

CHAPTER

13

Study Guide

Static Electricity

Vocabulary Review

Write the term that correctly completes the statement. Use each term once.

adhesive forces	coefficient of linear expansion	combined gas law	Pascal's principle
amorphous solid	coefficient of volume expansion	crystal lattice	plasma
Archimedes' principle	cohesive forces	fluid	pressure
Bernoulli's principle		ideal gas law	streamlines
buoyant force		pascal	thermal expansion

- _____ A _____ flows and has no definite shape of its own.
- _____ Force divided by surface area equals _____.
- _____ _____ states that the magnitude of the buoyant force on an object equals the weight of fluid displaced by the object.
- _____ A _____ is a gas-like state that contains electrons and positively charged ions.
- _____ The _____ is the SI standard unit of pressure.
- _____ The _____ states that for a fixed amount of ideal gas, the pressure times the volume divided by the Kelvin temperature equals a constant.
- _____ A fixed pattern of particles within a solid is a(n) _____.
- _____ The _____ can be expressed by the relationship $PV = nRT$.
- _____ The _____ is an upward force on an object immersed in a liquid.
- _____ _____ states that as the velocity of a fluid increases, the pressure exerted by the fluid decreases.
- _____ When an increase in temperature produces an increase in the volume of matter and a decrease in its density, it is called _____.
- _____ _____ are the electromagnetic attractions of particles within a substance for one another.
- _____ The _____ is equal to the change in length divided by the original length and the change in temperature.
- _____ _____ states that a change in pressure at any point on a confined fluid is transmitted undiminished through the fluid.

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15. _____ Attractive forces between particles of different substances are _____.
16. _____ A(n) _____ is a substance that has definite volume and shape but no regular crystal structure.
17. _____ _____ are representations of the flow of fluids around objects.
18. _____ The _____ is equal to the change in volume divided by the original volume and the change in temperature.

Section 13.1 Properties of Fluids

In your textbook, read about pressure on page 342.

For each statement below, write true or rewrite the italicized part to make the statement true.

- _____ Fluids flow and have no definite *volume*.
- _____ The SI unit of pressure is the pascal, *Pa*.
- _____ Pressure is inversely proportional to *force*.
- _____ *Fluids* have no definite shape of their own.
- _____ The forces that hold molecules of the floor together cause the floor to exert an *upward pressure* on your feet.
- _____ As you move to higher altitudes on Earth, atmospheric pressure *increases*.
- _____ The typical pressure at the center of the Sun is *greater* than the typical pressure at the center of Earth.
- _____ 1 Pa is equivalent to 1 *N/m³*.
- _____ Standard atmospheric pressure is equal to *101.3 kPa*.

In your textbook, read about the gas laws on page 344.

For each term on the left, write the letter of the corresponding item.

- _____ **10.** Boyle's Law
- _____ **11.** Charles' Law
- _____ **12.** Combined Gas Law
- _____ **13.** Ideal Gas Law
- _____ **14.** Avogadro's number

- a.** $PV = nRT$
- b.** 6.022×10^{23}
- c.** $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$
- d.** $P_1 V_1 = P_2 V_2$
- e.** $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

In your textbook, read about thermal expansion and plasma on pages 347–348.

Answer the following questions. Use complete sentences.

15. How does thermal expansion explain convection in a pan of water being heated?

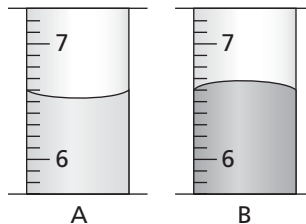
16. At what temperature does H_2O reach its greatest density? What happens if you cool it below that point?

17. What is one primary difference between gas and plasma?

Section 13.2 Forces Within Liquids

In your textbook, read about cohesive and adhesive forces on pages 349–350.

The diagram shows two different liquids in glass graduated cylinders. Refer to the diagram to answer questions 1 and 2.



1. Which liquid has the greatest cohesion? How do you know?

2. How do the adhesive forces of each liquid compare?

3. A flat piece of aluminum foil is placed on the surface of a pan of water. Although the aluminum is more dense than water, the foil does not sink. Why?

