

Name: _____

12/14/10

Present neat and orderly answers for each question.**Clearly indicate your method of solution for each problem, including equations used.****Include appropriate units.****Show all work.**

$$c = 3.0 \times 10^8 \text{ m/s}$$

Multiple Choice (2 pts each)

1. A glass rod is placed in vegetable oil. The glass rod seems to disappear. Why?
 - a. Total internal reflection occurs at the oil glass rod interface.
 - b. No refraction occurs between the oil and the glass rod.
 - c. The oil absorbs all light.
 - d. The light diffracts around the glass rod.Ans. _____

2. You have a thin converging lens that creates an image on the right side of the lens of an object on the left side of the lens. What will happen to the image if you cover half of the lens?
 - a. same image and same intensity;
 - b. same image and half intensity;
 - c. half the image and same intensity;
 - d. half the image and half intensity.Ans. _____

3. Which of the following is true for sunlight incident on a standard window at a large angle?
 - a. The light intensity is decreased and reflected light is vertically polarized.
 - b. The light intensity is decreased and reflected light is horizontally polarized.
 - c. The light intensity is increased and reflected light is vertically polarized.
 - d. The light intensity is increased and reflected light is horizontally polarized.Ans. _____

4. Red light with a wavelength of 600 nm is mixed with blue light which has a wavelength of 400 nm resulting in magenta light. The magenta combined light is projected at normal incidence on to the surface of a 3.1 μm thick soap film on water. What would you see reflected from the film?
 - a. Red light;
 - b. Blue light;
 - c. Magenta light;
 - d. No light is reflected.Ans. _____

5. You walk towards a plane mirror at a speed of 5 m/s. How fast does you image walk towards you?
 - a. 2.5 m/s;
 - b. 5.0 m/s;
 - c. 7.5 m/s;
 - d. 10.0 m/s.Ans. _____

Problem 1 (20 pts)

A shallow glass dish is 4.0 cm in diameter. A person looking at the near edge of the top of the dish can see the far edge of the bottom of the dish (a single ray can be drawn between the two points). The index of refraction of the dish is 1.66, and that of air is 1.0. The glass is 5 mm thick.

- a) If the dish is completely filled with water ($n = 1.33$), and the person looks along the same line they will see the center of the bottom of the dish as opposed to the far bottom edge. What is the height of the dish? (8 pts)
- b) If green laser light ($f = 5.86 \times 10^{14}$ Hz) is incident on the surface of the water determine the change in the wavelength of the green light. (5 pts)
- c) If light from a green laser is incident at an angle of 30° on the bottom of the dish (from underneath the dish), with the dish completely filled with water, determine the distance that the beam is shifted from its original path when it emerges from the surface of the water. (7 pts)

