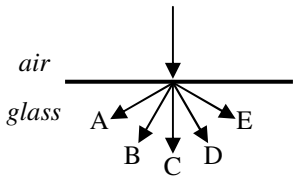
A-Day Due Fri., Feb 27
B-Day: Due Mon., Mar 2

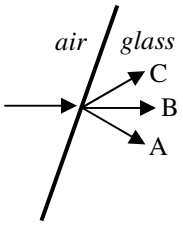
2009 PreAP Light and Optics 3

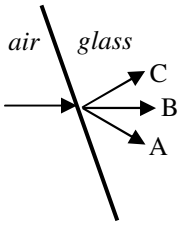
Use the "Refraction" Notes to answer the following:

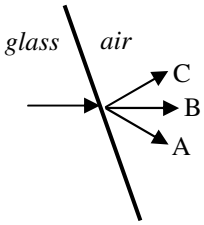
1. In which material is light faster: air or glass?
   Why?

2. For the following situations decide which way the light ray will refract.







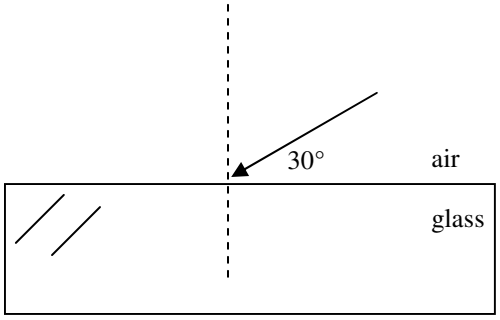


3. Why does light refract (*and be specific as for angles)*?

4. Find the speed of light in ice.

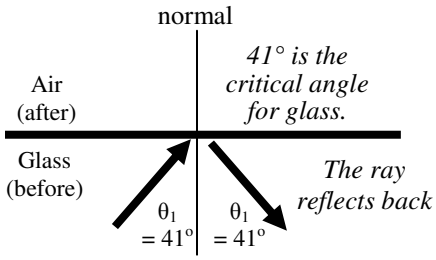
5. For substance A, n = 2.45; substance B n = 1.65.
   A. Which one is denser?
   B. In which substance will light have the fastest velocity?

6. Use the diagram at the right to answer the following questions.
   A. Which is the first substance light is traveling in?
   B. For Snell's Law ($n_1 \sin\theta_1 = n_2 \sin\theta_2$), n_1 is air or glass?
   C. If all angles must be from the normal, what is θ_1?
   D. Draw what will happen to the light in the glass AND after it passes all the way thru the glass.
   D. Find the angle of refraction in glass.



7. 41° is the critical angle for glass (see diagram).
   A. At 40°, will light reflect or refract from glass to air?
   B. At 42°, will light reflect or refract from glass to air?

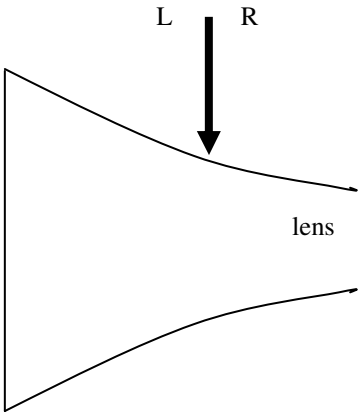
8. Find the critical angle of light crossing from diamond and air.



9. What is the critical angle from air to ice? (*Use the index of refraction table on the notes.)*

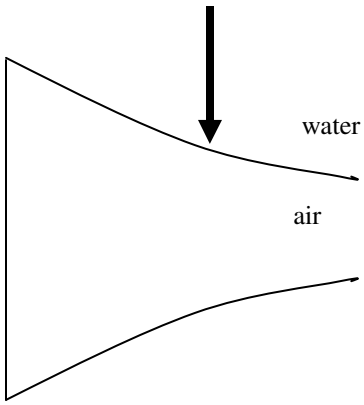
10. What's the speed of microwaves? Radiowaves? Radar?

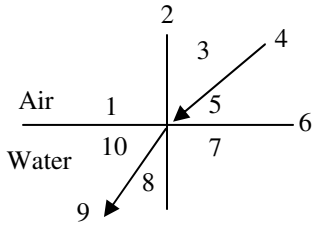
11. 550 nm green light is traveling in air.
   A. What is its speed?
   B. What is its frequency?
   C. When it passes into water, what will be its speed?
   D. What will be its frequency in water?
   E. What will be its wavelength (in nm)?



12. *A ray of light is passing from air into a lens.*
    - *A. Which substance has a bigger index of refraction?*
    - *B. In which substance does light have a faster speed?*
    - *C. Which side of the arrow reaches the lens first: left or right?*
    - *D. Draw what will happen to the ray as it passes into the lens.*
    - *E. Which side gets out of the lens first?*
    - *F. Draw what will happen to the ray as it passes out of the lens.*
    - *G. This kind of lens is concave or convex?*
    - *H. Is it divergent or convergent?*

13. *Now let's imagine that the lens is made out of plastic and has air in the middle. We put the air-filled lens into water. Draw the path of the light ray as it passes thru both boundaries.*

