Pressure and Particle Theory

Particles in solid, liquid and gas are constantly moving. When we increase energy(temp) then particles move faster and when we decrease energy (temp) then particles move slower. When they move the particles bump into each other spreading them out and leaving more space between them.

Moving particles exert force in the direction of their motion. Most of the forces cancel out each other, but some are not canceled. These forces are exerted against the wall of the container, causing pressure. Thus when there is a crack or hole on the container the fluid will flow out. This indicates that the pressure of a fluid is exerted equally in all directions, as shown below.

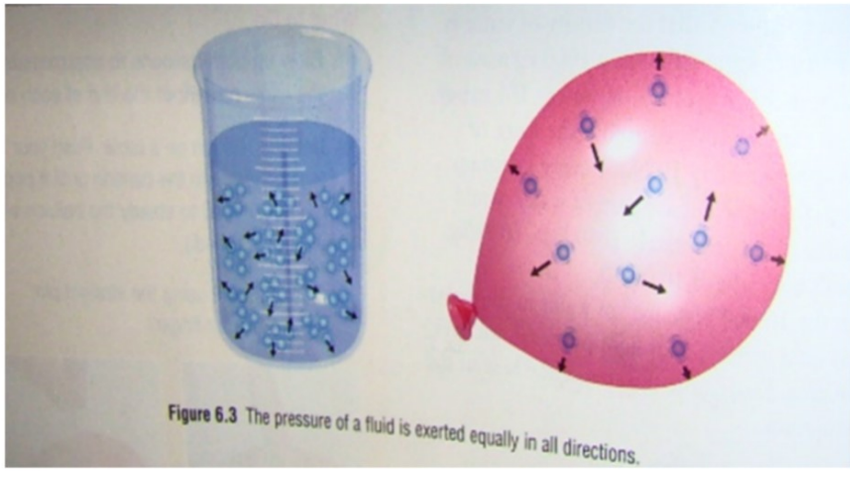


Figure 6.3 The pressure of a fluid is exerted equally in all directions.

Spaces Between Particles

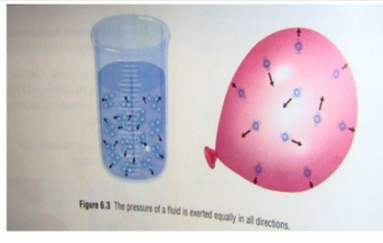
Space between particles depends on 2 factors:

1) the physical state of the substance (solid, liquid, or gas)

2) the amount of energy that the particles have

Since gas particles are spread out they have lots of space between particles, thus gases are compressible.

Compressible - is the ability to be squeezed into a smaller volume



When force is applied to a solid the particles within cannot move closer so they transmitted (pass along) the force like the domino effect. They are **incompressible.**

Gases are easiest to compress, solids most difficult | Compressibility | Chemistry

When gases are under pressure (squeezed in a bottle), they are ready to expand when given the opportunity. So when a gas finds a way to escape, through a hole or nozzle, it exits with a great deal of force.

Great for oxygen tanks and certain tools suck as air compressors

Flow Pressure - is pressure that causes motion because the fluid is moving

ex) wind is moving air that can lift your hair

ex) water pressure from tap can remove food off plates

Static Pressure - is a fluid's pressure that exerts a force on an object even if it is not moving. It pushes 90° to the walls of the pipe.

ex) When the water in your tap is turned off,the water in your pipes is exerting static pressure.

ex) when you swim deep underwater you can feel pressure on your eardrums. (the deeper you go the more pressure you feel since the weight of the water and air above you pushes down.)

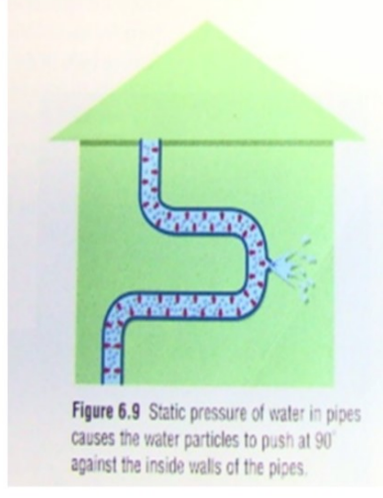


Figure 6.9 Static pressure of water in pipes causes the water particles to push at 90° against the inside walls of the pipes.

Pressure and Temperature

The particle theory suggests that particles move faster when they are heated because they gain more energy. Keeping the particle theory in mind, compare Figures 6.8A and B, representing the behaviour of air particles inside two balloons.

- In which balloons are the particles of air colliding with each other and with the inner walls of the balloon with greater force?
- Pressure is force measured over a certain area. In which balloon are the particles of air exerting greater pressure against the inner walls of the balloon?
- Does an increase in temperature cause an increase or a decrease in pressure?

Increase heat causes an increase in pressure

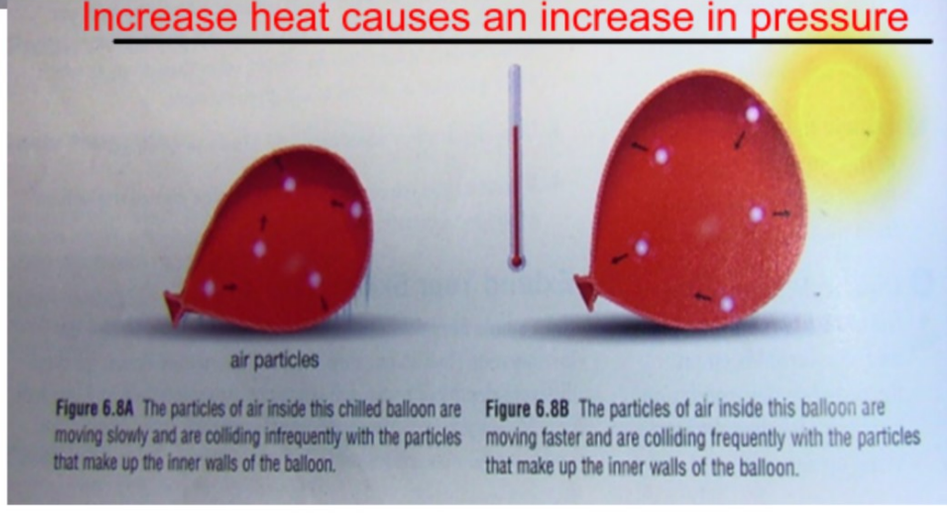


Figure 6.8A The particles of air inside this chilled balloon are moving slowly and are colliding infrequently with the particles that make up the inner walls of the balloon.

Figure 6.8B The particles of air inside this balloon are moving faster and are colliding frequently with the particles that make up the inner walls of the balloon.