

PHYSICS

1. A ray of light is travelling from glass to air. (Refractive index of glass = 1.5) The angle of incidence is 50° . The deviation of the ray is

1) $\sin^{-1}\left[\frac{\sin 50^\circ}{1.5}\right] - 50^\circ$ 2) $50^\circ - \sin^{-1}\left[\frac{\sin 50^\circ}{1.5}\right]$

3) 80° 4) 0°

2. A vessel of height $2d$ is half filled with a liquid of refractive index $\sqrt{2}$ and the other half with a liquid of refractive index n . (The given liquids are immiscible). Then the apparent depth of the inner surface of the bottom of the vessel (neglecting the thickness of the bottom of the vessel) will be

1) $\frac{nd}{d + \sqrt{2}n}$ 2) $\frac{\sqrt{2}n}{d(n + \sqrt{2})}$

3) $\frac{d(n + \sqrt{2})}{n\sqrt{2}}$ 4) $\frac{n}{d(n + \sqrt{2})}$

3. A ray of light is incident normally on one face of a right angled isosceles prism. It then grazes the hypotenuse. The refractive index of the material of the prism is

1) 1.732 2) 1.5
3) 1.414 4) 1.33

4. Two thin equiconvex lenses each of focal length 0.2 m are placed coaxially with their optic centres 0.5 m apart. Then the focal length of the combination is

1) 0.1 m 2) -0.1 m
3) 0.4 m 4) -0.4 m

5. A prism of a certain angle deviates the red and blue rays by 8° and 12° respectively. Another prism of the same angle deviates the red and blue rays by 10° and 14° respectively. The prisms are small angled and made of different materials. The dispersive powers of the materials of the prisms are in the ratio

1) 11 : 9 2) 6 : 5
3) 9 : 11 4) 5 : 6

(Space for Rough Work)

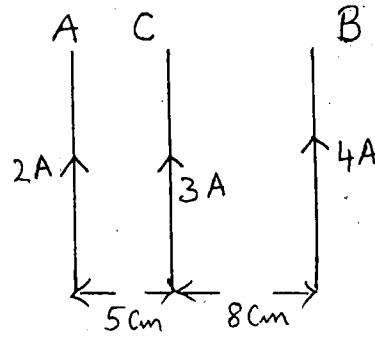
6. The electro magnetic theory of light failed to explain
- 1) Interference
 - 2) Diffraction
 - 3) Polarisation
 - 4) Photo electric effect
7. Light from two coherent sources of the same amplitude A and wavelength λ illuminates the screen. The intensity of the central maximum is I_0 . If the sources were incoherent, the intensity at the same point will be
- 1) $\frac{I_0}{2}$
 - 2) I_0
 - 3) $2I_0$
 - 4) $4I_0$
8. In Young's double slit experiment with sodium vapour lamp of wavelength 589 nm and the slits 0.589 mm apart, the half angular width of the central maximum is
- 1) $\text{Sin}^{-1}0.1$
 - 2) $\text{Sin}^{-1}0.001$
 - 3) $\text{Sin}^{-1}0.0001$
 - 4) $\text{Sin}^{-1}0.01$
9. A single slit Fraunhofer diffraction pattern is formed with white light. For what wavelength of light the third secondary maximum in the diffraction pattern coincides with the second secondary maximum in the pattern for red light of wavelength 6500 \AA ?
- 1) 9100 \AA
 - 2) 4642.8 \AA
 - 3) 4100 \AA
 - 4) 4400 \AA
10. The head lights of a jeep are 1.2 m apart. If the pupil of the eye of an observer has a diameter of 2 mm and light of wavelength 5896 \AA is used, what should be the maximum distance of the jeep from the observer if the two head lights are just separated?
- 1) 3.39 m
 - 2) 3.39 km
 - 3) 33.9 m
 - 4) 33.9 km

(Space for Rough Work)

