Chemistry Study Sheet: Gases

Kinetic Theory of Gases:

* Gas particles do not attract or repel each other.
* Gas particles are much smaller than the distance between them.
* Almost all volume of gas is empty space.
* Gases are in constant random motion. (They move in a straight line until they collide with each other or the walls of their container.
* No Kinetic Energy is lost when gas particles collide with each other, or the walls of their container. (As long as the temperature stays the same, the total kinetic energy of the system remains constant)
* All gases have the same average kinetic energy at a given temperature. (As the temperature increases, the total energy of the gas system increases and visa versa)

All these assumptions are made on four factors: Number of gas particles, temperature, pressure and volume.

Decreasing volume pushes gas particles closer together (thus increasing pressure).

Gas Laws:

Boyle’s Law:

If temperature is kept constant, doubling the pressure of a fixed amount of gas decreases its volume by half. This is an inversely proportional relationship that can be mathematically expressed as:

P1V1 = P2V2

A pressure-volume curve where volume is on the y axis and pressure is on the x axis is a downward curve.

Charle’s Law

As temperature increase, and pressure is kept constant, the volume of a gas sample also increases.

(At higher temperature, gas particles move faster, exerting pressure on the walls of the container.)

In order for pressure to stay constant the volume has to increase so that the particles have to travel longer.

The resulting graph of this relationship is a straight line.

V1/T1 = V2/T2

In order to properly implement this gas law you have to change any centigrade measurements into kelvins.

Gay-Lussac’s Law:

Pressure and temperature are directly proportional when the volume is kept constant.

P1/T1 = P2/T2

You also have to convert into Kelvins when doing this one.

Avogadro’s Principle:

According to the KMT particles in a gas sample are usually far enough apart that size has a negligible

influence on the volume offered by a fixed number of particles.

Example: 1000 large krypton gas particles occupy roughly the same amount of space as 1000

Smaller helium particles.

Avogadro’s principle states that equal volumes of gases at the same temperature and pressure contain equal numbers of gas particles.

Molar volume for a gas is the volume that one mole of gas occupies at 0.00 degrees Celsius and 1.00 atm.

One mole of any gas will occupy 22.4 L at STP

Suppose you need to find the volume of a certain number of moles of gas at STP. You will use the conversion factor of 22.4 L / 1 mole. Then you can find the number of particles using avogadros law.