



**Literacy Design
Collaborative**

Chemical Reactions

by Joanna Bruno

Adapted from "Chemical Reactions" by Jen Varrella, Gena D. Rowell, Joanna Bruno, and Cathrine N. Prenot

This module is meant to be taught independently or in conjunction with the Colorado Department of Education Instructional Unit Sample for High School Chemistry, "Chemical Reactions", found at: <http://www.cde.state.co.us/standardsandinstruction/instructionalunits-science>

This unit focuses on chemical changes and culminates in a performance assessment that asks students to investigate a reaction between zinc metal and hydrochloric acid in order to identify the useful product, state the reaction type and determine how much zinc would be required to make enough of this product. Students will react zinc metal with hydrochloric acid and determine stoichiometric ratio and calculate percent yield. Analysis of results will follow in the form of a formal lab report.

This is the culminating performance assessment for the Colorado Teacher-Authored Instructional Unit Sample: Chemical Reactions (<http://www.cde.state.co.us/standardsandinstruction/instructionalunits-science>). The performance task can be used in isolation or as a final assessment.

GRADES

9 - 12

DISCIPLINE

 **Science**

COURSE

 **Chemistry**

Section 1: What Task?

Teaching Task

Task Template 21 - Informational or Explanatory

Given known quantities of reactant, how much product can be made? After reading the lab procedures and performing the experiment, write a formal lab report in which you analyze the lab, providing examples to clarify your analysis.

Standards

CCSS

Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects

RST.11-12.1

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.2

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.11-12.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11—12 texts and topics.

RST.11-12.6

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

RST.11-12.10

By the end of grade 12, read and comprehend science/technical texts in the grades 11—CCR text complexity band independently and proficiently.

WHST.11-12.2

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.11-12.2.a

Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

WHST.11-12.2.b

Develop the topic thoroughly by selecting the most significant and relevant

facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

WHST.11-12.2.c Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

WHST.11-12.2.d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

WHST.11-12.2.e Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

WHST.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Colorado

Colorado Academic Standards for Science

- Matter can change form through chemical or nuclear reactions abiding by the laws of conservation of mass and energy
- Recognize, analyze, interpret, and balance chemical equations (synthesis, decomposition, combustion, and replacement) or nuclear equations (fusion and fission)
- Predict reactants and products for different types of chemical and nuclear reactions
- Predict and calculate the amount of products produced in a chemical reaction based on the amount of reactants



Examine, evaluate, question, and ethically use information from a variety of sources and media to investigate the conservation of mass and energy

Texts

 Chemical Reactions – Richard Spilsbury [lexile level 1100]

ISBN-10: 1403493421

 Chemistry: The Molecular Nature of Matter – Martin Silberberg [lexile level 1270]

ISBN-10: 0073402656

 Chemistry – Ann Newmark [lexile level 1040]

