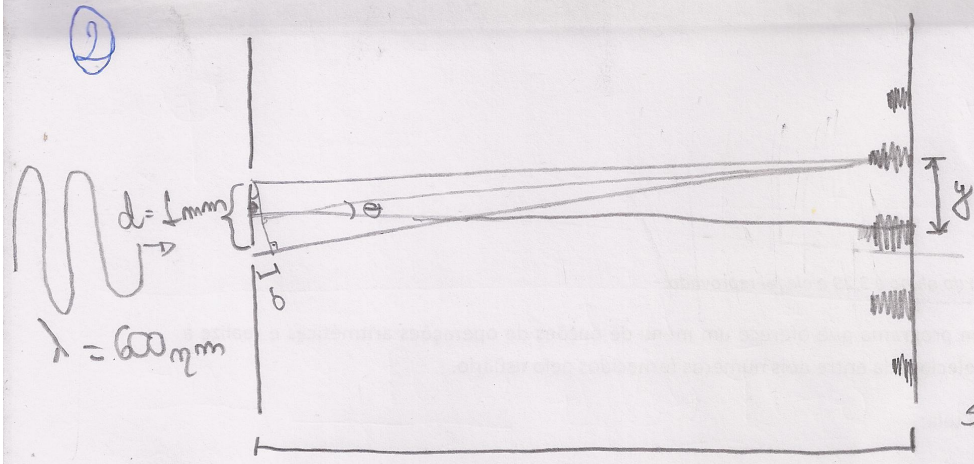
Lista 4 - Interferência e Difração

②



$\text{sen}\theta = \frac{\delta}{d}$

$\delta = d\,\text{sen}\theta$

$\text{tg}\theta = \frac{y}{D}$

Para $D \gg d \rightarrow \text{tg}\theta \approx \text{sen}\theta$

$\delta \cong \frac{dy}{D}$

Interferência construtiva:

$m = 0 \rightarrow dy_{máx} = 0$

$m\lambda = \frac{dy_{máx}}{D}$

$m = 1 \rightarrow dy_{máx} = \lambda D \rightarrow y_{máx} = \frac{\lambda D}{d}$

$y_{máx} = \frac{600.10^{-9} \cdot 2}{1.10^{-3}} \rightarrow y_{máx} = 1200.10^{-6} = 1,2.10^{-3} = 0,12\ cm$

franjas	dist (cm)
1	0,12
n	1

$0,012\,n = 1$

$n = \frac{1}{0,12} = 8,3$ franjas/cm

③ (a)

$$y^1_{máx} = \frac{D\lambda_1}{d} \qquad y'^1_{máx} = \frac{D\lambda_2}{d}$$

$$y^1_{máx} < y'^1_{máx} \rightarrow \frac{D\lambda_1}{d} < \frac{D\lambda_2}{d} \rightarrow \boxed{\lambda_1 < \lambda_2}$$

(b) $$\frac{D\lambda}{d_1} < \frac{D\lambda}{d_2} \rightarrow \frac{1}{d_1} < \frac{1}{d_2} \rightarrow \boxed{d_1 > d_2}$$

④ (a) 7 ordens de máximo e 6 de mínimos

(b) $y_0 = 0$

$$y^1_{MÁX} = \frac{D\lambda}{d} = \frac{1{,}2.10^{-2} \cdot 532.10^{-9}}{200.10^{-6}} = 3{,}2.10^{-5}\ m$$

$$y^2_{máx} = \frac{2D\lambda}{d} = 6{,}4.10^{-5}\ m$$

$$y^3_{máx} = \frac{3D\lambda}{d} = 9{,}6.10^{-5}\ m$$

$$y^{-3}_{máx} = -\frac{3D\lambda}{d} = -9{,}6.10^{-5}\ m$$

$$y^{(-2)}_{máx} = -\frac{2D\lambda}{d} = -6{,}4.10^{-5}\ m$$

$$y^{(-1)}_{máx} = -\frac{D\lambda}{d} = -3{,}2.10^{-5}\ m$$

(c) $$y'_{máx} = \frac{D\lambda}{2d} = \frac{1}{2}\left(\frac{D\lambda}{d}\right)$$

se reduz à metade

(d) $$y''_{máx} = \frac{D.1{,}2\lambda}{d} = 1{,}2\left(\frac{D\lambda}{d}\right)$$

se $y''_{máx} > y_{máx}$ então $y''_{mín} > y_{mín}$.

⑤ $\frac{(2m-1)}{4m}\lambda = d \xrightarrow{m=1} \lambda = \frac{4md}{2m-1}$

$\lambda_1 = \frac{4 \cdot 1.45 \cdot 300 \cdot 10^{-9}}{2 \cdot 1 - 1} = 1740 \cdot 10^{-9}$ (Infra-vermelho)

$m=2$

$\lambda_2 = \frac{1740}{3} \cdot 10^{-9} =$ **580 nm (Amarelo)**

$m=3$

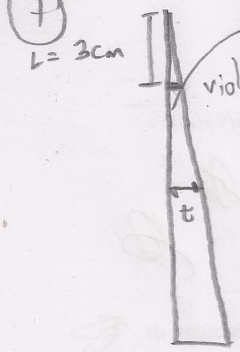
$\lambda_3 = \frac{1740}{5} \cdot 10^{-9} =$ 348 nm (Ultra-violeta)

⑥ $2nt = m\lambda$ $\quad$ **$t = d_{cabelo}$**

$2 \cdot 1 \cdot t = 120 \cdot 600 \cdot 10^{-9}$

$t = \frac{120 \cdot 600 \cdot 10^{-9}}{2} = 36000 \cdot 10^{-9} =$ **36 mm**

(7)



película de água e sabão

comprimento de onda

espessura do filme

$$\frac{(2m-1)}{4m}\lambda = d$$

$n = 1{,}33$

(a) $\boxed{5{,}32t = (2m-1)\lambda}$

(b) $t = \dfrac{(2.1-1).4{,}10.10^{-9}}{5{,}32} = 77{,}1.10^{-9} = \boxed{77\,nm}$

(c) $tg\theta = \dfrac{t}{L} = \dfrac{77.10^{-9}}{3.10^{-2}} = 25{,}7.10^{-7} = \boxed{257.10^{-8}}$

$5{,}32.L.tg\theta = 683.10^{-9} \rightarrow L = \dfrac{683.10^{-9}}{5{,}32.257.10^{-8}} = 0{,}49.10^{1}$

$L = 4{,}9.10^{-2}\,m = \boxed{4{,}9\,cm}$

(d) $t = L\,tg\theta \rightarrow t = 4{,}9.10^{-2}.257.10^{-8}$

$t = 1260.10^{-10} = 126.10^{-9} = \boxed{126\,nm}$