Chapter 10 Assessment

Vocabulary

Select the correct term to complete the sentences.

brittleness	thermal expansion	amorphous
buoyancy	chemical properties	Archimedes' principle
elasticity	crystalline	pressure
Pascal	viscosity	Bernoulli's principle
fluid	ductility	malleability
hardness	Boyle's law	physical properties
tensile strength	strength	Charles's law
density		

Section 10.1

1. The mass per unit volume of a material is its _____.

Section 10.2

2. ____ are properties that can be observed directly.
3. ____ can only be observed when a substance is changed to another substance.
4. A solid having randomly arranged atoms or molecules is called ____.
5. The tendency to crack or break is called _____.
6. A(n) _____ solid has an orderly, repeating arrangement of particles.
7. _____ is the ability to bend without breaking.
8. A solid that can be bent and stretched and then return to its original shape has high _____.
9. A solid's ability to resist being scratched is called _____.
10. Gold has high _____ because it can be pounded into very thin sheets.
11. The ability to maintain shape under the application of forces is called _____.
12. A measure of how much pulling a material can withstand before breaking is called _____.
13. When a heated material changes size it is said to undergo _____.

Section 10.3

14. _____ is a measure of a fluid's resistance to flow.
15. Any matter that flows when force is applied is referred to as a(n) _____.
16. _____ is the measure of force per unit of area.
17. _____ is a relationship that describes energy conservation in a fluid.
18. The SI unit of pressure is the _____.
19. _____ states that pressure and volume are inversely related.

Section 10.4

20. _____ is a measure of the upward force a fluid exerts on an object that is submerged.
21. _____ states that the buoyant force is equal to the weight of the fluid displaced by an object.
22. _____ describes the relationship between the temperature and volume of a gas.

Concepts

Section 10.1

1. In general, how do the densities of a material in solid and liquid form compare? Name a common exception to the general rule.
2. Which makes better packing material: a high density or a low density material? Why?

Next

3. A cube of solid steel and a cube of solid aluminum are both covered with a thin plastic coating, making it impossible to identify the cubes based on color. Referring to Figure 10.2 on page 217, tell how you could determine which cube is steel and which is aluminum.

Section 10.2

4. Explain the difference between physical and chemical properties. Use an example in your explanation.
5. The density of a solid material depends on two things. Name those two things.
6. Compare the arrangement of atoms or molecules in an amorphous solid to the arrangement of atoms or molecules in a crystalline solid.
7. Classify the following as a physical property (P) or a chemical property (C).
   a. ____ ice melts at room temperature
   b. ____ an apple turns brown when it is peeled
   c. ____ mercury is a metal that is liquid at room temperature
   d. ____ rust is orange
   e. ____ copper is shiny
   f. ____ copper forms a blue-green patina after being exposed to the air for a long period of time
8. Use the word *amorphous* or *crystalline* to describe each of the materials listed below.
   a. metal
   b. glass
   c. rubber
   d. diamond
   e. taffy candy
   f. plastic
   g. sugar
   h. ice
9. Match the materials below with the mechanical property associated with the material.
   a. ____ gold
   b. ____ rubber
   c. ____ glass
   1. brittleness
   2. ductility
   3. elasticity

Section 10.3

10. Compare the terms *liquid* and *fluid*.
11. Describe how Newton's third law is related to fluid pressure.
12. Explain how Bernoulli's principle helps to explain the lift that airplane wings experience.

Section 10.4

13. Compare the buoyant force to the weight of a floating block of foam.
14. Explain why a solid steel ball sinks in water but a steel ship floats in water.
15. A solid steel ball and a hollow steel ball of the same size are dropped into a bucket of water. Both sink. Compare the buoyant force on each.
16. Why does ice float in a glass of water? Explain in terms of density and buoyancy.

Problems

Section 10.1

1. A chunk of paraffin (wax) has a mass of 50.4 grams and a volume of 57.9 cm^3. What is the density of paraffin?
2. Gold has a density of 19,300 kg/m^3. Calculate the mass of one gold bar that has dimensions of 1.00 cm × 2.00 cm × 10.0 cm.

Section 10.2

3. Your teacher gives you two stainless steel ball bearings. The larger has a mass of 25.0 g and a volume of 3.2 cm^3. The smaller has a mass of 10.0 g. Calculate the volume of the smaller ball bearing.
4. At 20°C, the density of copper is 8.9 g/cm^3. The density of platinum at the same temperature is 21.4 g/cm^3. What does this tell you about how the atoms are "packed" in each material?

Section 10.3

5. What is the pressure if 810 N of force is applied on an area of 9 m^2?
6. A 4,000-pound car's tires are inflated to 35 pounds per square inch (psi). How much tire area must be in contact with the road to support the car?
7. Another unit of pressure is the atmosphere (atm). One atmosphere of pressure is equal to 101,325 pascals. 1.00 L of helium at 1 atm is compressed to 350 mL. What is the new pressure of the gas in atmospheres? Assume that temperature and mass are constant.
8. 5.00 L of oxygen is pumped from a tank with a pressure of 20 atm into another tank. The new pressure is 80 atm. What is the new volume of the oxygen? Assume that temperature and mass are constant.

Section 10.4

9. You hold a balloon with a volume of 2,000 mL under water. What is the buoyant force on the balloon?
10. An object weighing 45 newtons in air is suspended from a spring scale. The spring scale reads 22 newtons when the object is fully submerged in water. Calculate the buoyant force on the object.
11. A stone that weighs 6.5 newtons in air weighs only 5.0 newtons when submerged in water. What is the buoyant force exerted on the rock by the water?
12. A 100.0-mL oak object is placed in water. What volume of water is displaced by the oak object? The density of oak is 0.60 g/cm3.
13. At 225°C, a gas has a volume of 350 mL. What is the volume of this gas at 120°C? Assume constant pressure and mass.
14. At 210°C, a gas has a volume of 7.5 L. What is the volume of this gas at –20.0°C? Assume constant pressure and mass.
15. A 7.25 L sample of nitrogen is heated from 80.5°C to 86.0°C. Find its new volume if the pressure and mass remain constant.

Applying Your Knowledge

Section 10.1

1. Deep ocean currents are caused by differences in ocean water density. What two things can cause density differences in ocean water? How does the density difference actually cause the movement of deep ocean water? Do some research to find the answers to these questions. Be sure to cite your references.

Section 10.2

2. You are an engineer who must choose a type of plastic to use for the infant car seat that you are designing. Name two properties of solids that would help you decide, and explain why each is important.

Section 10.3

3. Describe how your body makes use of Boyle's law in order to breathe.
4. Many studies have been done about the viscosity of lava from various volcanic eruptions around the world. Do some research to find out how scientists determine the viscosity of lava, and find out if there is much variation in the viscosity of different lava flows.

Section 10.4

5. The Dead Sea is a body of water that lies between Israel and Jordan. It is so salty that almost no organisms other than a few types of bacteria can survive in it. The density of its surface water is 1.166 g/mL. Would you find it easier to float in the Dead Sea or in a freshwater lake? Give a reason for your answer.