Rigorous Curriculum Design

Unit Planning Organizer

Subject:	Chemistry			Grade:	10-12
Unit Number:	4	Unit Name:	Stoichiometry		
Unit Length	Days:6 weeks + 1 week buffer		Mins/Day:		
Unit Synopsis	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.				

<table>
<tr><td rowspan="2">Priority Performance Expectations</td><td>NGSS</td><td colspan="2">Science and Engineering Practice(s)</td></tr>
<tr><td>HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.] [Assessment Boundary: Assessment does not include complex chemical reactions.]</td><td colspan="2">○ Ask Questions/Define Problems
○ Plan and Carry Out Investigations
○ Analyze and Interpret Data
○ Develop and Use Models
○ Construct Explanations and Design Solutions
○ Engage in Argument from Evidence
○ Use Mathematics and Computational Thinking
○ Obtain, Evaluate, and Communicate Information
Disciplinary Core Ideas
PS1.B: Chemical Reactions
▪ The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PS1-2),(HS-PS1-7)</td></tr>
<tr><td>Crosscutting Concepts</td><td colspan="3">○ Patterns
○ Cause and Effect: Mechanism and Explanation
○ Scale, Proportion, and Quantity
○ Systems and System Models
○ Energy and Matter: Flows, Cycles, and Conservation
○ Structure and Function
○ Stability and Change</td></tr>
<tr><td rowspan="2">Supporting Performance Expectations</td><td>NGSS</td><td>Math CCSS</td><td>Literacy CCSS</td></tr>
<tr><td>HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible</td><td>MP.2Reason abstractly and quantitatively. (HS-PS1-5),(HS-PS1-7)

HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7)
HSN-Q.A.2Define appropriate quantities for the purpose of descriptive modeling. (HS-PS1-4),(HS-PS1-7)
HSN-Q.A.3Choose a level of accuracy appropriate to limitations on measurement</td><td></td></tr>
</table>

	social, cultural, and environmental impacts. HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.	when reporting quantities. *(HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7)*	
Interdisciplinary Connections	NG ELD Standards		Literacy / Science / History / Other
	Productive 12 Selecting and applying varied and precise vocabulary and language structures to effectively convey ideas		

Unwrapped Priority Performance Expectations

PE:HS-PS1-7				
Skills	Concepts	Bloom's	DOK (Rigor Matrix)	Language Demand
Use	mathematical representations	Apply	1	
To support	the claim that atoms, and therefore mass, are conserved during a chemical reaction.			

PE:				
Skills	Concepts	Bloom's	DOK (Rigor Matrix)	Language Demand

PE: Chemical Rxns				
Skills	Concepts	Bloom's	DOK (Rigor Matrix)	Language Demand

Learning Progressions of Skills and Concepts

Previous Course_____	Current Course	Next Course_____
MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved	HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.	

DCI Reacting substances rearrange to form different molecules, but the number of atoms is conserved. Some reactions release energy and others absorb energy.	DCI Chemical processes are understood in terms of collisions of molecules, rearrangement of atoms, and changes in energy as determined by properties of elements involved.	

PE: DCI(s):		
Previous Course_____	Current Course	Next Course_____

PE: DCI(s):		
Previous Course_____	Current Course	Next Course_____

PE: DCI(s):		
Previous Course_____	Current Course	Next Course_____

PE: DCI(s):		
Previous Course_____	Current Course	Next Course_____

PE: DCI(s):		
Previous Course_____	Current Course	Next Course_____

Big Idea(s)	Corresponding Essential Question(s)

Mass is conserved in a chemical reaction Recycling preserves our environment.	What happens to mass in a chemical reaction? Why is recycling important?

Unit Vocabulary Words	
Academic Cross-Curricular Vocabulary (Tier 2)	Content/Domain Specific Vocabulary (Tier 3)
Mass; yield; products; synthesis; decomposition; particles; grams; coefficient; precipitate; ratio; conversion; neutral	Stoichiometry; chemical reaction; moles; reactants; combustion; single-replacement; double-replacement; acids; bases
Supporting Vocabulary (Tier 2)	Supporting Vocabulary (Tier 3)

Resources for Vocabulary Development (Strategies, Routines and Activities)

- Instagram vocab activity
- Vocabulary Matchbooks/Frayer model/Looping
- Vocabulary Flashcards
- Vocabulary Flipbook/Foldable
- Vocabulary around the World
- Vocabulary Snowball Fight
- Vocabulary Examples/non-examples
- Vocabulary Matrix
- Vocabulary Web
- Vocabulary Focus Word Wall
- Mnemonics

