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13 STATES OF MATTER

Chapter Test A

A. Matching

Match each description in Column B with the correct term in Column A. Write the letter of the correct description on the line.

	Column A	Column B
_____ **1.**	amorphous	**a.** an empty space with no particles of matter
_____ **2.**	unit cell	**b.** the temperature at which a solid changes into a liquid
_____ **3.**	crystal	**c.** a device used to measure atmospheric pressure
_____ **4.**	normal boiling point	**d.** the pressure resulting from the collision of particles in air with objects
_____ **5.**	barometer	**e.** the temperature at which the vapor pressure of a liquid is equal to the external pressure
_____ **6.**	atmospheric pressure	**f.** the smallest group of particles within a crystal that retains the shape of the crystal
_____ **7.**	melting point	**g.** a solid in which the particles are arranged in an orderly, repeating, three-dimensional pattern
_____ **8.**	sublimation	**h.** a measure of the force exerted by a gas above a liquid
_____ **9.**	boiling point	**i.** describes a solid that lacks an ordered internal structure
_____ **10.**	kinetic theory	**j.** the temperature at which a liquid boils at a pressure of 101.3 kPa
_____ **11.**	allotrope	**k.** one of two or more different molecular forms of the same element in the same physical state
_____ **12.**	vapor pressure	**l.** the conversion of a liquid to a gas or vapor at a temperature below the boiling point
_____ **13.**	evaporation	**m.** states that the tiny particles in all forms of matter are in constant motion
_____ **14.**	vacuum	**n.** the change of a solid to a vapor without passing through the liquid state

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B. Multiple Choice

Choose the best answer and write its letter on the line.

_____ **15.** The average kinetic energy of water molecules is greatest in
- **a.** steam at 200°C.
- **b.** liquid water at 90°C.
- **c.** liquid water at 373 K.
- **d.** ice at 0°C.

_____ **16.** According to the kinetic theory of gases,
- **a.** the particles in a gas move rapidly.
- **b.** the particles in a gas are relatively far apart.
- **c.** the particles in a gas move independently of each other.
- **d.** all of the above are true.

_____ **17.** The temperature at which the motion of particles theoretically ceases is
- **a.** 0°C.
- **b.** 273°C.
- **c.** −273 K.
- **d.** 0 K.

_____ **18.** The average kinetic energy of particles of a substance
- **a.** is not affected by the temperature of the substance.
- **b.** increases as the temperature of the substance decreases.
- **c.** is directly proportional to the temperature of a substance.
- **d.** is equal to 0.

_____ **19.** Which of these statements is *not* true, according to kinetic theory?
- **a.** There is no attraction between particles of a gas.
- **b.** Only particles of matter in the gaseous state are in constant motion.
- **c.** The particles of a gas collide with each other and with other objects.
- **d.** All collisions between particles of gas are perfectly elastic.

_____ **20.** Standard conditions when working with gases are defined as
- **a.** 0 K and 101.3 kilopascals.
- **b.** 0 K and 1 mm Hg.
- **c.** 0°C and 101.3 kilopascals.
- **d.** 0°C and 1 mm Hg.

_____ **21.** The pressure of a gas in a container is 76 mm Hg. This is equivalent to
- **a.** 0.1 atm.
- **b.** 1 atm.
- **c.** 0.2 atm.
- **d.** 0.76 atm.

_____ **22.** A phase diagram gives information on
- **a.** volumes of gases.
- **b.** conditions at which a substance exists as a solid, liquid, and gas.
- **c.** volumes of liquids and solids.
- **d.** changes in mass of solids, liquids, and gases.

_____ **23.** An increase in the temperature of a contained liquid
- **a.** causes the vapor pressure above the liquid to increase.
- **b.** decreases the vapor pressure above a liquid.
- **c.** causes fewer particles to escape the surface of the liquid.
- **d.** has no effect on the kinetic energy of the liquid.

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_____ **24.** Water could be made to boil at 105°C by
- **a.** applying a great deal of energy.
- **b.** increasing the air pressure above the water.
- **c.** heating the water more gradually.
- **d.** decreasing the air pressure above the water.

_____ **25.** The direct change of a substance from a solid to a vapor is called:
- **a.** evaporation
- **b.** sublimation.
- **c.** condensation.
- **d.** vaporization.

_____ **26.** Most solids
- **a.** are amorphous.
- **b.** lack an orderly internal structure.
- **c.** are dense and not easily compressed.
- **d.** have low melting points.

_____ **27.** The escape of molecules from the surface of an uncontained liquid is
- **a.** boiling.
- **b.** sublimation.
- **c.** evaporation.
- **d.** condensation.

C. True-False

Classify each of these statements as always true, AT, sometimes true, ST, or never true, NT.

_____ **28.** The rates of evaporation and condensation are equal at equilibrium.

_____ **29.** The kinetic energy of all the particles in a given sample of matter is the same.

_____ **30.** The average kinetic energy of all the molecules in liquid water at 80°C is the same as the average kinetic energy of the molecules in oxygen gas at 80°C.

_____ **31.** Heating a liquid will increase the temperature of the liquid.

_____ **32.** The melting point and freezing point of a substance are the same.

D. Problems

Solve the following problems in the space provided. Show your work.

33. A gas is at a pressure of 3.70 atm. What is this pressure in kilopascals?

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34. What is the pressure of the gas in problem 33, expressed in millimeters of mercury?

E. Essay

Write a short essay for the following.

35. Explain why the temperature of a gas does not depend on the number of particles in the sample of gas.

F. Additional Problems

Solve the following problems in the space provided. Show your work.

36. A gas has a pressure of 610.0 mm Hg. What is the pressure in atmospheres?

37. What is the pressure of the gas in problem 36, expressed in kilopascals?

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G. Additional Questions

Answer the following questions in the space provided.

38. A 100-g sample of water is heated from 50°C to 100°C. At 100°C, although the water is still being heated, the temperature of the water does not rise. Explain why.

39. Some types of bacteria are killed by being heated to a temperature of 150°C for 30 minutes. Explain why water heated under pressure can be used to kill these bacteria, although boiling water at atmospheric pressure does not kill them.

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