



PHYSICS

BOOKS - TARGET PHYSICS (MARATHI ENGLISH)

REFRACTION OF LIGHT

Classical Thinking

1. Light consists of

A. transverse electromagnetic waves.

B. transverse waves in a string.

C. longitudinal waves.

D. stationary waves.

Answer: A



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2. For visible light the wavelength ranges from

A. 2600 \AA to 7500 \AA

B. 3600 Å to 7500 Å

C. 3600 Å to 8500 Å

D. 4600 Å to 9500 Å

Answer: B



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3. If medium changes

A. only velocity of light changes.

B. only wavelength of light changes.

C. only frequency of light changes.

D. velocity and wavelength of light changes

but frequency remains the same.

Answer: D



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4. The colour of light is determined by

A. velocity.

B. medium through which it travels.

C. frequency

D. time required to reach eye.

Answer: C



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5. LASER is a ___

A. monochromatic light

B. composite light

C. white light

D. light from black body

Answer: A



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6. A wave of light of ____ wavelength is called monochromatic light.

A. fixed velocity and

B. mixed frequencies and

C. maximum

D. single

Answer: D



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7. When a ray of light is incident normally on a surface, then

A. bends away from then refracted ray

B. bends towards the normal.

C. travels along the same path without any deviation.

D. will make an angle of 60° with the normal.

Answer: C



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8. When a ray of monochromatic light is incident obliquely on the interface of two media,

A. all the light is reflected back into same medium only.

B. all the light is transmitted (refracted) into other medium.

C. only partially reflected back into the same medium.

D. Part of light is reflected back into the same medium.

Answer: D



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9. When monochromatic light passes from one transparent medium into another, its direction changes (except for normal incidence). This phenomenon is known as ____

- A. reflection of light
- B. refraction of light
- C. polarisation of light
- D. diffraction of light

Answer: B



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10. Glancing angle θ is equal to (where, i is angle of incidence and r is angle of refraction)

A. $(90 - r)^\circ$

B. $(180 - i)^\circ$

C. $(90 - i)^\circ$

D. $(180 - r)^\circ$

Answer: C



11. The ray of light travelling from an optically denser medium to optically rarer medium bends

- A. towards the normal
- B. along the normal.
- C. away from the normal
- D. by reversing its path.

Answer: C



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12. Name the phenomenon due to which a swimming pool appears less deep than it really is.

A. reflection

B. scattering

C. refraction

D. diffraction

Answer: C



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13. A person swimming at the bottom of a swimming pool looks up to the diving board.

The board.

A. is not seen at all

B. appears nearer.

C. appears farther

D. appears at the correct position.

Answer: C



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14. ${}_1\mu_2$ or ${}_1n_2$ is called as

A. refractive index of 2^{nd} medium with respect to 1^{st} medium

B. refraction index of 1^{st} medium with respect to 2^{nd} medium

C. the relative refractive index of 1^{st} medium.

D. absolute refractive index of 2^{nd} medium.

Answer: A



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15. If μ_1 and μ_2 are absolute refractive index of medium 1 and medium 2 respectively, then

A. ${}_1\mu_2 = \frac{\mu_1}{\mu_2}$

B. ${}_1\mu_2 = \frac{\mu_2}{\mu_1}$

C. ${}_1\mu_2 = \mu_1\mu_2$

D. ${}_1\mu_2 = \frac{1}{\mu_1\mu_2}$

Answer: B



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16. The absolute refractive index of any medium is always

- A. greater than one
- B. less than one
- C. equal to one
- D. any value between 0 to 1.

Answer: A



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17. The value of refractive index of __ is highest.

A. ice

B. water

C. diamond

D. glass

Answer: C



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18. When a ray of monochromatic light enters from rarer medium to denser medium obliquely, the angle of incidence i and angle of refraction r is related is

A. $i < r$

B. $i = r$

C. $i > r$

D. $i \leq r$

Answer: C



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19. The velocity of light is maximum in _____

A. alcohol

B. water

C. vacuum

D. galss

Answer: C



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20. If the ray of light travels from medium 1 to medium 2 and ultimately reverses its path then the phenomenon is _____

- A. principle of reflection
- B. principle of refraction
- C. principle of reversibility
- D. principle of wave theory

Answer: C



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21. If refractive indices of glass and water with respect to air are $\frac{3}{2}$ and $\frac{4}{3}$ respectively, what is the refractive index of glass with respect to water ?

A. $\frac{8}{9}$

B. $\frac{9}{8}$

C. $\frac{7}{6}$

D. $\frac{3}{2}$

Answer: B



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22. The refractive index of air with respect to glass is $\frac{2}{3}$. The refractive index of diamond with respect to air is $\frac{12}{5}$. Then the refractive index of glass with respect to diamond will be

A. $\frac{5}{8}$

B. $\frac{8}{9}$

C. $\frac{5}{18}$

D. $\frac{18}{5}$

Answer: A



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23. A monochromatic ray is incident on a glass slab with glancing angle 30° with the surface, If the refractive index of glass with respect to

air is $\sqrt{3}$, the angle of refraction in the glass slab is

A. 30°

B. 45°

C. 60°

D. 70°

Answer: A



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24. A monochromatic light of wavelength 4800 Å travelling in air is incident on a glass slab of refractive index 1.5, its wavelength in glass slab is

A. 5000 Å

B. 4800 Å

C. 3500 Å

D. 3200 Å

Answer: D



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25. The refractive index of water relative to air is $5/3$. A ray of light passing from water into air is incident at the interface at an angle of 32° with the normal. What angle does the refracted ray make with the normal?

A. $61^\circ 2'$

B. 8°

C. $62^\circ 2'$

D. $60^\circ 1'$

Answer: C



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26. When the ray of light travels from an optically denser medium to optically rarer medium the maximum value of angle of refraction is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: D



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27. Which of the following is a CORRECT statement ?

A. For total internal reflection, light must pass from optically denser medium to

optically rarer medium with angle of incidence greater than the critical angle.

B. For total internal reflection, light must pass from optically rarer medium to optically denser medium with angle of incidence greater than the critical angle.

C. For total internal reflection, light must pass from optically denser medium to optically rarer medium with angle of incidence less than critical angle.

D. For total internal reflection, only medium plays a role and not angle of incidence.

Answer: A



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28. Mirage' is a phenomenon due to

A. reflection of light

B. refraction of light

C. total internal reflection of light.

D. diffraction of light

Answer: C



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29. Which of the following is not a property of light?

A. It requires a material medium for propagation.

B. It shows rectilinear propagation

C. It involves transportation of energy

D. It has finite speed

Answer: A



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30. A ray of light travelling in water is incident on its surface open to air. The angle of incidence is θ , which is less than the critical angle. Then there will be

- A. only reflected ray and no refracted ray.
- B. only refracted ray and no refracted ray
- C. a refracted ray, a refracted ray with angle between them less than $(180^\circ - 20)$.
- D. a reflected ray , a refracted ray with angle between them greater than $(180^\circ - 20)$

Answer: C



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31. The principle used in optical fibre is ____

A. scattering

B. successive

C. reflections

D. refraction

Answer: D



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32. In periscopes, totally reflecting prisms are used which turns the ray through

A. 180°

B. 90°

C. 270°

D. 45°

Answer: B



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33. When a monochromatic ray of light travels from an optically denser medium to optically rarer medium then critical angle is the angle of incidence for which angle of refraction is

A. 0°

B. 45°

C. 90°

D. 180°

Answer: C



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34. The angle of incidence corresponding to which the angle of refraction is a right angle is called as _____

A. angle of reflection

B. angle of refraction

C. critical angle

D. polarising angle

Answer: C



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35. The critical angle i_c is given by [μ is the refractive index of optically denser medium with respect to air]

A. $i_c = \sin^{-1}(\mu)$

B. $i_c = \sin^{-1}\left(\frac{1}{\mu}\right)$

C. $i_c = \frac{1}{2}\sin^{-1}(\mu)$

D. $i_c = 2\sin^{-1}\left(\frac{1}{\mu}\right)$

Answer: B



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36. Critical angle of light passing from glass to air is maximum for _____

A. red

B. green

C. yellow

D. violet

Answer: A



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37. The refractive index of medium with respect to air, for the critical angle 60° is

A. 1.6

B. 1.5

C. 1.2

D. 1.15

Answer: D



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38. An endoscope is employed by a physician to view the internal parts of body organ. It is based on the principle of

A. refraction

B. total internal reflection

C. reflection

D. dispersion

Answer: B



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39. Optical fiber consists of large number of

A. extremely thin fibres of fine quality glass or quartz.

B. extremely thin fibres of metal with high ductility.

C. extremely fine fibres of metal with very high polished surface

D. thick fibres of fine quality glass or quartz.

Answer: A



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40. When a light is incident at one end of wood with quartz. At a small angle, then refracted light falls on the wall of the fibre at an angle

A. equal to critical angle

B. greater than 90°

C. equal to 0°

D. greater than critical angle

Answer: D



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41. The light entering into the fibre suffers

- A. number of reflections
- B. total internal reflections
- C. number of refractions
- D. multiple refractions.

