Name: Due Date

Assignment 6.01: Thin Film Interference

Color	λ (nm)
Red	620 to 750
Orange	590 to 620
Yellow	570 to 590
Green	495 to 570
Blue	450 to 495
Violet	380 to 450

1. A layer of oil (n=1.2), of thickness T=1.3 x 10^{-7}m floats on top of water (n=1.33).

   (a) What is the speed of light in the oil?

   2.5×10^{8} m/s

   (b) Derive a relationship for λ_{oil}, the wavelenth of a light ray in the oil, in terms of λ_{vacuum}, n, and fundamental constants.

   (c) Derive an expression for reflective, constructive interference, using T, λ, n, m, and fundamental constants.

   (d) What is the color seen when the oil slick is seen from directly above?

   312 nm → invisible (ultraviolet)
   the oil will appear dark/black.

2. A water/soap (n=1.33) bubble has a thickness of 150 nm. What is the color that the bubble appears, if any?

   $\lambda = 798$nm
   invisible → (infrared)

3. The average wavelength of sunlight that reaches the earths surface is 575 nm. In order to keep a building cool, you are designing a coating of polycarbonate (n = 1.56) to apply to the glass of a window to reflect as much as possible.

   (a) What is the thickness of the smallest amount of coating that could be applied?

   184.295 nm

   (b) You are now designing a solar panel and wish it to reflect as little light as possible at 500 nm. What is the thickness of the smallest amount of coating that should be applied?

   destructive

   80.128 nm

4. How thin would the wall of a bubble need to be in order to show no iridescence?

   71.429 nm