

## **Problems A** - Light as a wave, polarization, reflection and refraction

1. What is the range of visible light wavelengths?
2. What type of wave is light?
3. Who first accurately clocked the speed of light?
4. What is the speed of light in a vacuum?
5. What does it mean when light is polarized? How can we use this?
6. Differentiate between Transparent, Translucent and Opaque. Give examples
7. What is the difference between Luminous and Illuminated? Give examples.
8. How does Luminous intensity change as you get farther away? Why?
9. What is the law of reflection?
10. What is the difference between a regular and a diffuse reflection?
11. What is a normal line?
12. Does an object that is more dense refract more or less?
13. What is total internal reflection? Why does it occur?
14. A light ray bounces into a mirror at a 42 degree angle. What is the angle between the incident and reflected wave?
15. A beam of light strikes a diamond at a 75 degree angle. If the index of refraction of diamond is 2.42, what is the refracted angle?
16. What is the critical angle between a piece of diamond and water? (n of H<sub>2</sub>O = 1.33)

Answers A:  
 (6) 33.3°  
 (5) 23.5°  
 (4) 84°

## **Problems B** - Diffraction / Solar

1. Why do soap bubbles have rainbow colors in them?
2. How does a mirage occur?
3. Why do rainbows form? Which color bends the most?
4. Which object would produce the most distinct diffraction pattern, an apple, a pencil lead, or a human hair?
5. What are three ways solar power is uniquely useful?
6. What are three disadvantages of solar power?

## **Problems C** - Mirrors & Lenses

1. What are the three types of mirrors?
2. What types of images can be formed by each mirror type?
3. What lens type acts like which mirror type?
4. Which lens cannot produce a real image?
5. If an object is placed 13 cm in front of a plane mirror, how far behind the mirror does the image appear to form? Is this a real or virtual image? How big is the image compared to the object?
6. If a 156 cm person is standing 256 cm before a convex mirror with a -19.3 cm focal length, where does the image form and how big is it?
7. Your face is 25.0 cm in front of a concave mirror that has a 35.0 cm focal length. How much bigger does your face look?
8. If you move yourself to a distance of 70.0 cm from the mirror in #7, what will you look like and how big will you be?
9. A 5.00 cm lens is used in a slide projector. To focus the 35 mm slide perfectly on the wall, it is placed 5.83 cm from the lens. How far away is the wall and how big is the picture?
10. A magnifying glass with a 5.89 cm focal length is held 5.25 cm over a page. If the letters are 7.2 mm tall, how big do they look?
11. A photographer is shooting a 15.3 cm bird through a 300.0 mm lens. If the film plane is 30.9 cm from the lens's center, how far away is the bird? How big will the bird be on the film?

Answers C:  
 (5) 13 cm  
 (6) 17.9 cm behind, 10.9 cm  
 (7) 3.5x  
 (8) upside down, life-sized  
 (9) 35.1 cm away, 21.1 cm tall  
 (10) 66 mm tall  
 (11) 1030 cm, .459 cm tall