Unit 14 - The Gas Laws

1. The atmosphere - "ocean" of different gases mixed together.
	1. Composition:
		1. Nitrogen (N2) --> 78%
		2. Oxygen (O2) --> 21%
		3. Argon --> 0.93%
		4. Water Vapor (H2O) --> 0.1%
		5. Carbon Dioxide (CO2) --> 0.03%
		6. Trace amounts of: He, Ne, Rn, SO2, CH4, etc...
2. The Greenhouse Effect
	1. Good thing --> without it the Earth would be too cool
	2. Bad thing --> too much CO2 --> too warm
	3. Why is there more CO2 in the atmosphere?
3. Depletion of the ozone layer
	1. Ozone (O3) is a charged particle that in the upper atmosphere blocks UV Rays
		1. UV rays cause cancer and cataracts
		2. O3 depletion is caused by chlorofluorocarbons (CFCs)
		3. Uses for CFCs included refrigerants and aerosol propellants
	2. CFCs were banned in the USA and much of the world
	3. Ozone is formed every time a strike of lightning occurs
4. Common Units used when describing Gases
	1. Temperature: K and °C
		1. Conversion
			1. °C = K – 273
	2. Pressure: kPa, mm Hg, atm, psi
		1. Conversions:
			1. 1 kPa = 7.5 mm Hg
			2. 1 atm = 101.3 kPa
			3. 1 atm = 760 mm Hg
			4. 1 atm = 14.7 psi
5. The Kinetic Molecular Theory (KMT)
	1. explains why gases behave as they do
	2. deals with "ideal" gas particles
	3. The 5 claims that the KMT makes about gases are that Air molecules:
		1. are so small they are assumed to have zero volume
		2. are in constant, straight-line paths
		3. experience elastic collisions
		4. no energy is lost
		5. have no attractive or repulsive forces acting towards each other
		6. have an average kinetic energy that is proportional to the absolute temperature of the gas
6. Gas Pressure - A force that is exerted on an area by air molecules
	1. Pressure = Force / Area P = F/A
		1. If F acts on a large area - pressure is small
		2. But if F acts on a small area - pressure is large
		3. At Sea Level, air pressure = standard pressure
			1. 1 atm, 101.3 kPa, 760 mm Hg, 14.7 lb/in2
		4. Key important things about gas pressure:
			1. Gases exert force in all directions
			2. Atmospheric pressure changes with altitude
				1. As altitude increases, pressure decreases
			3. Barometer is the tool we measure pressure
7. Bernoulli's Principle
	1. For a fluid traveling parallel to a surface
	2. Fast moving fluid exerts Low Pressure
	3. Slow moving fluids exert High Pressure
8. Boyle's Law
	1. The relationship between Pressure and Volume
	2. At constant temperature and number of particles
	3. As pressure increases, volume decreases
	4. As pressure decreases, volume increases
9. Charle's Law
	1. Relationship between Temperature and Volume
	2. At constant Pressure and number of particles
	3. As temperature increases, volume increases
	4. As temperature decreases, volume decreases
10. Amonton's Law / Gay-Lussac's Law
	1. Relationship between Pressure and Temperature
	2. At a constant volume and number of particles
	3. As temperature increases, pressure increases
	4. As temperature decreases, pressure decreases
11. Avogadro's Law
	1. Relationship between amount of gas and Volume
	2. At a constant pressure and temperature
	3. As amount of gas increases, volume increases
	4. As amount of gas decreases, volume decreases
12. The Combined Gas Law



* 1. STP --> Temp = 0 °C or 273 K
	2. Pressure = 1 atm
1. The Ideal Gas Law
	1. **PV = nRT**
		1. **P = Pressure (in kPa)**
		2. **V = Volume (in Liters)**
		3. **n = # of moles of gas (mol)**
		4. **T = temperature (in K)**
		5. **R = universal gas constant = 8.314 L-kPa/mol-K**
2. **Gas Stoich**
	1. **If problem is at STP, then use 22.4**
	2. **If problem is not at STP, use ideal gas law to convert**
		1. **Given liters of gas, start with ideal gas law**
		2. **Looking for liters of gas, start with stoich conversion**