

Wave Phenom # ~~6~~ 4 p 884 Concept 10, ~~11~~, 20, 21  
p 885 Problems 20

04

p 884 - Concept

(4)

10) Investigate pattern from double slit. Cover 1 slit

- The pattern of light observed on a screen after it passes through double slit is an alternating pattern of light + dark bands of approximately equal width over which is ~~super~~ superimposed a slowly varying envelope pattern.
- The envelope pattern has a strong central peak w/ weak symmetric oscillations to either side that get progressively weaker the farther you go from the central spot. Thus in the central peak of the envelope pattern you can see several bright + dark fringes. Also in the peaks to each side you can see a few alternating bright + dark
- If you cover one slit, the underlying alternate bright + dark pattern disappears, leaving only envelope pattern. You therefore observe a single central bright spot w/ very weak bright + dark bands symmetrically arranged
- These bright + dark bands get progressively weaker the farther they are.

(1)

20) You see green light on soap bubble,  
why see longer  $\lambda$  @ sides

- The green light rays reaching your eyes from ~~near~~ nearest part of the bubble leave the bubble in a direction normal to the bubble surface.

- Rays from other parts of the bubble must traverse the bubble film in a non-normal direction to reach your eyes, and so traverse a longer path in the bubble than green light.

(1)

• Thus, when looking at other parts of the bubble you see light that has traversed longer path in the bubble. The wavelength of the light for which the constructive interference occurs is proportional to the path length in the bubble, therefore you will observe a greater  $\lambda$ .



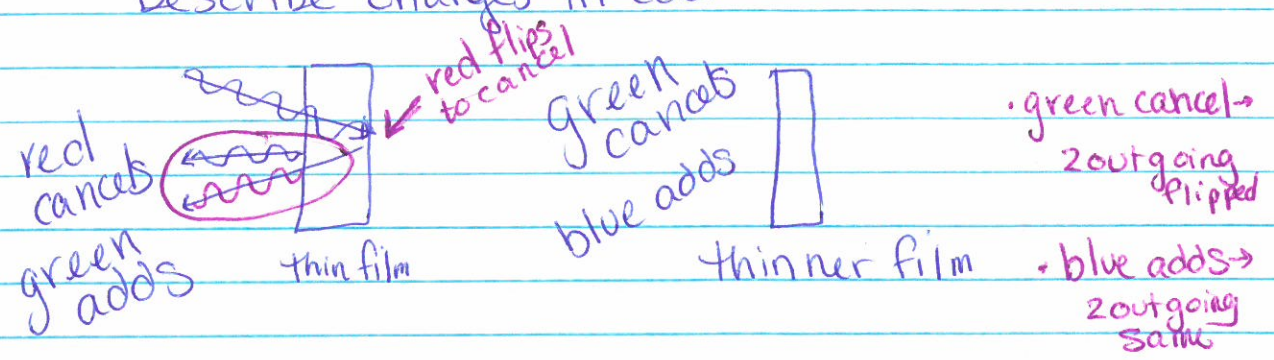
21) Very thin uniform oil film on surface of water  
 $t_{oil} < \lambda_{light}$  White light on film

• The index of refraction is greater than water. Thus light incident on the film will undergo a phase change of  $\frac{1}{2}\lambda$  at the air-oil boundary, and no phase change will occur upon reflection from the oil-water boundary

• The result is that the light reflected from the front & back of the film is out of phase by  $\frac{1}{2}\lambda$  + so interferes destructively, which means that the film will appear black.

### - Problem

20) You look at soap bubble film  $\perp$  to surface  
Describe changes in color



look at 2 reflect

- red cancels  $\rightarrow$  need 2 outgoing to flip
- green adds  $\rightarrow$  need 2 outgoing same