Name: Date:

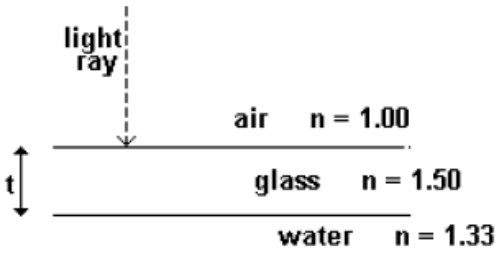
Wave Optics: Thin Films WS 7

1. Give 3 different thicknesses in nanometers where a soap bubble will exhibit destructive interference for red light. Assume the soap bubble has an index of refraction of 1.4 and the red light has a wavelength of 600 nm.

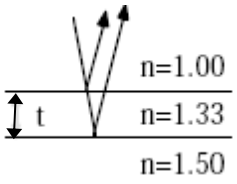
2. A layer of oil, index 1.25 is on top of a glass slide (index 1.5). Which of the following thicknesses will yield constructive interference for blue light of wavelength 500nm? (Support your answer with calculations.)

   A) 100nm B) 125nm C) 200nm D) 250nm

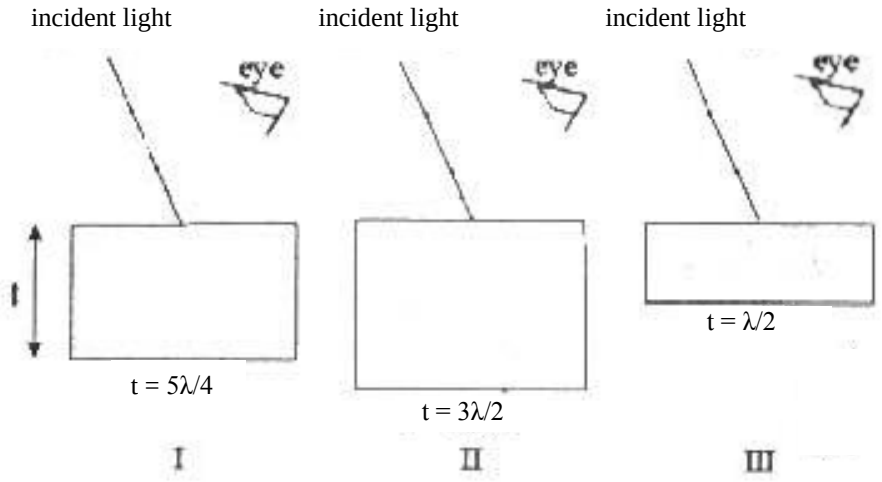
3. A light ray is incident normal to a thin layer of glass. Given the figure, what is the minimum thickness of the glass that gives the reflected light an orangish color (λ(air) orange light = 600nm)



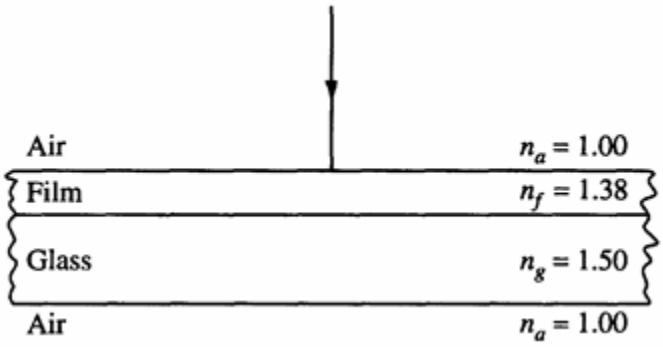
4. A thin film of thickness *t* and index of refraction 1.33 coats a glass with index of refraction 1.50 as shown to the right. Which of the following thicknesses *t* will not reflect light with wavelength 640 nm in air? (Support your answer with calculations.)
   A) 160 nm B) 240 nm C) 360 nm D) 480 nm E) 640 nm



5. Light strikes three different thin films, which are in air, as shown. If *t* denotes the film thickness and λ denotes the wavelength of the light in the film, which films will produce constructive interference as seen by the observer?



6. 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 green ($\lambda = 525$ nm).



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

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

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

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