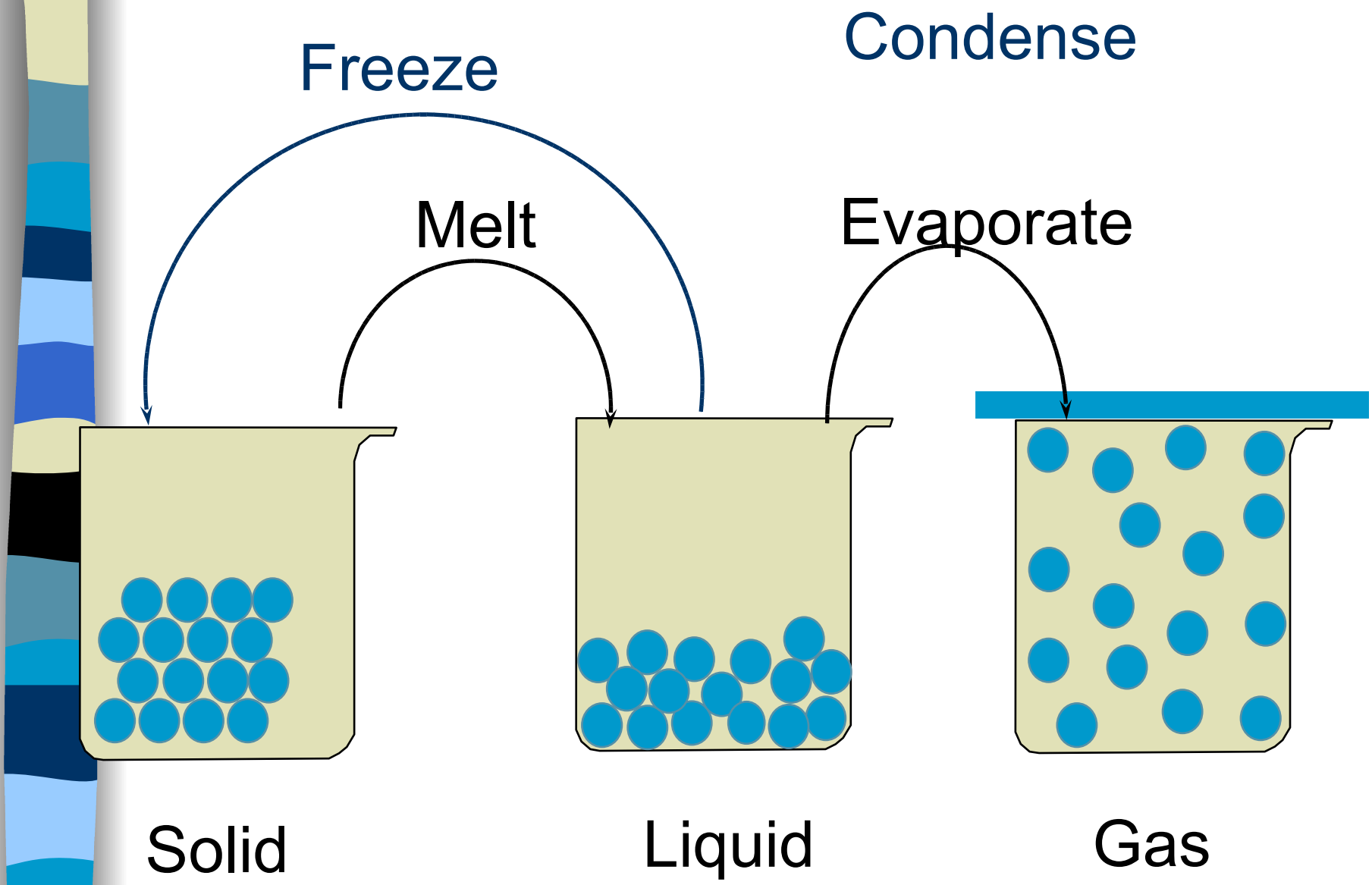
Gas Laws

By Mr.V


Freeze
Condense
Melt
Evaporate
Solid
Liquid
Gas

Kinetic Molecular Theory

- A gas consists of molecules in constant random motion.
- Gas molecules influence each other only by collision.
- There are no intermolecular forces of attraction between molecules.
- All collisions between gas molecules are perfectly elastic; all kinetic energy is conserved.
- The volume actually occupied by the molecules of a gas is negligibly small; the vast majority of the volume of the gas is empty space through which the gas molecules are moving.

Boyles Law

- The volume of a given mass of gas is inversely proportional to its pressure at constant temperature.

$$V \propto \frac{1}{P}$$

Boyles Law

Mathematical form of law

$$P_1V_1 = P_2V_2$$

Charles Law

- The volume of a given mass of gas is directly proportional to temperature at constant pressure

$$V \alpha T$$

Charles Law

Mathematical form of law

$$V_1 T_2 = V_2 T_1$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

Avogadro's Law

- Equal volume of all gases under the same temperature and pressure contains the same number of molecules
- Volume is proportional to the number of moles

$$V \alpha n$$

Gay Lussac's Law

- Also known as pressure temperature law. At constant volume the pressure of a gas is directly proportional to its temperature.

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

Combined Gas Law

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

Ideal gas

- An ideal gas obeys all the gas laws at all temperatures and pressures

Ideal Gas Equation

$$PV = nRT$$

$PV = nRT$

- P = Pressure
- V = Volume
- n = Number of moles of gas
- R = universal gas constant
- Value of R = 8.314 J/Kmol

Real Gases

- Real gases do not obey the gas laws for all temperatures and pressures
- They behave ideally at high temperatures and low pressures.

Van der waals equation for real gases

$$P + \frac{a}{V^2}\left(V - b\right) = RT$$

Other gas laws

Daltons law of partial pressures

- The total pressure exerted by a mixture of non reacting gas is the sum of the partial pressures of the individual gases
- $P_{total} = P_A + P_B + P_C$
- Where $P_A + P_B + P_C$ are partial pressures of gases A, B and C

- We can find out the pressure in the fourth container.
- By adding up the pressure in the first 3.

2 atm + 1 atm + 3 atm = 6 atm