ISBN-10: 075661385X



 **Lab Report Rubric**

 **Zn + HCl lab experiment**



 **Procedure for Performance Task**



 **Performance Task Instructions**

LDC Student Work Rubric - Informational or Explanatory

	Not Yet	Approaches Expectations	Meets Expectations	Advanced
	1	2	3	4
Focus	Attempts to address prompt, but lacks focus or is off-task.	Addresses prompt appropriately, but with a weak or uneven focus.	Addresses prompt appropriately and maintains a clear, steady focus. D: Addresses additional demands sufficiently.	Addresses all aspects of prompt appropriately and maintains a strongly developed focus. D: Addresses additional demands with thoroughness and makes a connection to controlling idea.
Controlling Idea	Attempts to establish a claim, but lacks a clear purpose.	Establishes a controlling idea with a general purpose.	Establishes a controlling idea with a clear purpose maintained throughout the response.	Establishes a strong controlling idea with a clear purpose maintained throughout the response.
Reading/Research	Attempts to present information in response to the prompt, but lacks connections or relevance to the purpose of the prompt.	Presents information from reading materials relevant to the purpose of the prompt with minor lapses in accuracy or completeness.	Presents information from reading materials relevant to the prompt with accuracy and sufficient detail.	Accurately presents information relevant to all parts of the prompt with effective selection of sources and details from reading materials.
Development	Attempts to provide details in response to the prompt, including retelling, but lacks sufficient development or relevancy.	Presents appropriate details to support the focus and controlling idea.	Presents appropriate and sufficient details to support the focus and controlling idea.	Presents thorough and detailed information to strongly support the focus and controlling idea.
Organization	Attempts to organize ideas, but lacks control of structure.	Uses an appropriate organizational structure to address the specific requirements of the prompt, with some lapses in coherence or awkward use of the organizational structure.	Maintains an appropriate organizational structure to address the specific requirements of the prompt.	Maintains an organizational structure that intentionally and effectively enhances the presentation of information as required by the specific prompt.
Conventions	Attempts to demonstrate standard English conventions, but lacks cohesion and control of grammar, usage, and mechanics. Sources are used without citation.	Demonstrates an uneven command of standard English conventions and cohesion. Uses language and tone with some inaccurate, inappropriate, or uneven features. Inconsistently cites sources.	Demonstrates a command of standard English conventions and cohesion, with few errors. Response includes language and tone appropriate to the audience, purpose, and specific requirements of the prompt. Cites sources using an appropriate format with only minor errors.	Demonstrates and maintains a well-developed command of standard English conventions and cohesion, with few errors. Response includes language and tone consistently appropriate to the audience, purpose, and specific requirements of the prompt. Consistently cites sources using an appropriate format.
Content Understanding	Attempts to include disciplinary content in explanations, but understanding of content is weak; content is irrelevant, inappropriate, or inaccurate.	Briefly notes disciplinary content relevant to the prompt; shows basic or uneven understanding of content; minor errors in explanation.	Accurately presents disciplinary content relevant to the prompt with sufficient explanations that demonstrate understanding.	Integrates relevant and accurate disciplinary content with thorough explanations that demonstrate in-depth understanding.

Background for Students

Students will be trained in lab safety, will have had chemical nomenclature and will be competent in the mole concept.

Extension

To extend this work, teachers may have students:

- determine the cost of the zinc required for each battery given zinc's current price,
- perform the lab and test for hydrogen gas with a burning splint to support their product predictions,
- write half reactions for the oxidation and reduction processes (if redox has been introduced), or
- determine reaction rate based on different concentrations of HCl (if rates have been introduced)

<http://www.infomine.com/investment/metal-prices/zinc/> (Prices for zinc metal)

Section 2: What Skills?

Preparing for the Task

BRIDGING CONVERSATION > TASK ENGAGEMENT: Ability to connect the task and new content to existing knowledge, skills, experiences, interests, and concerns.

TASK AND RUBRIC ANALYSIS > TASK ANALYSIS: Ability to understand and explain the task's prompt and rubric.

Transition to Writing

BRIDGING CONVERSATION > PREPARING FOR WRITING: Ability to begin linking experimental results to writing task.

Writing Process

INTRODUCTION: ABILITY TO EXPLAIN THE PURPOSE OF THE LAB EXPERIMENT INCLUDING THE PROBLEM: Problem and Hypothesis

PROCEDURE: ABILITY TO EXPLAIN THE PROCEDURE/TECHNIQUES COMPLETELY.:



DATA: ABILITY TO CONSTRUCT APPROPRIATE TABLES, GRAPHS, AND CHARTS.:

DISCUSSION/CONCLUSION: ABILITY TO DESCRIBE FINDINGS BASED ON DATA AND OBSERVATIONS.:

REVISION: ABILITY TO REFINE TEXT, INCLUDING LINE OF THOUGHT, LANGUAGE USAGE, AND TONE AS:

ABSTRACT: THE ABILITY TO CONCISELY DESCRIBE THE EXPERIMENT.:

Section 3: What Instruction?

