

11. When a particle oscillates simple harmonically, its kinetic energy varies periodically. If the frequency of the particle is n , the frequency of kinetic energy is
 [a] n [b] $2n$ [c] $n/2$ [d] $n/4$
12. With sound waves one cannot observe the phenomenon of
 [a] refraction [b] interference [c] diffraction [d] polarization
13. The dispersive power of a grating is equal to
 [a] $\frac{1.22\lambda}{a}$ [b] $\frac{a}{1.22\lambda}$ [c] $\frac{nN'}{\cos\theta}$ [d] $\frac{\cos\theta}{nN'}$
14. The radius of the first half period zone on a zone plate, behaving like a convex lens of focal length 60 cm ($\lambda = 6000 \text{ \AA}$) is
 [a] 0.6 mm [b] 0.6 cm [c] 1.2 mm [d] 1.2 cm
15. A shift of 100 circular fringes is observed when the movable mirror of the Michelson Interferometer is shifted by 0.0295 mm. Then the wavelength of light is,
 [a] 5890 \AA [b] 5893 \AA [c] 5896 \AA [d] 5900 \AA
16. The expression of intensity of wave is _____
17. The temperature at which the speed of sound in air becomes double of its value at 27°C is equal to _____
18. The thickness of half wave plate of quartz increases with increase in _____
19. If the plane of vibration of the incident beam makes an angle of 30° with the optic axis, the ratio of intensities of extraordinary and ordinary light is _____
20. The specific rotation, if the plane of polarization is turned through 26.4° traversing 20 cm length of 20% sugar solution is _____

Level : B.Sc.
Year : II
Time : 2 hrs. 30 mins.

Course : PHYS 211
Semester : II
F. M. : 55

SECTION "B"

[5Q × 4 = 20 marks]

Attempt *ALL* questions.

1. What do you mean by a progressive wave? Derive the equation of progressive wave. Discuss its properties.

OR

Define quality factor for a damped harmonic oscillator. Deduce an expression for it.

2. Describe the working of Michelson's interferometer. Develop the theory to determine the difference in wavelengths of two D-lines of sodium.
3. Define Lissajous's figure? Show the equation represented by two S.H.M of same frequencies.
4. Prove that in case of a thin convex lens $\frac{1}{v} - \frac{1}{u} = (\mu - 1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$ and find the value of both principal focal lengths.
5. What do you mean by polarization of light? Explain how can you produce and detect beams of circularly and elliptically polarized light.

SECTION "C"

[5Q × 7 = 35 marks]

Attempt *ALL* questions.

6. Define forced harmonic oscillation. Write differential equation for forced harmonic oscillation and solve the equation with special cases.
7. What is reverberation time? Derive Sabine's formula for the period of reverberation.
8. What do you mean by spherical and chromatic aberration of a lens? Explain how they are caused. How would you correct for chromatic aberration in case of a lens system in contact.
9. In a biprism experiment with sodium light, bands of width 0.0195 cm are observed at 100 cm from the slit. On introducing a convex lens, 30 cm away from the slit, two images of the slit are seen 0.7 cm apart, at 100 cm distance from the slit. Calculate the wavelength of sodium light.

OR

A mass of 1 kg is suspended from a linear spring with a force constant 1×10^3 N/m and a damping coefficient $b = 0.05$ N-s/m. The spring is driven by an external force $F = F_0 \sin pt$ where $F_0 = 25$ N and p is twice the natural frequency of the system. What is the amplitude of resulting motion? How much (in radians) is the displacement shifted in phase from the driven force?

10. What are quarter-wave and half-wave plates? Deduce their thickness for a given wavelength in terms of refractive indices

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