PHYSICS

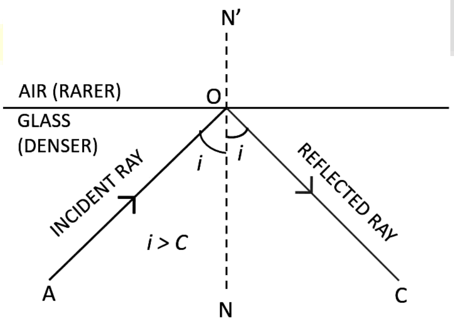
41. (2)
It is due to scattering of light.
Scattering $\propto \frac{1}{\lambda^4}$.
Hence, the light reaches us is rich in red.

42. (3)
$\frac{1}{f} = ({}_l\mu_g - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$, where, ${}_l\mu_g = 1$ is given.
$\Rightarrow \frac{1}{f} = (1-1)\left(\frac{1}{R_1} + \frac{1}{R_2}\right) = 0 \Rightarrow f = \infty$

43. (3)
From the formula,
$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{25} - \frac{1}{25} = 0$
Power of combination $= \frac{1}{f} = 0$

44. (3)

45. (4)
For the total internal reflection when $i = i_C$, then refracted ray grazes with the surface. That means the angle of refraction r = 90°.



46. (1)
Wavefront is the locus of all points, where the particles of the medium vibrate with the same phase.

47. (4)
If source are coherent
$I_R = I_1 + I_2 + 2\sqrt{I_1 I_2}\cos\phi$
If source are incoherent,
$I_R = I_1 + I_2 + 2I = \frac{4I}{2} = \frac{I_0}{2}$

48. (2)
The wavelength of light in water $\left(\lambda_w = \frac{\lambda_a}{\mu}\right)$ is less than that in air. When the set-up is immersed in water, fringe width $\beta(\propto\lambda)$ will decrease.

49. (2)
For constructive interference d sin θ = nλ given $d = 2\lambda \Rightarrow \sin\theta = \frac{n}{2}$, where n = 0, 1, −1, 2, −2 hence five maxima are possible

50. (1)
Let θbe the angular width in water.
We know angular width $= \frac{\lambda}{d}$
Angular width $\propto \lambda$
$\frac{\theta}{0.4^\circ} = \frac{\lambda_w}{\lambda_a}$ … (i)
Now, ${}_a\mu_w = \frac{\lambda_a}{\lambda_w} \Rightarrow \frac{\lambda_a}{\lambda_w} = \frac{4}{3}$
Hence from eq. (1), we have
$\frac{\theta}{0.4^\circ} = \frac{3}{4} \Rightarrow \theta = 0.3^\circ$