

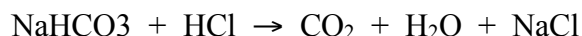
## GAS LAWS PRACTICE #2: "ADVANCED GAS LAWS" AP CHEMISTRY

1. The empirical formula for an unknown compound is found to be  $\text{CH}_3$ . At  $20.0^\circ\text{C}$  and  $1.00\text{ atm}$ ,  $1.22\text{ g}$  of this unknown gas takes up a volume of  $1.00\text{ L}$ .

A) What is the molar mass of the unknown?

B) What is the molecular formula of the unknown?

2. In the news there was a sad story about some poor sap who ate 5 heaping tablespoons of baking soda,  $\text{NaHCO}_3$ , to neutralize his acid reflux. The baking soda reacted with his stomach acid as follows:



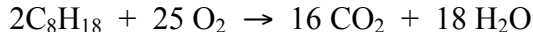
They reported that the guy exploded! Given the following data, calculate the pressure his stomach *would* have experienced - had it not exploded first.

Volume of stomach =  $1.5\text{ liters}$

Body Temperature =  $37.0^\circ\text{C}$

One heaping teaspoon of baking soda =  $3.0\text{ grams}$

3. The balanced equation for the combustion of octane is shown below:



The volume of one cylinder in an automobile is about  $0.500\text{ L}$ . If the air intake is  $45.0^\circ\text{C}$  and  $1.00\text{ atm}$  of pressure, calculate the grams of octane that the fuel injection should send to the cylinder to completely react with the  $\text{O}_2$  in the sample of air. Assume that air is  $20.0\%$  oxygen.

4. Gas laws can be used to solve for the Molar Mass of a gas. What is the formula used to calculate the density of a gas (mass/volume)?

A) The  $\text{N}_2$  gas inside a fire extinguisher is pressurized to  $1345\text{ kPa}$ . What is the density of the  $\text{N}_2$  gas at  $25.0^\circ\text{C}$  if the volume of the tank is  $1.00\text{ L}$ ?

B) How does this compare with the density of the  $\text{N}_2$  gas in the air we breathe at  $25.0^\circ\text{C}$  and  $1.00\text{ atm}$ ?

5. In retrospect we might think that whoever decided to fill the Hindenburg Zeppelin with Hydrogen gas to be very silly! Didn't they know that  $\text{H}_2$  gas is flammable? For safety reasons Helium gas is a much better choice. However, hydrogen gas has significantly greater "lifting power", meaning hydrogen is much less dense than helium. Explain why an equal volume of  $\text{H}_2$  gas would be so much less dense than helium?