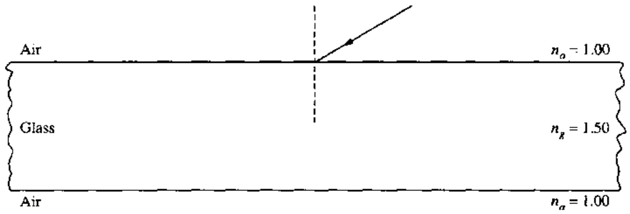
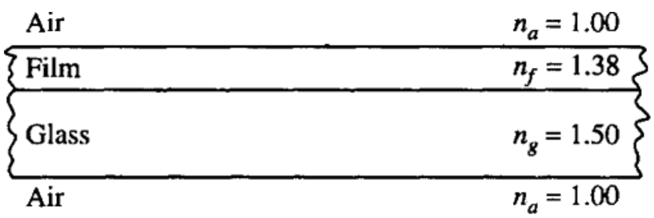
AP Physics
Interference

Name:______________________________
Period: 2-3a 3b-4 5-6a 6b-7



A sheet of glass has an index of refraction n_g = 1.50. Assume that the index of refraction for air is $n_a = 1.00$.

a. Monochromatic light is incident on the glass sheet, as shown in the figure below, at an angle of incidence of 60° to the normal. Calculate the angle of refraction.



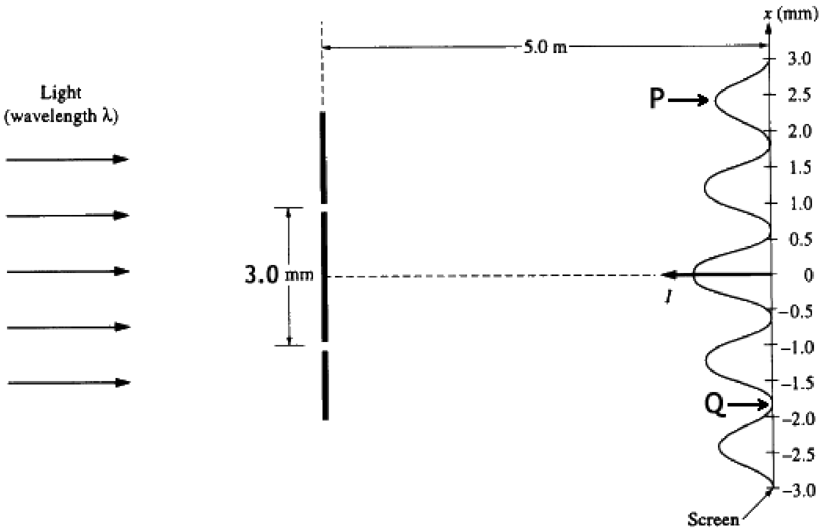
b. Next a thin film of material is to be tested on the glass sheet for use in making reflective coatings. The film has an index of refraction n_f = 1.38. White light is incident normal to the surface of the film as shown below. It is observed that at a point where the light is incident on the film, light reflected from the surface appears blue (λ = 470 nm).

i. What is the frequency of the blue light in air?

ii. What is the frequency of the blue light in the film?

iii. What is the wavelength of the blue light in the film?

iv. Calculate the minimum thickness of film that would produce this blue reflection.



Note: Figure not drawn to scale.

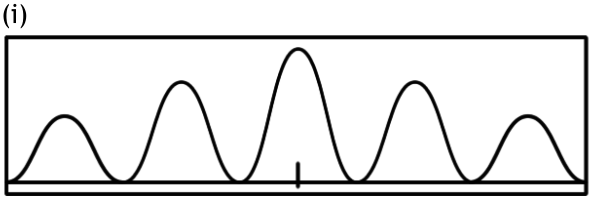
Coherent monochromatic light of wavelength λ in air is incident on two narrow slits, the centers of which are the 2.0mm apart, as shown to the right. The interference pattern observed on a screen 5.0 m away is represented in figure by the graph of light intensity I as a function of position x on the screen.

a. Determine the wavelength, λ, of the light.

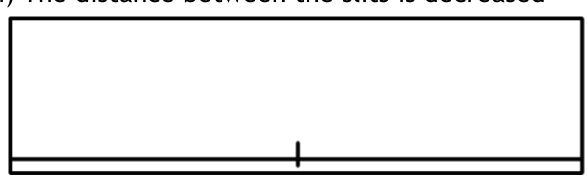
b. At point P in the diagram, there is a maximum in the interference pattern. Determine the <u>path difference</u> between the light arriving at this point from the two slits.

c. Diagram (i) shows the interference pattern for the above situation. Sketch the new patterns when the following changes are made.

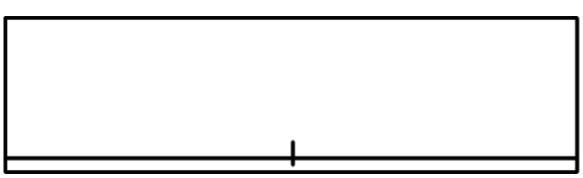
(i)



iii) The distance between the slits is decreased



(ii) A higher frequency light is used



iii) A single slit is used