

Grade & Course: 9-12 Chemistry		Topic: Stoichiometry	Duration: 3 weeks
Georgia Standards and Content: SC3. Obtain, evaluate, and communicate information about how the Law of Conservation of Matter is used to determine chemical composition in compounds and chemical reactions. d. Use mathematics and computational thinking to identify and solve different types of reaction stoichiometry problems (i.e., mass to moles, mass to mass, moles to moles, and percent yield) using significant figures. (Clarification statement: For elements c and d emphasis is on use of mole ratios to compare quantities of reactants or products and on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.) e. Plan and carry out an investigation to demonstrate the conceptual principle of limiting reactants.			
Narrative / Background Information Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT) S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter. f. Construct an explanation based on evidence to describe conservation of matter in a chemical reaction including the resulting differences between products and reactants. (Clarification statement: Evidence could include models such as balanced chemical equations.)			
Year-Long Anchoring Phenomena: (LEARNING PROCESS) Changes to the measurement of chemicals added to Flint Michigan's water supply created dangerous levels of lead contamination in the drinking water.			
Unit Phenomena (LEARNING PROCESS) Airbags inflate to protect vehicle passengers when a collision sensor triggers solid sodium azide to rapidly decompose into nitrogen gas and sodium metal.			
MYP Inquiry Statement: Quantitative relationships exist between reactants and products in chemical reactions and help us predict the amount of substances involved in their corresponding yields.			
MYP Global Context: Scientific and Technical Innovation			
Approaches to Learning Skills: Communication skills Social skills Self Management skills Research skills Thinking skills	Disciplinary Core Ideas: (KNOWLEDGE & SKILLS) Stoichiometry Significant Figures Moles to Moles Mass to Moles Moles to Mass Mass to Mass Experimental Yield Theoretical Yield Percent Yield Limiting Reactants	Crosscutting Concepts: (KNOWLEDGE & SKILLS) Systems and System Models Stability and Change Scale, Proportion, and Quantity	
		MYP Key and Related Concepts: Models Evidence Consequences	

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Absence of conservation of particles during a chemical change.

Chemical changes perceived as additive, rather than interactive. After chemical change the original substances are perceived as remaining, even though they are altered.

Failure to perceive that individual substances and properties correspond to certain types of particles formation of a new substance with new properties is seen as simply happening rather than as the result of particle rearrangement.

Key Vocabulary: (KNOWLEDGE & SKILLS)

Stoichiometry

Significant Figures

Moles to Moles

Mass to Moles

Moles to Mass

Mass to Mass

Experimental Yield

Theoretical Yield

Percent Yield

Limiting Reactants

Inquiry Questions:

Factual - How can we determine mole ratios using a balanced chemical equation?

Conceptual - How is cooking and baking similar to chemistry? What is the amount of product dependent on?

Debatable - Is mass really being conserved on Earth?

MYP Objectives	Summative assessment	
Sciences	<p>Criterion A: Knowing and Understanding</p> <ul style="list-style-type: none"> Common Summative Assessment <p>Criterion B: Inquiring and Designing</p> <p>Criterion C: Processing and Evaluating</p> <ul style="list-style-type: none"> Common Laboratory Experience 	<p>Relationship between summative assessment task(s) and statement of inquiry: Students will perform tasks and respond to assessment items that will gauge their mastery of reactions as required by the Georgia Standards of Excellence. Mastery of these concepts is necessary to move forward in our student of chemical behavior.</p>

Learning Activities and Experiences	Inquiry & Obtain: (LEARNING PROCESS)	Evaluate: (LEARNING PROCESS)	Communicate: (LEARNING PROCESS)
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<div>Week 1</div> <div>Week 2</div> <div>Week 3</div>	<div>Engage:</div> <ul style="list-style-type: none">Core Interactive Text: Understanding the Importance of Mathematics of Formulas and EquationsVideo: Airbag Explosion - How do you think a chemist can use chemical formulas and equations to predict what will happen inside the airbag? <div>Explore:</div> <ul style="list-style-type: none">Image: The Stoichiometry of Water - What is the ratio of hydrogen to oxygen in water?Core Interactive Text: How Are the Principles of Stoichiometry Used to Calculate Quantities of Reactants or Products in a Chemical Reaction?Video: Practicing with Limiting Reactants - Why are two calculations necessary?Exploration: Mathematics of Formulas and Equations - Can you calculate the yield of these chemical reactions?	<div>Evaluate:</div> <ul style="list-style-type: none">Common Formative AssessmentCommon Summative Assessment	<div>Explain:</div> <ul style="list-style-type: none">Core Interactive Text: Explaining Mathematics of Formulas and Equations <div>Elaborate:</div> <ul style="list-style-type: none">Core Interactive Text: Applying Mathematics of Formulas and EquationsImage: Baking Pastries - How can a professional baker use mathematics of formulas and equations to increase or decrease the size of a recipe?
<div>Resources (hyperlink to model lessons and/or resources):</div> <div>Discovery Education Science Techbook</div>			

Reflection: Considering the planning, process and impact of the inquiry:

Prior to teaching the unit	During teaching	After teaching the unit
Review with students how to write formulas of ionic and covalent compounds.	Be consistent with daily formative assessment so students can practice and apply their knowledge.	(click here)