21st Century Skills

- ☐ Creativity and Innovation
- ☐ Critical Thinking and Problem Solving
- ☐ Communication and Collaboration
- ☐ Flexibility and Adaptability
- ☐ Globally and Financially Literate
- ☐ Communicating and Collaborating
- ☐ Initiative and Self-Direction
- ☐ Social and Cross-Cultural Skills
- ☐ Productivity and Accountability
- ☐ Leadership and Responsibility
- ☐ _____
- ☐ _____

Connections between 21st Century Skills, NGSS, and Unit Overview:

Costa & Kallick, 2008

Unit Assessments	
Pre-Assessment	Post-Assessment
Please see www.alvordschools.org/cfa for the most current EADMS CFA ID numbers.	Please see www.alvordschools.org/cfa for the most current EADMS CFA ID numbers.
Scoring Guides and Answer Keys	

Assessment Differentiation			
Students with Disabilities	***Accommodations*** Reference IEP to ensure appropriate testing environment ***Modifications***	English Language Learners	Emerging Expanding

Engaging Scenario Overview (Situation, challenge, role, audience, product or performance)	
Description:	Suggested Length of Time Days: Mins/Day:

Engaging Learning Experiences Synopsis of Authentic Performance Tasks		
Authentic Performance Tasks	Description	Suggested Length of Time
Task 1:	Problem Solving: SEP:	Days: Mins/Day:
Task 2:	Problem Solving:	Days:

	SEP:	Mins/Day:
Task 3:	Problem Solving:	Days:
	SEP:	Mins/Day:
Task 4:	Problem Solving:	Days:
	SEP:	Mins/Day:

Authentic Performance Task 1

Name:		Suggested Length	Days: Mins/Day:

Performance Expectations / Standards Addressed

Priority Standards

NGSS	Science and Engineering Practice(s)
	Disciplinary Core Idea(s)
	Crosscutting Concept(s)

Supporting Standards

NGSS	CCSS Math	CCSS Literacy	NG ELD

Teaching and Learning Progression

Bloom's	DOK

Scoring Rubric

Instructional Strategies			
All Students	SWD	ELs	Enrichment
	Accommodations	Emerging	
	Modifications	Expanding	
		Bridging	

Authentic Performance Task 2

Name:		Suggested Length	Days: Mins/Day:

Performance Expectations / Standards Addressed	Priority Standards			
	NGSS	Science and Engineering Practice(s)		
		Disciplinary Core Idea(s)		
		Crosscutting Concept(s)		
	Supporting Standards			
	NGSS	CCSS Math	CCSS Literacy	NG ELD

Teaching and Learning Progression		Bloom's	DOK
		Scoring Rubric	

Instructional Strategies			
All Students	SWD	ELs	Enrichment

	Accommodations	Emerging	
	Modifications	Expanding	
		Bridging	

Authentic Performance Task 3

Name:		Suggested Length	Days: Mins/Day:

Performance Expectations / Standards Addressed	Priority Standards			
	NGSS	Science and Engineering Practice(s)		
		Disciplinary Core Idea(s)		
		Crosscutting Concept(s)		
	Supporting Standards			
	NGSS	CCSS Math	CCSS Literacy	NG ELD

Teaching and Learning Progression		Bloom's	DOK
		Scoring Rubric	

Instructional Strategies			
All Students	SWD	ELs	Enrichment
	Accommodations	Emerging	

	Modifications	Expanding Bridging	

Authentic Performance Task 4

Name:			Suggested Length	Days: Mins/Day:
Performance Expectations / Standards Addressed	Priority Standards NGSS	Science and Engineering Practice(s) Disciplinary Core Idea(s) Crosscutting Concept(s)		
	Supporting Standards NGSS	CCSS Math	CCSS Literacy	NG ELD
Teaching and Learning Progression			Bloom's	DOK
			Scoring Rubric	
Instructional Strategies				
All Students	SWD	ELs	Enrichment	
	Accommodations ***Modifications***	Emerging Expanding		

		Bridging	

Engaging Scenario

Detailed Description (situation, challenge, role, audience, product or performance)			
Instructional Strategies			
All Students	SWD	ELs	Enrichment
	Accommodations	Emerging	
		Expanding	
	Modifications		
		Bridging	
Scoring Guide:			

Feedback to Curriculum Team Reflect on the teaching and learning process within this unit of study. What were some successes and challenges that might be helpful when refining this unit of study?		
	Successes	Challenges
Student		

Perspective		
Teacher Perspective		