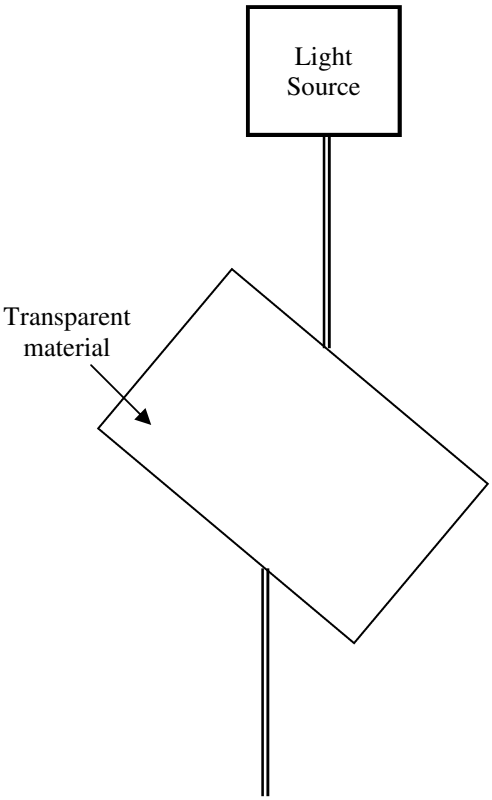




14. The diagram at the left shows a ray of lightrefracting from air to water. Which number corresponds to:
    - A. _____ θ_1
    - B. _____ normal
    - C. _____ Surface of water
    - D. _____ Incident ray
    - E._____ θ_2
    - F._____ Refracted ray

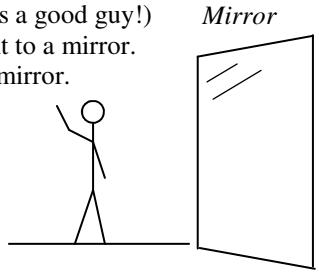
15. If the above incoming angle is 50º, find the refracted angle.

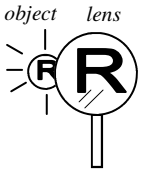
16. The diagram at the right shows light refracting thru a transparent material.
    - A) Why does the light change directions?
    - B) Find the index of refraction for the transparent material and using the table or in your notes, figure out what material it is. (*You will need a protractor.)*



17. *From the book: p. 550: Q14, 16, 20*

18. Slim Jim is waving hello to you. (He's a good guy!) Just so happens that he is standing next to a mirror. Draw the image of Jim you see in the mirror.

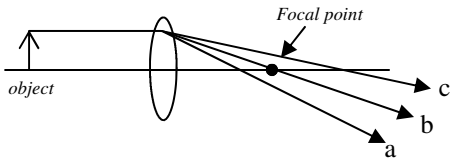




From the "Optics Basics" notes:

19. You are looking thru a lens at an object.
    A. Is the image real or virtual?

    B. Why?

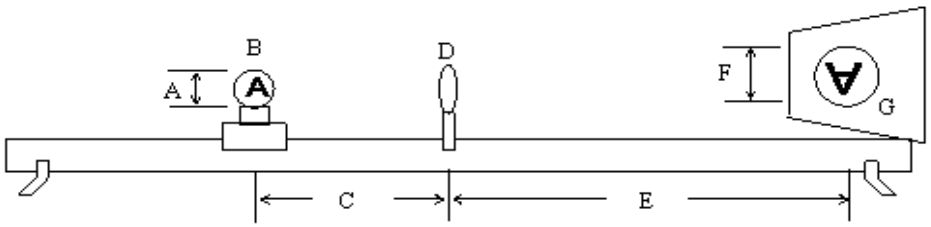


20. Which letter above shows where the light will go?

From the "Lens Equations" Notes:

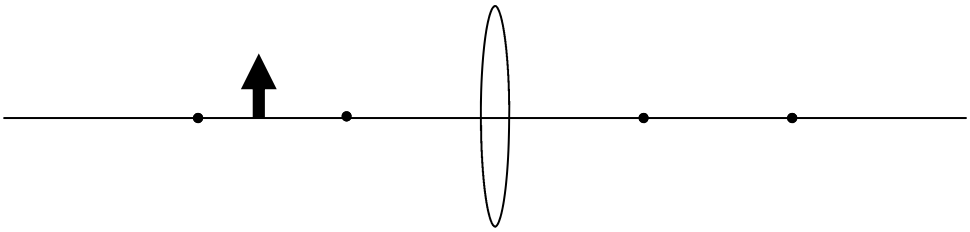
21. A. Label the diagram with p, q, h, and h'. Be sure to mark them with + or –.
    A. Is the image real or virtual?
    B. Why?
    C. Will the magnification be a positive or negative number?

    D. Will the magnification be greater than or less than 1?



From the "Ray Diagram" Notes:

22. Use the rules on the notes to draw the image. (Be sure to label the focal point and radius of curvature.)



TAKS

23. Donny uses a force of 10 newtons to move a 15-kg box a distance of 3 meters. How much work did Donny do?

24. According to the periodic table, which of the following pairs of elements is most chemically similar?
    A. Fluorine and neon B. Chlorine and argon C. Chlorine and chlorine D. Sulfur and chlorine

25. Physical or chemical change?
    A. _____Ice melts to form liquid water
    B. _____Salt dissolved in water
    C. _____Wood burns producing ash and smoke
    D. _____A glass breaks

26. A 3 kg mass is on a frictionless table.
    A. If it is moving 4 m/s, how much energy does it have in the first picture?
    B. What kind of energy does it have in the middle picture?

    C. How much energy does it have in the last picture?