

# Chapter 10

## States of Matter

Day 1

### The Nature of Gases

#### *Kinetic Theory*

- Kinetic Energy – Energy of motion
- Kinetic Theory – Deals with the constant motion of tiny particles
- A gas is composed of tiny spheres that have no attractive or repulsive forces towards each other. They are in constant motion.
- The molecules travel in straight, constant paths.
- All collisions are perfectly elastic

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#### *Gas Pressure*

- Defined as – the force exerted by a gas on a given surface area (the number of and force of the collisions)
- No pressure = vacuum
- Atmospheric pressure – results from the collisions of air molecules
- Barometers – used to measure air pressure

#### *Pressure and Temperature*

- Pascal (Pa) – the SI unit for pressure
  - Two older units = mmHg and atm
  - Standard pressure – the pressure required to maintain a 760 mm column of Hg at 25° C
- 1 atm = 760 mmHg = 101.3 kPa
- Temperature = measure of average kinetic energy
  - Absolute zero = temperature at which all motion stops. (zero Kelvin)
- $K = ^\circ C + 273$

Day 2

### The Nature of Liquids

- While gases are mostly empty space and may take the shape and size of their container, liquids have very little space and the molecules “flow” past each other.
- Liquids take the shape of their container but have a fixed volume.
- Liquids have medium intermolecular forces (mild attraction for each other)

### *Evaporation*

- Vaporization = conversion of liquid into a vapor
- Evaporation = vaporization that occurs at the surface of a non-boiling liquid
- When a liquid evaporates, the molecules with above average kinetic energy overcome the intermolecular forces and enter the gas phase.
- Why does the temperature of a liquid go down when evaporation occurs?
- Vapor Pressure - the pressure caused by gas molecules above a liquid (measured with a manometer)
- If the container is closed, a dynamic equilibrium is established  
Rate of evaporation = Rate of condensation

### *Boiling Point*

- Boiling = vaporization through out the liquid
- Boiling Point - the temperature at which vapor pressure of the liquid is equal to the external pressure
- Normal Boiling Point = Boiling Point at normal atmospheric pressure (1 atm)
- Boiling and evaporation are cooling processes
- Vapor has a higher potential energy but an equal kinetic energy as the liquid at the boiling point.