11. When the angle of incidence is 60° on the surface of a glass slab, it is found that the reflected ray is completely polarised. The velocity of light in glass is
- 1) $3 \times 10^8 \text{ ms}^{-1}$ 2) $2 \times 10^8 \text{ ms}^{-1}$
3) $\sqrt{3} \times 10^8 \text{ ms}^{-1}$ 4) $\sqrt{2} \times 10^8 \text{ ms}^{-1}$
12. A 20 cm length of a certain solution causes right handed rotation of 38° . A 30 cm length of another solution causes left handed rotation of 24° . The optical rotation caused by 30 cm length of a mixture of the above solutions in the volume ratio 1 : 2 is
- 1) right handed rotation of 3° 2) left handed rotation of 3°
3) right handed rotation of 14° 4) left handed rotation of 14°
13. Two identical charges repel each other with a force equal to 10 mgwt when they are 0.6 m apart in air. ($g = 10 \text{ ms}^{-2}$) The value of each charge is
- 1) $2\mu\text{C}$ 2) 2nC
3) $2 \times 10^{-7}\text{C}$ 4) 2mC
14. The potential of the electric field produced by a point charge at any point (x, y, z) is given by $V = 3x^2 + 5$, where x, y, z are in metres and V is in volts. The intensity of the electric field at $(-2, 1, 0)$ is
- 1) -12Vm^{-1} 2) $+12\text{Vm}^{-1}$
3) -17Vm^{-1} 4) $+17\text{Vm}^{-1}$
15. The potential of a large liquid drop when eight liquid drops are combined is 20V. Then the potential of each single drop was
- 1) 2.5 V 2) 5 V
3) 7.5 V 4) 10 V

(Space for Rough Work)

26. A and B are two infinitely long straight parallel conductors. C is another straight conductor of length 1 m kept parallel to A and B as shown in the figure. Then the force experienced by C is



- 1) towards B equal to $0.6 \times 10^{-5} N$
- 2) towards A equal to $5.4 \times 10^{-5} N$
- 3) towards B equal to $5.4 \times 10^{-5} N$
- 4) towards A equal to $0.6 \times 10^{-5} N$

27. An electric bulb has a rated power of 50 W at 100 V. If it is used on an a.c. source 200 V, 50 Hz, a choke has to be used in series with it. This choke should have an inductance of

- 1) 1.1 H
- 2) 0.1 H
- 3) 1 mH
- 4) 0.1 mH

28. An inductance of $\frac{200}{\pi}$ mH, a capacitance of $\frac{10^{-3}}{\pi}$ F and a resistance of 10Ω are connected in series with an a.c. source 220 V, 50 Hz. The phase angle of the circuit is

- 1) $\frac{\pi}{3}$
- 2) $\frac{\pi}{2}$
- 3) $\frac{\pi}{4}$
- 4) $\frac{\pi}{6}$

29. A stepdown transformer reduces the voltage of a transmission line from 2200 V to 220 V. The power delivered by it is 880 W and its efficiency is 88%. The input current is

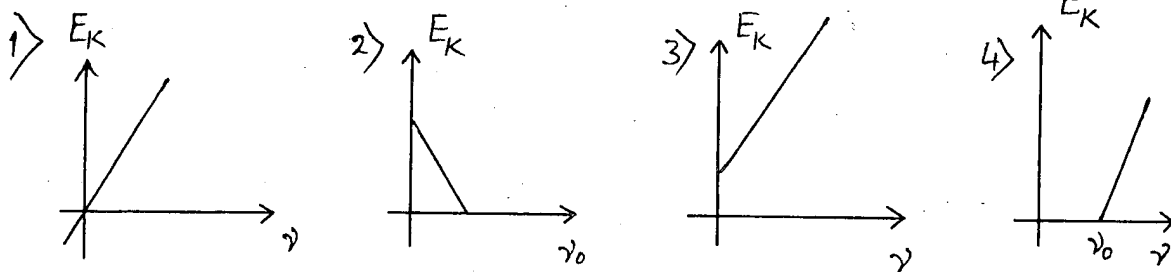
- 1) 4.65 A
- 2) 0.465 A
- 3) 0.0465 A
- 4) 4.65 mA

30. Current in a coil changes from 4 A to zero in 0.1 second and the emf induced is 100 V. The self inductance of the coil is

- 1) 4 H
- 2) 2.5 H
- 3) 0.4 H
- 4) 0.25 H

(Space for Rough Work)

31. All components of the electromagnetic spectrum in vacuum have the same
- 1) Frequency
 - 2) Wavelength
 - 3) Velocity
 - 4) Energy
32. Which one of the following graphs represents the variation of maximum kinetic energy (E_K) of the emitted electrons with frequency γ in photoelectric effect correctly ?



