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QAD Series

Optics, Sound & Waves

1. **A lamp is place between two plane mirror inclined to each other at 30°. How many images can be seen?**
   a) 7 b) 5 c) 9 d) 11

2. **A bright spot situated at 60cm in front of a convex mirror forms a virtual image 20cm, behind the mirror. The focal length of the mirror is:**
   a) 30 cm b) 50cm c) 60cm d) 75cm

3. **A fish looking up through the water sees the outside world contained in a circular horizon. If the refractive index of water is 4/3 & fish is 12cm, below the surface, what is the radius of the circle?**
   a) $12 \times 3 \times \sqrt{5}$ cm b) $12 \times \sqrt{\frac{5}{3}}$ cm
   c) $12/\sqrt{7 \times 3}$ cm d) $12 \times 3/\sqrt{7}$ cm

4. **A completely transparent material will be invisible in vacuum when the refractive index μ is:**
   a) unity b) More than unity
   c) Less than unity d) Equal to 1.33

5. **There is a prism with refractive index equal to $\sqrt{2}$ & the refracting angle equal to 30°. One of the refracting surfaces of the prism is polished. A beam of monochromatic light will retrace its path if its angle of incidence over the refracting surface of the prism is:**
   a) 0° b) 30° c) 45° d) 60°

6. **An equilateral prism is made of a material of refractive index $\sqrt{3}$. The angle of minimum deviation for prism is:**
   a) 30° b) 45° c) 60° d) 90°

7. **Light entering an air-glass (μ =1.5) boundary is partly reflected & partly refracted. If the incidence & reflected rays are at right angles to each other, the angle of refraction r is given by:**
   a) $\sin r = \frac{\sqrt{2}}{3}$ b) $\sin r = \sqrt{\frac{2}{3}}$
   c) $\sin r = \frac{2}{\sqrt{3}}$ d) None of the above

8. **An equi-convex glass lens with radius of each face equal to 50cms is placed in air. If $_a\mu_g = 3/2$ then its focal length is:**
   a) 25 cm b) 50 cm c) 100 cm d) 75 cm

9. **A fish looks straight upward through a water air interface & sees a fly 40mm directly above. At what point should the fish aim in order to catch the fly.**
   a) 20 mm b) 30mm
   c) 40mm d) 50mm

10. **For telescope given magnifying power is:**
    a) Maximum for normal adjustment
    b) Maximum for near point adjustment
    c) Same for both the above cases
    d) None of these

11. **A long sighted person has a minimum distance of distinct vision of 50cm. He wants to reduce it to 25cm. He should use a lens of focal length:**
    a) -50cm b) +25cm
    c) +50cm d) -25cm

12. **The illumination on a screen 5 metre away from a source of light is 10 *lx*. What is the luminous intensity of the source?**
    a) 50 candela b) 10 candela
    c) 5 candela d) 250 candela

13. **What happens to fringe pattern when young's double slit experiment is performed in water instead of air?**
    a) shrinks b) unchanged
    c) Disappears d) Enlarged

14. **Constructive interference will take place it path difference between two waves is:**
    a) $(2n - 1)\lambda/2$ b) $(2n - 1)\lambda$
    c) $n\lambda$ d) $(2n + 1)\lambda/4$

15. **The first diffraction minima due to a single slit diffraction is at θ = 30° for a light of wavelength 5000 Å. The width of the slit is:**
    a) 5×10^{-5} cm b) 1.0×10^{-4} cm
    c) 2.5×10^{-5} cm d) 1.25×10^{-5} cm

16. **Which of the following phenomena cannot be explained by the wave theory of light?**
    a) Reflection b) Diffraction
    c) Total internal reflection d) Photelectric effect

17. **When light is refracted into a medium**
    a) its wavelength decreases and frequency remains unchanged
    b) its wavelength and frequency both increase
    c) its wavelength and frequency both increase
    d) its wavelength and frequency both decrease

18. **A monochromatic light gets refracted from vacuum into glass of refractive index μ. The ratio of the wavelengths of incident and refracted waves is**
    a) 1:1 b) 1: μ c) μ:1 d) μ^2:1

19. **Light is refracted from vacuum to a medium (refractive index = μ). If angle of incidence is twice the angle of refraction, then angle of incidence is**
    a) $2\cos^{-1}(\mu/2)$ b) $\cos^{-1}(\mu/2)$
    c) $2\sin^{-1}(\mu/2)$ d) $\sin^{-1}(\mu)$

20. **An air bubble under water shines brightly because of the phenomenon of**
    a) dispersion b) interference
    c) diffraction d) total internal refraction

21. **The colour of sky as seen from Earth if there were no atmosphere will be**
    a) blue b) red c) black d) orange

