A.P. Physics – B
Unit 11: Light & Optics

Name: _____

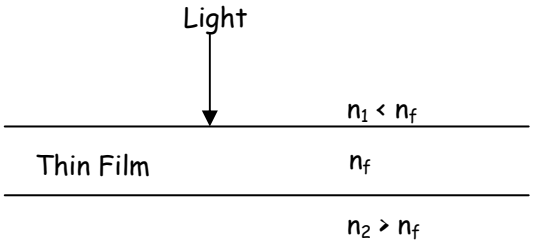
Date: _____

CHAPTER 24 E.C. QUIZ: THIN FILMS

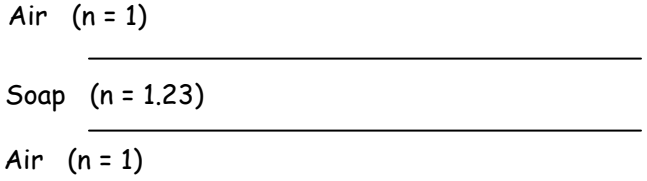
Answer the following questions using ideas you've learned while completing the extra credit assignment. Show work on all problems.

1. A thin film with index of refraction n_f separates two materials, with indexes of refraction as indicated in the diagram. A monochromatic beam of light is incident normally on the film, as shown. If the light has wavelength λ within the film, which one of the following is the minimum thickness of film that will lead to constructive interference?

a. 3λ
b. 2λ
c. λ
d. $\lambda/2$
e. $\lambda/4$



2. A thin soap film (n = 1.23) forms a bubble in the air. At both interfaces, some incident light is reflected and some and passes into the new substance. Interference between the reflected rays is most strongly observed for light of wavelength 700nm.



a. Is the light inverted upon reflection at the first boundary (air to soap)? At the second boundary (soap to air)? Explain how you are able to tell.

b. What is the minimum thickness of the film in order for it to produce the constructive interference mentioned above?

3. A thin soap film (n=1.28) that is 300nm thick is floating atop a sink full of water (n=1.33). What wavelength is most strongly reflected from the film when illuminated by white light?

4. Two glass blocks (n=1.52) are separated at one end by a very thin wire, as shown in the diagram. When light of 520nm is incident normally, 24 dark lines are observed (with one at each end). How thick is the wire?