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Ch.10 Outline - States of Matter

Section 1- The Kinetic Molecular Theory of Matter

The Kinetic Molecular Theory of Gases-pg.329
The Kinetic Molecular Theory and the Nature of Gases-pg.330
Deviations of Real Gases from Ideal Behavior-pg.332

KEY CONCEPTS
-STATE THE KINETIC MOLECULAR THEORY OF MATTER, AND DESCRIBE HOW IT EXPLAINS CERTAIN PROPERTIES OF MATTER.
-LIST THE FIVE ASSUMPTIONS OF THE KINETIC MOLECULAR THEORY OF GASES. DEFINE THE TERMS IDEAL GAS AND REAL GAS.
-DESCRIBE EACH OF THE FOLLOWING CHARACTERISTIC PROPERTIES OF GASES: EXPANSION, DENSITY, FLUIDITY, COMPRESSIBILITY, DIFFUSION, AND EFFUSION.
-DESCRIBE THE CONDITIONS UNDER WHICH A REAL GAS DEVIATES FROM IDEAL BEHAVIOR.

Key Terms
-kinetic molecular theory: the idea that particles of matter are always in motion.
-ideal gas: hypothetic gas that perfectly fits all the assumptions of the kinetic molecular theory.
-elastic collision: there is no net loss of total kinetic energy.
-diffusion: spontaneous mixing of particles from two substances caused by random motion.
-effusion: gas particles pass through a tiny opening
-real gas: gas that does not behave completely according to the kinetic molecular theory.

Figures
figure 1: diagram of how gas particles move
figure 2: the process of diffusion of gases
figure 3: the reducing of volume in a gas as pressure is added.

Questions:
1. Use the kinetic molecular theory to explain each of the following properties of gases: expansion, fluidity, low density, compressibility, and diffusion.
2. Describe the conditions in which a real gas is most like likely to behave ideally.
3. Which of the following gases would you expect to deviate significantly from ideal behavior: He, O2, H2, H2O, HCl, or NH3?
4. How does the kinetic molecular theory explain the pressure exerted by gases?
5. What happens to gas particles when a gas is compressed?
6. What happens to gas particles when a gas is heated?

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Section 2- Liquids

Properties of Liquids and the Kinetic Molecular Theory-pg. 333

KEY CONCEPTS
-DESCRIBE THE MOTION OF PARTICLES IN LIQUIDS AND THE PROPERTIES OF LIQUIDS ACCORDING TO THE KINETIC MOLECULAR THEORY
-DISCUSS THE PROCESS BY WHICH LIQUIDS CAN CHANGE INTO A GAS. DEFINE VAPORIZATION.
-DISCUSS THE PROCESS BY WHICH LIQUIDS CAN CHANGE INTO A SOLID. DEFINE FREEZING.

Key Terms
-fluid: substance that can flow and take the shape of its container
-surface tension: force that tends to pull adjacent parts of a liquids surface together, thereby decreasing it to its smallest size
-capillary action: attraction of the surface of a liquid to the surface of a solid
-vaporization: process by which a liquid or solid changes to a gas
-evaporation: process by which particles escape from the surface of a non boiling liquid and enter the gas state.
-freezing: the physical change of liquid to a solid by removal of energy as heat

Figures
figure 4: difference of density in liquids
figure 5: example of diffusion of liquids
figure 6: a diagram to help understand the attraction in surface tension
figure 7: attractions in different liquids
figure 8: an example of evaporation in a liquid

Questions
1. Describe the liquid state according the the kinetic molecular theory.
2. List the properties of liquids.
3. How does the kinetic molecular theory explain the liquid properties of relatively high density, ability to diffuse, and ability to evaporate.
4. Explain why liquids in a test tube form a meniscus.
5. Compare vaporization and evaporation.

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Section 3- Solids

Properties of Solids and the Kinetic Molecular Theory-pg.337
Crystalline Solids-pg.339
Amorphous Solids-pg.341

KEY CONCEPTS
-DESCRIBE THE MOTION OF PARTICLES IN SOLIDS AND THE PROPERTIES OF SOLIDS ACCORDING TO THE KINETIC MOLECULAR THEORY
-DISTINGUISH BETWEEN THE TWO TYPES OF SOLIDS
-DESCRIBE THE DIFFERENT TYPES OF CRYSTAL SYMMETRY. DEFINE CRYSTAL STRUCTURE AND UNIT CELL

Key Terms
-crystalline solid: consist of crystals
-crystal: substance in which the particles are arranged in an orderly, geometric, repeating pattern.
-amorphous solid: on in which the particles are randomly arranged
-melting: physical change of solid to liquid by addition of energy in heat.
-melting point: the temperature at which a solid becomes a liquid
-crystal structure: three-dimensional arrangement of particles of a crystal.
-unit cell: smallest portion of a crystal lattice that shows the three-dimensional pattern of the entire lattice

Figures
figure 9: particles of sodium metal in the three states of matter
figure 10: scanning electron micrograph of a sodium chloride crystal
figure 11: pictures of the seven basic crystalline systems
figure 12: covalent three-dimensional network solid diagram

Questions
1. Describe the solid state according to the kinetic molecular theory.
2. What is the difference between an amorphous solid and a crystalline solid?
3. Account the definite volume, relatively high density, extremely low rate of diffusion of solids.
4. Compare and contrast the four types of crystals.
5. Why do crystalline solids shatter into regularly shaped fragments when broken?