Objectives:

- Understand Dalton's Law of Partial Pressures
- Know the definitions of Diffusion and Effusion
- Understand Grahams Law

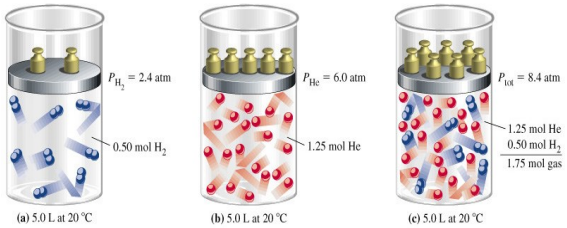
Dalton's Law of Partial Pressures

- In a mixture of gases, *the total pressure exerted by the mixture is equal to the sum of the partial pressures exerted by the separate components.*

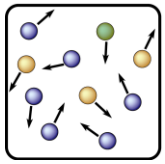
  $P_{total} = p_{gas\ \#1} + p_{gas\ \#2} + p_{gas\ \#3} + \ldots$

Dalton's Law of Partial Pressure

It states that the total pressure of a mixture of gases is the sum of the partial pressures of the components of the mixture.



- ***In effect, each gas behaves independently of the other gases in the mixture.***



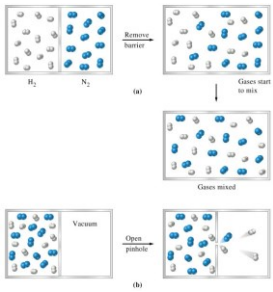
6 molecules = 60% of 90.0 kPa = 54.0 kPa
3 molecules = 30% of 90.0 kPa = 27.0 kPa
1 molecules = 10% of 90.0 kPa = 9.0 kPa
10 molecules 100% = 90.0 kPa

Dalton's Law of Partial Pressures

- Each gas has the same average kinetic energy at the same temperature.
- Collisions from each gas molecule, on average will provide the same pressure.
- The more gas molecules of one kind, the greater the pressure due to that gas.

Gas Properties Relating to the Kinetic-Molecular Theory

- Diffusion
  - Migration of molecules that results in a homogenous mixture.
- Effusion
  - Escape of gas molecules through a tiny pinhole.



Graham's Law

$$\frac{rate\ of\ effusion\ of\ A}{rate\ of\ effusion\ of\ B} = \sqrt{\frac{M_B}{M_A}}$$

- Only for gases at low pressure (natural escape, not a jet).
- Tiny orifice (no collisions)
- Does not apply to diffusion.

- Ratio used can be:
  - Rate of effusion (as above)
  - Molecular speeds
  - Effusion times
  - Distances traveled by molecules
  - Amounts of gas effused.