PACING	SKILL AND DEFINITION	PRODUCT AND PROMPT	SCORING GUIDE	INSTRUCTIONAL STRATEGIES
Preparing for the Task				
15 mins	BRIDGING CONVERSATION > TASK ENGAGEMENT: Ability to connect the task and new content to existing knowledge, skills, experiences, interests, and concerns.	SHORT CONSTRUCTED RESPONSE We've observed many chemical reactions. How can we determine how much product is made?	None	Demonstration of a chemical reaction (ex. Aluminum foil and Copper (II) chloride). Refer to previous chemical reactions that have been studied or observed.
15 mins	TASK AND RUBRIC ANALYSIS > TASK ANALYSIS: Ability to understand and explain the task's prompt and rubric.	NOTES Given the lab rubric sheet and the lab format writing guide, what questions or concerns do you have concerning writing a formal lab report?	None	Discuss questions students have about the rubric and how to meet the requirements. Use this rubric as a guide for the writing, but the LDC Informational rubric for scoring the final product.
Additional Attachments:				
<ul style="list-style-type: none">  Rubric explanation  Lab Rubric 				
Transition to Writing				
45 mins	BRIDGING CONVERSATION > PREPARING FOR WRITING: Ability to begin linking experimental results to writing task.	NOTES Perform calculations described in the lab procedure.	None	<ul style="list-style-type: none"> • Discussion-based strategies, such as seminar. • Small group discussion using question.
Writing Process				
30 mins	INTRODUCTION: ABILITY TO EXPLAIN THE PURPOSE OF THE LAB EXPERIMENT INCLUDING THE PROBLEM: Problem and Hypothesis	SHORT CONSTRUCTED RESPONSE: INTRODUCTION Write an introduction using the lab report format.	Rubric	<ol style="list-style-type: none"> 1. Explains the purpose of the lab experiment. 2. Include the problem and hypothesis (may be implied). 3. Any special technique or equipment (materials) should be listed and briefly explained.
30 mins	PROCEDURE: ABILITY TO EXPLAIN THE PROCEDURE/TECHNIQUES COMPLETELY.:	SHORT CONSTRUCTED RESPONSE: PROCEDURE Explain the procedure/techniques completely.	Rubric	This section should consist of a paragraph or paragraphs explicitly describing procedure. You may use the "bullet" method if you wish. This section should explain the unique procedure/technique that you developed, if applicable.
40 mins	DATA: ABILITY TO CONSTRUCT APPROPRIATE TABLES, GRAPHS, AND CHARTS.:	DATA Present data from the experiment.	Rubric	All tables, graphs, and charts and raw data should be included in this section. Include a sample calculation from the data manipulation of the experiment if it is warranted.

PACING	SKILL AND DEFINITION	PRODUCT AND PROMPT	SCORING GUIDE	INSTRUCTIONAL STRATEGIES
40 mins	DISCUSSION/CONCLUSION: ABILITY TO DESCRIBE FINDINGS BASED ON DATA AND OBSERVATIONS.:	LONG CONSTRUCTED RESPONSE Write a discussion/conclusion using lab report format.	Rubric	Be sure to answer all questions on original lab handout in paragraph form. Describe your findings based on your data and observations. Interpret your data and calculate % error. Explain your findings and discuss sources of error. You must make a connection between the lab and current topic being covered in the textbook to receive full credit. A major constituent of this section is drawing significance of your findings (tie in to purpose).
20 mins	REVISION: ABILITY TO REFINE TEXT, INCLUDING LINE OF THOUGHT, LANGUAGE USAGE, AND TONE AS:	NOTES Refine existing formal lab report.	Improvements/ revisions made from previous draft.	Students peer edit lab reports, using the rubric to give feedback for improvement.
30 mins	ABSTRACT: THE ABILITY TO CONCISELY DESCRIBE THE EXPERIMENT.:	SHORT CONSTRUCTED RESPONSE Construct an abstract using lab report format.	Rubric	<ol style="list-style-type: none"> 1. Concise 2-3 sentences (for this class' experiments) that briefly discusses purpose, findings and implications of the findings. 2. See handout of rubric for more explanation. 3. This section may seem redundant, but it is sometimes the only thing a reader will see.

Instructional Resources

No resources specified

Section 4: What Results?

Student Work Samples

No resources specified

Teacher Reflection

Not provided

All Attachments

 **Lab Report Rubric** : <https://s.ldc.org/u/8wxrj12agiqipbjlkczp4agco>

 **Zn + HCl lab experiment** : <https://s.ldc.org/u/7dy0k5n14p6higmapb1rnr1vl>

 **Procedure for Performance Task** : <https://s.ldc.org/u/88e3k2bghbxiehd5drqsgvfro>

 **Performance Task Instructions** : <https://s.ldc.org/u/ej423u803ufmplnklerd4lb24>