THE UNIVERSITY OF BRITISH COLUMBIA

Physics 122 Assignment # 11: INTERFERENCE

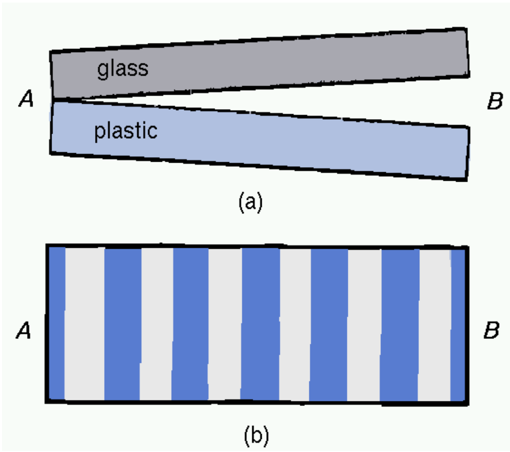
Fri. 22 Mar. 2002 — finish by **Wed. 27 Mar.**

1. **NON-REFLECTIVE FILM COATING:** A sheet of glass having an index of refraction of 1.35 is to be coated with a film of material having a refractive index of 1.5 such that bluish-green light (wavelength = 500 nm) is preferentially transmitted.

   (a) What is the minimum thickness of the film that will achieve the desired result?

   (b) Why are other parts of the visible spectrum not also preferentially transmitted?

   (c) Will the transmission of any colors be sharply reduced?



2. **FRINGES IN A WEDGE:** A pefectly flat piece of glass ($n = 1.45$) is placed over a perfectly flat piece of black plastic ($n = 1.30$) as shown at upper right. They touch at A. Green light of wavelength 525 nm is incident normally from above. Any light transmitted into the plastic is completely absorbed. The location of the dark fringes in the reflected light is shown in the sketch at lower right.

   (a) How thick is the space between the glass and the plastic at B?

   (b) Water ($n = 1.33$) seeps into the region between the glass and plastic. How many dark fringes are seen when all the air has been displaced by water?

   (The straightness and equal spacing of the fringes is an accurate test of the flatness of the glass.)

3. **THREE-SLIT INTERFERENCE PATTERN:** Light of wavelength 600 nm is incident normally on *three* parallel narrow slits separated by 0.60 mm. Sketch the intensity pattern observed on a distant screen as a function of angle θ for the range of values $-0.003 \le \theta \le 0.003$ radians.

(continued on reverse...)

4. ***N*-SLIT INTERFERENCE PATTERN:** The figure below shows the intensity pattern produced by light passing through an opaque foil with N narrow slits 0.3 mm apart and falling on a screen parallel to the foil 2.0 m distant.

(a) What wavelength of light is being used?

(b) How many slits are there?

(Neglect the finite widths of the slits; this is an *interference* problem, *not* a *diffraction* problem.)