a) 1.22v
   b) 0.61v
   c) 1.50v
   d) 0.75v

5. Speed of sound in air is 332m/sec at N.T.P the speed of sound in hydrogen at N.T.P. the speed of sound in hydrogen at N.T.P. will be:

a) 5312m/s
b) 2546 m/s
c) 1328 m/s
d) 664 m/s
6. Which of the following statements is correct?
   a) Both sounds and light waves in air are longitudinal
   b) Both sounds and light waves in air are transverse
   c) Sounds waves in air are transverse while light longitudinal
   d) Sounds waves in air are longitudinal while light transverse
7. Sounds waves in air cannot be polarised because:
   a) Their speed is small
   b) They require medium
   c) These are longitudinal
   d) Their speed is temperature dependent
8. Consider the wave represented by $y= \cos (500t-70x)$ where y is in m, x in m and t is sec. without of the following are true?
   a) The wave is standing wave
   b) The speed of the wave is (100) / 7m/s.
   c) The frequency of oscillation is $250/\pi$ Hz
   d) Two nearest points in the same phase have separation (20/7) cm.

9. A bus to make a land rattling sound at a certain speed on the road. Explain why?
10.   Can displacement and acceleration be in the same direction in an SHM ?
11.   Can velocity and acceleration be in the same direction in an SHM ?
12.   A pendulum is taken on the hill it oscillates slower or faster ? give reason.
13.   How the time period of the simple pendulum will change if pendulum is in lift and (a)lift is accelerating downward with acceleration 'a' (b) lift is accelerating upward with acceleration

'a' . (c) lift is accelerating horizontally with acceleration 'a'. (d) lift is falling freely under the action of gravitational force only .

14.   What do you mean by SHM ? Find expression for its displacement, velocity and acceleration , also write their phase difference .

15.   What is meant by symmetric & Doppler effect?

16.   How does the frequency of a tuning fork change, when the temperature is increase?

17.   Tube a has both ends open, whole tube B has one end closed otherwise the two tubes are identical. what is the ratio of fundamental frequency of the tubes A and B?

18.   When we start an empty bucket with water, the pitch of the sound produced foes on changing. Why?

19.   A sine wave is travelling in a medium. What is the minimum distance between two particles always have same speed?

20.   Two waves of the same frequency and amplitude superpose to produce a resultant disturbance of the same frequency. What is the phase difference between the waves?

21.   A spring balance has a scale that reads from 0 to 50 kg. the length of the scale is 20cm. a body suspended from this spring, when displaced and released, oscillates with a period of 0.60 s. what is the weight of the body?

22.   A spring of mass 2.50 kg is under a tension of 200 N. the length of the stretched string is 20.0 m. if a transverse jerk is struck at one end of the string, how long does the disturbance take to reach the other end.

23.   A policeman on duty detects a drop of 15% in the pitch of the horn of a motor car as it crosses him, if the velocity of sound is 330m/s, calculate the speed of the car.

24.   The third overtone of a closed organ pipe is found to be in unison with the first overtone of an open pipe. Find the ratio of the length of the pipes.

25. A sitar wire is under a tension of 40 N and the length between the bridges is 70cm. A 5m sample of the wire has a mass of 1.0g. Deduce the speed of transverse waves on the wire, frequency of the fundamental and the frequency of first two harmonics.

26. A bus to make a land rattling sound at a certain speed on the road. Explain why?

27. What is meant by symmetric & Doppler effect ?

28. How does the frequency of a tunning fork change, when the temperature is increase?

29. Tube A has both ends open, whole tube B has one end closed otherwise the two tubes are identical. What is the ratio of fundamental frequency of the tubes A and B ?

30. When we start filling an empty bucket with water, the pitch of the sound produced goes on changing. Why?

31. A sine wave is travelling in a medium. what is the minimum distance between two particles always have same speed?

32. Two waves of the same frequency and amplitude superpose to produce a resultant disturbance of the same frequency. What is the phase difference between the waves?

33. A pendulum clock is taken to lift moving down with a uniform velocity. Will it gain or lose time?

34. What is the phase difference between displacement and velocity of the particle executing S.H.M.?

35. The potential energy of a particle is S.H.M. varies periodically. If V is the frequency of oscillation of the particle then what is the frequency of variation of potential energy?

36. At what positions, the tension in the string of a simple pendulum is (i) maximum and (ii) minimum?

37. A body executing S.H.M. has a velocity of 4m/s at a distance of 3m from mean position and 3m/s at a distance of 4m from the mean position. Find the amplitude and the period of the motion.

38. The S.H.M. of particle is given by the equation $y = 3\sin\omega t + 4\cos\omega t$ find its amplitude

39. The length of a simple pendulum executing simple harmonic motion is increased by 20%. What is the percentage increase in the time period of the pendulum?

40. Two successive resonance frequencies in a open pipe 1944Hz and 259Hz. Find the length of the tube. The speed of sound in air is 324m/s.

41. Derive an expression for the total energy of a particle executing S.H.M. In what position of the oscillator is the energy wholly potential or kinetic .

42. What is simple pendulum? Show that the motion of a pendulum is S.H.M. and hence deduce an expression for the time period of pendulum. And also states what is the second pendulum? Also find the length of the second pendulum on the surface of earth.

43. Distinguish between free, forced, damped and resonant oscillation.

44. Discus the effect of the following factors on the velocity of sound
   (i) Change in pressure
   (ii) Change in density
   (iii) Change in temperature

45. What are the stationary waves. Obtain the equation of the stationary wave formed when a progressive wave is reflected at
   (i) The rigid boundary
   (ii) The open boundary

46. A particle executes simple harmonic motion under the restoring force provided by a spring. The time period is T. if the spring is divided in n equal parts and one part is used to continue the simple harmonic motion, what will be its time period.?

47. A policeman on duty detect a drop of 15% in the pitch of the horn of a motor car as it crosses him. If the velocity of sound is 330m/s, calculate the speed of the car.

48. The third overtone of a closed organ pipe is found to be in unison with the first overtone of an open pipe. Find the ratio of the lengths of the pipes.

49. The shortest distance travelled by a particle executing S.H.M from mean position in 2 second is $\sqrt{3}/2$ times its amplitude. Determine its time period.

50. Two waves of angular frequency 50 and 5000 rad/s have the same displacement and the amplitude, 3×10^{-5} cm. deduce the acceleration amplitude for them.

51. Discuss the Newton's formula for velocity of sound and what correction made by the Laplace ? Explain.

52. What is beats ? Find the beats frequency.

53. Find the expression for the frequency of sound in (a) open organ pipe and (b) closed organ pipe .

54. Find the expression of the velocity of wave in a stretched string .