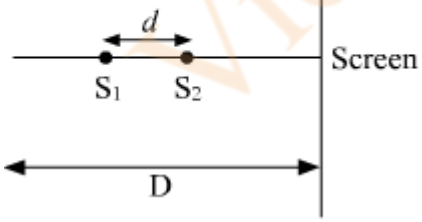
Wave Optics

Q.No.1:
A beam of unpolarised light of intensity I_0 is passed through a polaroid A and then through another polaroid B which is oriented so that its principal plane makes an angle of 45° relative to that of A. The intensity of the emergent light is:

JEE 2013

A. I_0
B. $\frac{I_0}{2}$
C. $\frac{I_0}{4}$
D. $\frac{I_0}{8}$

Q.No.2:
Two coherent point sources S_1 and S_2 are separated by a small distance 'd' as shown. The fringes obtained on the screen will be:



JEE 2013

A. points
B. straight lines
C. semi-circles
D. concentric circles

Q.No.3: Two beams, A and B, of plane-polarised light with mutually perpendicular planes of polarisation are seen through a polaroid. From the position when the beam A has maximum intensity (and beam B has zero intensity), a rotation of the polaroid through 30° makes the two beams appear equally bright. If the initial intensities of the two beams are I_A and I_B respectively, then $\frac{I_A}{I_B}$ equals

A. 1

B. $\frac{1}{3}$

C. 3

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

Q.No.4:
On a hot summer night, the refractive index of air is smallest near the ground and increases with height from the ground. When a light beam is directed horizontally, the Huygens' principle leads us to conclude that as it travels, the light beam :

JEE 2015

A. becomes narrower

B. goes horizontally without any deflection

C. bends downwards

D. bends upwards

Q.No.5: Assuming human pupil to have a radius of 0.25 cm and a comfortable viewing distance of 25 cm, the minimum separation between two objects that human eye can resolve at 500 nm wavelength is : **JEE 2015**

A. 1 μm

B. 30 μm

C. 100 μm

D. 300 μm

Q.No.6: The box of a pin hole camera, of length L, has a hole of radius *a*, It is assumed that when the hole is illuminated by a parallel beam of light of wavelength λ the spread of the spot (obtained on the opposite wall of the camera) is the sum of its geometrical spread and the spread due to diffraction. The spot would then have its minimum size (*say* b_{min}) when : **JEE 2016**

A. $a = \sqrt{\lambda L} \text{ and } b_{min} = \left(\frac{2\lambda^2}{L}\right)$

B. $a = \sqrt{\lambda L}$ and $b_{min} = \sqrt{4\lambda L}$

C. $a = \sqrt{\frac{\lambda L}{2}}$ and $b_{min} = 2\sqrt{2\lambda L}$

D. $a = \frac{\lambda^2}{L}$ and $b_{min} = \left(\frac{2\lambda^2}{L}\right)$

Q.No.7: In a Young's double slit experiment, slits are separated by 0.5 mm, and the screen is placed 150 cm away. A beam of light consisting of two wavelengths, 650 nm and 520 nm, is used to obtain interference fringes on the screen. The least distance from the common central maximum to the point where the bright fringes due to both the wavelengths coincide is: **JEE 2017**

A. 15.6 mm

B. 1.56 mm

C. 7.8 mm

D. 9.75 mm

Q.No.8: An observer is moving with half the speed of light towards stationary microwave source emitting waves at frequency 10GHz. What is the frequency of the microwave measured by the observer? (speed of light = 3×10^8 ms^{-1})

JEE 2017

A. 15.3 GHz

B. 10.1 GHz

C. 12.1 GHz

D. 17.3 GHz

Q.No.9: Unpolarized light of intensity I passes through an ideal polarizer A. Another identical polarizer B is placed behind A. The intensity of light beyond B is found to be $\frac{I}{2}$. Now another identical polarizer C is placed between A and B. The intensity beyond B is now found to be $\frac{I}{8}$. The angle between polarizer A and C is : **JEE 2018**

A. 45°

B. 60°

C. 0°

D. 30°

Q.No.10: The angular width of the central maximum in a single slit diffraction

pattern is 60°. The width of he slit is 1 μm. The slit is illuminated by monochromatic plane waves. If another slit of same width is made near it, Young's fringes can be observed on a screen placed at a distance 50 cm from the slits. If the observed fringe width is 1 cm, what is slit separation distance? (i.e. distance between the centres of each slit.) **JEE 2018**

A. 75 μm

B. 100 μm

C. 25 μm

D. 50 μm