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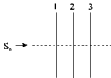
Discussion Instructor (circle): Billster Bulson Muntean Paul Pomeroy

Discussion Section # _____

REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!

Use the conversion constants and data given on the front page.

- (a) Unpolarized light goes through three polarizing sheets in succession. Sheet 1 is oriented vertically. Sheet 2 is oriented 30° from the vertical and sheet 3 is 90° from the vertical. If light of intensity S_0 is incident on the first, calculate the intensity of light leaving sheet 3.



$$S = S_0 \times \frac{1}{2} \times \cos^2 30^\circ \times \cos^2 60^\circ = 3S_0/32 = 0.0938 S_0$$

- (b) Calculate the time constant for the current in the circuit after the switch is closed.

$$\epsilon = 150 \text{ V}, R = 650 \Omega, L = 42.0 \text{ mH}$$



$$\tau = L/R = 6.46 \times 10^{-5} \text{ s}$$

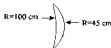
- (c) A diamond ($n = 2.40$) is immersed in water ($n = 1.33$). Determine the polarizing angle for polarizing light in water reflected off the diamond.

$$\theta_p = \tan^{-1} \left(\frac{2.40}{1.33} \right) = 61.0^\circ$$

- (d) For the system in (c), calculate the critical angle for total internal reflection for light emerging from the diamond into the water.

$$\theta_c = \sin^{-1} \left(\frac{1.33}{2.40} \right) = 33.7^\circ$$

- (e) Calculate the focal length, with sign, for the lens shown. The lens is made of glass with $n = 1.55$.



$$f = \frac{1}{n-1} \left(\frac{1}{R_1} - \frac{1}{R_2} \right)^{-1} = 148.8 \text{ cm}$$

- (f) If the earth's magnetic field is $1.20 \times 10^{-4} \text{ T}$, oriented at 65° to the horizontal, find the magnetic flux through an area 50 m wide by 100 m long.



$$\Phi = 1.20 \times 10^{-4} \text{ T} \times 5 \times 10^3 \text{ m}^2 \times \cos 25^\circ = 0.548 \text{ Wb}$$