22. **Myopic eye forms image of distant objects**
    a) in front of retina b) on retina
    c) behind retina d) in front of cornea

23. **Which mirror has wide field of vision ?**

a) convex mirror b) concave mirror
c) plane mirror d) ellipsoidal mirror

24. Brightness is measured in

a) phot b) lux c) lambert d) lumen

25. In young's double slit experiment, if the monochromatic source of yellow light is replaced by red light. The fringe width

a) decreases b) increases
c) remains unchanged d) fringes disappear

26. The speed of sound in oxygen at 0°c is 317 m/sec. What is the speed of sound in hydrogen at same temperature?

a) 2540 m/s b) 635 m/s c) 1270 m/s d) 317.5 m/s

27. The r.m.s velocity of the molecules of a gas is c & the velocity of sound in this gas is v. the relation v & c is:

a) $\frac{v}{c} = \frac{r}{3}$ b) $\frac{v}{c} = 3r$ c) $\frac{v}{c} = \sqrt{3r}$ d) $\frac{v}{c} = \sqrt{\frac{r}{3}}$

28. A sound has an intensity level of 30 decibels. Its intensity in watt cm^{-2} is ($I_0 = 10^{-16}$ Wcm^{-2})

a) 10^{-15} b) 10^{-13} c) 10^{-11} d) 10^{-10}

29. Two waves of the same frequency traveling in the same medium but in opposite direction if superposed give rise to:

a) resonance b) beats
c) standing waves d) harmonics

30. An open organ pipe has fundamental frequency 300Hz. the first overtone of the open pipe is the same as the first overtone of a closed organ pipe. The length of the closed organ pipe is:

a) 10 cm b) 41 cm c) 82 cm d) 164 cm

31. Tuning fork a of frequency 180Hz produces 6 beats in 2 seconds with tuning fork B. the possible frequency of B is:

a) 177 & 183 b) 180 & 174
c) 174 & 189 d) none

32. Two stretched wires of same material of lengths l & 2l vibrate with frequencies 100 & 150 Hz respectively. The ratio of their tension is:

a) 2:3 b) 3:2 c) 1:9 d) 1:3

33. The sound having it's frequency greater than the audible sound is called

a) infrasonic sound b) ultrasonic sound
c) supersonic sound d) any one of them

34. When an empty vessel is filled with water, its frequency

a) decreases b) increases
c) remains unchanged d) none of them

35. The quality of sound depends on

a) frequency b) intensity
c) overtones d) amplitude

36. The shortest length of the air column in a tube open at both ends that resonates with a tuning fork is 16 cm. At what length will the second resonance occur in a tuning fork?

a) 24 cm b) 32 cm
c) 40 cm d) 64 cm

37. Beats are produced by two waves y_1 = a sin 2000 πt and $y_2 = a$ sin 2008 πt. The number of beats heard per second is

a) Zero b) one c) four d) eight

38. 16 tuning forks are arranged in increasing order of frequency. Any two consecutive tuning forks when sounded together produce 8 beats per second. If the frequency of last tuning fork is twice that of the first, the frequency of first tuning fork is

a) 60 b) 80
c) 100 d) 120

39. A man is traveling in a train moving away with a speed of 30 m/s. Calculate the apparent frequency heard by him of a whistle which is blown at the station with a frequency 1000 c/s

a) 909 c/s b) 1010 c/s
c) 90.9 c/s d) 0.09 c/s

40. If V is the speed of sound in air, then the shortest length of the closed pipe which resonates to a frequency n is

a) $4n/V$ b) $2n/V$
c) $V/2n$ d) $V/4n$

41. An open pipe is suddenly closed with the result that the second overtone of the closed pipe is found to be higher in frequency by 100 Hz than the first overtone of the original pipe. The fundamental frequency of open pipe will be

a) 100 Hz b) 300 Hz c) 150 Hz d) 200 Hz

42. At what temperature, the velocity of sound in air is 1.5 times the velocity at 7°C?

a) 357 °C b) 476°C
b) 588°C d) 819°C

43. The distance between two points differing in phase by 60° on a wave having a wave velocity 360 m/s and frequency 500 Hz is

a) 0.72 metre b) 0.12 metre
c) 0.18 metre d) 0.36 metre

44. A sound source is moving towards a stationary listener with (1/10)th of the speed of sound. The ratio of apparent to real frequency is

a) 10/9 b) $(10/9)^2$
c) $(11/10)^2$ d) 11/10

45. Velocity of sound in air is 300 m/s. Then the distance between two successive nodes of a stationary wave of frequency 1000 Hz is

a) 10 cm b) 20 cm c) 15 cm d) 30 cm