Yashwantrao Chavan College of Science Karad
B.Sc II : Semester III : Paper VI
Subject: Wave and Optics I
Question Bank

Choose the correct alternatives

(1) Microphones are

    a) active transducers

    b) passive transducers

    c) transducers

    d) amplifiers

(2) Standard unit of absorption of sound is.

    a) one square foot

    b) one square meter

    c) one square meter of open window

    d) one square foot of open window

(3) Reverberation time should be .for good acoustics.

    a) Optimum

    b) very small

    c) very large

    d) zero

(4) Expression for travelling wave in positive x-direction

    a) $y = a\sin(\omega t - kx)$

    b) $y = a\sin\left(\frac{2\pi}{\lambda}wt - kx\right)$

    c) $y = a\sin(\omega t + kx)$

    d) $y = a\sin\left(\frac{2\pi}{\lambda}wt + kx\right)$

(5) In Poiseuille's experiment to determine the coefficient of viscosity of a liquid, the capillary is always kept

    a) horizontal

    b) vertical

    c) slanted

    d) making an angle of 45 with the horizontal

(6) For Rankine's method the amount of gas required is

    a) large

    b) very large

    c) very small

    d) huge amount

(7) Liquids used as lubricants are of .... viscosity.

    a) low

    b) high

    c) zero

    d) infinite

(8) Dimensions of the coefficient of viscosity are

    a) $[M^{-1}L^{-1}T^{-1}]$

    b) $[MLT^{-1}]$

    c) $[M^2L^{-1}T^{-1}]$

    d) $[ML^{-1}T^{-1}]$

(9) If S is actual surface area, a is coefficient of absorption then effective absorbing area (A) is given by

    a) $A = Sa$

    b) $A = S$

    c) $A = (aS)^2$

    d) $A = as$

(10) Simple harmonic oscillations are.

    a) periodic

    b) aperiodic

    c) sinusoidal

    d) non-sinusoidal

(11) Total energy of a coupled system of two pendula is

    a) $2mA^2 \left(\frac{\omega_1+\omega_2}{2}\right)^2 \sin^2\left(\frac{\omega_1-\omega_2}{2}\right)t$

    b) $2mA^2 \left(\frac{\omega_1+\omega_2}{2}\right)^2 \cos^2\left(\frac{\omega_1-\omega_2}{2}\right)t$

    c) $2mA^2 \left(\frac{\omega_1+\omega_2}{2}\right)^2$

    d) all of the above

(12) In a normal mode of oscillation the oscillating parts have

a) same frequency

b) same amplitude

c) same phase

d) all the above

(13) If both pendula move either outwards or inwards when the spring is respectively stretched or compressed. Such mode of oscillation is . Mode.

a) Symmetric mode

b) asymmetric mode

c) slow mode

d) both a and c

(14) Principle of superposition is obeyed by

a) homogeneous equations

b) linear equations

c) homogeneous and linear equations

d) non-linear equations

(15) Beat frequency of two SHMs with frequencies n_1 and n_2 is given by ..

a) $(n_1 + n_2)$

b) $(n_1 - n_2)$

c) $\frac{1}{(n_1+n_2)}$

d) $\frac{1}{(n_1-n_2)}$

(16) The resultant of two SHMs acting at right angles to each other and having same frequency, different amplitudes and a phase difference of $\frac{\pi}{4}$ is ..

a) a straight line

b) an ellipse

c) an oblique ellipse

d) a circle

(17) The resultant of two SHMs acting at right angles to each other and having same frequency, same amplitude but differing in phase by $\frac{\pi}{2}$ is ..

a) a straight line

b) an ellipse

c) an oblique ellipse

d) a circle

(18) Nodes in standing waves are the points where..

a) displacement is zero

b) amplitude is zero

c) displacement is maximum

d) amplitude is maximum

(19) Expression for velocity of transverse wave travelling along a stretched string is..

a) $v = \frac{T}{m}$

b) $v = \frac{m}{T}$

c) $v = \sqrt{\frac{T}{m}}$

d) $v = \sqrt{\frac{m}{T}}$

(20) Group velocity of a wave is

a) $v = \frac{w}{k}$

b) $v = \frac{k}{w}$

c) $v = \frac{dw}{dk}$

d) $v = \frac{dk}{dw}$

Long answer questions

(1) Derive Sabine's formula for the reverberation time.

(2) Describe the experimental determination of the coefficient of viscosity of a liquid by Poiseuille's method.

(3) What are normal modes of vibration of a stretched string? Obtain an expression for the pth mode.

(4) Discuss in detail, analytically the resultant vibration of SHMs having equal periods and acting at right angles to each other.

(5) Give the analytical treatment of the formation of beats and also derive the condition for the formation of maxima and minima.

Short answer questions

(1) Write a note on standing waves.

(2) Write a note on Rankine's method for the determination of the viscosity of a gas.

(3) Define reverberation and write a note on reverberation time.

(4) Write a note on travelling waves.

(5) How does the viscosity of a liquid vary with temperature?

(6) Discuss the nature of normal modes of oscillation of two identical pendula coupled by a spring of spring constant k.

(7) Explain, analytically the resultant motion of two SHMs acting at right angles to each other and having frequencies in the ratio 2:1 and a phase difference α. (Find the general equation only)

(8) Two tuning forks are approximately an octave apart and the frequency of the lower fork is 100 Hz. The cycle of changes in the Lissajous figures is found to be completed 5 times in 20 seconds. Find the frequency of the upper fork.