Baking Soda - Stoichiometry Lab name: _____ (40 min)

When you heat up baking soda, gas is given off, but the actual chemical reaction is vague at the moment. During this lab, we will decompose baking soda, better known as sodium hydrogen carbonate, but heating it up in an evaporating dish with a Bunsen burner. When we're done, we can measure the mass of the left over solid salt, and we will determine which of three different chemical reactions really happened. We'll measure mass, but by using stoichiometry (3 times) we'll be able to discover what reaction happened in the lab.

Baking soda is also known by its old fashioned name: sodium bicarbonate, but we will not call it that in our class, that naming protocol has been abandoned (but not by food chemists).

Procedure: Put on your goggles first. Then, set up a ring stand with clay triangle, get Bunsen burner at the ready. Get a clean and dry evaporating dish. Get mass of dish empty. Measure out 3.40 grams of the sodium hydrogen carbonate and make sure it's ALL INSIDE the dish - not on the scale.

Heat the dish for at least 20 minutes under moderate heat. Your teacher should check the intensity. We don't need to burn the heck out of it, and if it's too hot, the dishes might crack. Hot enough but not hell on wheels. Then we will cool the dish, and mass it. Finally we will heat again for 2 minutes, cool, mass it again for a final time.

Clean up: warm water, soap, put the dish next to sink UPSIDE down to dry. Put equipment away. The "cooked" baking soda can go into the sink or into the trash, it's not harmful.

The reason that this is such a cool lab is that you probably don't know what really happened in that dish. Here are three possible word equations, they all look possible but only one of them happens.

A. Baking soda decomposes into sodium hydroxide solid + carbon dioxide gas

B. Baking soda decomposes into sodium oxide solid + carbon dioxide gas + water gas

C. Baking soda decomposes into sodium carbonate solid + carbon dioxide gas + water gas

Data	Measure on the scale	Mass in grams
A	Empty evaporating dish	
B	Dish + Sodium hydrogen carbonate	
C	Sodium hydrogen carbonate alone (B - A)	3.40 grams
D	After first heating, dish + solid	
E	After final heating, dish + solid	
H	Mass of left over solid only (E - A)	

Lab Questions, to be done on loose leaf paper, in order, neatly, with plenty of space to write you back some fun notes and hints on how to think more.

1. Write the balanced chemical equation for possible reaction A.
2. If you used 3.40 g of sodium hydrogen carbonate, how many grams of sodium hydroxide should form?
3. Write the balanced chemical equation for possible reaction B.
4. If you used 3.40 g of sodium hydrogen carbonate, how many grams of sodium oxide should form?
5. Write the balanced chemical equation for possible reaction C.
6. If you used 3.40 g of sodium hydrogen carbonate, how many grams of sodium carbonate should form?
7. How many grams of solid formed in your lab experiment? Which of these 3 reactions do you think happened? Try to support your choice with a few well worded sentences so I can see if you guessed or if you understand.
8. Calculate your percent error (of grams of solid product forming). Remember: % Error always gets a sign and proper SF!
9. The mass of the solid product is noticeably less than the mass of the solid reactant in this reaction. Is that OK or does this somehow break the Law of Conservation of Matter?
10. Why is baking soda a common ingredient in cake recipes? (for box cake mixes, it's already included into the mix)

Points for this lab:

Cover Page: with title, nice optional diagram/picture, and mandatory descriptive sentence. = 2 points
Ten questions above x 2 points each = 20 points
In your Conclusion , for the final 3 points, you must include the following parts:

1. Explain what stoichiometry is, and what is it used for. How did <u>you</u> use stoichiometry in this lab?
2. Name the 5 kinds of chemical reactions you know already.
3. Explain what the letters of TOPIC-B stand for.
4. Write out the (entire) Law of Conservation of Matter. (in full sentences)
5. Write out the Law of Conservation of Energy. (in full sentences)
6. Name 6 kinds of phase changes (physical changes, not chemical changes) properly paired up.