Chemistry

Independent Learning Packet 2

Student Name: ________________________

Teacher: ___________ WYATT ____________

Period: ______________
**Determine if the following statements are true or false.**

_____ 1. A liquid takes the volume of its container.

_____ 2. Particles of amorphous solids have no definite pattern.

_____ 3. A beef steak is an example of a crystalline solid.

_____ 4. Viscosity causes water to curve upward at the top rim of a glass.

_____ 5. There is more gas than any other state of matter in the universe.

_____ 6. All states of matter have a fixed mass and fixed volume.

_____ 7. The volume and shape of a solid can never change.

_____ 8. Surface tension explains why water forms droplets.

_____ 9. Water has greater viscosity than any other liquid.

_____ 10. A gas spreads out to fill all available space.

**Energy and States of Matter**

Why do different states of matter have different properties? It’s because of differences in energy at the level of atoms and molecules, the tiny particles that make up matter. Energy is the ability to cause changes in matter. Energy that causes matter to move is called kinetic energy. According to the kinetic theory of matter, the particles that make up matter have kinetic energy and are constantly moving.

So why don’t all the particles move apart? Particles of matter of the same substance, such as the same element, are attracted to one another. This force of attraction tends to pull the particles closer together. The particles need a lot of kinetic energy to overcome the force of attraction and move apart. It’s like a tug of war between opposing forces. The kinetic energy of individual particles is on one side, and the force of attraction between different particles is on the other side. The outcome of the “war” depends on the state of matter.

- In solids, particles don’t have enough kinetic energy to overcome the force of attraction between them. The particles are packed closely together and cannot move around. All they can do is wiggle, or vibrate, in place. This explains why solids have a fixed volume and a fixed shape.

- In liquids, particles have enough kinetic energy to partly overcome the force of attraction between them. They can slide past one another but not pull apart. This explains why liquids can change shape but have a fixed volume.

- In gases, particles have a lot of kinetic energy. They can completely overcome the force of attraction between them and move apart. This explains why gases have neither a fixed volume nor a fixed shape.

**Questions**

1. Create a table comparing and contrasting solids, liquids, and gases.

2. Relate the kinetic theory of matter to states of matter.
Terms
a. solid  
b. liquid  
c. gas  
d. plasma  
e. kinetic energy  
f. state of matter  
g. energy

Definitions
_____ 1. state of matter that lacks a fixed volume and a fixed shape
_____ 2. state of matter with a fixed volume and a fixed shape
_____ 3. energy that moves matter
_____ 4. ability to cause changes in matter
_____ 5. state of matter with a fixed volume but not a fixed shape
_____ 6. state of matter that consists of ions
_____ 7. solid, liquid, gas, or plasma

Changes of State
Changes of state are physical changes in matter. They are reversible changes that do not involve changes in matter's chemical makeup or chemical properties. Common changes of state include melting, freezing, sublimation, deposition, condensation, and vaporization. You can see how each process changes the state of matter in the diagram below.

The particles of matter are constantly moving. They move most quickly in gases, less quickly in liquids, and most slowly in solids. When matter changes state, it either loses or absorbs energy. For example, when matter changes from a liquid to a solid, it loses energy, because particles of solids have less energy than particles of liquids. When it changes from a solid to a liquid, it absorbs energy.
Questions

1. Which process changes a gas to a liquid? What happens during this process?

2. Create a table to show how energy changes in each of the processes in the diagram above.

Determine if the following statements are true or false.

_____ 1. Matter rarely changes state.
_____ 2. A gas changes directly to a solid by freezing.
_____ 3. The average kinetic energy of particles of matter can be measured with a thermometer.
_____ 4. All matter has the same freezing and boiling points.
_____ 5. A liquid can change to a gas without boiling.
_____ 6. The melting point of a substance is the same as its freezing point.
_____ 7. Iron melts at a lower temperature than water.
_____ 8. Evaporation occurs only at the exposed surface of a liquid.
_____ 9. Vaporization explains why a mud puddle dries up on a sunny day.
_____ 10. Ice changes directly to water vapor through the process of deposition.

