LAD D5 (pg 1 of 2) **Law of Constant Composition** Name________________________Per___

Synthesis of Magnesium Oxide

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 that forms when magnesium and oxygen are combined, will be analyzed. By comparing the class data, the law of constant composition may be verified. Magnesium will react with oxygen in the air by heating the two together. This is a synthesis reaction (the combination of two or more substances into a single compound) and it is also a form of combustion (the reaction of oxygen with another substance producing heat and light and resulting in some oxide compound(s)). In order to determine if the ratio between Mg and O is constant, the mass of Mg and the mass of oxygen must be determined.

PreLAD

Read the Procedure & Proceesing the Data, then set up a Data/Results table on a new tab in your Google Sheet.

Procedure *This will be done as a class demonstration.*

A. Determine the mass of the clean, dry, empty crucible. The magnesium must be completely free of any "rust" – so clean and shine the metal strip using sand paper. After cleaning the magnesium, determine the mass of the magnesium. Then crumple the strip and place the strip in the crucible as shown in class. The magnesium must be touching the bottom of the crucible in order for magnesium to ignite, yet you should not coil the stip in a tight ball or the air will have difficulty getting at all of the magnesium.

B. Put the crucible without the cover on the clay triangle, making sure the base of the crucible sits at the hottest part of the flame, and heat until Mg ignites. To reduce the loss of any product (magnesium oxide powder) as smoke, quickly cover the crucible to catch the smoke, and REMOVE the burner IMMEDIATELY after magnesium ignites. Lift the cover carefully to take a quick peek and see if the reaction has subsided, and is smoking less. If there is no smoke, replace the burner and watch carefully as the coil may ignite again causing more smoke, which you again remove the burner and be ready with cover to try to catch the smoke in the cover. When the smoking has subsided completely and the magnesium does not light up again, continue to heat with the cover off for about 5 minutes.

C. The completed reaction will result in a light gray residue. Turn off the burner and allow everything to cool. Mass the crucible, cover with the magnesium oxide product.

PROCESSING THE DATA - *Show the work for trial 1 calculations here. Label the identity of the numbers. You will also put your data in your google spread sheet with embedded formulas. You should get all the data trials from the class data sheet.l*

1. Calculate the mass of the magnesium oxide product. (A simple subtraction should do it.)

2. Calculate the mass of oxygen that combined with the starting mass of magnesium using the starting mass of magnesium, and the mass of the magnesium oxide product. (Again, a simple subtraction should do it.)

3. Calculate the experimental mass ratio of magnesium to mass of oxygen: Mg / O using the mass of magnesium and the mass of oxygen that combined with that magnesium as calculated in #2.

4. Use the masses of Mg and O in the periodic chart to calculate the theoretical mass ratio. The chemical formula for magnesium oxide is MgO.

5. Calculate the % error.

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Law of Constant Composition with Mg

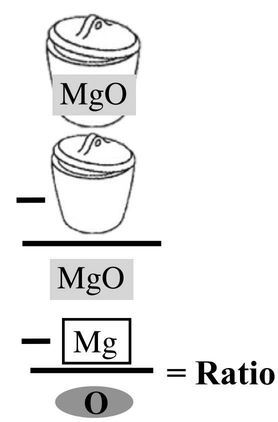
POST Lab QUESTIONS

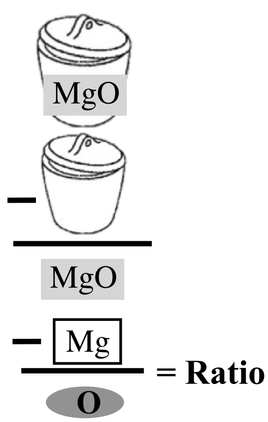
1. Write out the combination (synthesis) balanced equation that represents the production of the magnesium oxide.

2. What caused the reaction to stop, and if it had been heated longer would the mass ratio have changed.

3. State the Law of Constant Composition. Does the class data verify the Law of Constant Composition? Why is it important to do or look at more than one trial to verify this law?

4. Mark each item in the picture to the right with an "m" for measurement and "c" for calculation.
   - If lots of "smoke" had been lost while heating the magnesium, would you expect the mass ratio of Mg/O to be larger, smaller, or no change than the theoretical ratio?
     ***** Circle one *****
     (Hint: You might want to think about what the "smoke" actually is.)
   - Justify your response by putting ↑, ↓, or = to indicate what measurements change and the resulting effect on any calculations.





5. If soot had collected on the bottom of the dish during the heating, would you expect the mass ratio of Mg/O to be larger, smaller or no change than the theoretical ratio?
   ***** Circle one *****
   - Justify your response by putting ↑, ↓, or = to indicate what measurements change and the resulting effect on any calculations.

6. If the magnesium had been covered with a thick coating of "rust" before burning, would you expect the mass ratio of Mg/O to be larger, smaller, or no change than the theoretical ratio?
   ***** Circle one *****
   - Justify your response by putting ↑, ↓, or = to indicate what measurements change and the resulting effect on any calculations.