Cycle 7 Chemistry II Lesson 4

"Gases" Unit
The Ideal Gas Law

Vocab: "Ideal Gas Law", "Gas Constant"

Classwork:

Calculate the volume of 1 mole of gas @ STP (298 °K, 1 atm)

Ideal Gas Law Worksheet

End Of Slide

Gas Laws

- Gases are described by their measurable properties.

- A **gas law** is a mathematical rule which relates 2 or more properties of a gas.

- *P* = pressure exerted by the gas
- *V* = total volume occupied by the gas
- *T* = temperature in kelvins of the gas
- *n* = number of moles of the gas

The Ideal Gas Law

- Boyle's law states the relationship between the pressure and the volume of a sample of gas.
- Charles's law states the relationship between the volume and the absolute temperature of a gas.
- Gay-Lussac's law states the relationship between the pressure and the temperature of a gas.
- Avogadro's law relates volume to the number of moles of gas.

End Of Slide

The Ideal Gas Law, *continued*

Boyle's law	$P_1V_1 = P_2V_2$
Charles's law	$\frac{V_1}{T_1} = \frac{V_2}{T_2}$
Gay-Lussac's law	$\frac{P_1}{T_1} = \frac{P_2}{T_2}$
Avogadro's law	$V = kn$

End Of Slide
Chapter menu
Resources

The Ideal Gas Law Relates All Four Gas Variables

- In using the basic gas laws, we have made use of four variables: pressure, *P,* volume, *V,* absolute temperature, *T,* and number of moles, *n.*

- Boyle's law, Charles's law, Gay-Lussac's law, and Avogadro's law can be combined into one equation that gives the relationship between all four variables, *P*, *V,* *T,* and *n,* for any sample of gas. This relationship is called the **ideal gas law.**

Equation: PV = nRT

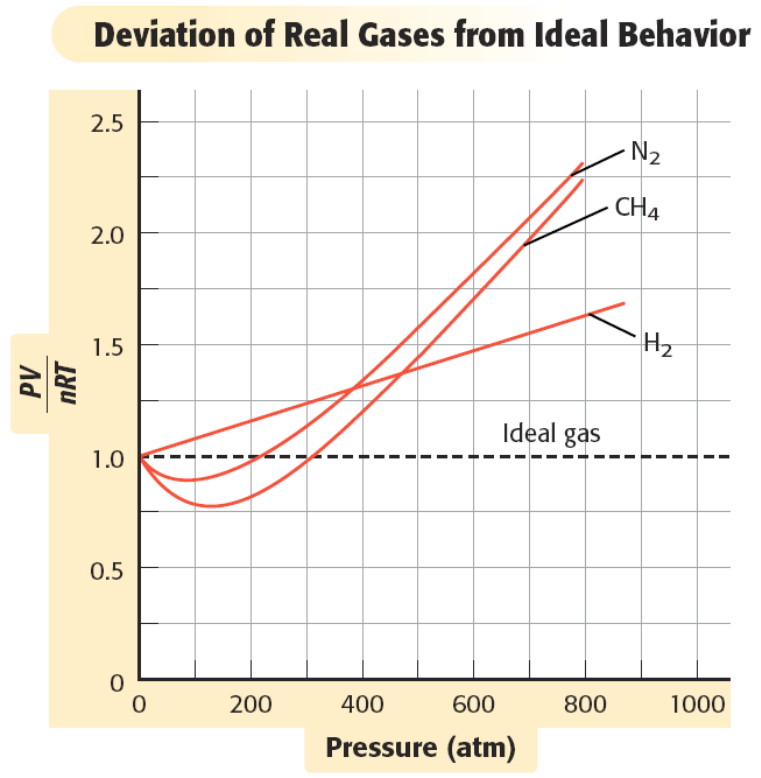
R is the "Gas Constant"

- For problems that use units of kilopascals and liters when using the ideal gas law, the value you will use for *R* is as follows:
  - **R = 8.314 (L•kPa)/(mol•K)**
- If the pressure is expressed in atmospheres, then the value of *R* is:
  - **R = 0.0821 (L•atm)/(mol•K)**
- There are other values of R for other units. I will give them to you if we need them (we probably won't).

End Of Slide

The Ideal Gas Law, *continued*

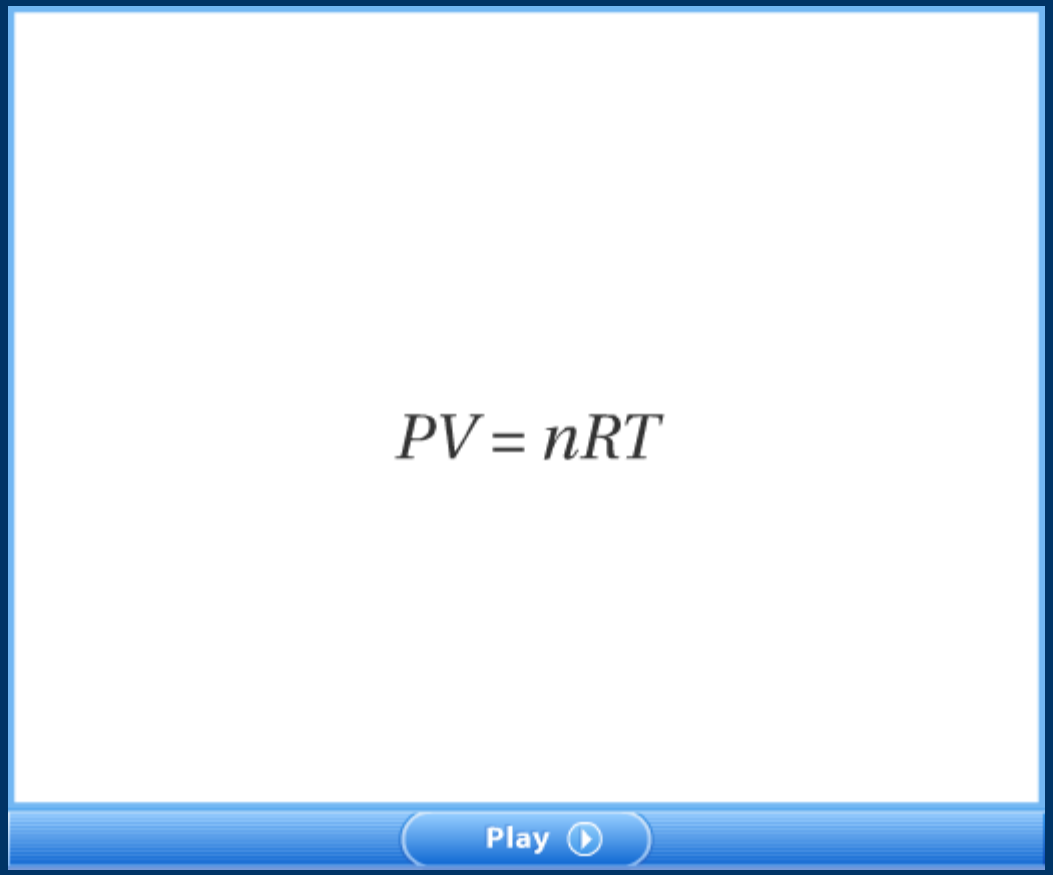
The Ideal Gas Law Relates All Four Gas Variables, *continued*



- For an ideal gas, the ratio of *PV*/*nRT* is 1, which is represented by the dashed line.
- Real gases deviate somewhat from the ideal gas law and more at very high pressures.

End Of Slide

Ideal Gas Law



Equation for the Ideal Gas Law