CHAPTER 14 REVIEW

True or False

1. Obsidian is a type of glass-like sedimentary rock formed in the ground under great pressure.
2. One of the earliest forms of man-made glass was accidentally produced in Syria during food preparation.
3. Metal oxides added to glass produce glass of different colors.
4. Safety glass is made so it will not crack and not break apart into pieces upon impact.
5. When it is hit, glass bends and stretches before breaking.
6. Secondary fracture lines radiate out from the center of impact as glass shatters.
7. If glass is located near a fire within a building, it will tend to shatter outward.

Multiple Choice

8. The refractive index refers to the ability of a substance to
   a) bend light
   b) reflect light
   c) absorb light
   d) convert light to heat energy

9. The substance added to glass that makes crystal glasses seem to sparkle is
   a) copper
   b) silver
   c) lead
   d) aluminum

10. The speed of light in a vacuum is approximately
    a) 30,000 kilometers/hour
    b) 300,000 kilometers/hour
    c) 30,000 miles/hour
    d) 300,000 meters/hour

11. Which refractive index would indicate the densest material?
    a) 1.2
    b) 1.3
    c) 1.4
    d) 1.5

12. As the density of a medium increases, the refractive index should
    a) increase
    b) decrease
    c) stay the same

13. The normal is the line that is
    a) parallel to the surface where two different mediums meet
    b) moving in the same direction as the beam of light through the first medium
    c) perpendicular to the surface where two different mediums meet
    d) the line of light passing through a vacuum

14. What are the correct units when measuring density?
    a) milliliters/gram
    b) cubic centimeters/milliliter
    c) grams/milliliter
    d) millimeters/second

Short Answer

15. Describe how to use the submersion method to determine the refractive index of a piece of glass found at a crime scene.

16. In order to determine the refractive index of a small piece of glass, the glass is submerged in different liquids and viewed under a compound microscope. The appearance of a Becke line is used to determine the refractive index.
    a) What is a Becke line?

    b) Why does a Becke line form?

    c) What does the location of the Becke line tell you about the refractive index of the piece of glass and the surrounding liquid in which it is placed?

Refer to Figure 14-10 on page 403 to answer question 17.

17. You are testifying as an expert in glass evidence. You want to demonstrate that the evidence glass found embedded in a blanket came from a broken headlight of a vehicle suspected to be the vehicle involved in a hit-and-run accident.
    a. What liquid would you use to demonstrate that the glass fragment was obtained from a broken car headlight?

    b. Describe the demonstration that you would show the jury.

    c. What explanation would you provide to the jury to convince them that the glass evidence has to come from a glass like the glass found in a car headlight?

18. A beam of light passes through air into a second medium. Angle 1 (angle of incidence) is 33°. Angle 2 (angle of refraction) is 48°. Calculate the refractive index. Show all your work.

19. Compare and contrast radial and concentric glass fractures. Include in your answer:
    a. Description of each type of fracture

    b. On which side of the glass will they form

    c. Which type of fracture will form first and why

20. A window is broken. The group of vandals who were standing behind the broken window run away. If the broken glass projected inward, how is it possible that a small amount of trace broken glass evidence was found on their clothes?

21. List characteristics of glass that can be used to compare suspect glass samples to glass found at a crime scene.

22. Using a light source and a protractor, explain how to calculate the refractive index of a liquid.

Bibliography

Books and Journals

Giancoli, Douglas C. *Physics, Principles and Applications,* 5th ed. Englewood Cliffs, NJ: Prentice Hall, 1998.

Saferstein, Richard, ed. "Criminalistics," in *Introduction to Forensic Science*, 9th ed. Englewood Cliffs, NJ: Prentice Hall, 2006.

Stratton, David R. "Reading the Clues in Fractured Glass." *Security Management* 38(1): 56, January 2004.

Web sites

Gale Forensic Science eCollection, school.cengage.com/forensicscience.
http://hypertextbook.com/facts/2004/ShayeStorm.shtml
http://www.glassonline.com/infoserv/history.html
http://tpub.com/neets/book10/39h.htm
http://scienceworld.wolfram.com/physics/SnellsLaw.html
http://www.gwu.edu/~forchem/BeckeLine/BeckeLinePage.htm
http://www.fbi.gov/hq/lab/fsc/backissu/jan2005/standards/2005standards9.htm
http://www.newton.dep.anl.gov/askasci/chem00/chem00135.htm
http://www.matter.org.uk/schools/SchoolsGlossary/refractive_index.html
http://www.gazettetimes.com/articles/2005/10/09/news/top_story/news01.txt
http://radiationcenter.oregonstate.edu/Research/Research%20home.html
http://www.gazettetimes.com/articles/2005/10/09/news/top_story/news01.txt
http://www.haines.com.au/Gee_Store/Scripts/prodList.asp?idCategory=1136