

Gas Laws	
Boyle's Law	$P_{\text{initial}}V_{\text{initial}} = P_{\text{final}}V_{\text{final}}$
Charles's Law	$V^i \div T^i = V^f \div T^f$
Combined Gas Law	$P^iV^i \div T^i = P^fV^f \div T^f$
Avogadro's Law	$V^i \div n^i = V^f \div n^f$
Ideal Gas Law	$PV = nRT$
Dalton's Law of Partial Pressure	$P_{\text{total}} = P^1 + P^2 + P^3 \dots$

Dalton's Law of Partial Pressure	
Partial Pressure	$P^{\text{gas}}(\text{atm}) = (\text{total pressure} \times \text{moles}^{\text{gas}}) / \text{moles}$
PP when volumes are different	$P^{\text{total}} = P^1(\text{atm} \times V^1 \div V^{\text{total}}) + P^2(\text{atm} \times V^2 \div V^{\text{total}}) \dots$
Mole fraction	moles of gas ÷ total moles
Wet Gas	$P^{\text{wet gas}} = P^{\text{total}} - P^{\text{H}_2\text{O}}$
then use $PV = nRT$ to solve for variables	

Real Gases	
Van der waal's equation	$P = [(nRT) \div (V - nb)] - [(a \cdot n^2) \div (V^2)]$
When comparing real gases	a gas with a larger "a" value will require the largest correction to account for intermolecular forces
	a gas with a smaller "b" value will behave most ideally at high pressures
	If Vdw's pressure is lower than the ideal pressure, attractive forces dominate
	If Vdw's pressure is higher than ideal pressure, repulsive forces dominate

Real Gases (cont)	
Real Gas Behavior	attractive forces between molecules cause a decrease in pressure
	As molecules increase in size deviations from ideal behavior become apparent at relatively HIGH temps
	In general, most gases behave most ideally at HIGH temps and LOW pressures

Pressure Units and Conversions	
1 atm =	1 atm (R = .08206)
	760 mmHg (R = 62.364)
	760 torr
	1.013×10^5 Pa
	101.3 kPa
	29.92 inches Hg
	14.69 psi
	1.01325 bar

Stoichiometry and Gases	
Mole ratio = Volume ratio	$2A + 3B = AB$
	$2A : 3B$
	2mL A : 3mL B

Kinetic Molecular Theory	
Temperature	If temperature is increased, Pressure and KE increase by a factor of $T^f \div T^i$ and rms increases by a factor of $\sqrt{T^f \div T^i}$
Volume	If volume is increased, Pressure increases by a factor of $V^i \div V^f$ while KE and rms increase by a factor of 1 (because they are not affected))
Moles	If moles are increased, pressure increases by a factor of $n^f \div n^i$, while KE and rms increase by a factor of 1 (no change)

Using Ideal Gas Law to Calculate Gas Properties	
Ideal Gas Law	$PV = nRT$
STP	0 degrees celcius, 273 degrees Kelvin, 1 atm, 22.4 L/mol
Density	$d = MP \div RT$ where M is molar mass
Volume	When not given volume, but told to assume ideal gas behavior, use $V = 1L$

Diffusion and Effusion	
G1=gas 1	G2=gas 2
Average Kinetic Energy	$KE^{G1} = KE^{G2}$ when $T^{G1} = T^{G2}$
Molecular Speed	$\sqrt{u^2} = \sqrt{3RT \div M}$ where M is the molar mass $\sqrt{u^2}^{G1} \div \sqrt{u^2}^{G2} = \sqrt{M^{G2} \div M^{G1}}$
Rate	$d/dx^{G1} \div d/dx^{G2} = \sqrt{M^{G2} \div M^{G1}}$
Time	$t^{G2} \div t^{G1} = \sqrt{M^{G2} \div M^{G1}}$

