Report Form #1

Name: _____

Experiment: _____

Objective:

Be specific. The objective of virtually *all* experiments done in connection with a course is to "learn how to make good measurements" and to "connect the theories learned in class with observations in lab", so do not include these kinds of general statements in your objective. What is the objective or the reason for doing this specific experiment? Ask yourself what is the main result that you will obtain at the end of the experiment, or at the end of doing the calculations for this experiment? This is your objective. Your objective should mirror your **Conclusion** section at the end of the report. This section should be 1-3 complete, correct sentences.

Procedure:

Write in paragraph form, in complete, correct sentences, in your own words. You need enough detail so that a student from a different class, who hasn't done the experiment, could follow it.

Chemical and/or Physical Equation(s)

Write the appropriate equation(s) and the header(s) should be either chemical reaction or physical process. Unless otherwise stated, the equation should be balanced, and include the states.

Observations:

Describe each reactant before the experiment, describe how it changes during the experiment, and describe the product(s) at the end of the experiment.

Data Table:

Data are the direct measurements made in lab, plus any "given" information such as molar masses, or a constant obtained from the CRC Handbook (a chemistry reference book), and unknown numbers. Directly obtained data and reference book values must be listed in their original form (if a measurement is obtained using the unit of "mL" do not list it as "cm^3" or as "L", these are units to which the original data have been converted, and so must be shown in the **Calculations** section, and then listed in the **Results** section. Data or measurements, should be listed in the order they are obtained. There should be a description of the data, and the units in parentheses, in the left column, and then the actual number obtained in the right column. The number obtained does not need to include units because they are already listed in the left hand column. Masses should be written to show *all* of the decimal places shown on the balance. It is incorrect to show fewer decimal places, and points will be deducted for this.

Data - Part 1	Trial 1	Trial 2	Trial 3
Color of substance before heating			
Chemical Formula of Substance			
Name or Unknown #			
Mass of dish (g)			
Mass of dish and hydrate (g)			
Mass of dish and hydrate after first heating (g)			
Mass of dish and hydrate after second heating (g)			
Mass of dish and hydrate after third heating (g)			
Mass of dish and anhydrate (g)			

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When you are working with an unknown, always ***include the unknown # in the data table*** *(for this experiment, the first part is known, the second part contains an unknown)* ***and in the conclusion.***

Data - Part 2	Trial 1	Trial 2	Trial 3
Unknown #			
Color of substance			
Mass of dish (g)			
Mass of dish and hydrate (g)			
Mass of dish and hydrate after first heating (g)			
Mass of dish and hydrate after second heating (g)			
Mass of dish and hydrate after third heating (g)			
Mass of dish and anhydrate (g)			

Calculations

Each calculation must have 3 parts: 1) a header (H) that tells me what you are calculating, 2) a verbal (V) or formula portion, that explains to me where your numbers are coming from, and 3) one sample (S) calculation.
The **header** should be brief.
The **verbal** can either be in words (as seen below) or a common formula like PV = nRT or D=m/V, but have the variable you are looking for isolated. (for example if looking for mass using a density formula: m = DV.
The one **sample calculation** should be the calculation from your first trial, unless you want to discard the information from the first trial because of errors made. If you are excluding your first trial, write a sentence telling me a) why you are not using Trial 1 and b) which trial you are using. Be consistent, if you use data from Trial 1 in the first calculation, use Trial 1 data in all of the calculations.

H. Mass of Hydrate
V. (Mass of Dish and Hydrate) – Mass of Dish
S.

H. Mass of Dish and Anhydrate
V. Use the lowest of all masses of Dish and Hydrate
S.

H. Mass of Anhydrate
V. (Mass of Dish and Anhydrate) – Mass of Dish
S.

H. Mass of Water
V. (Mass of Dish and Hydrate) – (Mass of Dish and Anhydrate)
S.

H. Moles of Water
V. Mass of Water / Molar Mass of Water (Calculate all molar masses to the hundredths place)
S.

H. Moles of Anhydrate – if your calculation is different for parts 1 and parts 2, show both.
Part 1
V.
S.

H. Moles of Anhydrate
Part 2
V.
S.

H. Mole Ratio of Water: Anhydrate
V. Moles of water / moles of anhydrate (since these are calculate above, no need to explain where these numbers are coming from here too). Calculate this number to the correct number of significant figures.
S.

