PHY 1321

IDEAL GAS

Δ = change (delta) ISO = constant

- Ideal gases have NO intermolecular forces among each other
  - ↳ EXCEPT during collisions
  - ↳ assumed to be non-existent
- Ideal gas based on assumptions aren't 100% true
  - ↳ Hence the term "ideal"

(Boyle's Law): [pressure + volume] (assumes we have a gas ; experiences a change in either temp or pressure)

$$P_1V_1 = P_2V_2$$

P_1V_1: before change; P_2V_2: after Δ

(Charles and Gay-Lussac's Law) ~ (temperature in kelvins)

- temp + volume inversely proportional
- pressure + temp are directly proportional

$P \propto T$

[Charles]:
- pressure is caused by hitting walls of container
  - ↳ smaller volume = gas molecules will hit container more often ; increasing pressure

(volume of ideal gas increases / decreases by same factor as temp [Kelvin]) $P \propto 1/V$

(Ideal Gas Law):

$$PV = nRT$$

- P = pressure (pascals (N/m²))
- V = volume (L)
- n = (# moles) amount
- R = gas constant = 8.314 J/mol·K = 0.08214 L·atm/mol·K
- T = temperature (K)

(avogadros constant) $N_A = 6.022 \times 10^{23}$

* # moles can be determined by: $n = m/M$ (moles = mass / molar mass) OR $n = N/N_A$ (moles = # particles in substance / avogadro)

(alternate form):

$$PV = nRT = (N/N_A)RT = Nk_BT$$

$k_B = 1.38 \times 10^{-23}$ J/K (Boltzmann's constant)

- isothermal expansion / contraction
  - ↳ constant temperature = isothermal
  - ↳ when volume is constant = isovolumetric

* isobaric