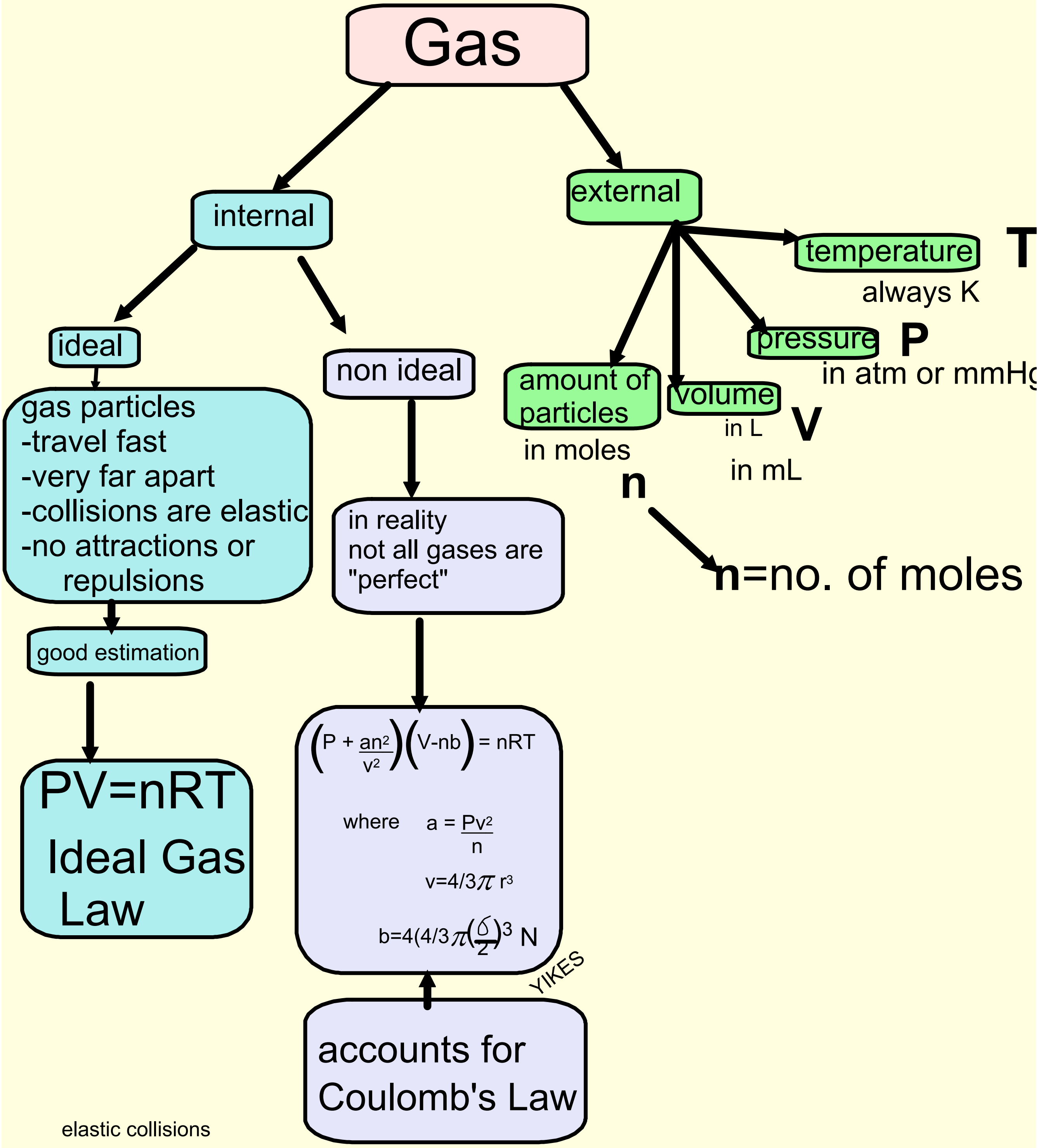


elastic collisions

http://sci-culture.com/advancedpoll/GCSE/collisions.htm

$$\text{pressure} = \frac{\text{force}}{\text{area}} = \frac{\text{collisions}}{\text{area}}$$

Gas-- external factors

Pressure $= \frac{\text{force}}{\text{area}} = \frac{\text{collisions}}{\text{area}}$

Temperature = **speed of particles**

Volume

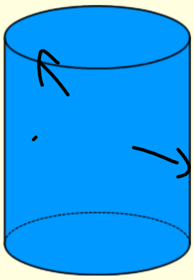
no. of particles (moles)