Answer: B



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42. If I is the intensity of light entering into the optical fibre and I_e is that emerging from the fibre then

A. $I \approx I_e$

B. $I < I_e$

C. $I > I_e$

D. $I_e \approx \frac{I}{2}$

Answer: A



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43. The separation of white light into its constituent colours after passing through a prism is called as ___ of light.

A. deviation

B. refraction

C. scattering

D. dispersion

Answer: D



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44. When white light passes through prism then constituent colours are obtained because

A. different colours are due to different velocities and different wavelenghts

B. different colours are due to same velocity and different wavelenghts.

C. different colours are already present in prism.

D. same colour appears different due to different frequency in another medium.

Answer: A



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45. When white light passes through prism then constituent colours are obtained because

A. phase of different colour is different

B. amplitude of different colours is
different

C. energy of different colours is different

D. velocity of different colours is different.

Answer: D



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46. The refractive index of glass is minimum for

A. red light

B. green light

C. yellow light

D. violet light

Answer: A



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47. When white light passes through prism, the angle of deviation is

A. maximum for red and minimum for violet.

B. maximum for yellow and minimum for red.

C. maximum for yellow and minimum for violet

D. minimum for red and maximum for violet.

Answer: D



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48. As the refractive index of the material of prism for different colours increases their corresponding wavelength _____

A. decreases

B. increases

C. remains the same

D. depends on frequency

Answer: A



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49. The ratio of the refractive index of red light to blue light in air is

- A. less than unity
- B. equal to unity
- C. greater than unity

D. less or greater than unity depending upon the experimental arrangement

Answer: A



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50. A ___ shaped triangular transparent block having three rectangular planes and two triangular planes is called a prism.

A. wedge

B. hexagonal

C. polygonal

D. ellipsoidal

Answer: A



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51. The angle of between the two plane rectangular refracting surface is called _____

A. refracting angle of the prism

B. angle of refraction

C. reflecting angle of the prism

D. dispersion angle

Answer: A



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52. The rectangular face opposite to the refracting edge is called ___

A. refracting surface

B. base of prism

C. intersection of base and one of the
refracting surface

D. principle section of a prism

Answer: B



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53. The angle between incident ray and ___ ray
is called angle of deviation.

A. reflected

B. refracted

C. emergent

D. normal

Answer: C



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54. If A is angle of prism, δ is angle of deviation, i is angle of incidence and e angle

of emergence, then what is the correct relation between them ?

A. $i + e = \frac{A + \delta}{2}$

B. $i = A + \delta + e$

C. $A = i + e + \delta$

D. $i + e = A + \delta$

Answer: D



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55. What is the condition for minimum deviation through then prism ? What is prism formula ?

A. angle fo incidence is equal to angle of deviation.

B. angle of incidence is equal to angle of refraction.

C. angle of incidence is equal to refracting angle of prism

D. angle of emergence and angle of incidence are equal

Answer: D



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56. Thin prism has small ____ -

A. angle of incidence

B. refractive index

C. angle of reflection

D. refracting angle

Answer: D



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57. For thin prism angle of minimum deviation(δ) is given by

A. $\delta = A(1 - \mu)$

B. $\delta = A\left(\frac{\mu}{2} - 1\right)$

C. $\delta = A\left(1 - \frac{\mu}{2}\right)$

$$D. \delta = A(\mu - 1)$$

Answer: D



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58. A prism of angle 4° gives a deviation of 2.4° . The refractive index of the material of the prism is

A. 1.5

B. 1.55

C. 1.6

D. 1.8

Answer: C



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59. The refractivity of the material of the prism is given by

A. μ

B. $\frac{1}{\mu}$

C. $\frac{1}{\mu^2}$

D. $(\mu - 1)$

Answer: D



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60. A glass prism placed in a homogeneous transparent medium will deviate an incident ray

A. always towards its base.

B. always away from its base

C. towards its base, only if the medium has a refractive index greater than that of glass .

D. towards the base, only if the medium has a refractive index less than that of glass .

Answer: D



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61. A ray is incident at an angle of incidence i on one surface of a prism of small angle A and emerge normally from opposite surface. If the refractive index of the material of prism is μ . the angle of incidence i is nearly equal to

A. $\frac{A}{\mu}$

B. $\frac{A}{2\mu}$

C. μA

D. $\frac{\mu A}{2}$

Answer: C



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62. A narrow beam of white light enters slab having parallel faces.

A. the beam inside the slab remains as white light

B. the emergent beam is red in colour.

C. the beam inside the slab undergoes dispersion

D. the glass slab never causes dispersion.

Answer: C



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63. Angular dispersion depends upon

- A. refracting angle of the prism
- B. refractive index of the prism
- C. velocity of light in the prism
- D. both (A) and (B)

Answer: D



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64. The net angular dispersion produced without deviation for crown glass ($\mu = 1.56$) and flint glass ($\mu = 1.7$) is

A. positive

B. zero

C. negative

D. infinite

Answer: C



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65. The refractive index of a glass is 1.520 for red light and 1.525 for blue light. Let D_1 and D_2 be angles of minimum deviation for red and blue light respectively in a prism of this glass. Then,

A. $\delta_r = \delta_b$

B. $\delta_r > \delta_b$

C. $\delta_r < \delta_b$

D. both (A) and (B)

Answer: C



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66. The angular dispersion produced by a prism of angle 5° is $[\mu_v = 1.665, \mu_r = 1.645]$

A. 2°

B. 1°

C. 0.2°

D. 0.1°

Answer: D



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67. The dispersive power (ω) of the material of prism is given by

A. $\omega = \frac{A(\mu_v - \mu_r)}{(\mu_y - 1)}$

B. $\omega = \frac{(\mu_v - \mu_r)}{A(\mu_y - 1)}$

C. $\omega = \frac{(\mu_v + \mu_r)}{(\mu_y - 1)}$

$$D. \omega = \frac{(\mu_v - \mu_r)}{(\mu_y - 1)}$$

Answer: D



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68. The refractive index of the prism for violet colour is 1.7 and that for red is 1.65. Then dispersive power of the material of prism is

A. 0.74

B. 0.074

C. 0.054

D. 0.015

Answer: B



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69. The net angular dispersion without deviation is equal to

A. $\delta \left(1 - \frac{\omega}{\omega'} \right)$

B. $\delta \left(1 - \frac{\omega'}{\omega} \right)$

C. $\delta(\omega' - \omega)$

D. $\delta(\omega - \omega')$

Answer: C



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70. The arrangement of dispersion without deviation is used in ____

A. direct vision spectroscopy

B. indirect spectroscopy

C. binocular vision

D. periscope

Answer: A



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71. In optical instruments, to minimise the effect of dispersion and obtain clear and well defined images ,

A. three prisms are used side by side.

B. achromatic combination of prisms are used.

C. chromatic combination of prisms are used

D. two prisms of different glasses and same angle of prism is used.

Answer: B



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72. A thin prism P_1 with angle 4degree and made from glass of refractive index 1.54 is combined with another thin prism P_2 made from glass of refractive index 1.72 to produce dispersion without deviation. The angle of the prism P_2 is

A. 2.6°

B. 3°

C. 4°

D. 5.33°

Answer: B



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73. The first explanation of rainbow was given by

A. Rayleigh

B. Demini

C. Huygen

D. Newton

Answer: B



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74. The rainbow is formed due to

A. scattering of sun light by water droplets.

B. refraction and total internal reflection by
water droplets.

C. dispersion, reflection and refraction of
sun light by water droplets.

D. only reflection and refraction by water droplets.

Answer: C



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75. The complete circle of rainbow can be seen when

A. the sun and observer are co-axial

B. the observer and clouds are co-axial.

C. the sun, the observer and clouds are co-axial.

D. the sun and clouds are co-axial

Answer: C



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76. To observe any rainbow the altitude of sun or the angle made by the sun with the horizontal should be _____

A. less than 42°

B. greater than 42°

C. between 45° to 50°

D. between 60° to 63°

Answer: A



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77. The primary rainbow is due to ___ total internal reflection inside droplet and two refractions.

A. one

B. two

C. three

D. infinite

Answer: A



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78. Angular width of primary rainbow is

A. 2°

B. 3°

C. 5°

D. 6°

Answer: A



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79. The average of inclination of the primary rainbow with the axis is

A. 40°

B. 41°

C. 42°

D. 43°

Answer: B



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80. In a primary rainbow, what is the order of colours ? And what is true for secondary rainbow ?

A. red

B. orange

C. violet

D. pink

Answer: C



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81. Which light rays undergoes two internal reflection inside a raindrop, which of the rainbow is formed?

