(30 pts.) Monochromatic light of variable wavelength is incident normally on a thin sheet of plastic film ($n = 1.6$) suspended in air.

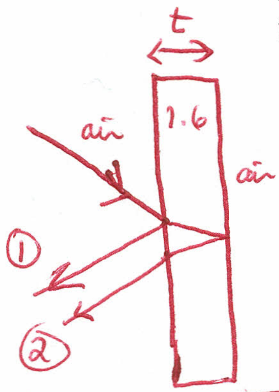
a. (10 pts.) If the intensity of the reflected light is a minimum for incident light of wavelength 400 nm, what are the three smallest possible thicknesses of the film?

b. (10 pts.) If the intensity of the reflected light is a *also* a minimum for incident light of wavelength 600 nm, what is the minimum thickness of the film?

c. (10 pts.) Given the thickness you calculated in part (b), are there any wavelengths of visible light (400 - 700 nm) for which the intensity of the reflected light is a *maximum*? If so, what are those wavelengths? If not, explain why not.

3. (30 pts.) Monochromatic light of variable wavelength is incident normally on a thin sheet of plastic film ($n = 1.6$) suspended in air.

a. (10 pts.) If the intensity of the reflected light is a minimum for incident light of wavelength 400 nm, what are the three smallest possible thicknesses of the film?



wave ① is inverted upon reflection. Wave ② is not.

destructive: $2nt = (m\lambda)$

$t = \frac{m\lambda}{2n} = \frac{m(400)}{2(1.6)}$

$m = 0$ ✗ No film at all!

$$\boxed{\begin{aligned} m &= 1, & t &= 125\text{ nm} \\ m &= 2, & t &= 250\text{ nm} \\ m &= 3 & t &= 375\text{ nm}. \end{aligned}}$$

b. (10 pts.) If the intensity of the reflected light is a *also* a minimum for incident light of wavelength 600 nm, what is the minimum thickness of the film?

$t = \frac{m(600)}{2(1.6)}$

$m = 1$: $t = 187.5\text{ nm}$

$\boxed{m = 2: \quad t = 375\text{ nm}}$ ← $t = 375$ nm is the minimum value that works for both $\lambda = 400$ and 600 nm.

(c) constructive: $2nt = (m + \frac{1}{2})\lambda \Rightarrow \lambda = \frac{2nt}{m + 1/2} = \frac{1200}{m + 1/2}$

$m = 0$: $\lambda = 2400$ nm. NOT VISIBLE

$m = 1$: $\lambda = 800$ NOT VISIBL

$\boxed{m = 2: \quad \lambda = 480\text{ nm} \quad \text{VISIBLE}}$

$m = 3$: $\lambda = 343$ nm NOT VISIBLE.

c. (10 pts.) Given the thickness you calculated in part (b), are there any wavelengths of visible light (400 - 700 nm) for which the intensity of the reflected light is a *maximum*? If so, what are those wavelengths? If not, explain why not.