Particle Theory and States of Matter
Review Notes

Here is a chart to help you study characteristics of the 3 states of matter.

<table>
<thead>
<tr>
<th></th>
<th>Picture</th>
<th>Movement</th>
<th>Attraction</th>
<th>Energy</th>
<th>Shape/Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Solid</strong></td>
<td><img src="image1.png" alt="Solid Picture" /></td>
<td>Particles remain in fixed position and vibrate.</td>
<td>Particles have a strong attraction.</td>
<td>Particles have little energy.</td>
<td>Particles have a fixed shape and volume (neither change unless acted upon by an external force)</td>
</tr>
<tr>
<td><strong>Liquid</strong></td>
<td><img src="image2.png" alt="Liquid Picture" /></td>
<td>Particles slide and glide, though they do not move far.</td>
<td>Particles have a medium attraction.</td>
<td>Particles have a medium amount of energy.</td>
<td>Fixed volume (does not change). Shape is determined by the container.</td>
</tr>
<tr>
<td><strong>Gas</strong></td>
<td><img src="image3.png" alt="Gas Picture" /></td>
<td>Particles move in straight lines randomly and as far as possible.</td>
<td>Particles have a weak attraction.</td>
<td>Particles have lots of energy.</td>
<td>Volume and shape are determined by the container.</td>
</tr>
</tbody>
</table>

Changes of State
Particle Theory of Matter

1. All matter is made up of tiny Particles.
2. Particles are always moving.
3. There are spaces between particles.
4. Particles of a pure substance are identical.
5. Particles of a pure substance are attracted to one-another.
6. When matter is heated, it expands; when cooled, it contracts.
1. Which state of matter has no definite shape but a definite volume?
2. Which state of matter has no definite volume or shape?
3. Which state of matter has a definite shape and a definite volume?
4. Compare the movement of particles in a gas to that of particles in a solid.
5. In which state of matter do particles move independently?
6. Define what kinetic energy means and how it applies to particles of a solid, liquid and gas.
7. Name the process when a gas turns into a liquid. When this happens, do molecules slow down or speed up?
8. Name the process when a solid turns into a liquid. When this happens, does heat energy increase or decrease?
9. Name the process of a liquid becoming a gas. When this happens, do molecules move closer together or farther apart?
10. Compare and contrast evaporation and boiling. Describe particle movement, spacing and energy.
11. Read the following scenario. During phys-ed class, you twist your ankle while making the game winning basket. Your teacher gives you an ice pack from the freezer. It is frozen solid when you first place it on your ankle, but 20 minutes later, it is room temperature. Draw a picture of the particles in the ice pack when it is first taken from the freezer. Draw a second picture of the particles in the ice pack 5 minutes after it is placed on your ankle. Draw a third picture of the ice pack when it is room temperature. Below your picture, describe how the spacing, movement and energy in the particles of the ice pack have changed over time.
12. Describe where you have seen matter change from a solid, to a liquid to a gas in your day to day life.

**True or False. If the statement is false, correct it.**

_____ Solids can expand to fill the space in a container.
_____ Liquids are held together by a force that can’t be broken.
_____ The particles in a gas are in constant motion.
_____ After evaporation, the matter is a gas.
_____ Matter can be changed by adding or removing heat energy.
_____ When a solid melts, it becomes a vapour.
_____ When a solid melts into a liquid, there are more particles in the liquid.
_____ When a gas condenses into a liquid, the spaces between the particles become smaller.