

Lab Report*Mole Ratio Investigation*

Name _____

Period _____ Date _____

AST7.1: Based on observations and science principles, I can formulate a question or hypothesis that can be investigated through the collection and analysis of relevant information.

Question: Does the ratio of reactants in a chemical reaction change the amount of product formed?

Purpose: To examine how the ratio of reactants affects the amount of products formed.

Background:

A balanced chemical equation is like a recipe. The _____ in front of each reactant in a chemical formula in a balanced equation indicates the _____ in which substances react. This ratio is called the _____. In this lab, we are going to examine how the ratio of reactants affects the amount of products formed in two different chemical reactions:

Chemical Reaction 1: aqueous calcium chloride with aqueous sodium carbonate to produce calcium carbonate precipitate in an aqueous sodium chloride solution. Write the balanced chemical equation for this reaction in the space provided:

Chemical Reaction 2: aqueous copper (II) sulfate with aqueous sodium hydroxide to produce copper (II) hydroxide precipitate in an aqueous sodium sulfate solution.

Hypothesis

If we run the chemical reaction with different ratios of reactants then the amount of product formed will be greatest when _____

because we know that _____.

Variables

Dependent Variable: _____

Independent Variable: _____

Controlled variable(s): _____

AST 7.2 I can design and conduct a controlled experiment, field study, or other investigation to make systematic observations about the natural world, including the collection of sufficient and appropriate data.

Procedure

Safety Instructions:

Wear goggles at all times! Sodium hydroxide, _____, is corrosive. Use extreme caution. In case of spills, notify your teacher immediately and rinse with large amounts of water.

Materials

- 12 x 75 mm test tubes (Set of 10)
 - Test Tube Rack
 - Distilled water bottle
 - Waste Container
- Dropper bottles each containing 25 mL of:
- 0.10 M solution of CaCl_2
 - 0.10 M solution of Na_2CO_3
 - 0.10 M solution of CuSO_4
 - 0.10 M solution of NaOH

Procedure

There are two reactions in this experiment. In your team of four students, one pair will complete Part 1 while the other pair completes Part 2. Then you will exchange data so that all students have both sets of data to analyze. Decide who will complete each experiment and write the names below:

Part 1: Calcium Carbonate Formation: Students: _____ and _____

Part 2: Copper (II) Hydroxide Formation: Students: _____ and _____

AST7.3: I can collect, organize, and display sufficient and appropriate data to facilitate scientific analysis and interpretation.

Data Tables, Patterns, and Graphs

Staple your completed Lesson 24 Mole to Mole Lab handout to the back of this document. You will refer to the data in your handout as you write the conclusion and summary for your lab today.

AST7.4: Analyze and Interpret Results - I can summarize and analyze data to draw a valid and supported conclusion to communicate the findings of an investigation, and identify uncertainties.

Conclusion (Evaluating the Hypothesis)

On the next page you will write your lab summary communicated in one or two well written paragraphs.

Key Question: How can you convert all reactants to products?

Here is a sample outline:

1. Restate your hypothesis and include the balanced chemical equations.
2. Did your results support your hypotheses for each reaction? Discuss the data from the lab. Refer to the data table and the balanced chemical equations. (e.g. if you predicted the most CaCl_2 would be in test tube #4, did your results support this? What did you see?)
3. Your method probably wasn't perfect, that's ok, as long as you discuss the issues. Discuss the tools used—were dropper bottles the best tool? Did the same person count the drops? Do you think you got the same size drops? How would the size of drops impact the results?
4. Propose improvements and then write a concluding sentence that ties to your introduction and brings your paragraph to a close.

Rubric for the Mole Ratio Lab Conclusion

Students earning a “2” or “1” may revise one time to raise proficiency to a “3.”

Report Aspects	4 “Highly Proficient”	3 “Proficient”	2 “Nearly Proficient”	1 “Beginning Proficient”
Writing Style:	<input type="checkbox"/> Summary has a strong & unique topic sentence. <input type="checkbox"/> The closing sentence relates well with the topic sentence. <input type="checkbox"/> It is communicated in a well-written report including complete sentences, correct spelling, grammar and punctuation.	<input type="checkbox"/> Summary has a relevant topic sentence. <input type="checkbox"/> The closing sentence relates well with the topic sentence. <input type="checkbox"/> It includes complete sentences, correct spelling, grammar and punctuation with only <u>minor errors</u> .	<input type="checkbox"/> Summary has a fairly relevant topic sentence. <input type="checkbox"/> The closing sentence does not relate well with the topic sentence. <input type="checkbox"/> It includes sentences, spelling, grammar and punctuation with <u>some errors</u> .	<input type="checkbox"/> Summary may or may not have a topic sentence. <input type="checkbox"/> It has no closing sentence or it does not relate with the topic sentence. <input type="checkbox"/> It is communicated in paragraphs but includes sentence fragments, poor spelling, poor grammar and punctuation.
Science Concepts: <input type="checkbox"/> Balanced equation <input type="checkbox"/> Mole ratio <input type="checkbox"/> reactant <input type="checkbox"/> product	<input type="checkbox"/> All 4 chemistry concepts are included and are accurately defined and used.	<input type="checkbox"/> All 4 chemistry concepts are included but some are defined or used with minor error.	<input type="checkbox"/> Some chemistry concepts are not included or are defined with some error.	<input type="checkbox"/> The chemistry concepts are defined with major error or missing altogether.
Evidence: Concepts are supported or explained with evidence from the lab and reading.	<input type="checkbox"/> The paragraph body includes very strong evidence and includes <u>both correctly balanced chemical equations</u> to support explanation.	<input type="checkbox"/> The paragraph body includes evidence and <u>at least one of the correctly balanced chemical equations</u> to support explanation.	<input type="checkbox"/> The paragraph body includes some evidence and examples to support explanation. The chemical equations may be missing, incomplete or incorrectly balanced.*	<input type="checkbox"/> The paragraph body includes evidence and examples to support explanation but is not relevant.