4. It's a very hot day at the beach. The air temperature is greater than $32^{\circ}C$ and there's no breeze to cool you off. Why do you feel cooler when you get out of the water?

Section 13.3 Fluids at Rest and in Motion

In your textbook, read about fluids at rest and swimming under pressure on page 352.

Next to each situation, write Pascal's principle or Archimedes' principle to indicate which principle best applies to the situation.

- _____ 1. A person uses a hydraulic brake to stop a car.
- _____ 2. An ice cube floats in water.
- _____ 3. A fish uses an air bladder to move up and down in water.
- _____ 4. Squeezing one end of a balloon makes the other end larger.
- _____ 5. A person feels lighter in water than on land.
- _____ 6. A camper pumps up an air mattress with a foot pump.
- _____ 7. Rolling a toothpaste tube from the bottom squeezes toothpaste from the tube.
- _____ 8. A scientist determines the volume of an irregular object by placing it in water.

Answer the following questions. Use complete sentences.

9. You are trying to install a 1-m long bookshelf on a wall and want to make sure it's level. You don't have a level, but you do have 2 m of clear plastic tubing and some water. How could you use the tubing to level the shelf? What principle are you applying?

10. When a cargo ship bound for Florida leaves a port on Lake Michigan, a paint spot on the side of the ship is just above the water line. The ship sails through the St. Lawrence Seaway and reaches the Atlantic Ocean. Assume that nothing has been added to or removed from the ship during its journey. Where is the paint spot compared with where it was when the ship left port? Explain your answer.

11. What is the pressure, in kPa, exerted by a 23.0-m column of freshwater? How does this compare to standard air pressure in atmospheres?

In your textbook, read about swimming under pressure on page 352.

Write the term that correctly completes the statement.

The (12.) _____ force a body experiences when it is submerged in a fluid is called the (13.) _____ force. The relationship of this force was discovered by the ancient Greek scientist (14.) _____, and the principle is named after him/her. This force is dependent upon gravity, the (15.) _____ of the fluid and the (16.) _____ of the object submerged. The (17.) _____ of the submerged object does not play a part in determining this force.

This principle also explains why (18.) _____ floats at the top of your drink. Objects with an apparent weight of zero have (19.) _____. One practical application of this principle is the construction of (20.) _____, which use water pumps to move water in or out of chambers to change its (21.) _____ and either rise or sink. The same principle is used with the (22.) _____ of fish, allowing them to move up or down through the water.

Section 13.4 Solids

In your textbook, read about solid bodies and thermal expansion of solids on pages 359–361.

For each statement below, write true or false.

- _____ 1. Particles in a crystal lattice do not move at all.
- _____ 2. Butter and glass are examples of amorphous solids.
- _____ 3. When most substances freeze, their particles move closer together.
- _____ 4. Water is most dense at 0°C, its freezing point.
- _____ 5. Increasing the pressure on water increases its freezing point.
- _____ 6. Elasticity is the ability of a solid object to return to its original form.
- _____ 7. Ductility is the property of a solid that allows it to be hammered into sheets.
- _____ 8. The symbol for the coefficient of linear expansion is α .
- _____ 9. The change in the length of a solid is proportional to the change in temperature.
- _____ 10. Metals used in a bimetallic strip have the same rates of thermal expansion.

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Answer the following questions. Use complete sentences or show your calculations.

- 11.** In an area that experiences both hot summers and cold winters, why would the time of year that overhead power lines are installed change the way the wires are strung?

- 12.** In making a thermometer, why is it important that the glass have as little thermal expansion as possible?

- 13.** An aluminum baseball bat is 86.40 cm long at 20.0°C. On a hot day, when the the temperature reaches 32.0°C, what will be the length of the bat?

- 14.** Explain why a bridge in Vermont must have larger gaps in the expansion joints than the same structure built in Florida.

- 15.** The volume of a copper sphere is 2.44 cm³ at 12°C. What was the volume of the copper sphere after it was heated to 984°C? The coefficient of volume expansion for copper is $\beta = 48 \times 10^{-6} (\text{°C})^{-1}$.