Gas Laws and KMT

Unit 7 Module 3

Ideal Gas Law

□ The mathematical relationship between all four variables that define a gas.

PV = **nRT**, where R is the IDEAL GAS CONSTANT

R = 0.08206 L*atm	OR	R = 8.31 kPa*L
mol*K		mol*K

Using this equation, if you know three of the variables that define a given sample of gas, you can calculate the fourth variable.

(Notice that the two values of R differ because of the different <u>pressure units</u> in the constant. Choose and use the value of R in the problem based on what units are given for the pressure.)

Ideal Gas Law Example #1

What is the pressure in kilopascals exerted by a 0.500 mol sample of N₂ gas in a 10.0 L container at 298K?

Ideal Gas Law Example #2

Calculate the number of moles of gas contained in a 3.0 L vessel at 3.00 x 10² K with a pressure of 1.50 atm.

Combined Gas Law

A combination of the first three gas laws. By holding any of these variables constant, you derive the first three gas laws.

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

Combined Gas Law Example #1

A helium-filled balloon has a volume of 50.0 L at 25°C and 1.08 atm. What will the temperature be if the pressure is changed to 0.855 atm and the volume is expanded to 60.0 L?