---

rigid container

Volume-constant

n -Mass/moles-constant



if ↑ T then ↑P

if ↓ T then ↓P

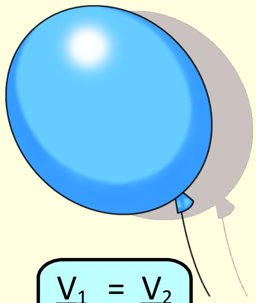
$\frac{P_1}{T_1} = \frac{P_2}{T_2}$

↑ T, ↑ $\frac{\text{collisions}}{\text{area}}$ **(P)**

flexible container

Pressure is constant

n - Mass/moles-constant



$P_{in} = P_{out}$

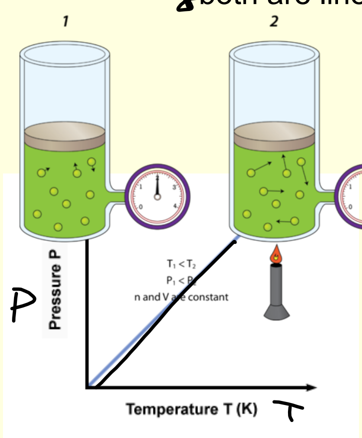
if ↑ T then ↑V

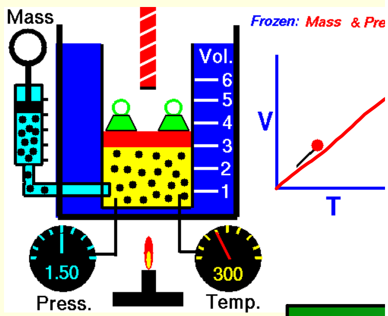
if ↓ T then ↓V

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

↑ T, ↑ $\frac{\text{collisions}}{\text{area}}$ **(P)**, ↑V

both are linear relationships





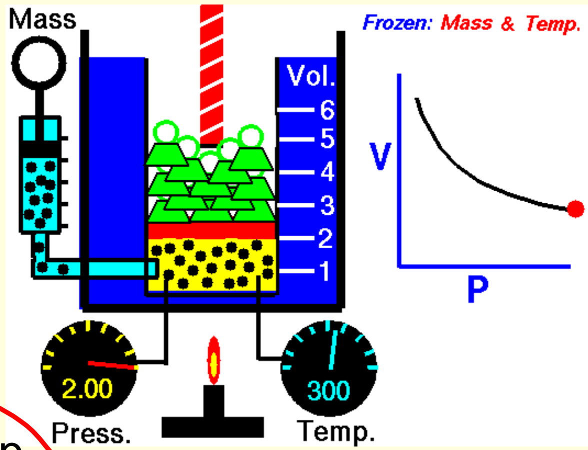
Temperature constant

n -Mass/moles-constant

if ↑ V then ↓ P

if ↓ V (more collisions) then ↑ P

use a piston to demonstrate:



$P_1V_1 = P_2V_2$

*reciprocal relationship

Put all 3 together:

Guy-Lussacs Law

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

Boyles Law

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

Charles Law

$$P_1V_1 = P_2V_2$$

Combined Gas Law

$$\frac{V_1P_1}{T_1} = \frac{V_2P_2}{T_2}$$

6 variables: solve for one

Temperature must be in Kelvin for all gas laws

$$^{o}C + 273 = K$$

*Convert 25°C to K

$25^{\circ}C + 273 = 298K$

Convert 300K to °C $300 - 273 = 27^{\circ}C$

A gas had an initial pressure of 2.4 atm and a volume of 5.6 L.

If the pressure of the gas changes to 1.7 atm, what is the new volume?

Held constant:

Variables: $P_1 = 2.4$ atm
$V_1 = 5.6$ L
$P_2 = 1.7$ atm

$V_1 P_1 = V_2 P_2$

Plug into equation:

$$\frac{(5.6\text{ L})(2.4\text{ atm})}{1.7} = \frac{V_2 (1.7\text{ atm})}{1.7}$$

$V_2 = 7.9$ L

Mar 14-1:52 PM

A balloon has a volume of 3.4 L at 213 K.

If the temperature drops to 197 K, what is the volume of the balloon?

Held constant:

Variables:

$V_1 = 3.4 L$ V_2 ?

$T_1 = 213 K$ $T_2 = 197 K$

Plug into equation:

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \qquad \frac{3.4}{213} = \frac{x}{197}$$

$$\frac{(3.4)(197)}{213} = \frac{213\,x}{213}$$

$x = 3.14 L$

A balloon has a volume of 1.2 L at a temperature of 253 K.
The temperature changes to 305 K. What is the new volume of the balloon?

Mar 14-1:55 PM

The pressure inside a container is 770 mm Hg at a temp of 57 degrees Celsius.

What would the pressure be at 75 degrees Celsius?

$P_1 = 770 mmHg$

$T_1 \quad 57°C + 273 = 330K$

$T_2 = 75 + 273 = 348K$

$$\frac{\cancel{V_1} P_1}{T_1} = \frac{\cancel{V_2} P_2}{T_2} \qquad \frac{770}{330} = \frac{P_2}{348}$$

A gas filled balloon has a temp of 42 degrees C at a pressure of 0.75 atm.
The pressure changes to 1.02 atm.
What is the new temperature of the gas in the balloon?

A gas at 110 kPa and 30 degrees Celsius fills a 2 L container.
If the temp goes to 80 degrees C and the pressure goes
to 440 kPa, what is the new volume?

A balloon has a volume of 1.2 L at a pressure of .75 atm when the temp is 315 K.
The temp changes to 274 K and the pressure drops to .60 atm,
what is the new volume of the balloon?

Mar 14-2:00 PM