**Assignment # 7**

**Optics I**

**Chapter 33: The Nature and Propagation of Light**

**Important Concepts and Formulas:**

Law of reflection: $\theta_a = \theta_r$

Law of refraction: $n_a \sin\theta_a = n_b \sin\theta_b$

Refractive Index: $n = \frac{c}{v} = \frac{\lambda_O}{\lambda}$

Malus's Law: $I = I_{max} \cos^2 \varphi$

Brewster Law: $\tan\theta_a = \frac{n_b}{n_a}$

**Question 1:**

The vitreous humor, a transparent, gelatinous fluid that fills most of the eyeball, has an index of refraction of 1.34. Visible light ranges in wavelength from 380 nm (violet) to 750 nm (red), as measured in air. This light travels through the vitreous humor and strikes the rods and cones at the surface of the retina.

(a) What are the ranges of the wavelength?
(b) The frequency.
(c) The speed of the light just as it approaches the retina within the vitreous humor?

**Question 2:**

A parallel beam of light in air makes an angle of $47.5^O$ with the surface of a glass plate having a refractive index of 1.66.

(a) What is the angle between the reflected part of the beam and the surface of the glass?
(b) What is the angle between the refracted beam and the surface of the glass?

**Question 3:**

(a) Unpolarized light with intensity $I_0$ is incident on two polarizing filters. The axis of the first filter makes an angle of $60.0^o$ with the vertical, and the axis of the second filter is horizontal. What is the intensity of the light after it has passed through the second filter?
(b) Draw the schematic diagram of the situation in part (a).

**Question 4:**

Speed of light in vacuum is universal constant, but when ray of light enters into any medium then its speed decreases, why? Explain your answer by the definition of refractive index of medium.

**Question 5:**

Write the statements of laws of reflection and draw supporting diagrams with each statement to explain.