A. one

B. two

C. three

D. four

Answer: B



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82. The straight line joining the sun and the observer along which centre of both the primary and secondary rainbow lies is called

A. axis of rainbow.

B. principle line of rain bow

C. radius of primary rainbow

D. radius of secondary rainbow.

Answer: A



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83. One cannot see through fog,
because

A. fog absorbs light

B. the refractive index of fog is infinity.

C. light suffers total internal reflection at the droplets in fog.

D. light is scattered by the droplets in fog

Answer: D



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84. (a) What is the essential condition for Rayleigh scattering ?

(b) In Rayleigh scattering, how is intensity of scattered light related to wavelength of light ?

A. directly proportional to the wavelength of light.

B. Inversely proportional to the wavelength of light

C. inversely proportional to the square of the wavelength of light

D. inversely proportional to the fourth power of the wavelength of light.

Answer: D



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85. Rayleigh's law of scattering assumes

A. scattering of light by extremely small particles.

B. scattering of light by particles of twice the size of the particle.

C. scattering of light by very large particles.

D. scattering of light by dust particles only

Answer: A



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86. The sky would appear red instead of blue if

- A. atmospheric particles scatter blue light more than red light.
- B. atmospheric particles scatter all colours equally
- C. atmospheric particles scatter red light more than blue light
- D. scattering does not take place.

Answer: C



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87. Beyond the earth's atmosphere, the sky will look

A. dark (black) because there is no scattering

B. white only because there is equal scattering

C. blue because there is medium scattering

D. violet because there is maximum scattering.

Answer: A



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88. Just after the sunrise, the sun is very close to horizon, so the sunlight has to travel

A. longer path through the atmosphere to reach the observer.

B. shorter path through the atmosphere to reach the observer.

C. through cold atmosphere of the earth.

D. through hot atmosphere of the sun.

Answer: A



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89. The sun appears reddish or orange reddish

at the

A. sunset

B. mid day

C. sunrise

D. both (A) and (c)

Answer: D



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90. Our eyes are more sensitive to blue as compared to_____

A. yellow

B. violet

C. pink

D. white

Answer: B



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91. Sir C.V Raman was awarded Nobel prize for his work concerned with which of the following phenoment of radiation?

A. scattering

B. diffraction

C. interference

D. polerisation

Answer: A



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92. In Raman scattering there

A. is increases in wavelength

B. is decrease in wavelength.

C. are both increase and decrease in the wavelenth.

D. is no change in wavelength

Answer: C



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93. The angle between incident ray and reflected ray or refracted ray is called _____

A. respective angle of deviation

B. angle of minimum deviation

C. glancing angle

D. emergence angle

Answer: A



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94. When a ray of light passes from air to denser medium, its speed is reduced by 30%.

What is the refractive index of the medium?

A. 1.33

B. 1.43

C. 1.5

D. 1.1

Answer: B



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95. A light of wavelength 6500 \AA in air is passed through water of refractive index 1.3.

The percentage change in wavelength will be nearly

A. 0.15

B. 0.23

C. 0.25

D. 0.3

Answer: B



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96. A yellow light travels from rarer medium to denser medium. At the value of critical angle, the ray will

- A. graze along the surface with angle of refraction of 90°
- B. be reflection back only
- C. be dispersed into another medium
- D. be refracted into denser medium.

Answer: A





97. Which of the following is the CORRECT statement?

- A. The dispersive power depends upon the angle of prism
- B. The angular dispersion depends upon the refracting angle of the prism
- C. The angular dispersion does not depend upon the dispersion power

D. The dispersive power in vacuum is one

Answer: B



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98. A completely transparent material will be invisible in vacuum when its refractive index μ is _____

A. unity

B. more than unity

C. less than unity

D. equal to 1.33

Answer: A



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Critical Thinking

1. Assertion: The frequencies of incident, reflected and refracted beam of monochromatic light incident beam of

monochromatic light incident from one medium to another are same

Reason: The incident, reflected and refracted rays are coplanar

- A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion
- B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion
- C. Assertion is True, Reason is False
- D. Assertion is False, Reason is False.

Answer: B



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2. If ${}_i\mu_j$ represents refractive index when a light ray goes from medium i to medium j , then the product ${}_2\mu_1 \times {}_3\mu_2 \times {}_4\mu_3$ is equal to

A. ${}_3\mu_1$

B. ${}_3\mu_2$

C. $\frac{1}{{}_1\mu_4}$

D. $4\mu_2$

Answer: C



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3. A ray of light falls on a glass plate of refractive index $\mu = 1.5$.

What is the angle of incidence of the ray if the angle between the reflected and refracted rays is 90° ?

A. $\sin^{-1}(\mu)$

B. $\cos^{-1}(\mu)$

C. $\tan^{-1}(\mu)$

D. $\tan^{-1}(1/\mu)$

Answer: C



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4. To an observer on the earth the stars appear to twinkle. This can be ascribed to

A. the fact that stars do not emit light continuously

B. frequency absorption of star light by their own atmosphere

C. frequency absorption of star light by the earth's atmosphere

D. the refractive index fluctuations in the earth's atmosphere

Answer: D



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5. A glass-slab is placed in the path of convergent light. The point of convergence of light_____

- A. moves towards the glass slab
- B. moves away from the glass slab
- C. remains at the same point
- D. undergoes a lateral shift

Answer: A



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6. A man standing in a swimming pool looks at a stone lying at the bottom. The depth of the swimming pool is h . At what distance from the surface of water is the image of the stone formed? (Line of vision is normal, Refractive index of water is n)

A. h/n

B. n/h

C. h

D. hn

Answer: A



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7. A bucket completely full of water is 46 cm deep. A coin kept at the bucket when viewed normally will appear at $\left(\mu_w = \frac{4}{5}\right)$

A. 40 cm

B. 34.5 cm

C. 39 cm

D. 32 cm

Answer: B



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8. A fish in water (refractive index n) looks at a bird vertically above in the air. If y is the height of the bird and x is the depth of the fish from the surface, then the distance of the bird as estimated by the fish is

A. $x + y\left(1 + \frac{1}{n}\right)$

B. $y + x\left(1 - \frac{1}{n}\right)$

C. $y + x\left(1 - \frac{1}{n}\right)$

D. $x + yn$

Answer: D



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9. In a photocell, increasing the intensity of incident light increases

A. reflected light gradually decreases and that of refracted light gradually increases.

B. reflected and refracted light increases

C. reflected light gradually increases and that of refracted light gradually decreases.

D. reflected light and refracted light both decreases.

Answer: C



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10. Light travels from a medium of refractive index μ_1 to another of refractive index μ_2 ($\mu_1 > \mu_2$). For total internal reflection of light, which is NOT true?

A. Light can travel from medium of

refractive index $\mu_1 \rightarrow \mu_2$

B. Angel of incidence must be greater than

the critical angle

C. There is no refraction of light

D. Light can travel from the medium of

refractive index $\mu_2 \rightarrow \mu_1$

Answer: D



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11. A diver in a swimming pool wants to signal his distress to a person lying on the edge of the pool by flashing his water proof flash light

A. he must direct the beam vertically upwards.

B. he has to direct the beam horizontally

C. he has to direct the beam at an angle to the vertical which is slightly less than the critical angle of incidence

D. he has to direct the beam at an angle to the vertical which is slightly more than the critical angle of incidence.

Answer: C



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12. A ray of light travelling inside a rectangular glass block of refractive index $\sqrt{2}$ is incident on a glass-air surface at an angle of incidence of 45° . The refractive index of air is one. Under these conditions, the ray

- A. will emerge into the air without any deviation
- B. will be reflected back into the glass

C. will be absorbed

D. will emerge into the air with an angle of refraction equal to 90°

Answer: D



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13. With respect to air, critical angle in a medium for light of red colour $[\gamma_1]$ is θ . Other facts remaining same, critical angle for light of yellow colour $[\gamma_2]$ will be

A. θ

B. more than θ

C. less than θ

D. $\frac{\theta\lambda_1}{\lambda_2}$

Answer: C



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14. During dispersion of white light by prism placed in air, for a particular value of angle of prism.

- A. only angular spread takes place
- B. only angular deviation takes place
- C. both angular deviation and angular
- D. for a particular value of angle of prism
either of angular deviation for mean
colour or spread takes place

Answer: C



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15. When a white light passes through a hollow prism, then there is

A. no dispersion and no deviation

B. dispersion but no deviation

C. deviation but no dispersion

D. dispersion and deviation both

Answer: A



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16. A given ray of light suffers minimum deviation in an equilateral prism P. Additional prisms Q and R of identical shape and of same material as P are now added as shown in the figure. The ray will now suffer



- A. greater deviation
- B. no deviation
- C. same deviation
- D. total internal reflection

Answer: C



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17. A glass prism is immersed completely in water. How does angle of minimum deviation change ?

