

Chapter 2.1 States of Matter

Vocabulary:

Solid –

Crystalline solid –

Amorphous solid –

Liquid –

Fluid –

Surface tension –

Viscosity –

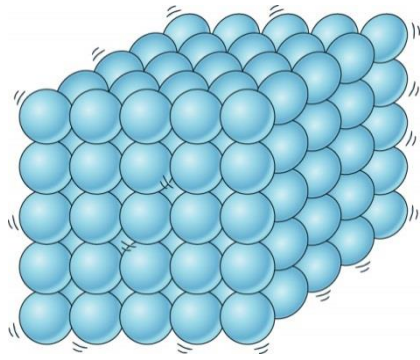
Gas –

Pressure –

LCD in a TV or cell phone stands for Liquid Crystal Display. They have replaced the picture tubes in many computer monitors and television sets because they are lighter and use less power. Liquid Crystal is neither solid nor liquid – they are somewhere in between. It takes just a small amount of thermal energy to change a liquid crystal to a liquid, so LCDs are very sensitive to heat.

Solid – has a definite shape and volume.

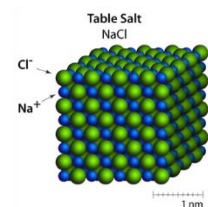
The particles that make up a solid are packed very closely together and are tightly fixed in one position. The particles can move, but are so closely locked in position, that they can only vibrate in place. (like a group of people running in place) It does not take the shape or volume of its container.



Types of solids –

Solids made up of particles that form a regular, repeating pattern are called **crystalline solids**. Salt, sugar, and snow are examples of crystalline solids. When a crystalline solid is heated, it will melt at a certain temperature.

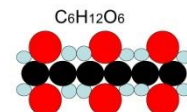
salt:



sugar:



sugar molecule
chemical energy



Snowflake being formed:

<https://www.youtube.com/watch?v=MCA2VmDVzEo>

Amorphous solids have particles NOT arranged in a regular pattern, and they do not melt at a distinct temperature. Instead, it will just become softer or change into another substance.

Glass, plastics, and rubber are examples of amorphous solids.

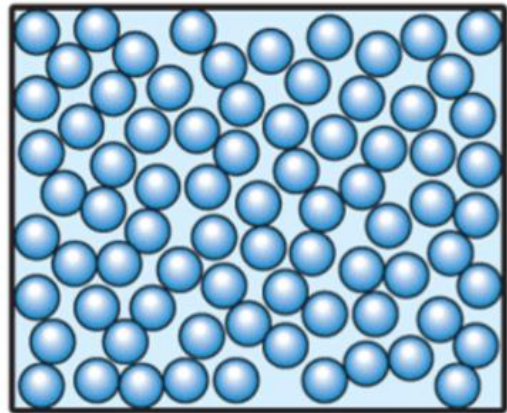
Glass blowing video:

<https://www.youtube.com/watch?v=dtxrtKd-Vao>

Describing a liquid –

Liquid – has a definite volume, but no shape of its own

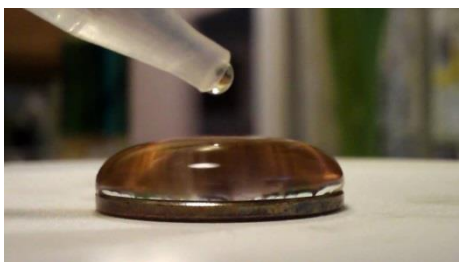
The particles in a liquid are packed almost as closely together as in a solid, but they can move around one another freely.



These freely moving particles allow a liquid to flow from place to place. A liquid is also called a **fluid**, meaning “a substance that flows.”

Properties of a liquid –

Surface Tension – the inward pull among the molecules in a liquid that brings the molecules on the surface closer together. Water molecules attract one another strongly. These attractions cause molecules at the water’s surface to be pulled slightly toward the water molecules beneath its surface.



Viscosity – a liquid’s resistance to flowing

Water has a low viscosity; honey has a high viscosity. A liquid’s viscosity depends on the size and shape of its particles.



Describing a Gas –

Like a liquid, gas is also considered a fluid, but **gas does NOT have a definite shape nor a definite volume.** If gas is in a closed container, the gas particles will move and spread apart as they fill the container. If you could see the particles that make up a gas, you would see them moving in all directions.

Volume – the amount of space that matter fills. Volume can be measured in cubic centimeters (cm^3) cubic meters (m^3), milliliters (mL), liters (L). Gas particles move and fill all of the space available, so a volume of gas is the same as the volume of the container.

Gas particles are constantly colliding with one another and with the walls of their container. And gas particles, such as helium, can be compressed to fit into a metal tank. When you use helium to fill balloons, it expands to fill many balloons that have a total volume much greater than the tank.

Pressure – the force of the outward push divided by the area of the walls of the container

Gas particles constantly collide with one another and with the walls of their container. As a result, the gas pushes on the walls of the container.

Pressure = Force/Area

Example – the air inside an inflated ball has a higher pressure than the air outside, because there is a higher concentration of gas particles inside the ball than in the surrounding air.



The firmness of a gas-filled object comes from the pressure of the gas. When a ball has a tiny hole, air leaks out because the gas particles inside the ball reach the hole and escape more often than gas particles outside the ball are going in. The pressure inside drops until it is equal to the pressure outside.

Temperature - is a measure of the average energy of random motion of particles of matter.

The faster the particles are moving, the greater their energy and the higher the temperature. (So a thermometer is really like a speedometer for particles in a liquid)

Even at room temperature, the average speed of particles in a gas is very fast. At 20°C, the particles are traveling about 500 meters per second – that's twice the speed of a jet plane.

In a hot air balloon, a propane burner is used to heat the air inside the balloon. Once the temperature of the air is hot enough, the balloon will begin to rise.

<https://www.youtube.com/watch?v=46Tgd5WJUUG>

hot air balloon taking off