ICYMI- Chemistry – 11.21.17

1. Question of the Day #86
2. Review gas stoichiometry.
3. New material – gas laws

GAS LAWS NOTES

* Unlike Ideal Gas Equation, the "Gas Laws" describe one gas undergoing a change in conditions. The Gas Laws are also different from the Ideal Gas Equation because you do not have to convert any units except temperature that has to be in Kelvins.

Combined Gas Law: $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

* All of the other gas laws can be derived from the combined gas law. *

~ Boyle's Law

- describes relationship between pressure & volume when temperature is constant
- because temperature is constant, it can be excluded from the equation
- so, equation for Boyle's Law is _____ $P_1V_1 = P_2V_2$
- pressure & volume are inversely _____ proportional
- graph of pressure vs. volume would have the general shape of

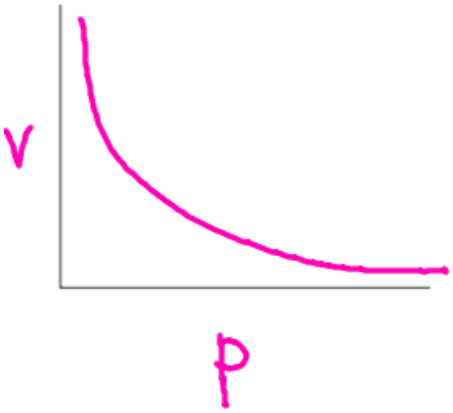
EXAMPLE: A sample of gas occupies 15 liters under 2.1 atm of pressure. What would the volume of the gas be if the pressure were decreased to 1.2 atm? (Assume that temperature is constant.)

$P_1V_1 = P_2V_2$

$2.1 \cdot 15 = 1.2 \cdot X$

$X = 26.25$

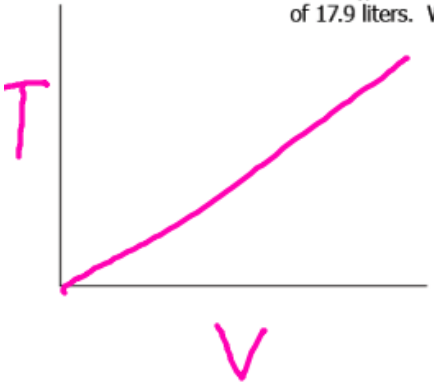
26 L



~ Charles' Law

- describes relationship between volume & temperature when pressure is constant
- because pressure is constant, it can be excluded from the equation
- so, equation for Charles' Law is _____ $\frac{V_1}{T_1} = \frac{V_2}{T_2}$
- volume & temperature are directly _____ proportional
- graph of volume vs. temperature would have the general shape of

EXAMPLE: When I purchase a helium balloon at the store (where the temperature is 25 °C) for my friend's birthday, the clerk fills the balloon to a volume of 20.0 liters. When I go outside, the balloon shrinks to a volume of 17.9 liters. What is the temperature outside?



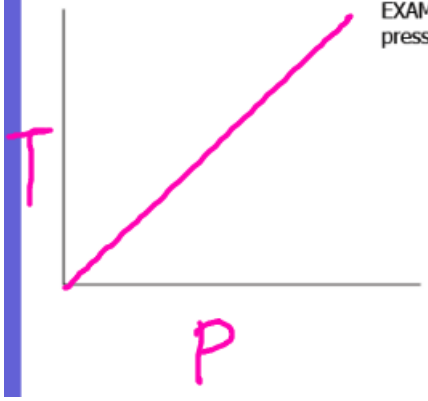
$$\frac{20.0}{298} = \frac{17.9}{x}$$

$$x = 267\ K \text{ (or } -6°C)$$

~ Gay-Lussac's Law

- describes relationship between pressure & temperature when volume is constant
- because volume is constant, it can be excluded from the equation
- so, equation for Gay-Lussac's Law is _____ $\frac{P_1}{T_1} = \frac{P_2}{T_2}$
- pressure & temperature are directly _____ proportional
- graph of pressure vs. temperature would have the general shape of

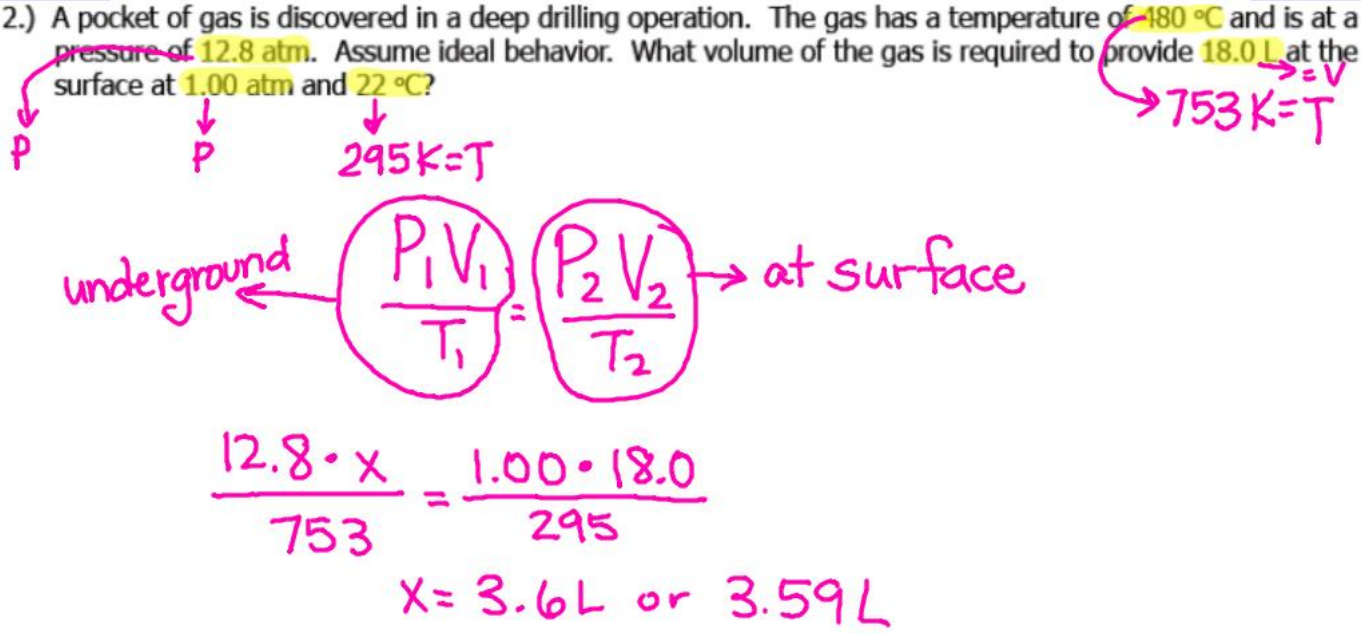
EXAMPLE: An aerosol can has an internal pressure of 2.75 atm at room temperature (25 °C). What is the pressure in the can if I leave it outside in the sun and the temperature goes up to 35 °C?



$$\frac{2.75}{298} = \frac{x}{308}$$

$$x = 2.84\ atm$$

2.) A pocket of gas is discovered in a deep drilling operation. The gas has a temperature of 180 °C and is at a pressure of 12.8 atm. Assume ideal behavior. What volume of the gas is required to provide 18.0 L at the surface at 1.00 atm and 22 °C?



Homework:

→ "Gas Law Problems" wksht.

→ Finish calculations and questions on "Determining Molar Mass…" lab

→ Work on typing out report for "Mole Relationship…" lab (due 12/1/17)