

Name\_\_\_\_\_

**Phys 2020 (NSCC), Spring 2008**  
**Problem Set #7**

**1.** The brightest star in the night sky is Sirius, which is at a distance of  $8.3 \times 10^{16}$  m from the earth. How long does it take the light from Sirius to reach the earth? Express the answer in years.

**2.** A space probe will be visiting Pluto in a few years; when it gets there, its distance from the earth will be roughly  $6.0 \times 10^{12}$  m. At that distance how long will it take an electromagnetic signal to travel from the earth to the space probe? (Express the answer in hours.)

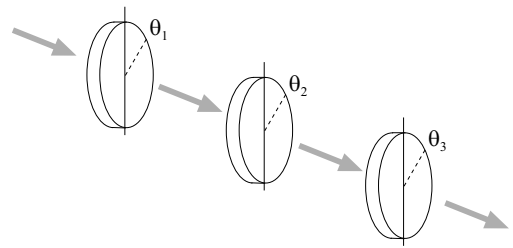
**3.** A laser beam emits a narrow beam of light. The radius of the beam is  $1.0 \times 10^{-3}$  m and the power is  $1.2 \times 10^{-3}$  W. What is the intensity of the laser beam?

**4.** The Sun delivers EM waves with an average power of  $1340 \frac{\text{W}}{\text{m}^2}$  at the top of the Earth's atmosphere. Find the (peak) magnitudes  $E_0$  and  $B_0$  for the electromagnetic waves at the top of the atmosphere.

**5.** Unpolarized light passes through two polaroid sheets. The axis of the first is vertical, and that of the second is at  $30.0^\circ$  to the vertical. What fraction of the initial light is transmitted?

**6.** Only 25% of the intensity of a *polarized* light wave passes through a polarizing filter. What is the angle between the electric field and the axis of the filter?

7. Three polarizing plates whose planes are parallel are centered on a common axis. The direction of the transmission axes relative to the common vertical direction are shown at the right. An *unpolarized* beam of light is incident on the first disk. Find the fraction of the intensity which is transmitted when  $\theta_1 = 20.0^\circ$ ,  $\theta_2 = 40.0^\circ$  and  $\theta_3 = 60.0^\circ$ .



8. Unpolarized light passes through two polaroid sheets. The axis of the first is vertical, and that of the second is at some angle  $\theta$  to the vertical. It is found that a fraction 0.20 of the incident light is transmitted through both. What is the angle  $\theta$ ?