A. increases

B. remains the same

C. decreases

D. depends on frequency of incident light

Answer: C



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18. A ray of light is incident on a 60° prism at the minimum deviation position. The angle of refraction at the first face (i.e. incident face) of the prism is-

A. zero

B. 30°

C. 45°

D. 60°

Answer: B



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19. A prism having refractive index $\sqrt{2}$ and refracting angle 30° , has one of the refracting surfaces polished. A beam of monochromatic light incident on the other refracting surface will retrace its path if the angle of incidence is

A. 0°

B. 30°

C. 45°

D. 60°

Answer: C



Watch Video Solution

20. A monochromatic ray of light travels through an equilateral prism such that angle of deviation is 30° . If the difference between

angles of incidence and emergence is 10° ,
then i and r respectively are

A. 45° , 55°

B. 50° , 40°

C. 35° , 45°

D. 30° , 40°

Answer: B



Watch Video Solution

21. A ray of light is incident on a refracting face of glass prism of refracting angle 30° . If the ray emerges normally from the second refracting surface, the angle of incidence is

$$[\mu_g = 1.5]$$

A. $\sin^{-1}(0.6)$

B. $\sin^{-1}(0.7)$

C. $\sin^{-1}(0.75)$

D. $\sin^{-1}(0.8)$

Answer: C



Watch Video Solution

22. The critical angle between an equilateral prism and air is 45° . If the incident ray is perpendicular to the refracting surface, then

A. 0°

B. 90°

C. 45°

D. 30°

Answer: B



Watch Video Solution

23. If the critical angle for the material of a prism is C and the angle of the prism is A , then there will be no emergent ray when

A. after deviation it will emerge from the second refracting surface

B. it is totally reflected on the second surface and emerges out perpendicularly

from third surface in air .

C. it is totally reflected from the second and third refracting surface and finally emerges out from the first surface

D. it is totally reflected from all the three sides of prism and never emerges out

Answer: B



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24. A ray of light is incident normally on one face of a prism of refracting angle A . After travelling through prism. The ray emerges from the second refracting surface making an angle of deviation of δ . The refractive index of the material of prism is

A. $A < 2C$

B. $A = 2C$

C. $A > 2C$

D. $A < \frac{C}{2}$

Answer: C



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25. A monochromatic ray of light is incident normally on one of the refracting surfaces of a prism . The emergent ray grazes the second refracting surface . What is the angle of the prism if the refractive index of the material of the prism is 1.6 ?

$$\text{A. } \frac{\sin\left(\frac{A+\delta}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

B. $\frac{\sin A}{\sin \delta}$

C. $\frac{\sin \delta}{\sin A}$

D. $\frac{\sin(A + \delta)}{\sin(A)}$

Answer: D



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26. A light ray is incident upon a prism in minimum deviation position and suffers a deviation of 34° . If the shaded half of the

prism is knocked off, the ray will



- A. suffer a deviation of 34°
- B. suffer a deviation of 68°
- C. suffer a deviation of 17°
- D. not come out of the prism

Answer: C



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27. The refractive index of a glass is 1.520 for red light and 1.525 for blue light . Let D_1 and D_2 be the angles of minimum deviation for red light and blue light respectively in a prism of this glass. Then

A. $D_1 > D_2$

B. $D_1 = D_2$

C. $D_1 < D_2$

D. D_1 can be less than or greater than D_2

prism

Answer: C



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28. The ratio of the angle of minimum deviation of a prism in air and when dipped in water will be

$$\left(a\mu_g = \frac{2}{3} \text{ and } w\mu_g = \frac{9}{8} \right) \text{ and}$$

A. $\frac{1}{8}$

B. $\frac{1}{2}$

C. $\frac{3}{4}$

D. $\frac{1}{4}$

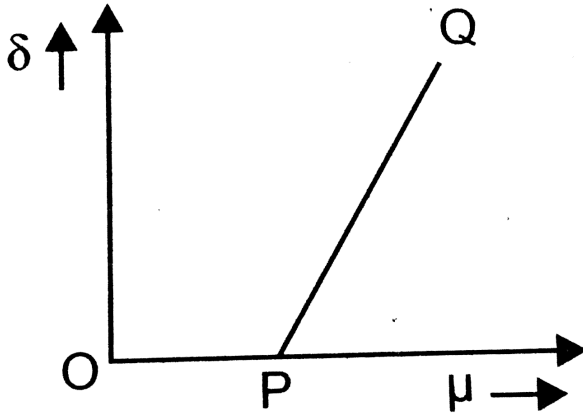
Answer: D



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29. For a small angled prism, angle of prism A of minimum deviation (δ) varies with the refractive index of the prism as shown in the

graph



- A. Point P corresponds to $\mu = 1$
- B. Slope of the line $PQ = A/2$
- C. Slope of line $PQ = A$
- D. Both (A) and (C) are true

Answer: D



30. The angle of the prism is A and B if the angle of minimum deviation is $(180^\circ - 2A)$ then the refractive index of the material of the prism is

A. $\cos\left(\frac{A}{2}\right)$

B. $\sin\left(\frac{A}{2}\right)$

C. $\tan\left(\frac{A}{2}\right)$

D. $\cot\left(\frac{A}{2}\right)$

Answer: D



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31. A beam of light composed of red and green rays is incident obliquely at a point on the face of rectangular glass slab. When coming out on the opposite parallel face, the red and green rays emerge from

A. two points propagating in two different non-parallel directions

B. two points propagating in two different parallel directions

C. one point propagating in two different directions.

D. one point propagating in same direction.

Answer: B



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32. When a glass prism is placed inside water, its dispersive power _____

A. decreases

B. remains the same

C. increases

D. may increase or decrease depending on refracting angle of prism

Answer: A



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33. Angle of minimum deviation for a prism of refractive index 1.5, is equal to the angle of the prism. Then the angle of the prism is

$$(\cos 41^\circ = 0.75)$$

A. 62°

B. 41°

C. 82°

D. 31°

Answer: C



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34. The angle of minimum deviation of a prism of refractive index $\sqrt{3}$ is equal to its refracting angle. Then the refracting angle of that prism is

A. 30°

B. 45°

C. 60°

D. 90°

Answer: C



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35. Two prisms of different materials and angles are used to give dispersion without deviation. Which of the following statements is true?

A. The order of colours of the spectrum in combination is reversed

B. The order of colours of the spectrum in combination remains the same.

C. The mean colour is absorbed after the rays emerge from combination

D. Only order of first colour (or red colour) is changed, other colours remain same.

Answer: A



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36. To produce deviation without dispersion with the help of crown glass prism of refracting angle (A) and flint glass (A') they must be related as

A. $A > A'$

B. $A = A'$

C. $A < A'$

D. $A = \frac{A'}{2}$

Answer: A



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37. A crown glass prism of refracting angle $A = 6^\circ$ is to be achromatised for red and blue light using a flint glass prism. Find the angle of flint glass prism (A') and also, the mean deviation from the following data :

$$\mu_b = 1.531 \quad \mu_r = 1.520 \quad \mu'_b = 1.684$$

$$\mu'_r = 1.662$$

A. $9^\circ, 1.134^\circ$

B. $6^\circ, 2.268^\circ$

C. 3° , 3 , 334°

D. 3° , 1.134°

Answer: D



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38. If the refractive indices of crown glass for red, yellow, and violet colours are 1.5140, 1.570 and 1.5318 respectively, and for flint glass these values are 1.6434, 1.6852 respectively, then the

dispersive powers for crown and flint glass are respectively

A. 0.034 and 0.064

B. 0.064 and 0.034

C. 1.00 and 0.064

D. 0.034 and 1.0

Answer: A



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39. The dispersive powers of crown and flint glasses are 0.03 and 0.05 respectively. The refractive indices for yellow light for these glasses are 1.517 and 1.621 respectively. It is desired to form an achromatic combination of prism of crown and flint glasses which can produce a deviation of 1° in the yellow ray. Find the refracting angles of the two prisms needed.

A. refracting angle of crown glass is 4.8°

and that of flint glass is 2.4°

B. refracting angle of crown glass is 2.4°

and that of flint glass is 4.8°

C. refracting angle of both the glasses is

4.8° each.

D. refracting angle of both the glasses is

2.4° each.

Answer: A



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40. Raman line lies in_____.

A. infra-red region

B. microwave region

C. ultraviolet region

D. visible region

Answer: D



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41. A ray of monochromatic light is incident on one refracting face of a prism of refracting angle 75° . It passes through the prism and is incident on the other face at the critical angle. If the refractive index of the material of prism is $\sqrt{2}$, the angle of incidence on the first face of the prism is

A. 0°

B. 30°

C. 45°

D. 60°

Answer: C



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42. A ray of light passing through a prism having refractive index $\sqrt{2}$ suffers minimum deviation. It is found that the angle of incidence is double the angle of refraction within the prism. Then angle of prism is

A. 45°

B. 60°

C. 75°

D. 90°

Answer: D



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43. The distance travelled by a ray of light in two media, in the same time are in the ratio 2 : 3. The ratio of refractive index of the first medium to second medium is

A. 3: 2

B. 4: 9

C. 2: 3

D. 9: 8

Answer: A



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44. A small bulb is placed at the bottom of a tank containing water to a depth of 80cm. What is the area of the bulb can emerge out?

