**Burning a Hydrocarbon I – DUE Thursday April 2nd**
(Paper or electronic fricks_barbara_s15@svvsd.org is acceptable)

Name_____ Class Section_____

Problem Statement: How are the masses of reactants and products related?

I. Data Collection:
A. Goto http://genchem1.chem.okstate.edu/CCLI/CCLIDefault.html and open the "Burning a Hydrocarbon I Simulation". To get to the simulation: click on the above link; on the left click on "Web-based simulations". Scroll down and click on the link "Burning a Hydrocarbon I" under the Simulation tab (far right). Your screen should look like the figure. -
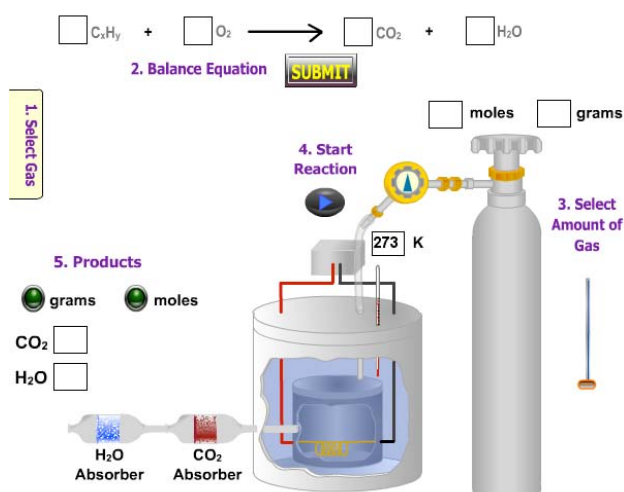
The apparatus represents a reaction container that can be filled with different amounts of hydrocarbon gases from a gas cylinder. A hydrocarbon is a chemical substance containing only hydrogen and carbon. When hydrocarbons combine with oxygen, (i.e. burn), they produce carbon dioxide and water as products. The reaction container will also hold oxygen gas to react with the hydrocarbon. To use the simulation you must:

       (1) Select a gas by clicking on the select tab.
       (2) Balance the chemical equation and submit it.
       (3) Specify the amount of gas with a slide bar.
       (4) Start the reaction.
       (5) Examine the amount of products.

These steps are numbered in the simulation.

B. Click on the Select Gas tab and pick CH_4, methane. Balance the equation using the lowest ratio of whole numbers and submit the equation. Add 10.0g of CH_4 to the reaction container and start the reaction. The simulation will burn the gas and pass the products through filters that will absorb the product molecules so that they can be weighed. Click on the product buttons. Record the data you collected in the following table. Assume your initial amount of hydrocarbon is completely consumed (final mass = 0g; final moles =0g).

$$\_\_\_\_CH_4 + \_\_\_\_O_2 \rightarrow \_\_\_\_CO_2 + \_\_\_\_H_2O$$

	CH₄	O₂	CO₂	H₂O
Initial Amount (moles) – I	___		___	___
Change (moles) – C	___	___	___	___
Ending Amount (moles) – E	___		___	___
Initial Amount (grams) – I	___		___	___
Change (grams) – C	___	___	___	___
Ending Amount (grams) – E	___		___	___

C. Calculate the change in the number of moles and grams that occurred when the reaction was complete. Use stoichiometry to calculate the number of actual moles and grams of oxygen. Record your results in the tables above.

II. Data Analysis and Interpretation

A. What must you assume about the amount of oxygen present in the reaction container at the beginning of the reaction to account for your observations.

B. How do you know that all of the CH_4 reacted when the reaction was complete (think about grams of C from percent composition of C in hydrocarbon compared to the product)?

C. Compare the total mass of the compounds that reacted with the total mass of the products that was formed.

D. Compare the balanced equation to the data in the tables. Which data best describes the relationships represented by the balanced equation?