- 1) 1
- 2) 2
- 3) 3
- 4) 4

33. A and B are two metals with threshold frequencies 1.8×10^{14} Hz and 2.2×10^{14} Hz. Two identical photons of energy 0.825 eV each are incident on them. Then photoelectrons are emitted in
- 1) A alone
 - 2) B alone
 - 3) in both A and B
 - 4) in neither A nor B
- (Take $h = 6.6 \times 10^{-34}$ Js)

34. The ionization energy of L_i^{++} is equal to
- 1) hcR
 - 2) $2 hcR$
 - 3) $6 hcR$
 - 4) $9 hcR$
35. Electrons in a certain energy level $n = n_1$, can emit 3 spectral lines. When they are in another energy level $n = n_2$. They can emit 6 spectral lines. The orbital speeds of the electrons in the two orbits are in the ratio
- 1) 1 : 2
 - 2) 2 : 1
 - 3) 3 : 4
 - 4) 4 : 3

(Space for Rough Work)

46. The dimensional formula for impulse is
- 1) $ML^{-1}T^{-1}$
 - 2) $M^{-1}LT^{-1}$
 - 3) $ML^{-1}T$
 - 4) MLT^{-1}
47. The maximum height attained by a projectile when thrown at an angle θ with the horizontal is found to be half the horizontal range. Then $\theta =$
- 1) $\tan^{-1} \frac{1}{2}$
 - 2) $\frac{\pi}{4}$
 - 3) $\frac{\pi}{6}$
 - 4) $\tan^{-1} 2$
48. A shell of mass 20 kg at rest explodes into two fragments whose masses are in the ratio 2 : 3. The smaller fragment moves with a velocity of 6 ms^{-1} . The kinetic energy of the larger fragment is
- 1) 360 J
 - 2) 144 J
 - 3) 216 J
 - 4) 96 J
49. Water rises in plant fibres due to
- 1) Osmosis
 - 2) Fluid pressure
 - 3) Viscosity
 - 4) Capillarity
50. The acceleration due to gravity becomes $\left(\frac{g}{2}\right)$ where $g =$ acceleration due to gravity on the surface of the earth at a height equal to
- 1) $\frac{R}{2}$
 - 2) $2R$
 - 3) $\frac{R}{4}$
 - 4) $4R$

(Space for Rough Work)

56. The maximum particle velocity in a wavemotion is half the wave velocity. Then the amplitude of the wave is equal to

1) λ

2) $\frac{\lambda}{2\pi}$

3) $\frac{2\lambda}{\pi}$

4) $\frac{\lambda}{4\pi}$

57. The ratio of the velocity of sound in hydrogen $\left(r = \frac{7}{5}\right)$ to that in helium $\left(r = \frac{5}{3}\right)$ at the same temperature is

1) $\frac{\sqrt{21}}{5}$

2) $\frac{\sqrt{42}}{5}$

3) $\sqrt{\frac{5}{21}}$

4) $\sqrt{\frac{5}{42}}$

58. An engine is moving towards a wall with a velocity 50 ms^{-1} emits a note of 1.2 kHz . Speed of sound in air = 350 ms^{-1} . The frequency of the note after reflection from the wall as heard by the driver of the engine is

1) 1.2 kHz

2) 1.6 kHz

3) 0.24 kHz

4) 2.4 kHz

59. A glass tube is open at both the ends. A tuning fork of frequency f resonates with the air column inside the tube. Now the tube is placed vertically inside water so that half the length of the tube is filled with water. Now the air column inside the tube is in unison with another fork of frequency f' . Then

1) $f' = \frac{f}{2}$

2) $f' = 2f$

3) $f' = 4f$

4) $f' = f$

60. The surface temperature of the Sun which has maximum energy emission at 500 nm is 6000 K . The temperature of a star which has maximum energy emission at 400 nm will be

1) 6500 K

2) 7500 K

3) 4500 K

4) 8500 K

(Space for Rough Work)