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Exercises and Complements for the Introduction to Physics II

for Students

of Biology, Pharmacy and Geoscience

Sheet 10 / 04.05.2022 **Solutions**

Exercise 37.

For the angular magnification of the magnifying glass we have:

$$\Gamma = \frac{s_0}{f} = \frac{0.25 \text{ m}}{\frac{1}{12} \text{ dpt}} = 3$$

Exercise 38.

The following applies to the intensity of the light I_2 that passes through the polarization film:

$$I_2 = I_1 \cos^2 \theta$$

Here I_1 is the intensity of the light before it hits the film and θ is the angle that the transmission axis forms with the horizontal. This results in:

$$\arccos \sqrt{\frac{I_2}{I_1}} = \arccos \sqrt{0.15} = 67.2^\circ$$

Exercise 39.

(a) true, because the polarization axes of the last two filters are rotated by 90° to each other

(b) true, because after passing a polarizing filter twisted by 45° only exactly half of the intensity comes through ($\cos^2 45^\circ = 0.5$)

(c) false, because the polarization axes of the filters are shifted by 90°, this is impossible

(d) true, since the light is previously unpolarized

(e) true, because the polarization axes of the filters are always shifted by 45° and the light is unpolarized in the beginning

Exercise 40.

(a) See script 507-3. angle of incidence α_B for full polarization from Brewster's law:

$$\tan \alpha_B = \frac{n_{\text{glass}}}{n_{\text{air}}} \qquad \Rightarrow \qquad \alpha_B = 55.41^\circ$$

(b) See script 507-7.

$$\alpha = \varphi \cdot c \cdot d \qquad \Rightarrow \qquad c = \frac{\alpha}{\varphi \cdot d} = 3.0 \text{ g/l}$$

(c) $\alpha = 0$, since the same number of levorotatory and dextrorotatory molecules are present.