When light falls normally on soap film whose thickness is 5×10^{-5}cm and whose refractive index is 1.33 which wavelength in the visible region will be reflected most strongly?

Given :- $t = 5 \times 10^{-5}$ cm

$\mu = 1.33$

Formula

$$2\mu t \cos r = (2n+1)\frac{\lambda}{2}$$

For normal incidence $r = 0$

$$2\mu t \cos 0 = (2n+1)\frac{\lambda}{2}$$

$$2\mu t = (2n+1)\frac{\lambda}{2}$$

$$\boxed{\lambda = \frac{4\mu t}{(2n+1)}}$$

i) put $n = 0$, $\lambda = \dfrac{4 \times 1.33 \times 5 \times 10^{-5}}{1} = 26,600\ \text{Å}$.

ii) put $n = 1$, $\lambda = \dfrac{4 \times 1.33 \times 5 \times 10^{-6}}{3} = 8866\ \text{Å}$

iii) put $n = 2$ $\lambda = \dfrac{4 \times 1.33 \times 5 \times 10^{-6}}{5} = 5320\ \text{Å}$.

Thus

$\left.\begin{array}{l}\lambda_1 = 26,600 \\ \lambda_2 = 8866\ \text{A}^\circ\end{array}\right\}$ lies outside visible spectrum only 5320 Å lies inside visible spectrum. Thats our Answer

Interference fringes are produced by monochromatic light falling normally on a wedge shaped film of refractive index 1.4 the angle of wedge is 20 sec of an arc and the distance between successive fringes 0.25 cm calculate wavelength of light

$\boxed{\text{Given} :\Rightarrow}$ $\mu = 1.4$

$$\alpha = 20\,\text{sec} = \frac{20}{60 \times 60} \times \frac{\pi}{180} = \frac{1}{180} \times \frac{\pi}{180} \text{ radians}$$

$\beta = 0.25\,\text{cm}$

$$\boxed{\beta = \frac{\lambda}{2\mu\alpha}} \Rightarrow \lambda \Rightarrow 2\mu\alpha.\beta$$

$$\lambda = 2\mu\alpha\beta = 2 \times 1.4 \times \frac{\pi}{180 \times 180} \times 0.25$$

$$\boxed{\lambda = 6.79 \times 10^{-5}\,\text{cm.}}$$

2 plane rectangular pieces of glass are in contact at one edge and separated by hair at opposite edge so that a wedge is formed. when light of wavelength 6000 A^0 false normally on the Wedge 9 interference fringes are observed what is the thickness of hair?

Given :→

$\lambda = 6000 \times 10^{-8}$ cm.

$r = 0$ – for normal incidence

$n = 9$

Formula ⇒

$$\boxed{2\mu t \cos(r+\alpha) = n\lambda}$$

$$t = \frac{n\lambda}{2\mu \cos(r+\alpha)}$$

since $r = 0$ & α is Also small $\cos(r+\alpha) \cong 1$

$$t = \frac{n\lambda}{2\mu} = \frac{9 \times 6000 \times 10^{-8}}{2}$$

$$\boxed{t = 27 \times 10^{-5} \text{ cm.}}$$

Fringes of equal thickness are observed in a thin glass wedge of refractive index 1.52.The Fringe spacing is 1mm and the wavelength of light is 5893 A^0 .calculate the angle of WEDGE in seconds Of an arc.

Given :→

$\mu = 1.52$

$\lambda = 5893\,\mathring{A} = 5893 \times 10^{-8}$ cm.

$\beta = 1mm = 10^{-1}$ cm.

Formulae →

$$\boxed{\beta = \frac{\lambda}{2\mu\alpha}}$$

$$\Rightarrow \quad \alpha = \frac{\lambda}{2\mu\beta} = \frac{5893 \times 10^{-8}}{2 \times 1.52 \times 10^{-1}}$$

$$\Rightarrow \quad \alpha = 1.93 \times 10^{-4} \text{ radian}$$

$$\alpha = 1.93 \times 10^{-4} \times \frac{180}{\pi} \times 60 \times 60$$

$$\boxed{\alpha = 39.8 \text{ Sec}}$$

A parallel beam of sodium light of wavelength $5890 \ x \ 10^{-8}$ cm is incident on a thin glass plate

of refractive index 1.5, such that the angle of refraction into the plate is 60°. Calculate the smallest thickness of the plate which will make it appear dark by reflection

Given :→

$\lambda = 5890 \times 10^{-8}$ cm

$\mu = 1.5$

$r = 60°$

Condition for destructive interference in reflected system is

$$\boxed{2\mu t \cos r = n\lambda}$$

take $n = 1$.

$$2\mu t \cos r = \lambda$$

$$t = \lambda / 2\mu \cos r$$

$$t = \frac{\lambda}{2\mu \cos r} = \frac{5890 \times 10^{-9}}{2 \times 1.5 \times \cos 60}$$

$$\boxed{t = 3.926 \times 10^{-3} \text{ cm.}}$$

Interference fringes are produced with monochromatic light falling normally on a wedge shaped film of refractive index 1.4. The angle of wedge is 10 sec of an arc and the distance between successive fringes is 0.5 cm. What is the wavelength of light used ?

