The Particle Theory of Matter

Everything in the world – matter – is made up of particles. Understanding how particles work can help you understand how substances form and change. In this unit, you will examine matter, particles, and how particles behave in the different states of matter.

After completing this unit, you will

- understand that matter is made up of particles.
- understand that particles behave differently, depending on what state they are in.
- know the particle theory of matter.

Jimmy, look at this model of a solid sugar cube. It shows the particles packed closely together.

Vocabulary

- **matter**: physical substance; has mass and takes up space
- **particle**: one of the small pieces that make up matter
- **state**: refers to the solid, liquid, or gas state of matter
Outside of science, the term “theory” often means a guess. However, a scientific theory, like the particle theory of matter, is not a guess at all.

Look at the steps necessary to develop a scientific theory.

- **Start with an observation.**
- **Make a hypothesis.**
- **Test the hypothesis with an experiment.**
- **Publish the results in a scientific journal.**

Other scientists try the experiment to see whether they get the same results.

-- A Theory --

Hypothesis becomes

**A. Fill in the blanks to complete the sentences.**

--- Particle Theory of Matter ---

1. Matter is made up of ____________.
2. Particles are always ____________.
3. There is ____________ between particles.
4. ____________ causes particles to move faster.
5. All particles in a substance are ____________.
6. Attractive ____________ hold particles together. Particles in solids have strong attractive forces and particles in gases have very ____________ attractive forces.
B. Identify the states of matter and complete the drawings of the particles. Then fill in the blanks and give examples with the help of the picture.

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>gas</td>
<td>slip, barely</td>
</tr>
<tr>
<td>solid</td>
<td>directions</td>
</tr>
<tr>
<td>liquid</td>
<td>most, space, close</td>
</tr>
</tbody>
</table>

Particles and States of Matter

1. 
   - Particles are very _________ together and can _________ move.
   - Examples: ___________ and ___________ (my example)

2. 
   - Particles have more _________ between them than they do in solids and can _________ past each other.
   - Examples: ___________ and ___________ (my example)

3. 
   - Particles have the _________ space between them and can move in all _________.
   - Examples: ___________ and ___________ (my example)
C. Read the paragraph. Use the words in bold to complete the diagram and write whether heat is “added” or “taken away”. Then draw the particles in each state and complete what the boy says.

Water is unique because we can see its three states, but what causes a change in state? It is heat! When you remove an ice cube from the freezer, heat is added to the ice. The heat causes the ice particles to move faster and slip past each other, turning the ice into a liquid in a process called **melting**. Now you have water. If you boil the water in a pot, heat causes the particles to move so fast that some particles escape from the liquid as steam in a process called **evaporation**. Conversely, if heat is taken away from steam, it turns into liquid in a process called **condensation**. Liquid turns to ice when heat is taken away, too, and this is called **freezing**.

1. ___________; heat ___________

   ___________; heat ___________

   ___________; heat ___________

   ___________; heat ___________

The space between particles in solids is the ___________ among the three states of matter. Particles in ___________ have more energy than particles in liquids.