Chemistry Hour\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Dr. Wexler  
Ideal Gas Law Worksheet 1 (HS-PS1-3; HSN-Q.A.1)  
Date\_\_\_\_\_

**Summary of the relevant gas laws:**  
(note: Gay-Lussac’s Law, P1/T1 = P2/T2 does not apply here since it requires volume to be fixed)  
1. Charles’s Law V1/T1 = V2/T2 “Volume increases as temperature increases”  
2. Boyle’s Law P1V1 = P2V2 “Volume decreases as pressure increases”  
3. Avogadro’s Law V1/n1 = V2/n2 “Volume increases as #moles increases”

**What is an ideal gas?**  
An ideal gas is one which obeys Charles’s Law, Boyle’s Law, and Avogadro’s Law   
The Ideal Gas Law combines the three laws into one master law: n = P**V/RT**  
where P = pressure (kPa, kilopascals)  
 V = volume (L, liters)  
 n = moles of gas  
 T = temperature (K, Kelvin)  
 R = gas constant = 8.314 J K-1 mol-1

An Ideal Gas is modeled on the [Kinetic Theory of Gases](http://www.ausetute.com.au/kinetic.html) which has two major postulates (there are a total of four):

1. Gases consist of small particles (molecules) which are in continuous random motion
2. Pressure is due to the gas molecules colliding with the walls of the container

**What is partial pressure?**The partial pressure of a gas in a mixture of gases is determined by Dalton’s Law: Ptotal = P1 + P2 +….Pn.  
Thus, atmospheric pressure is the sum of the pressures of its component gases, including N2, O2, CO2, H2O, and others.

**Sample Problem:**

If you have 3 moles of gas in a container with a volume of 60 liters and at a temperature of 400 K, what is the pressure inside the container in kPa?

n = 3 moles  
V = 60L  
T = 400K  
P = ?

Formula: n = PV/RT   
Crossmultiplying: PV = nRT  
Solving for P: P = nRT/V  
Plugging in: P = (3 x 8.314 x 400)/60 = 166.28 kPa

**Ideal Gas Law Problems:** Show all work! This means listing the known values and the formula you are using solved for the unknown variable.

Problem 1: If you have 4 moles of a gas at a pressure of 567kPa and a volume of 12 liters, what is the temperature in Kelvin?

Problem 2: If you have an unknown quantity of gas at a pressure of 1.2 atm, a volume of 31 liters, and a temperature of 87 0C, how many moles of gas do you have? (note: be sure to convert from atmospheres to kilopascals, where 1 atm = 101.3 kPa)(note: be sure to convert from Celsius to Kelvin by adding 273)