Terms

a. condensation  b. deposition  c. evaporation  d. freezing  e. melting  f. sublimation

g. vaporization

Match each definition with the correct term.

Definitions

_____ 1. process in which a liquid changes to a gas without boiling
_____ 2. process in which a liquid changes to a solid
_____ 3. process in which a gas changes to a liquid
_____ 4. process in which a solid changes to a liquid
_____ 5. process in which a liquid boils and changes to a gas
_____ 6. process in which a gas changes directly to a solid
_____ 7. process in which a solid changes directly to a gas
Read this passage from the text and answer the questions that follow.

What Is Pressure?

The molecules of a gas are constantly moving and bumping into things. The force of the particles against whatever they bump into creates pressure. Pressure is defined as the amount of force pushing against a given area. How much pressure a gas exerts depends on the amount of gas. The more gas particles there are, the greater the pressure.

You usually cannot feel it, but air has pressure. The gases in Earth’s atmosphere exert pressure against everything they contact. The atmosphere rises high above Earth’s surface and contains a huge number of individual gas particles (see diagram below). As a result, the pressure of the tower of air above a given spot on Earth’s surface is substantial. If you were standing at sea level, the pressure would be 10.14 newtons per square centimeter (14.7 pounds per square inch).

Questions

1. Explain why gases exert pressure.
2. Describe how the pressure exerted by Earth’s atmosphere changes with altitude. Explain why atmospheric pressure changes in this way.

Determine if the following statements are true or false.

3. _____ 1. Particles of a gas move only when they are heated.
4. _____ 2. The pressure a gas exerts depends only on its volume.
5. _____ 3. For gas at a given temperature, volume and pressure change in opposite directions.
6. _____ 4. Gas bubbles in water get bigger when they are under less pressure.
7. _____ 5. Heating a gas causes its particles to move more slowly.
8. _____ 6. Air pressure in a tire increases after you start driving because the air gets warmer.
9. _____ 7. As you go higher above Earth’s surface, the pressure of the atmosphere increases.
10. _____ 8. Cooling a gas in a closed container causes its pressure to decrease.
11. _____ 9. Adding more gas to a closed container has no effect on its pressure.
12. _____ 10. Adding energy to a gas raises its temperature.
Chemistry: Classifying Matter

Classify each of the materials below. In the center column, state whether the material is a pure substance or a mixture. If the material is a pure substance, further classify it as either an element or compound in the right column. Similarly, if the material is a mixture, further classify it as homogeneous or heterogeneous in the right column. Write the entire word in each space to earn full credit.

<table>
<thead>
<tr>
<th>Material</th>
<th>Pure substance Or Mixture</th>
<th>Element, Compound, Homogeneous, Heterogeneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugar + Water (C_{12}H_{22}O_{11} + H_2O)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron Filings (Fe)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limestone (CaCO_3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange Juice (with pulp)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Ocean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air inside a balloon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum (Al)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetylene (C_2H_2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tap water in a glass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pure Water (H_2O)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chromium (Cr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chex Mix</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt + Pure Water (NaCl + H_2O)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzene (C_6H_6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muddy Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baking Soda (NaHCO_3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Matching, Separations

ac. Centrifuge  ad. Paper Chromatography

1. Vaporizing a liquid and leaving the dissolved solid behind.
2. To pour off a liquid, leaving another liquid or solid behind.
3. Uses the property of molecular attraction to separate a mixture.
4. Takes advantage of the physical property of the state of matter with a screen that lets liquid particles through.
5. Takes advantage of physical properties such as color and shape.
6. Circular motion helps denser components sink to the bottom faster.
7. Takes advantage of the physical property of magnetism.
8. The separation of a mixture of liquids based on the physical property of boiling point.