1) The Kinetic Theory states that all matter consists of tiny particles that are in constant **motion**.

2) Three usual **states** of **matter** are solid, liquid, and gas.

3) **Plasma**, a fourth state, occurs at very high temperatures, is not very common on Earth, but is the most common state of matter in the universe.

4) **Solids**—have definite shapes and volumes because particles are packed closely together and merely vibrate in place.

5) Matter with a definite volume but no definite shape is a **Liquid**.  
   a) A liquid takes the shape of its **container**.  
   b) Particles of a liquid can slide over one another allowing it to **flow**.

6) **Gas** is a state matter that does not have a definite shape or volume, will expand to fill the shape and volume of its container.

7) A state of matter whose particles have broken apart consisting of + and - charged particles - **plasma**.

8) **Complete the table about the properties of the three states of matter. Use these terms:** definite, indefinite, easily, and not easily.

<table>
<thead>
<tr>
<th>Properties of the States of Matter</th>
<th>Solid</th>
<th>Liquid</th>
<th>Gas or Vapor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shape</strong></td>
<td>definite</td>
<td>indefinite</td>
<td>indefinite</td>
</tr>
<tr>
<td><strong>Volume</strong></td>
<td>definite</td>
<td>definite</td>
<td>indefinite</td>
</tr>
<tr>
<td>Can be compressed</td>
<td>no</td>
<td>Not under &quot;normal&quot; conditions</td>
<td>yes</td>
</tr>
</tbody>
</table>
9) Match each arrangement of the particles in matter with a physical state.

<table>
<thead>
<tr>
<th>Physical State</th>
<th>Arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>C  gas</td>
<td>a. packed tightly together</td>
</tr>
<tr>
<td>B  liquid</td>
<td>b. close, but free to flow</td>
</tr>
<tr>
<td>A  solid</td>
<td>c. spaced relatively far apart</td>
</tr>
</tbody>
</table>

10) Draw a picture describing the movement of particles in a solid liquid, & gas. Use longer arrows to show higher velocities, and shorter arrows to show lower velocities.

11) Draw a picture describing the density of particles in a solid liquid, & gas.

12). Which of the following relates the temperature and pressure of a gas?
   a. Boyle's Law
   \[\text{C} \] Charles' Law

13). Which of the following relates the volume and pressure of a gas?
   a. Boyle's Law
   b. Charles' Law

14) Charles' law says that as the temperature of a gas increases, its volume increases.

15) Boyle's law says that as the pressure placed on a gas increases, its volume decreases.
Use the terms below to identify the phase changes that can occur between the 4 states of matter: freezing, melting, sublimation, deposition, condensation, vaporization, ionization

16) Fill in the correct phase change below

A melting occurs when a solid changes directly to a liquid.
B condensation is when a gas changes directly to a liquid.
C vaporization happens when a liquid changes directly to a gas.
D sublimation occurs when a solid changes directly to a gas.
E ionization occurs when gas changes to plasma.
F freezing occurs when a liquid changes to a solid.
G deposition occurs when a gas changes directly to a solid.

Answer the following.

A 17) A liquid is a form of matter that
   a. flows. c. has no definite volume.
   b. is easily compressed. d. has a definite shape.

D 18) Which of the following is true of water?
   a. boiling point of 100°C c. melting point of 0°C
   b. freezing point of 0°C d. all of the above

19) Write the letter of the term that is NOT a physical state of matter.
   a. solid
   b. gas
   c. liquid
   d. water
   e. plasma

20. Sketch a time temperature graph for a substance that is being heated, melts at 20°C and vaporizes at 75°C.
21. Sketch a time/temp graph for a substance that is cooling, condenses at 63°C and freezes at -25°C.

[Diagram of time/temp graph with temperature range and phases labeled]

22. Sketch two time/temperature graphs for two identical liquids that boil at 80°C. There is twice as much liquid in graph A as there is in graph B.

[A and B graphs with temperature range and time axis labeled]