Baking Soda Stoichiometry Lab Name: _____ Partner: _____

In this lab you will combine your powers of observation, reasoning, equation balancing and knowledge of stoichiometric calculations to earn a perfect 10/10 (hopefully).

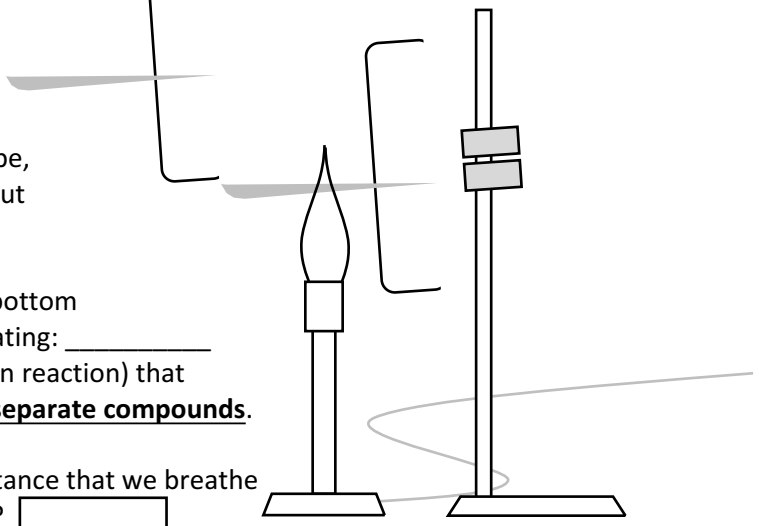
Procedure:

1. Obtain a large Pyrex test tube and weigh it on one of the scales in the front of the room. Record this mass in the table at right. Pyrex is a kind of glass that can be subjected to very high (and low) temperatures without shattering!

Data Table	

2. At the same scale place one large scoop of baking soda ($NaHCO_3$) into the test tube, then using the same scale as before, weigh the test tube with the baking soda. Record this mass in the table at right. (You should be able to figure out what mass of baking soda is in the test tube.)

3. Holding the test tube nearly horizontal, shake the baking soda gently so that it spreads out a bit as shown at right:



4. Then tighten the test tube clamp securely around the test tube, just below the lip so that it is positioned nearly horizontally about 20 cm above the lab desk as shown:

5. Light a burner and adjust it to a large cool flame hitting the bottom half of the test tube as shown: Record the time you started heating: _____
This heat will initiate a chemical change (a sort of decomposition reaction) that breaks the $NaHCO_3$ down, not into its elements **but into three separate compounds**.

6. One of the products of this decomposition is a gaseous substance that we breathe out. It contains carbon and oxygen. What is this substance? [ ]

6. What do you observe happening in the upper half of the test tube? _____

What common substance appears to be a second product of this reaction? [ ]

7. Move the burner occasionally to a different spot to ensure a thorough heating of the entire bottom half of the test tube. Consider the substance that is left in the test tube: it may look just like the baking soda you put in the test tube, but it has actually been converted into something else: sodium carbonate. This is the third product. What is the correct formula for sodium carbonate: [ ] Now go down and answer questions 1-4 below, but keep an eye on the time:

After you have heated the test tube for 8-10 minutes, turn off the burner and let the test tube cool for 5-6 minutes.

Questions:

1. You should have figured out from #6, 7 and 8 above what the three products are. Write the chemical equation (unbalanced) for the reaction that just took place:

[ ]

Check it with the teacher to make sure you have it right, then go back and balance it. (Hint: it is a very easy one to balance: the coefficients are all pretty small.)

2. Look back at your data table above. What mass of the $NaHCO_3$ did you start within the test tube: _____

3. Starting with that mass of $NaHCO_3$, use the mole to mole ratios from your balanced equation above to figure out what mass of sodium carbonate you should have ended up with in the test tube:

Show your work in dimensional analysis form:

4. So... assuming all the baking soda you started with got converted into sodium carbonate, what should the test tube (and contents) weigh right now?

This is your official prediction. Make sure it is correct. Your grade depends on it!

If your prediction is within…	then your grade will be….
0.03 g	10/10
0.10 g	9/10
0.20 g	8/10
0.30 g	7/10
0.50 g	6/10
1.00 g	5/10
5.00 g	4/10
10.00 g	3/10
20.00 g	2/10
50.00 g	1/10
Otherwise you get a 0/10	

If your test tube has been cooling for 5-6 minutes, it should be ready for the official weigh-in! Bring the test tube, along with this sheet containing your prediction above, up to the instructor at the front table. They will weigh it – on the same scale you used – but not show you the weight. They will tell you your grade based how close your prediction was to the actual weight (see the table at right). If you are satisfied with your grade, congratulations! You are done. If you are not satisfied, you can go back, correct your mistake and change your prediction for a second attempt. This second attempt will cost you one point, and you may end up with a lower score, so only try the second attempt if you are fairly sure you can correct whatever mistake you may have made the first time.

5. Observe the substance that is left in the test tube; compare it to the fresh test tube of $NaHCO_3$ at your lab station. Do you notice any slight difference between the two? _____.
After you have finished all of the above, rinse out the test tube into the sink, then place it in the used bin at the front of the room. Take a fresh (dry) test tube and place it in the clamp for the next group.

Follow-up Questions:

6. If you hadn't heated the test tube long enough, would that make your prediction come out too high or too low? _____
Explain:

7. CO_2 is more dense than air. But the CO_2 produced from the reaction rose <u>upward</u> out of the mouth of the test tube?

Why?

8. Why did the water only condense on the upper half of the test tube?

9. Using your original mass of baking soda ($NaHCO_3$), determine what mass of H_2O was produced: _____
show work:

10. Using your original mass of baking soda ($NaHCO_3$), determine what mass of CO_2 was produced: _____
show work:

11. Add the two masses from #9 and #10 above along with the calculated mass of Na_2CO_3 produced (#3 above). What total mass of products does this give: _____

12. How does this mass compare with the initial mass of $NaHCO_3$ you put in the test tube? _____

Explain why this makes sense: