PHYS 1512: Week 10

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Equations

$$tan(\theta_B) = \frac{n_2}{n_1} \quad \text{(Brewster's Angle)} \tag{1}$$

$$sin(\theta) = m\frac{\lambda}{d} \quad \text{(Double slit: Bright fringes)} \tag{2}$$

$$sin(\theta) = (m + \frac{1}{2})\frac{\lambda}{d} \quad \text{(Double slit: Dark fringes)} \tag{3}$$

$$Sin(\theta_c) = \frac{n_2}{n_1} \quad \text{(Critical Angle)} \tag{4}$$

$$\lambda_{film} = \frac{\lambda_{vacuum}}{n} \tag{5}$$

Some Concepts

- *Diopters* $:= \frac{1}{f}$

- Near point / Far point

-Constructive/Destructive interference (i.e. Principle of superposition)

******Thin film interference

Question #1

Lens!

Imagine you have an object placed to the left of a converging lens but outside the focal length.

a) Draw the ray diagram for this situation

b) What type of image is finally formed? (real/virtual and inverted/upright?)

c) If you placed a diverging lens to the right of the converging lens, repeat parts a) and b)

d) If instead you placed the diverging lens in-between the object and the converging lens, what is the final image of the system? (i.e. repeat b))

Question #2

Brew me up an angle

For light that originates within a liquid and strikes the liquid-air boundary, the critical angle is 39°. What is the Brewster's angle for this light?

Question #3

Physics-sighted

A nearsighted person cannot read a sign that is more than 5.2m from his eyes. To deal with this problem, he wears contact lenses that do not correct his vision completely, but do allow him to read signs located up to distances of 12.0m from his eyes. What is the diopter rating of the contacts?

Question #4

Double trouble

In a Young's double-slit experiment, the seventh **dark** fringe is located 0.025m to the side of the central bright fringe on a flat screen, which is 1.1 m away from the slits. The separation between the slits is $1.4 * 10^{-4} m$. What is the wavelength of the light being used?

Question #5

Don't Interfere

Two parallel slits are illuminated by light composed of two wavelengths, One wavelength is $\lambda_A = 645nm$. The other wavelength λ_B is unknown. On a viewing screen, the light with wavelength $\lambda_A = 645nm$ produces its third-order bright fringe at the same place where light with wavelength λ_B produces its fourth-order dark fringe. The fringes are counted relative to the central/zero-order bright fringe. What is the unknown wavelength?

Question #6

A thin problem

A non-reflective coating of magnesium fluoride (n=1.38) covers the glass (n=1.52) of camera lens. Assuming that the coating prevents reflection of yellow-green light (wavelength in vacuum = 565nm), determine the minimum nonzero thickness that the coating can have.