Refractive index of water is 1.33. (Consider the bulb to be a point source.)

A. $3.13 m^2$

B. $1.43 m^2$

C. $2.61m^2$

D. $0.88m^2$

Answer: C



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45. A tank is filled with water to height of 12.5 cm. The apparent depth of a needle lying at the bottom of the tank is measured by a microscope to be 9.4 cm. What is the refractive index of water? If water is replaced by a liquid of refractive index 1.63 upto the same height, by what distance would the microscope have to be moved to focus on the needle again?

A. 1.33, 1.7 cm

B. 1.7, 1.33 cm

C. 1.33, 7.7 cm

D. 1.7,7.7 cm

Answer: A



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46. A vessel of depth $2d$ cm is half filled with liquid of refractive index μ_1 and the upper half with a liquid of refractive index μ_2 . The apparent depth of the vessel seen perpendicular is

A. $d \left(\frac{\mu_1 \mu_2}{\mu_1 + \mu_2} \right)$

B. $d \left(\frac{\mu_1 \mu_2}{\mu_1 + \mu_2} \right)$

C. $2d \left(\frac{\mu_1 \mu_2}{\mu_1 + \mu_2} \right)$

D. $2d \left(\frac{1}{\mu_1 \mu_2} \right)$

Answer: B



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47. A layer of oil 3 cm thick is flowing on a layer of coloured water 5 cm thick. Refractive index of coloured water is $\frac{5}{3}$ and the apparent

depth of the two liquids appears to be $\frac{36}{7}$ cm

. What is the refractive index of oil?

A. 1.4

B. 2

C. 2.4

D. 3

Answer: A



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48. In the given figure, the principal section of a glass prism is an isosceles triangle ABC with $AB = AC$. The face AC is silvered. A ray incident normally on face AB , after two reflection, emerges from the the base BC in a direction perpendicular to it. What is the angle $\angle BAC$ of a prism?



A. 30°

B. 36°

C. 60°

D. 72°

Answer: B



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49. The deviation produced by a thin glass prism placed in air, when immersed in water is

[Given ${}_a\mu_g = 3/2$ and ${}_a\mu_w = 4/3$]

A. reduces to one fourth

B. reduces to half

C. remains the same

D. increases four times

Answer: A



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50. A fish at a depth of $\sqrt{7}$ cm below the surface of water sees the outside world through a circular horizon. What is the radius of the circular horizon? $\left[\mu_w = \frac{4}{3} \right]$

A. 4 cm

B. 3 cm

C. $\sqrt{7} \text{ cm}$

D. 1 cm

Answer: B



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51. A ray of light is incident normally normallyh on one of the faces of a prism of apex angle 30° and refractive index $\sqrt{2}$. The angle of

deviation of the ray is _____

degrees.

A. 15°

B. 30°

C. 45°

D. 60°

Answer: A



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52. A light ray is incident normally on the face AB of a right-angled prism ABC ($\mu = 1.50$) as shown in the figure. What is the largest angle ϕ for which the light ray is totally reflected at the face AC?



A. $\phi = \sin^{-1} \left(\frac{2}{3} \right)$

B. $\phi = \cos^{-1} \left(\frac{2}{3} \right)$

C. $\phi = \cos^{-1} \left(\frac{1}{3} \right)$

D. $\phi = \cot^{-1} \left(\frac{2}{3} \right)$

Answer: B



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53. On heating a liquid, the refractive index generally

A. decreases

B. increases or decreases depending on the rate of heating

C. does not change.

D. increases four times

Answer: A



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54. If \hat{i} denotes a unit vector along incident light ray, \hat{r} a unit vector along refracted ray into a medium of refractive index μ and \hat{n} unit vector normal to boundary of medium directed towards incident medium, then law of refraction is

A. $\hat{i} \cdot \hat{n} = \mu(\hat{r}\hat{n})$

B. $\hat{i} \times \hat{n} = \mu(\hat{n} \times \hat{r})$

C. $\hat{i} \times \hat{n} = \mu(\hat{r} \times \hat{n})$

D. $\mu(\hat{i} \times \hat{n}) = \hat{r} \times \hat{n}$

Answer: C



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55. The fine powder of a coloured glass is seen as

A. coloured

B. white

C. that of the glass colour

D. black

Answer: B



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56. A circular disc of which $\frac{2}{3}$ part is coated with yellow and $\frac{1}{3}$ part is with blue . It is

rotated about its central axis with high velocity. Then it will be seen as

A. green

B. blue

C. white

D. yellow

Answer: A



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57. Light enters at an angle of incidence in a transparent rod of refractive index n . For what value of the refractive index of the material of the rod the light once entered into it will not leave it through its lateral face whatsoever be the value of angle of incidence.

A. $n > \sqrt{2}$

B. $n = 1$

C. $n = 1.1$

D. $n = 1.3$

Answer: A



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58. A glass prism ($\mu = 1.5$) is dipped in water ($\mu = 4/3$) as shown in figure. A light ray is incident normally on the surface AB. It reaches the surface BC after total reflection, if



A. $\sin \theta \geq 8/9$

B. $2/3 < \sin \theta < 8/9$

C. $\sin \theta \leq 2/3$

D. It is not possible

Answer: A



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59. An isosceles prism of angle 120° has a refractive index of 1.44. Two parallel monochromatic rays enter the prism parallel to each other in air as shown. The rays

emerging from the opposite faces



A. are parallel to each other

B. are diverging

C. make an angle $2 \sin^{-1}(0.720)$ with each

D. make an angle $2[\sin^{-1}(0.72) - 30^\circ]$

with each other.

Answer: D



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60. When light is incident on a medium at angle i and refracted into a second medium at an angle r , the graph of $\sin i$ vs $\sin r$ is as shown in the graph, From this, one can conclude that



A. velocity of light in the second medium is 1.73 times the velocity of light in the 1 medium.

B. velocity of light in the I medium is 1.73 times the velocity in the II medium.

C. The critical angle for the two media is given by 45° .

D. $\sin i_c = \frac{1}{2}$

Answer: B



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61. Immixable transparent liquids A,B,C,D and E are placed in a rectangular container of glass with the liquids making layers according to their densities. The refractive index of the liquids are shown in the adjoining diagram. The container is illuminated from the side and a small piece of glass having refractive index 1.61 is gently dropped into the liquied layer. The glass piece as it descends downwards will not be visible in



A. liquid A and B only.

B. liquid C only.

C. liquid D and E only

D. liquid A,B,D,C and E

Answer: B



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Competitive Thinking

1. The angle made by incident ray of light with the reflecting surface is called

- A. glancing angle
- B. angle of incidence
- C. angle of deviation
- D. angle of refraction

Answer: B



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2. There is a small air bubble at the centre of a solid glass sphere of radius 'r' and refractive index μ . What will be the apparent distance of the bubble from the centre of the sphere, when viewed from outside?

A. r

B. $\frac{r}{\mu}$

C. $r \left(1 - \frac{1}{\mu} \right)$

D. Zero

Answer: D





3. The refractive index of water and glass with respect to air is 1.3 and 1.5 respectively, what will be the refractive index of glass with respect to water?

A. $\frac{1.5}{1.3}$

B. $\frac{1.3}{1.5}$

C. $\frac{1.5}{2.6}$

D. $\frac{2.6}{1.5}$

Answer: A



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4. A light of wavelength 6000 Å travels from rarer medium to denser medium of refractive index 1.5, If its frequency in rarer medium is 5×10^{14} Hz, then its frequency in denser medium will be

A. 3.3×10^{14} Hz

B. 5×10^{14} Hz

C. 2.5×10^7 Hz

D. 7.5×10^{14} Hz

Answer: B



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5. If light travels from vacuum to water, its wavelength

A. increases

B. remains constant

C. decreases

D. may increase or decreases

Answer: C



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6. Light waves travel from optically rarer medium to optically denser medium. Its velocity decreases because of change in _____

A. frequency

B. wavelength

C. amplitude

D. phase

Answer: B



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7. Monochromatic light is refracted from air into glass of refractive index μ . The ratio of the wavelength of the incident and refracted waves in

A. $1:1$

B. $1:\mu$

C. $\mu:1$

D. $\mu^2:1$

Answer: C



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8. A beam of light propagating at an angle α_1 from a medium 1 to another medium 2 at an angle α_2 . If the wavelength of light in medium

1 is λ_1 . The wavelength of light in medium 2, (λ_2 , is

A. $\frac{\sin \alpha_2}{\sin \alpha_1} \lambda_1$

B. $\frac{\sin \alpha_1}{\sin \alpha_2} \lambda_1$

C. $\left(\frac{\alpha_1}{\alpha_2}\right) \lambda_1$

D. λ_1

Answer: A



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9. A ray of light is incident on a glass plate of refractive index 1.5. The angle between the reflected and refracted rays is 90° . What is the ratio of wavelength of reflected t refracted rays ?

