Name _____ Class _____ Date _____

Chapter 3 States of Matter

Summary

3.1 Solids, Liquids, and Gases

Materials can be classified as solids, liquids, or gases based on whether their shapes and volumes are definite or variable.

- A **solid** is a material that has a definite shape and a definite volume.
- A **liquid** is a material that has a definite volume but not a definite shape.
- A **gas** is a material that has neither a definite shape nor a definite volume.

The kinetic theory of matter says that all particles of matter are in constant motion.

- **Kinetic energy** is the energy an object has due to its motion.

There are forces of attraction among the particles in all matter.

The constant motion of particles in a gas allows a gas to fill a container of any shape or size.

A liquid takes the shape of its container because particles in a liquid can flow to new locations. The volume of a liquid is constant because forces of attraction keep the particles close together.

Solids have a definite volume and shape because particles in a solid vibrate around fixed locations.

3.2 The Gas Laws

Collisions between particles of a gas and the walls of the container cause the pressure in a closed container of gas.

- **Pressure** is the result of a force distributed over an area. Pressure is measured in pascals.

Factors that affect the pressure of an enclosed gas are its temperature, its volume, and the number of its particles.

Raising the temperature of a gas will increase its pressure if the volume of the gas and the number of particles are constant.

Reducing the volume of a gas increases its pressure if the temperature of the gas and the number of particles are constant.

- **Charles's law** states that the volume of a gas is directly proportional to its temperature in kelvins (K) if the pressure and number of particles of the gas are constant.
- A temperature of 0 K is called **absolute zero.**

- **Boyle's law** states that the volume of a gas is inversely proportional to its pressure if the temperature and the number of particles are constant.

Increasing the number of particles will increase the pressure of a gas if the temperature and the volume are constant.

3.3 Phase Changes

Melting, freezing, vaporization, condensation, sublimation, and deposition are six common phase changes.

- A **phase change** is the reversible physical change that occurs when a substance changes from one state of matter to another.

The temperature of a substance does not change during a phase change.

Energy is either absorbed or released during a phase change.

- During an **endothermic** change, the system absorbs energy from its surroundings.
- The amount of energy absorbed during melting is the **heat of fusion.**
- During an **exothermic** change, the system releases energy to its surroundings.
- **Vaporization** is the phase change in which a substance changes from a liquid into a gas. Vaporization is an endothermic process.
- The amount of energy water absorbs to vaporize is called the **heat of vaporization.**
- **Condensation** is the phase change in which a substance changes from a gas or vapor to a liquid. Condensation is an exothermic process.
- **Sublimation** is the phase change in which a substance changes from a solid to a gas or vapor without changing to a liquid first. Sublimation is an endothermic change.
- **Deposition** is the phase change in which a substance changes from a gas or vapor directly into a solid. Deposition is an exothermic change.

The arrangement of molecules in water becomes less orderly as water melts and more orderly as water freezes.

Evaporation takes place at the surface of a liquid and occurs at temperatures below the boiling point.

- **Evaporation** is the process that changes a substance from a liquid to a gas at temperatures below the substance's boiling point.
- The pressure caused by the collisions of vapor and the walls of a closed container is called **vapor pressure.**