H. Average Mole Ratio of Water: Anhydrate
V. example 1: Sum of Mole Ratio from each trial / # of trials
V. example 2: Mole Ratio: (T1 + T2) / 2
V. example 3: (Mole ratio T1 + T2) / # of trials
S.

H. Average Mole Ratio (rounded to whole numbers).
V.
S.

H. % Error
V. $\frac{|\text{Correct value} - \text{Experimental Value}^{**}|}{\text{Correct Value}^{*}} \times 100$

* The correct value is the accepted or true value or sometimes the theoretical value.
**The experimental value is what *you found* using *your measurements* in *your experiment*.

S.

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Results

The results table summarizes all of the answers to all of your calculations. You only have to SHOW one calculation of each type, but you have to calculate all of the answers for all of the trials and summarize them in a table like the one below. The calculated information and the unit (in parentheses) is listed in the first column, and then write in the numbers to the correct significant figures in the table, but without the unit.

Part 1

	Trial 1	Trial 2	Trial 3
Mass of hydrate (g)			
Mass of anhydrate (g)			
Mass of water (g)			
Anhydrate (mol)			
Water (mol)			
Mole ratio: $\frac{\text{Water}}{\text{Anhydrate}}$ (unitless)			
Average Mole Ratio (not rounded)			
Average Mole Ratio (rounded)			
% error of Average Mole Ratio (not rounded) from Actual Mole ratio			

Part 2

	Trial 1	Trial 2	Trial 3
Mass of hydrate (g)			
Mass of anhydrate (g)			
Mass of water (g)			
Anhydrate (mol)			
Water (mol)			
Mole ratio: $\frac{\text{Water}}{\text{Anhydrate}}$ (unitless)			
Average Mole Ratio (not rounded)			
Average Mole Ratio (rounded)			
Since this is an unknown, there can be no % error. You must have a known theoretical answer to do a % error.			

Discussion

The discussion section will be assigned to you by your instructor. The discussion section should be in paragraph form, written in complete sentences.

Discussion sections include one or more of the following:

- One option is to not include a discussion section.
- A second option: A discussion of possible errors that occurred in your experiment (not all possible errors, but those that you think occurred in your experiment). Since instrument errors are always possible, in all experiments, do not include these in your discussion. For instance, each balance has an error in the mg place (one-thousandths of a gram). This is a very small error and does not contribute significantly to the overall error in your experiment. There is always the possibility that you have misread your measurements (buret volumes, for example), but unless you *suspect or know* that you read your measurements incorrectly, do not include this. Include things like spills or other mistakes made, or if you have reason to believe the experimental set-up was not very accurate.
- Answer any questions posed in the lab report procedure, in this section. When doing so, write the number of each question and answer it in its own paragraph form.
- Answer any questions given by your instructor.
- Write a molecular description of some aspect of the experiment (further explanation given by your instructor).

➢ For the Hydrated Ionic Compound experiment, the discussion should include 1) possible errors, and 2) a verbal description of what happened during the heating of the ionic compound at the molecular level. You may include a picture, but a verbal description is essential: (just 2-4 sentences) of what may have occurred in the lattice during one of your trials- choose any trial (known or unknown, "good" or "not so good").

Conclusion

Your conclusion section should mirror the objective section, so if "the objective is to determine the correct mole ratio of the hydrate", then the conclusion should state that "the mole ratio of the known hydrate is _____ +/- _____ as your percent error (always state the type of error analysis, which can be % error, standard deviation, average deviation etc...). The unknown hydrate # _____ has an experimental mole ratio of _____.
Whenever you are working with an unknown, ALWAYS write down the unknown number in both the data section and the conclusion section.

The error analysis results should ALWAYS be included as part of your conclusion. The number for which you have to do an error analysis will always be "the result" or one of the main results and therefore should be stated as an objective in your objective section and, once the objective has been calculated and determined, should be included in the conclusion section.

The conclusion section is *not* a discussion of how well or poorly you think the experiment was done. The conclusion section should be 1-3 sentences long.