WED HW

**Ideal Gas Law Practice Problems** Name: KEY p. ____

PV=nRT

1) STP = standard temperature: 273 K and standard pressure: 1.00 atm

2) At STP, one mole of any ideal gas takes up approximately 22.4 Liters.

3) R is called the ideal gas law constant. What is the numerical value and the units for this constant?

$$R = 0.0821 \frac{L \cdot atm}{mol \cdot K}$$

4) How many moles of gas does it take to occupy 2.25 L at STP?

$$n = \frac{PV}{RT} = \frac{(1.00\ atm)(2.25L)}{(0.0821 \frac{L \cdot atm}{mol \cdot K})(273K)} = \boxed{0.100\ L}$$

5) A 1.00 L aerosol canister holding 2.00 moles of gas is thrown in a campfire (not safe!). The temperature inside the metal can reaches 1,673 K right before it explodes, sending shrapnel in all directions. What was the pressure of the can right before it exploded?

$$P = \frac{nRT}{V} = \frac{(2.00 mol)(0.0821 \frac{L \cdot atm}{mol \cdot K})(1673K)}{1.00L}$$

$$\boxed{P = 275\ atm}$$

6) I have a balloon that can hold 50.0 L of air. If I blow up this balloon with 96.00 g of $O_2$ gas to a pressure of 1.00 atmosphere, what would the temperature inside the balloon be?

$$96.00g\ O_2 \left(\frac{1 mol\ O_2}{32.00g}\right) = 3.000\ mol\ O_2$$

$$T = \frac{PV}{nR} = \frac{(1.00 atm)(50.0L)}{(3.000 mol)(0.0821 \frac{L \cdot atm}{mol \cdot K})}$$

$$\boxed{T = 203\ K}$$

7) You perform a reaction that captures 1.00 g of $H_2$ gas in a glass bottle with a volume of 1,500. mL. The temperature in the bottle is 23.0°C. Find the pressure of the $H_2$ gas inside the bottle.

1.500 L

296 K

$$1.00g\ H_2 \left(\frac{1 mol\ H_2}{2.02g}\right) = 0.495 mol\ H_2$$

$$P = \frac{nRT}{V} = \frac{(0.495 mol)(0.0821 \frac{L \cdot atm}{mol \cdot K})(296K)}{1.500L}$$

$$\boxed{P = 8.02\ atm}$$

8) Using STP conditions, find the value of the R constant using these particular units: (mL x kPa)/(mol x K)

$$R = \frac{P \cdot V}{n \cdot T}$$

$$R = \frac{(101.325 kPa)(22,400 mL)}{(1.00 mol \cdot 273 K)}$$

$$\boxed{R = 8,310 \frac{kPa \cdot mL}{mol \cdot K}}$$