Decomposition of Baking Soda Name: _____

Procedure:

1. Put on your safety goggles.
2. Attach the iron ring to the ring stand. The height of the iron ring should be adjusted so that it is much higher than the top of the Bunsen burner.
3. Record the mass of a clean, dry crucible to the nearest 0.01 g.
4. Bring your crucible to your teacher to obtain a sample of baking soda.
5. Record the combined mass of the crucible and the baking soda to the nearest 0.01 g.
6. Place the clay pipe triangle on the iron ring, and carefully place the crucible in the center of the triangle.
7. Before you light the burner, make sure that you are still wearing safety goggles, long hair is tied back and loose sleeves are rolled up.
8. Heat the crucible for about 10 minutes.
9. Turn off your Bunsen burner. Use crucible tongs to remove the crucible from the triangle and place it on the laboratory counter to cool.
10. Allow the crucible to cool until a point when you can safely touch the sides comfortably. You can feel heat coming from the crucible if you hold your fingers near it. Be careful not to burn yourself. When the crucible has cooled, record the mass of the crucible and solid product to the nearest 0.01 g.
11. Bring the crucible to your teacher.

DATA TABLE

Mass of crucible	
Mass of crucible and baking soda	
Mass of crucible and solid product	

CALCULATIONS

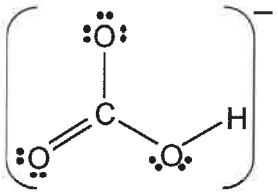
Mass of baking soda	
Mass of solid product	

Background Information and Analysis Questions

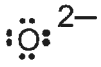
1. Based on the atomic number of sodium (Na) on the periodic table, a neutral atom of sodium contains _____ protons and _____ electrons.

2. When an atom of sodium changes into a stable ion, it (loses gains) exactly _____ electron(s). This stable sodium ion now becomes isoelectronic with, or has the same number of electrons as, a neutral atom of neon (Ne).

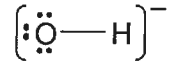
3. A stable sodium ion contains _____ protons and _____ electrons, and the charge on the sodium ion is equal to (+1 –1 +2 –2)



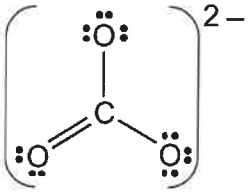
4. The structure shown above represents the bicarbonate ion, which has a charge of –1. The chemical formula of baking soda, or sodium bicarbonate, is _____ because the total charges of the ions in the formula must add up to equal zero.



oxide



hydroxide



carbonate

5. Three different negatively charged ions are shown above. Based on this information, write the correct chemical formulas for each of the following compounds. Make sure that the total charges of the ions in each formula add up to equal zero.

   (a) sodium oxide _____

   (b) sodium hydroxide _____

   (c) sodium carbonate _____

6. In this experiment, sodium bicarbonate was heated and a decomposition reaction occurred. Write a balanced chemical equation, using the lowest possible whole number coefficients, for each of the following decomposition reactions.

#1	sodium bicarbonate → sodium oxide + water vapor + carbon dioxide
#2	sodium bicarbonate → sodium hydroxide + carbon dioxide
#3	sodium bicarbonate → sodium carbonate + water vapor + carbon dioxide

7. The molar mass of sodium bicarbonate is equal to _____ g/mol

8. Based on your laboratory results, the mass of sodium bicarbonate used in today's experiment is equal to _____ g

9. Use a conversion factor to convert your answer to #8 from grams into moles. Show the setup for your calculation below, including the conversion factor, with units clearly labeled. Round off your final answer to the proper number of significant figures.

10. Take your answer from #9 and convert this quantity into grams of solid product. Since there are three different products that could have been formed in this experiment, you will need to set up three separate conversions. Make sure that your units are clearly labeled for each conversion factor and that your answers are rounded off to the proper number of significant figures.

_____ mol $NaHCO_3$ × _____ × _____ = g sodium oxide

_____ mol $NaHCO_3$ × _____ × _____ = g sodium hydroxide

_____ mol $NaHCO_3$ × _____ × _____ = g sodium carbonate

11. Based on your laboratory results, the mass of solid product formed in today's experiment is equal to _____ g

12. Based on your answers to #10 and #11, the most likely identity of the solid product formed in today's experiment is _____

13. In another experiment, a student reacted sodium bicarbonate with sulfuric acid (H_2SO_4). The products of this reaction are sodium sulfate (Na_2SO_4), water, and carbon dioxide. Write a balanced chemical equation, using the lowest possible whole number coefficients, for this reaction.

14. The student used 15.0 g of sodium bicarbonate in the experiment described in #13. Use a three-step conversion to calculate how many grams of sodium sulfate would be produced. Assume that the reaction goes to completion. Make sure that your units are clearly labeled for each conversion factor and that your answers are rounded off to the proper number of significant figures.

15.0 g $NaHCO_3$ × _____ × _____ × _____ = g Na_2SO_4