A. 2.1

B. 1.5

C. 1.6

D. None of these

Answer: B



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10. A beam of monochromatic blue light of wavelength 4200 \AA in air travels in water of refractive index $4/3$. its wavelength in water will be

A. 4200 \AA

B. 5800 \AA

C. 4150 \AA

D. 3150 \AA

Answer: D



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11. A wave of light having frequency 4×10^{14} Hz. And speed of light 3×10^8 m/s enters glass of R.I. 1.5. Change in wavelength is

A. 2.5×10^{-7}

B. 2.5×10^{-6}

C. 2.5×10^{-8}

D. 2.5×10^{-9}

Answer: A



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12. Light enters from air into a medium of refractive index 1.5. Percentage change in its wavelength is

A. 0.6666

B. 0.5

C. 0.3333

D. 0.25

Answer: C



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13. The velocity of light in glass is 2×10^8 m/s. If refractive index of glass with respect to water is $9/8$, then the velocity of light in water is

A. 1.6×10^8 m/s

B. 1.33×10^8 m/s

C. 3×10^8 m/s

D. 2.25×10^8 m/s

Answer: D



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14. The ratio of velocities of light in glass that in waters is (refractive index of glass = 1.5 and refractive index of water = 1.33)

A. 0.8803 : 1

B. 0.8989 : 1

C. 0.8867 : 1

D. 0.8504 : 1

Answer: C



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15. The refractive index of water is $\frac{4}{3}$ and speed of light in air is $3 \times 10^8 \text{ m/s}$. Find the speed of light in water

A. $2.67 \times 10^8 \text{ m/s}$

B. 2.25×10^8 m/s

C. 1.78×10^8 m/s

D. 1.50×10^8 m/s

Answer: B



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16. The refractive index of glass W.t.r. a medium is $\frac{4}{3}$. If $v_m - v_g = 6.25 \times 10^7$ m/s. then the velocity of light in the medium will be

A. 2.5×10^8 m/s

B. 1.5×10^7 m/s

C. 2.25×10^8 m/s

D. 4.5×10^7 m/s

Answer: A



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17. A ray of light is incident on the surface of separation of a medium with the velocity of light at an angle 45° and is refracted into the

medium at an angle 30° . What will be the velocity of light in the medium ?

A. 1.96×10^8 m/s

B. 2.12×10^8 m/s

C. 3.86×10^8 m/s

D. 3.33×10^8 m/s

Answer: B



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18. A thin oil layer floats on water. A ray of light making an angle of incidence of 40° shines on oil layer. The angle of refraction of light ray in water is [$\mu_{oil} = 1.45, \mu_{water} = 1.33$]

A. 36.1°

B. 44.5°

C. 26.8°

D. 28.9°

Answer: D



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19. A light beam is incident at an angle twice the angle twice the angle of refraction. The angle of refraction is

A. $2 \cos^{-1} \left(\frac{\mu}{2} \right)$

B. $\cos^{-1}(2\mu)$

C. $\frac{1}{2} \cos^{-1} \left(\frac{\mu}{2} \right)$

D. $\cos^{-1} \frac{\mu}{2}$

Answer: D





20. A ray of light strikes a transparent rectangular slab (of refractive index $\sqrt{2}$) At an angle of incidence of 45° . The angle between the reflected and refracted rays is

A. 75°

B. 90°

C. 105°

D. 120°

Answer: C



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21. A glass cube is placed on a white paper having spots of red, blue, yellow and green colour. Then, the one that appears least raised is

A. blue

B. red

C. yellow

D. green

Answer: B



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22. A plane glass is placed over a various coloured letters (Violet, green, yellow ,red).

The letter which appears to be raised more is

A. red

B. yellow

C. green

D. violet

Answer: D



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23. Two undentical beakers, one filled with water $\mu = \frac{4}{3}$ and the other filled with oil ($\mu = 1.6$) are viewed from directly above. On comparison, which of the following statements is correct?

A. Water filled beaker appears deeper by a factor of 1.2

B. Oil filled beaker appear deeper by a factor of 1.2.

C. Water filled beaker appears deeper by a factor of $\frac{4}{3}$

D. Oil filled beaker appears deeper by a factor of 1.6.

Answer: A



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24. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face, the thickness (in cm) of the slab is

A. 16

B. 8

C. 10

D. 12

Answer: D



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25. A ray of light is incident on the surface of a glass plate of thickness t . If the angle of incidence θ is small, the emerging ray would be displaced side ways by an amount

(Take n = refractive index of glass)

A. $t\theta n / (n + 1)$

B. $t\theta(n - 1) / n$

C. $t\theta n / (n - 1)$

D. $t\theta(n + 1) / n$

Answer: B



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26. A ray of light passes through four transparent media with refractive index n_1, n_2, n_3 and n_4 as shown, the surface of all media are parallel. If the emergent ray DE is

parallel to incident ray AB, then



A. $n_1 = n_4$

B. $n_2 = n_4$

C. $n_3 = n_4$

D. $n_1 = \frac{n_2 + n_3 + n_4}{3}$

Answer: A



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27. For total internal reflection to take place, the angle of incidence i and the refractive index μ of the medium must satisfy the inequality

A. $\frac{1}{\sin i} < \mu$

B. $\frac{1}{\sin i} > \mu$

C. $\sin i < \mu$

D. $\sin i > \mu$

Answer: A



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28. A diamond sparkles because of its

A. hardness.

B. emission of light by the diamond

C. absorption of light by the diamond.

D. high refractive index.

Answer: D



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29. A transparent solid cylindrical rod has a refractive index of $\frac{2}{\sqrt{3}}$. It is surrounded by air.

A light ray is incident at the mid-point of one end of the rod as shown in the figure.



The incident angle θ for which the light ray grazes along the wall of the rod is

- A. $\sin^{-1}(1/2)$
- B. $\sin^{-1}(\sqrt{3}/2)$
- C. $\sin^{-1}(2/\sqrt{3})$
- D. $\sin^{-1}(1/\sqrt{3})$

Answer: D



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30. White light is incident on the interface of glass and air as shown in the figure. If green light is just totally internally reflected then the emerging ray in air contains



A. yellow, orange and red.

B. violet, indigo and blue

C. all colours

D. all colours except green

Answer: A



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31. A green light is incident from the water to the air - water interface at the critical angle (θ). Select the correct statement.

A. The entire spectrum of visible light will come out of the water at an angle of 90° to the normal

B. The spectrum of visible light whose frequency is less than that of green light will come out to the air medium.

C. the spectrum of visible light whose frequency is more than that of green light will come out to the air medium

D. The entire spectrum of visible light will
come out of the water at various angles
to the normal

Answer: B



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32. Critical angle of light passing from glass to
air is maximum for _____

A. red

B. green

C. yellow

D. violet

Answer: D



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33. The critical angle for total internal reflection in diamond is 24.5° . The refractive index of the diamond is

A. 2.41

B. 1.41

C. 2.59

D. 1.59

Answer: A



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34. A light beam is travelling from Region I to Region IV (Refer Figure). The refractive index in Regions I, II, III and IV are

n_0 , $\frac{n_0}{2}$, $\frac{n_0}{6}$ and $\frac{n_0}{8}$, respectively. The angle of incidence θ for which the beam just misses entering Region IV is



A. $\sin^{-1}\left(\frac{3}{4}\right)$

B. $\sin^{-1}\left(\frac{1}{8}\right)$

C. $\sin^{-1}\left(\frac{1}{4}\right)$

D. $\sin^{-1}\left(\frac{1}{3}\right)$

Answer: B



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35. A ray of light passes from a medium A having refractive index 1.6 to the medium B having refractive index 1.5. the value of critical angle of medium A is _____

A. $\sin^{-1} \left(\frac{16}{15} \right)$

B. $\sin^{-1} \sqrt{\frac{16}{15}}$

C. $\sin^{-1} \left(\frac{1}{2} \right)$

D. $\sin^{-1} \left(\frac{15}{16} \right)$

Answer: D



36. Consider telecommunication through optical fibres. Which of the following statement is not true?

A. Optical fibres may have homogeneous core with a suitable cladding.

B. Optical fibres can be of graded refractive index

C. Optical fibres are subject to electromagnetic interference from outside.

D. Optical fibres have extremely low transmission loss

Answer: C



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37. Assertion: in optical fibre, the diameter of the core is kept small.

Reason: This smaller diameter fo the fibre should have incident angle more than the critical angle required for total internal reflection.

A. Assertion is True, Reason is True, Reason is a correct explantion for Assertion

B. Assertion is True, Reason is True, Reason is not a correc explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is False.

Answer: A



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38. Assertion: There is no dispersion of light refracted through a rectangular glass slab.

Reason : Dispersion of light is the phenomenon of splitting of a beam of white light into its constituent colours.

- A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion
- B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion
- C. Assertion is True, Reason is False
- D. Assertion is False, Reason is False.

