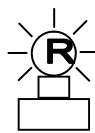# 2011-12 PreAP Light and Optics 4

1. A convex lens is used to make an image.
   A. Is the imager real or virtual?
   B. * Give the three ways you know this for certain:
   (See "Optic Basics")

   C. What happens if the top half of the lens is blocked by a piece of paper?

   D. Why do telescopes have really large lenses?

   A metal spoon will help you answer the following questions. The part you scoop with is a concave mirror.
   The opposite side (non-eating side) is a convex mirror.

2. Convergent or divergent device (*could be both*)?

   A. ___ A concave mirror.   D. ___ Can magnify.
   B. ___ A convex mirror.   E. ___ Can make a real image.
   C. ___ Can only reduce.   F. ___ Can make a virtual image.
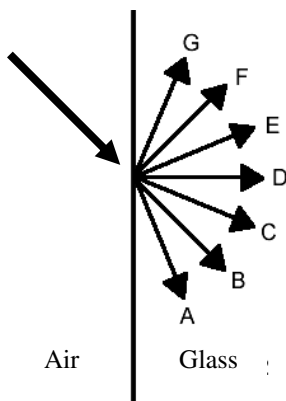
3. The diagram at the left shows a light ray traveling from air into glass. After marking the straight path (SP) and normal (N), decide which path the light ray will take.

4. In the right diagram, light goes between two unknown mediums.

   A. Did the ray bend toward or away from the normal?
   B. Which material is faster?
   C. Which material has the higher index of refraction?

Air   Glass

Material 1

Material 2
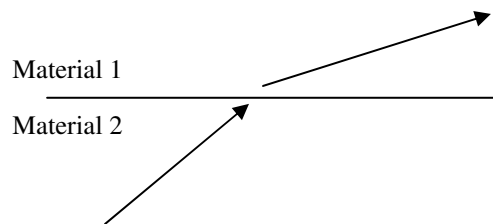
5. The diagram at the right is from the index of refraction lab we did in class. I have provided a protractor for those of you that do not have one. The different light rays are numbered.

   A. Which light ray is the incident ray?
   B. * What is the angle of incidence?
   C. Which ray is the reflected ray?
   D. What is the angle of reflection?
   E. How do these angles compare?

      (*This is ALWAYS the case. This is known as the "Law of Reflection". Also, it is always true that when a wave crosses a boundary some of the energy is reflected.*)
   F. Which ray is the ray that refracts inside the block?
   G. * For Snell's Law, what is θ_1?
   H. What is θ_2?
   I. What is n_1 (for air)?
   J. Calculate the index of refraction for this material.

   K. Using the table of indexes of refraction on your "Refraction" notes, what material is this?

Light Source

Transparent material

35°
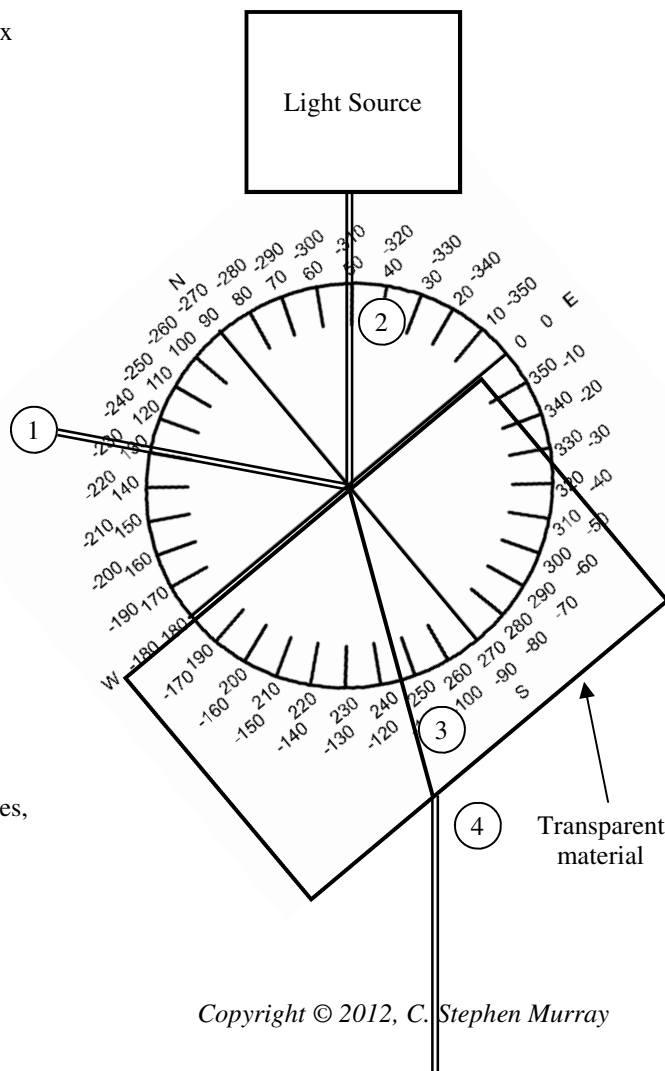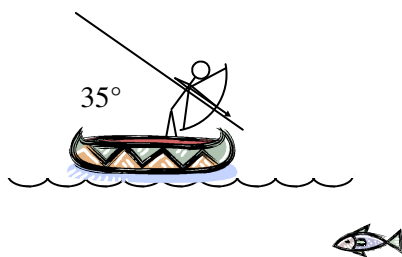
6. Slim Jim decides to go fishing. Fortunately for the fish, Jim forgets his physics. In his optical ignorance Jim aims exactly where he SEES the fish.
   A. Draw where the fish may really be (*approximately*).
   B. Where are all angles measured from in optics?
   C. What angle do we need to use for our equations?
   D. You know the indexes of refraction for air and water, so calculate the angle that the light actually travels in the water.

Using your TAKS notes (all 5 objectives)….

7. (Day 14) Salt is dissolved in water. Is this a physical or chemical change? Why?

8. (Day 15) Things that are less dense float or sink?   This can lead to what kind of heat transfer?

9. When a liquid is heated it tends to flow better this means it has less _____.

10. (Day 16) Give an element that has the same reactivity as oxygen.

11. What is the chemical symbol for sodium?   Potassium?

12. Consider Magnesium.   A) How many valence electrons? B) How many protons?
    C) Metal or nonmetal?   D) Does it tend to gain or lose electrons?

13. (Day 17) Give the formula for the balanced ionic compound created when Beryllium combines with Fluorine.

14. (Day 19) Which dissolves faster:
    A. Powdered sugar or granulated sugar?   B. In hot water or in cold water?
    C. Stirred or not stirred?   D. Large particles or small particles?

15. (Day 20) Which side of water is positive?   This makes water a _____ molecule.

16. (Day 21) A compound is mixed into water and it creates a lot of OH− ions. Is it an acid or a base?

17. A compound has a pH of 2.5. Acid or base?

18. A solution has a pH of 11. To get its pH to 9, what do you add?

19. What is the pH of pure water?

20. (Day 6) Which organelle is responsible for keeping unwanted materials out of the cell?

21. Which organelle makes proteins?   Makes energy?

22. (Day 7A) Are two organisms more closely related if they have the same class or the same genus?

23. Which of the four organisms are the most closely related? (*And can you name any of them*?)
    A. Ursus Maritimus   B. Melursus Ursinus
    C. Ailuropoda melanoleuca   D. Ursus arctos

24. (Day 7B) If the diagram shows a round membrane that is permeable to water, which way will the water flow?

* 1B) hint: which side is real?   5B) 40° G) 40°