Given :

$\mu = 1.4$

$\alpha = 10 \text{ sec} = \frac{10}{60 \times 60} \times \frac{\pi}{180}$ radian

$\beta = 0.5 \text{ cm}$

$$\boxed{\beta = \frac{\lambda}{2\mu\alpha}} \Rightarrow \lambda = 2\mu\alpha\beta$$

$$\lambda = 2\mu\alpha \cdot \beta = 2 \times 1.4 \times 0.5 \times 10^{-2} \times \frac{10\pi}{3600 \times 180}$$

$$\boxed{\lambda = 6783 \text{ Å}}$$

A beam of monochromatic light of wavelength 5.82 x 10-7 m falls normally on a glass wedge of wedge angle of 20 seconds of an arc. If the refractive index of glass is 1.5, find the number of dark interference fringes per cm of the wedge length.

$\boxed{\text{Given :}}$

$\lambda = 5.82 \times 10^{-7}\,m$

$\alpha = 20 \text{ seconds} = \frac{20}{60 \times 60} \times \frac{\pi}{180} = 9.69 \times 10^{-5}$

$\mu = 1.5$

Formula :

$$\boxed{\beta = \frac{\lambda}{2\mu\alpha}} = \frac{5.82 \times 10^{-7}}{2 \times 1.5 \times 9.69 \times 10^{-5}}$$

$\beta = 0.2 \times 10^{-2}\,m$

$$\boxed{\beta = 0.2\,cm.}$$

A soap film having refractive index 1.33, and thickness $5 x 10^{-5}$ cm is viewed at an angle of 35° to the normal. Find the wavelengths of light in the visible spectrum which will be absent from the reflected light.

$\boxed{\text{Given} -}$

$\mu = 1.33$

$t = 5 \times 10^{-5}$ cm

Angle of incidence $i = 35°$.

We Need to calculate r first by using snells Law

$$\boxed{\mu = \frac{\sin i}{\sin r}}$$

$$1.33 = \frac{\sin 35°}{\sin r} \Rightarrow \sin r = 0.431$$

$$r = 25.53°$$

, We know $\boxed{2\mu t \cos r = n\lambda}$

$$\lambda = \frac{2\mu t \cos r}{n} = \frac{2 \times 1.33 \times 5 \times 10^{-5} \times \cos 25.53°}{n}$$

$$\lambda = \frac{12000}{n} \text{ Å}$$

$n = 1 \Rightarrow \lambda = 12000$ Å $\Rightarrow$ 12000 Å $\longrightarrow$ Not in visible Region

$n = 2 \Rightarrow \lambda = \frac{12000}{2}$ Å $\Rightarrow$ 6000 Å – visible Region

$n = 2 \Rightarrow \lambda = \frac{12000}{3}$ Å $\Rightarrow$ 4000 Å – in visible Region.

$n=3, \quad \lambda = \frac{12000}{4}$ Å $\Rightarrow$ 3000 Å Not in visible Region.

$$\boxed{\text{Thus wavelengths Absent from visible Region are } 6000\,\text{Å} \;\&\; 4000\,\text{Å}.}$$

A soap film having refractive index 1.33, and thickness $5\ x\ 10^{-5}$ cm is viewed at an angle of 35° to the normal. Find the wavelengths of light in the visible spectrum which will be absent from the reflected light.

Thin film of MgF_2 of refractive index 1.38 is coated on a glass plate in order to reduce the reflection from the glass surface using interference. How thick is the coating needed to produce a minimum reflection at the centre of visible spectrum ($5500 A^0$)?

Given :-

$\mu = 1.38$

$\lambda = 5500 \times 10^{-8}$ cm.

For normal incidence $\cos r = 1$

Formula :-

$$t = \frac{\lambda}{4\mu} = \frac{5500 \times 10^{-8}}{4 \times 1.38}$$

$$\boxed{t = 996.37 \times 10^{-8} \text{ cm.}}$$