Worksheet #10

Name: **Period:**   **Seat#:**

Directions:
- Don't forget! You must show all work and units for conversions, gas laws, dimensional analysis, etc.
- Get an actual answer, including units! Box your answer!

Note

Because of the molar volume ratio (one mole of gas occupies 22.4 L at STP, mole ratios in balanced reaction equations are also represent *volume* ratios for gases!

Example   Balanced Reaction Equation: $CH_{4 (g)}$ + $2 O_{2 (g)}$ → $CO_{2 (g)}$ + $2H_2O_{(g)}$

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Mole Ratios	1	2	1	2
Volume Ratios	1	2	1	2

Volume to Volume Problems

1) Balance each combustion reaction equation and use volume ratios to determine the volume of oxygen needed to react with each fuel.

Gas	Combustion Reaction	Volume Ratio Fuel : Oxygen	Volume of Fuel	Volume of Oxygen
Ethane	____C_2H_6 + ____O_2 → ____CO_2 + ____H_2O		10 mL	
Acetylene	____C_2H_2 + ____O_2 → ____CO_2 + ____H_2O		10 mL	
Propane	____C_3H_8 + ____O_2 → ____CO_2 + ____H_2O		10 mL	
Butane	____C_4H_{10} +____O_2 → ____CO_2 + ____H_2O		10 mL	
MAPP	____C_3H_4 + ____O_2 → ____CO_2 + ____H_2O		10 mL	
Hydrogen	____H_2 + ____O_2 → ____H_2O		10 mL	

Mass to Volume Problems

2) Assume that 1.75 moles of propane react completely at 375 K and 4 atm.

____C_3H_8 + ____O_2 → ____CO_2 + ____H_2O
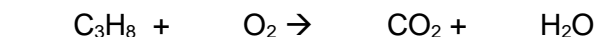
a. What volume of propane reacted? *(hint: use the ideal gas law!)*

b. What volume of carbon dioxide was produced? *(hint: use the ideal gas law to solve for volume of propane, then use volume to volume stoich to solve for volume of carbon dioxide!)*

c. What volume of water vapor was produced? *(hint: use the ideal gas law to solve for volume of propane, then use volume to volume stoich to solve for volume of water vapor!)*

3) Assume that 3.5 moles of MAPP gas reacts completely at 300 K and 1.2 atm.

    a. Balance the equation _____C_3H_4 + _____ O_2 → _____ CO_2 + _____ H_2O
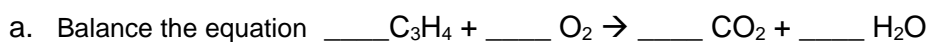
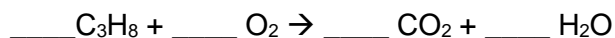   b. What volume of MAPP gas reacted?

    c. What volume of oxygen gas will be used up?

    d. What volume of carbon dioxide gas will be produced?

    e. Assume that 0.5 moles of MAPP gas reacts completely at 350 K and 3 atm. What volume of water vapor will be produced?

Volume to Mass Problems

4) Assume that 20 L of propane reacts completely at 295 K and 3 atm.

   _____C_3H_8 + _____ O_2 → _____ CO_2 + _____ H_2O

    a. How many moles of oxygen gas will be used up? *(hint: use volume to volume stoich to figure out the volume of oxygen gas, then use the ideal gas law to solve for n!)*

    b. How many grams of water vapor will be produced? *(hint: figure out the volume of water vapor, then use the ideal gas law to solve for n, then use molar mass to solve for grams!)*

    c. How many grams of CO_2 will be produced? *(hint: figure out the volume of carbon dioxide, then use the ideal gas law to solve for n, then use molar mass to solve for grams!)*

5) Assume that 30 L of MAPP gas reacts completely at 300 K and 1.2 atm.

_____ C_3H_4 + _____ O_2 → _____ CO_2 + _____ H_2O
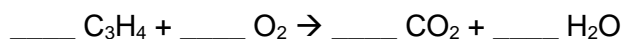
a. How many moles of oxygen gas will react with the given volume of MAPP gas?

b. How many moles of water vapor will be produced?

c. How many grams of water vapor will be produced?

d. How many grams of CO_2 will be produced?

Mass to Volume Problems

6) Assume that 50 g of propane reacts completely at 350 K and 2.5 atm.

_____ C_3H_8 + _____ O_2 → _____ CO_2 + _____ H_2O
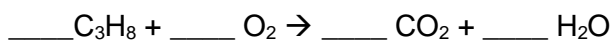
a. How many moles of propane reacted? _(hint: use molar mass!)_

b. What volume of propane reacted? _(hint: use molar mass, then use the ideal gas law to solve for volume)_

c. What volume of oxygen gas will be used up? _(hint: use molar mass to figure out the moles of propane gas, then use the ideal gas law to solve for propane volume, then use volume-volume stoichiometry to solve for volume of oxygen!)_

d. What volume of water vapor will be produced? _(hint: use molar mass to figure out the moles of propane gas, then use the ideal gas law to solve for propane volume, then use volume-volume stoichiometry to solve for the volume of water!)_

7) Assume that 90 g of MAPP gas reacts completely at 200 K at 5 atm.

_____ C_3H_4 + _____ O_2 → _____ CO_2 + _____ H_2O
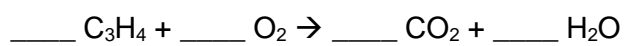
a. How many moles of MAPP gas reacted?

b. What volume of MAPP gas reacted?

c. What volume of oxygen gas is required for this reaction?

d. What volume of carbon dioxide gas will be produced?