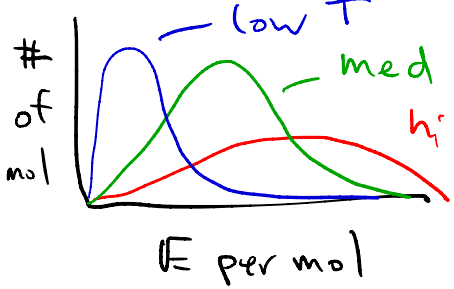


$$\overline{E_K} = \frac{3}{2}\left(\frac{R}{N_A}\right)T$$

The average kinetic energy of a particle of a gas is directly proportional to temperature.

$\overline{E_K}$ average kinetic energy

N_A Avogadro's #

R gas constant

$$\overline{E_K} = \frac{1}{2} m \overline{u^2}$$

speed

$\overline{u^2}$ The average of the squares of the speeds

$$\frac{1}{2} m \overline{u^2} = \frac{3}{2}\left(\frac{R}{N_A}\right)T$$

$$\frac{1}{2} m N_A \overline{u^2} = \frac{3}{2} RT$$

mN_A molar mass

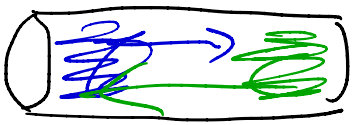
$$\frac{1}{2} MM\, \overline{u^2} = \frac{3}{2} RT$$

$$\overline{u^2} = \frac{3RT}{MM}$$

$$\sqrt{\overline{u^2}} = \sqrt{\frac{3RT}{MM}}$$

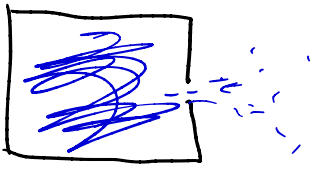
Root-mean-squared (RMS) speed - the speed that a particle with average energy travels at.

Diffusion and effusion



N_2 O_2

The process of gas particles mixing and moving past each other is diffusion.



The process of gas particles escaping through an opening is effusion.

$$\frac{\text{Speed A}}{\text{Speed B}} = \frac{\sqrt{3RT/MM_A}}{\sqrt{3RT/MM_B}} = \sqrt{\frac{1/MM_A}{1/MM_B}} = \sqrt{\frac{MM_B}{MM_A}}$$

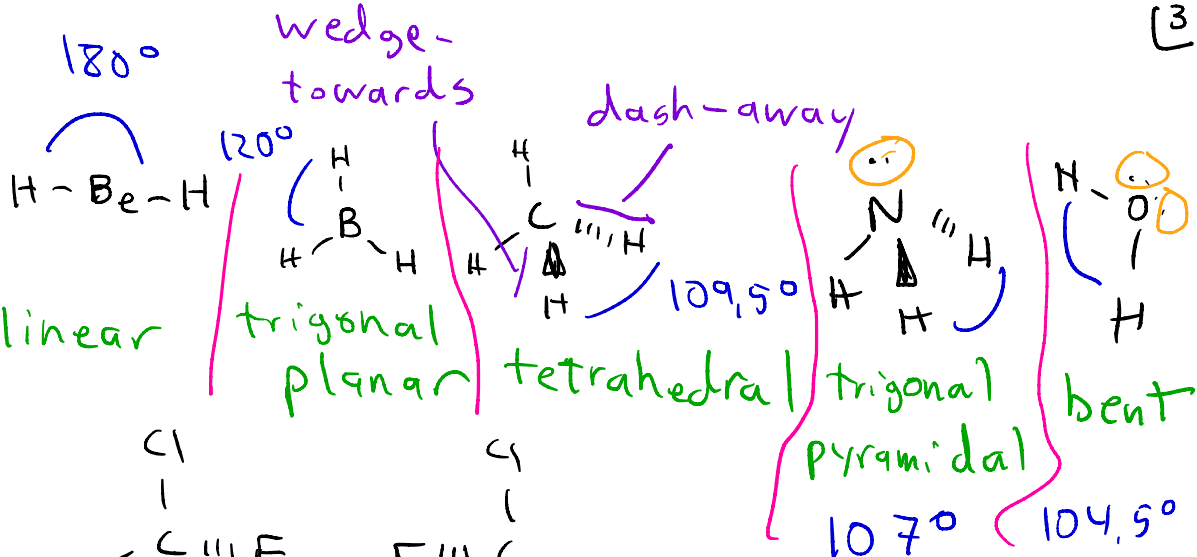
$\text{speed} \propto \frac{1}{\sqrt{MM}}$

speed is inversely proportional to molar mass

Ratio of gas particle speeds

VSEPR - Valence Shell Electron Pair Repulsion

Valence shell electrons are the highest energy electrons that participate in chemical rxns. Electrons normally occupy orbitals in pairs and a pair of electrons has more repulsive force than a single electron. Electrons repel as far away from each other as possible to lower the energy of the system.



thalidomide

Lone pairs have more repulsive force than bonding pairs so the bonding pairs are pushed closer together

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Electronegativity - The tendency of an atom to attract electron density to itself when part of a bond.