Answer: B



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39. A prism ($\mu = 1.5$) has the refracting angle of 30° . The deviation of a monochromatic ray incident normally on its one surface will be $[\sin 48^\circ 36' = 0.75]$

A. $18^\circ 36'$

B. $20^\circ 30'$

C. 18°

D. $22^\circ 1'$

Answer: A



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40. If the angle of prism is 60° and the angle of minimum deviation is 40° , the angle of refraction will be

A. 30°

B. 60°

C. 100°

D. 120°

Answer: A





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41. In the position of minimum deviation when a ray of yellow light passes through the prism, then its angle of incidence is

- A. less than the emergent angle
- B. greater than the emergent angle
- C. sum of angle of incidence and emergent
- D. equal to the emergent angle

Answer: D

42. The graph between angle of deviation (δ) and angle of incidence (i) for a triangular prism is represented by

A. 

B. 

C. 

D. 

Answer: C



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43. A ray of light is incident on an equilateral glass prism placed on a horizontal table. For minimum deviation which of the following is true?



A. PQ is horizontal

B. QR is horizontal

C. RS is horizontal

D. Either PQ or RS is horizontal

Answer: B



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44. The angle of minimum deviation for a prism is 40° and the angle of the prism is 60° .

The angle of incidence in this position will be

A. 30°

B. 60°

C. 50°

D. 100°

Answer: C



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45. Two beam of red and violet colors are made to pass separately through a prism (angle of the prism is 60°). In the position of minimum deviation, the angle of refraction will be

A. greater for red colour

B. equal but not 30° for both the colours.

C. greater than violet colour

D. 30° for both the colours.

Answer: D



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46. A ray of light passes through an equilateral glass prism in such a manner that the angle of incidence is equal to the angle of emergence

and each of these angles is equal to $\frac{3}{4}$ of the angle of the prism. The angle of deviation is

A. 45°

B. 39°

C. 20°

D. 30°

Answer: D



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47. A parallel beam of monochromatic light is incident on one surface of an equilateral prism. Angle of incidence is 55° and angle of emergence is 46° . The angle of minimum deviation will be

A. less than 41°

B. equal to 41°

C. more than 41°

D. Zero

Answer: A



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48. A prism of a refracting angle 60° is made with a material of refractive index μ . For a certain wavelength of light, the angle of minimum deviation is 30° . For this wavelength, the value of μ of material is

A. 1.82

B. 1.503

C. 1.414

D. 1.231

Answer: C



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49. A ray of light is incident at an angle of 60° on the face of a prism with an angle of 60° . Then the refractive index of the material of the prism is (the prism is in minimum deviation position)

A. 1.414

B. 1.623

C. 1.524

D. 1.732

Answer: D



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50. The angle of minimum deviation for an incident light ray on an equilateral prism is equal to its refracting angle. The refractive index of its material is

A. $\frac{1}{\sqrt{2}}$

B. $2\sqrt{3}$

C. $\sqrt{3}$

D. $\frac{\sqrt{3}}{2}$

Answer: B



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51. Angle of minimum deviation for a prism of refractive index 1.5, is equal to the angle of the

prism. Then the angle of the prism is

_____ ($\sin 48^\circ 36' = 0.75$)

A. $41^\circ 24'$

B. 80°

C. 60°

D. $82^\circ 48'$

Answer: D



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52. A ray of light suffers a minimum deviation when incident on an equilateral prism of refractive index $\sqrt{2}$ The angle of incidence is

A. 30°

B. 45°

C. 60°

D. 50°

Answer: B



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53. For an angle of incidence θ on an equilateral prism of refractive index $\sqrt{3}$, the ray refracted is parallel to the base inside the prism. The value of θ is

A. 30°

B. 45°

C. 60°

D. 75°

Answer: C



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54. The refractive index of the material of an equilateral prism is 1.6. The angle of minimum deviation due to the prism would be

A. 30°

B. between 30° and 45°

C. 45°

D. between 30° and 60°

Answer: D



55. The refracting angle of a prism is A , and refractive index of the material of the prism is $\cot\left(\frac{A}{2}\right)$. The angle of minimum deviation is

A. $180^\circ - 3A$

B. $180^\circ - 2A$

C. $90^\circ - A$

D. $180^\circ + 2A$

Answer: B



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56. The angle of incidence for a ray of light at a refracting surface of a prism is 45° . The angle of prism is 60° . If the ray suffers minimum deviation through the prism. The angle of minimum deviation and refractive index of the material of the prism respectively, are

A. $45^\circ, \sqrt{2}$

B. $30^\circ, \frac{1}{\sqrt{2}}$

C. $45^\circ, \frac{1}{\sqrt{2}}$

D. 30° , $\sqrt{2}$

Answer: D



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57. In an experiment for determination of refractive index of glass of a prism by $i - \delta$, plot it was found that a ray incident at angle 35° , suffers a deviation of 40° and that it emerges at angle 79° . In that case which of

the following is closest to the maximum possible value of the refractive index?

A. 1.6

B. 1.7

C. 1.8

D. 1.5

Answer: D



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58. A small angled prism of refractive index 1.6 gives a deviation of 3.6° . The angle of prism is _____.

A. 7°

B. 6°

C. 5°

D. 8°

Answer: B



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59. The refractive indices for the light of violet and red colours of any material are 1.66 and 1.64 respectively. If the angle of prism made of this material is 10° , then angular dispersion will be

A. 0.20°

B. 0.10°

C. 0.40°

D. 1°

Answer: A



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60. A spectrum is formed by a prism of dispersive power ω . If the angle of deviation is δ . Then the angular dispersion is

A. $\frac{\omega}{\delta}$

B. $\frac{\delta}{\omega}$

C. $\frac{1}{\delta\omega}$

D. $\omega\delta$

Answer: D



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61. A thin prism P of refracting angle 3° and refractive index 1.5 is combined with another thin prism Q of refractive index 1.6 to produce dispersion without deviation. Then the angle of prism Q is

A. 3°

B. 4°

C. 3.5°

D. 2.5°

Answer: D



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62. A thin prism having refracting angle 10° is made of glass of refracting index 1.42. This prism is combined with another thin prism of glass of refractive index 1.7. This combination produces dispersion without deviation. The refracting angle of second prism should be :

A. 6°

B. 8°

C. 10°

D. 4°

Answer: A



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63. An achromatic prism is made by combining two prisms $P_1(\mu_v = 1.523, \mu_r = 1.515)$ and $P_2(\mu_v = 1.666, \mu_r = 1.650)$ Where μ

represents the refractive index if the angle of the prism P_1 is 10° then the angle of the prism P will be

A. 5°

B. 7.8°

C. 10.6°

D. 20°

Answer: A



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64. Dispersive power depend upon

A. the shape of prism

B. material of prism

C. angle of prism

D. height of the prism

Answer: B



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65. In the visible region the dispersive powers and the mean angular deviations for crown and flint glass prisms are ω, ω' and d, d' respectively. The condition for getting deviation without dispersion when the two prisms are combined is

A. $\sqrt{\omega d} + \sqrt{\omega' d'} = 0$

B. $\omega' d + \omega d' = 0$

C. $\omega d + \omega' d' = 0$

D. $(\omega d)^2 + (\omega' d')^2 = 0$

Answer: C



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66. In the formation of a rainbow, light from the sun on water droplets undergoes

A. dispersion only

B. only total internal reflection

C. dispersion and total internal reflection

D. None of these

Answer: C



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67. In the formation of primary rainbow, the sunlight rays emerge at minimum deviation from rain-drop after

A. one internal reflection and one refraction

B. one internal reflection and two refractions

C. two internal reflections and one refraction

D. two internal reflections and two refractions

Answer: B



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68. Pick the correct statement from the following

- A. Primary rainbow is a virtual image and secondary rainbow is a real image.
- B. Primary rainbow is a real image and secondary rainbow is a virtual image.
- C. Both primary and secondary rainbows are virtual images
- D. Both primary and secondary rainbows are real images.

Answer: C



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69. According to Rayleigh's law, the amount of scattering of light is inversely proportional to the fourth power of its _____.

A. the light of only longer wavelengths is scattered more in earth's atmosphere.

B. small sized dust particles scatter preferentially smaller wavelengths of light

C. the large size dust particles scatter only

light of short wavelengths

D. the light coming from sodium lamps

show Rayleigh scattering very effeciently

by large sized dust particles.

Answer: B



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70. During scattering of light, the amount of scattering is inversely proportional to of wavelength of light

A. square

B. fourth power

C. half

D. cube

Answer: B



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71. Blue colour of water in sea is due to

A. image of sky in water

B. refraction of sunlight

C. interference of sunlight reflected from
the water surface

D. scattering of sunlight by the water
molecules.

Answer: D



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72. Assertion: A red object appears dark in yellow light.

Reason : Red colour is scattered less.

A. Assertion is True, Reason is True, Reason

is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason

is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is False.

Answer: B



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73. On decreasing the wavelength of incident light from 8000 \AA to 4000 \AA . The intensity of the scattered light in Rayleigh scattering will become _____ time the initial scattered intensity.

