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Solid State Physics

Siegen, 8/1/2020

Physics 1 for Nano: written Exercises 7

WS 2019 (sheet 7)

Exercise 37

A beam of partially polarized light can be considered to be a mixture of polarized and unpolarized light. Suppose we send such a beam through a polarization filter and then rotate the filter through 360° while keeping it perpendicular to the beam. IF the transmitted intensity varies by a factor of 5.0 during the rotation, what fraction of the intensity of the original beam is associated with the beam´s polarized light ?

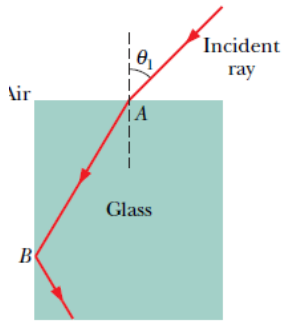
Exercise 38

Derive the image expression for the focal length of a spherically bent refractive surface (lense) in case of convex and concave bending. Hint: read the respective chapter in textbook and solve the exercise.

Exercise 39

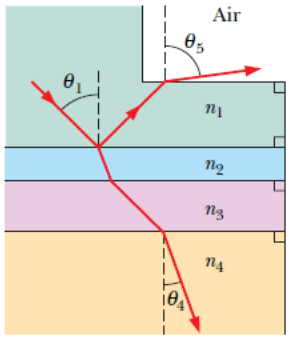
Determine the reflection and transmission coefficients at the interface between two glasses with n_1=1.39 and n_2 = 1.61 as function of incidence angle θ with respect to the material with n_1. Determine the Brewster angle and the critical angle of total external reflection.

Exercise 40



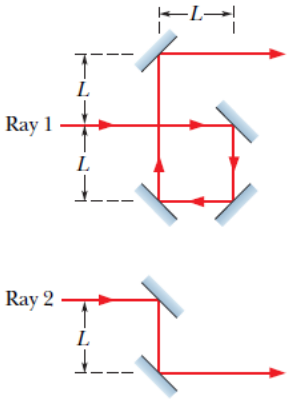
In figure left , a light ray enters a glass slab at point A at incidence angle θ=45.0° and then undergoes total internal reflection at point B. What ist he minimum value fort he index of refraction oft he glass can be inferred from this information ?

Exercise 41



In the figure left, light is incident at angle θ_1=40.1° on boundary between two transparent materials. Some oft he light travels down through the next 3 layers of transparanet material., while some o fit refelects upwardsand then escapes into the air. If n_1=1.30, n_2=1.40, n_3=1.32 and n_4= 1.45, what ist he value of θ_5 in the air and of θ_{14} in the bottom material?

Exercise 42



In the figure left, light rays 1 and 2 go through different paths by reflecting from the various flat surface. The light waves have a wavelength of 420nm and are initially in phase. What are the (a) smallest and (b) second smallest values of distance L that will put the waves exactly out of phase as they emerge from the region?

Exercise 43

A thin film of acetone (n=1.25) coats a thick glass plate (n=1.50). White light is incident normal to the film. In the reflections, fully destructive interference occurs at 600nm and fully constructive interference at 700nm. Calculate the thickness of the acetone film.

Note:
Exercises have to give back at lecture 14.01.20. It will be discussed in exercise hours at 15.01.20
Next Lectures: January 21 and 22 8:30am