III. Data Collection

Click on the Select Gas tab and pick C_2H_6, ethane. Balance the equation using the lowest ratio of whole numbers and submit the equation. Add 10.0g of C_2H_6 to the reaction container and start the reaction. Click on the product buttons. Record the data you collected in the following tables.

$$\_\_\_\_C_2H_6 + \_\_\_\_O_2 \rightarrow \_\_\_\_CO_2 + \_\_\_\_H_2O$$

	C_2H_6	O_2	CO_2	H_2O
Initial Amount (moles) – I	_____		_____	_____
Change (moles) – C	_____	_____	_____	_____
Ending Amount (moles) – E	_____		_____	_____
Initial Amount (grams) – I	_____		_____	_____
Change (grams) – C	_____	_____	_____	_____
Ending Amount (grams) – E	_____		_____	_____

Calculate the change in the number of moles and grams that occurred when the reaction was complete. Use stoichiometry to calculate the number of actual moles and grams of oxygen. Record your results in the tables above.

III. Data Analysis and Interpretation
A. Compare the total mass of the compounds that reacted with the total mass of the products that was formed. Is mass conserved?

B. Compare the total number of moles of the compounds that reacted with the total number of moles of the products that was formed. Is number of moles conserved?

IV. Data Collection:

A. Consider burning 10.0g C_3H_8, propane. Balance the following equation using the lowest ratio of whole numbers. Before trying the experiment, predict the amounts of reactants and products and fill in the tables below using stoichiometry.

Predictions:

$$\_\_\_C_3H_8 + \_\_\_O_2 \rightarrow \_\_\_CO_2 + \_\_\_H_2O$$

Initial Amount (moles) – I	_____		_____	_____
Change (moles) – C	_____	_____	_____	_____
Ending Amount (moles) – E	_____		_____	_____
Initial Amount (grams) – I	_____		_____	_____
Change (grams) – C	_____	_____	_____	_____
Ending Amount (grams) – E	_____		_____	_____

Test you predictions using the simulation. Record your values below

$$\_\_\_C_3H_8 + \_\_\_O_2 \rightarrow \_\_\_CO_2 + \_\_\_H_2O$$

|				
Initial Amount (moles) – I	_____		_____	_____
Change (moles) – C	_____	_____	_____	_____
Ending Amount (moles) – E	_____		_____	_____
Initial Amount (grams) – I	_____		_____	_____
Change (grams) – C	_____	_____	_____	_____
Ending Amount (grams) – E	_____		_____	_____

VII. Conclusions:

A. Compare the total mass of the compounds that reacted with the total mass of the products that was formed. Is mass conserved?

B. Compare the total number of moles of the compounds that reacted with the total number of moles of the products that was formed. Is number of moles conserved?

C. Click on the Select Gas tab and pick unknown hydrocarbon C_xH_y. Add 10.0g of C_xH_y to the reaction container and start the reaction. Click on the product buttons. Record the data you collected in the following tables.

$$\_\_\_\_C_xH_y + \_\_\_\_O_2 \rightarrow \_\_\_\_CO_2 + \_\_\_\_H_2O$$

	C_xH_y	O_2	CO_2	H_2O
Initial Amount (moles) – I	_____		_____	_____
Change (moles) – C	_____	_____	_____	_____
Ending Amount (moles) – E	_____		_____	_____
Initial Amount (grams) – I	_____		_____	_____
Change (grams) – C	_____	_____	_____	_____
Ending Amount (grams) – E	_____		_____	_____

D. Determine possible values for x and y. Balance the equation using the resulting hydrocarbon.

$$\_\_\_\_ C\_H\_ + \_\_\_O_2 \rightarrow \_\_\_\_CO_2 + \_\_\_\_ H_2O$$
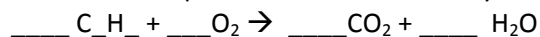
E. In a similar experiment a scientists adds 75g grams of the hydrocarbon, but only has 148g of O_2 available to combust. What is the limiting reagent in this experiment?

F. For the excess reagent, how many grams of excess were there?

G. In the above experiment how much CO_2 should be produced?

H. There was a 67% yield of water in a similar experiment, how much water was produced assuming 75g of hydrocarbon reacted with 148g of O_2.

I. Summarize how you were able to determine the molecular formula of the unknown hydrocarbon using complete sentences.