LAD 3.4A (pg 1 of 2) Law of Constant Composition

Name_____

Introduction

In the late 1700's Joseph Proust studied the chemical compounds and noticed that the elements always combined in constant mass ratio. In this lab the mass ratio of a chemical compound will be analyzed. By comparing the class data, the law of **constant** composition may be verified. Since we have not yet studied chemical formulas the chemical compound will be named SG, and the two parts of this compound will be called S and G. The data will allow the determination of the mass ratio of S to G.

PreLAD -

1. Set up a Data/Results table in Excel.
2. In the space below, answer the following question. Show your work.
   Suppose you were running a small copper and aluminum salvaging business. On you way into the salvage yard, the attendant weighed your wheelbarrow and found it to be 55 kg. After you dumped the copper, the wheelbarrow weighed 33 kg, on your way out of the yard the attendant reweighed your empty wheel barrow and found it to have a mass of 18 kg. Calculate the mass of copper and aluminum and calculate a mass ratio of copper to aluminum.

Procedure

Avoid handling the chemicals with your hands. Wash your hands after the lab.
Goggle should be worn at all times during this LAD.

1. Mass an empty clean dry evaporating dish. Then tare the dish and determine the mass of all of the chemical compound (SG).
2. Heat the chemical compound (SG) with a good hot flame for at least five minutes. The heat will cause the compound to decompose into just S as G escapes as a gas.
3. Allow the dish to cool and then determine the mass of the dish with the new chemical compound (S). Repeat the strong heating a second time to be sure all the G has been removed. After it cools, mass the compound (S) in the dish again. If the reaction was completed the first time, the mass should be the same (within 0.2 g). If the reaction had not been completed and more G left the compound, it will not have been "heated to a constant mass" and it will be necessary to heat it a third time.
4. Thus if necessary, repeat the heating procedure for a third time to confirm that the reaction was completed after the second heating. After the dish cools determine the mass of the dish with the compound (S). You will use the final mass measured in your calculations.
5. If a constant mass was not reached after the third heating, it seems unlikely to happen, so it is probably pointless to continue.

Disposal

Leave the evaporating dish on the tray on the center lab bench.

Processing the data

1. Calculate the mass of the chemical compound (S). (A simple subtraction should allow this calculation. You should use the mass after your final heating. Maybe after the second or for some of you it may be after the third.)
2. Calculate the mass of the gas portion of this compound (G) that was in the starting compound (SG). (A simple subtraction should allow you to make this calculation.)
3. Determine the mass ratio of S to G that was in the starting chemical compound (SG). A ratio is always a quotient. So S/G will give you the mass ratio.

This question will be done together in class, and answers will be put on your data table

4. Write the chemical formula for SG. Write the chemical formula for the S portion that remained after heating. Calculate the mass of the S portion of the chemical using atomic masses from the periodic table. Calculate the mass of the G portion of the chemical. Calculate the theoretical mass ration of S/G.

Post-LAD Questions

1. How can you tell when you are done heating?
   - Does the appearance of the chemical change during the reaction?
   - Why shouldn't you just heat this chemical just once?
   - How does "heating to a constant mass" help?

2. The Law of Constant Composition.
   - State the Law in your own words so it is accurate and makes sense to you.
   - What postulate of Dalton's Atomic Theory is essentially the Law of Constant Composition?
   - If matter were not made out of individual atoms why would it be unlikely for this law to work?

Error Discussion

3. Comment on the accuracy and precision of the class data.

4. Does the class data verify the Law of Constant Composition? Refer to the data in your comment.

5. If you had not heated the SG long enough or hot enough, would the final S/G ratio be larger or smaller than the theoretical ratio/. Justify your response.

6. If you had heated your SG so aggressively at first that some solid chemical popped out of the dish, would the final S/G ratio be larger or smaller than the theoretical ratio/. Justify your response.