A. 2

B. 4

C. 16

D. 8

Answer: C



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74. Blue colour of sea water is due to

A. interference

B. refractinon

C. polarization

D. scattering

Answer: D



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75. What will be the colour of the sky as seen from the earth if there were no atmosphere?

A. Black

B. blue

C. Orange

D. Red

Answer: A



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76. At sunrise or sunset, the sun looks more red than at mid-day because

A. the sun is hottest at these times

B. of the scattering of light

C. of the effects of refraction

D. of the effects of diffraction

Answer: B



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77. Check the correct statements on scattering of light

S1: Rayleigh scattering is responsible for the bluish appearance of sky

S2: Rayleigh scattering is proportional to $1/\lambda^4$ when the size of the scatterer is much

less than λ

S_3 : Clouds having droplets of water (large scattering objects) scatter all wavelengths are almost equal and so are generally white

S_4 : The sun looks reddish at sunset and sunrise due to Rayleigh scattering

A. S_1 only

B. S_1 and S_2

C. S_2 and S_3

D. S_1, S_2, S_3 and S_4

Answer: D



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78. If the critical angle for total internal reflection from a medium to vacuum is 30° , the velocity of light in the medium is

A. 3×10^8 m/s

B. 1.5×10^8 m/s

C. 6×10^8 m/s

D. $\sqrt{3} \times 10^8$ m/s

Answer: B



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79. Which of the following is not a correct statement?

A. The wavelength of red light is greater than the wavelength of green light

B. The wavelength of blue light is smaller than the wavelength of orange light.

C. the frequency of green light is greater than the frequency of blue light

D. The frequency of violet light is greater than the frequency of blue light.

Answer: C



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80. Each quarter of a vessel of depth H is filled with liquids of the refractive indices n_1, n_2, n_3 and n_4 from the bottom respectively. The apparent depth of the vessel when looked normally is

A.
$$\frac{Hn_1 - n_2 + n_3 + n_4}{4}$$

B.
$$\frac{H\left(\frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3} + \frac{1}{n_4}\right)}{4}$$

C.
$$\frac{(n_1 + n_2 + n_3 + n_4)}{4}$$

D.
$$\frac{H\left(\frac{1}{n_1} + \frac{1}{n_2} + \frac{1}{n_3} + \frac{1}{n_4}\right)}{2}$$

Answer: B



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81. How much water should be filled in a container of height 21cm , so that it appears

half filled to the observer when viewed from the top of the container ($\mu = 4/3$).

- A. 8.0 cm
- B. 10.5 cm
- C. 12.0 cm
- D. 14.0 cm

Answer: C



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82. The angle of a prism is A . One of its refracting surfaces is silvered. Light rays falling at an angle of incidence $2A$ on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index, μ , of the prism is

A. $2 \sin A$

B. $2 \cos A$

C. $\frac{1}{2} \cos A$

D. $\tan A$

Answer: B



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83. The refractive index of the material of a prism is $\sqrt{2}$ and the angle of the prism is 30° . One of the two refraction surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering. The prism from the other face will retrace its path (after reflection from the

silvered surface) if its angle of incidence on the prism is

A. 60°

B. 45°

C. 30°

D. Zero

Answer: B



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84. when a glass prism of refracting angle 60° is immersed in a liquid, its angle of minimum deviation is 30° . The critical angle of glass prism with respect to the liquid medium is



A. 42°

B. 45°

C. 50°

D. 52°

Answer: B



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85. A beam of light consisting of red, green and blue colours is incident on right angled prism. The refractive indices of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively.



A. separate the red colour part from the green and blue colours

B. separate the blue colour part from the red and green colours

C. separate all the three colours from one another

D. not separate the three colour at all .

Answer: A



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86. A ray falls on a prism ABC ($AB = BC$) and travels are shown in the figure. The minimum refractive index of the material of the prism should be



A. $\frac{4}{3}$

B. $\sqrt{2}$

C. $\frac{3}{2}$

D. $\sqrt{3}$

Answer: B



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87. Assertion: By roughening the surface of a glass sheet its transparency can be reduced.

Reason: Glass sheet with rough surface absorbs more light.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is False.

Answer: C



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88. A ray of light passing through the point $(1,2)$ reflects on the axis of x at the point A and the reflected ray passes through the point $(5,3)$. Determine the coordinates of the point A .

A. 5

B. $\sqrt{13}$

C. $2\sqrt{13}$

D. $1 + 2\sqrt{3}$

Answer: A



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Evaluation Test

1. Assertion : The images formed by total internal reflections are much brighter than those formed by mirrors or lenses.

Reason : There is no loss of intensity in total internal reflection.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is False.

Answer: A



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2. A ray of light passing through a prism of refracting angle 60° has to deviate by at least 30° . Then refractive index of prism should be

A. $\leq \sqrt{2}$

B. $< \sqrt{2}$

C. < 1

D. ≥ 1

Answer: B



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3. One side of a glass slab is silvered as shown in figure. A ray of light is incident on the other side at angle of incident $i = 30^\circ$. Refractive index of glass is given as 1.5 the deviation of the ray of light from its initial path when it

comes out of slab is



A. 90°

B. 30°

C. 120°

D. 60°

Answer: D



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4. Which one among the following is used to make periscope?

A. 

B. 

C. 

D. 

Answer: C



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5. Light propagates 4 cm distance in glass of refractive index 1.5 in time t_0 . In the same time t_0 light propagates a distance of 4.8 cm in a medium. The refractive index of the medium is

A. 1.25

B. 1.5

C. 1.7

D. 0.867

Answer: A

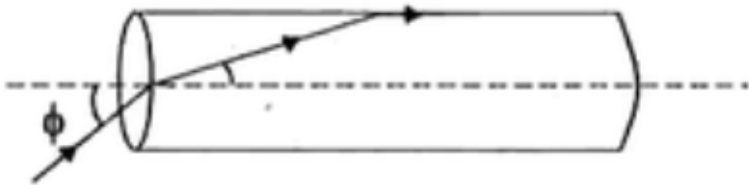


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6. A transparent solid cylindrical rod has a refractive index of $\frac{2}{\sqrt{3}}$. It is surrounded by air. A light ray is incident at the mid-point of one end of the rod as shown in the figure.

The incident angle ϕ for which the light ray grazes along the wall of the rod is

The incident angle ϕ for which the light ray grazes along the wall of the rod is



A. $\sin^{-1}\left(\frac{1}{2}\right)$

B. $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

C. $\sin^{-1} \sqrt{2}$

D. $\sin^{-1} \left(\frac{1}{\sqrt{3}} \right)$

Answer: C



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7. Assertion: When a glass prism is immersed in water, the deviation caused by prism decreases.

Reason: Refractive index of glass prism relative to water is less than that relative to air.

- A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion
- B. Assertion is True, Reason is True, Reason is not a correct explanation for Assertion
- C. Assertion is True, Reason is False
- D. Assertion is False, Reason is False.

Answer: A



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8. A beam of light consisting of red, and blue colours is incident on a right-angled prism ABC. The refractive indices of the material of the prism for the red and blue wavelength are 1.39 and 1.47 respectively. The colour/colours transmitted through the face AC of the prism will be



A. red only

B. red and blue

C. blue only

D. none

Answer: A



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9. Diamond is optically more dense than water because

A. it has a greater density than water

B. water is more transparent

C. water retards the speed of light less than a diamond.

D. a diamond glitters more than water.

Answer: C



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10. A diver swims obliquely above a fish in water. If he wants to hit the fish, he must aim



- A. at the fish
- B. below the fish
- C. above fish
- D. to the left of the fish

Answer: A



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11. Critical angle of glass is θ_1 and that of water is θ_2 . The critical angle for water and glass surface would be

$$(\mu_g = 3/2, \mu_w = 4/3)$$

A. between θ_1 and θ_2 .

B. greater than θ_2

C. less than θ_1

D. less than θ_2

Answer: B



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12. The value of critical angle is least for which of the following colours of light?

A. Violet

B. green light

C. Blue

D. yellow

Answer: A



13. The angular dispersion produced by a small angle prism placed in air

A. increases if the average refractive index of the prism increases

B. increases if the average refractive index decreases

C. remains constant whether the average refractive index increases or decreases.

D. has no relation with average refractive index.

Answer: A



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14. Between the primary and secondary rainbows, there is a dark band known as Alexander's dark band. This is because

- A. This region forms an image on blind spot on retina.
- B. there is no light scattered into this region.
- C. light is absorbed in this region
- D. angle made at the eye by the scattered rays with respect to the incident light of the sun lies between approximately 42° and 50°

Answer: D



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15. Assertion: The rainbow is seen sometimes in the sky when it is raining. When one sees a rainbow, one's back is towards the sun.

Reason: Internal reflection from water droplet causes dispersion. The final ray is in the backward direction.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True, Reason

is not a correct explanation for Assertion

C. Assertion is True, Reason is False

D. Assertion is False, Reason is False.

Answer: A



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