AAPS Blended Unit Planning Document #1

Grade Level/Content Area

9-12 High School/Chemistry

Unit Title

Chemical Reactions

Unit Abstract

A description of the featured unit of study that characterizes the subject matter to be studied and states very generally what students are expected to learn and the types of learning activities that will be conducted to provide opportunities for learning.

In this unit on Chemical reactions students will be able to differentiate between the five different types of chemical reactions of synthesis, decomposition, single replacement, double replacement, and combustion reactions. Students will also be able to apply the Law of Conservation of Matter and Mass towards chemical reactions; specifically balancing chemical reactions. The end goal will be for students to be able to when giving the reactants of a chemical reactions be able to predict the products, write a balanced equation, determine the amount of product produced in the reaction, while also determining the limiting reactant.

Standards/Benchmarks

Identifying Expectations and Standards helps to ensure curricular alignment.

Are the appropriate goals (ie: content standards, benchmarks, curriculum objectives) identified?

Students who demonstrate understanding can:

HS-PS1-2. **Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.** [Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [*Assessment Boundary: Assessment is limited to*

chemical reactions involving main group elements and combustion reactions.]

HS-PS1-4. **Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.** [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.] [*Assessment Boundary: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.*]

HS-PS1-5. **Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.** [Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.] [*Assessment Boundary: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.*]

HS-PS1-6. **Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.*** [Clarification Statement: Emphasis is on the application of Le Chatelier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.] [*Assessment Boundary: Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.*]

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.*]

Essential Questions

A meaning of “essential” involves important questions that recur throughout one’s life. Such questions are broad in scope and timeless by nature. They are perpetually arguable – What is justice? Is art a matter of taste or principles? How far should we tamper with our own biology and chemistry? Is science compatible with religion? Is an author’s view privileged in determining the meaning of a text? We may arrive at or be helped to grasp understandings for these questions, but we soon learn that answers to them are invariably provisional. In other words, we are liable to change our minds in response to reflection and experience concerning such questions as we go through life, and that such changes of mind are not only expected but beneficial. A good education is grounded in such life-long questions, even if we sometimes lose sight of them while focusing on content mastery. The big-idea questions signal that education is not just about learning “the answer” but about learning how to learn. (Wiggins, Understanding by Design)

What is occurring during a chemical reaction?
Why do certain chemicals react with each other?
What makes up fire?

Student will know...

Summarizing the key content by setting up knowledge and skill goals for the unit helps designers focus lesson content.

PS1.B: Chemical Reactions

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PS1-4),(HS-PS1-5)
- In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. (HS-PS1-6)
- 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)

Students will be able to....

Summarizing the key skills goals for the unit helps designers focus lesson content.

- Students will be able to explain that reactions involve the rearrangement of atoms into new substances.
- Students will be able to identify reactants and products and identify the number of atoms of each element
- Students will be able to recognize the five different types of chemical reactions
- Students will be able to compare and contrast the different chemical reactions
- Students will be able to recognize a balanced equation

Current Teaching Design*

List every activity that you currently complete in your traditional classroom situation to teach this unit.

-Demos of the five types of reactions
-Chemical Reaction Labs (Nail Lab, Reaction Type Lab, Combustion Lab)
-Phet.Colorado.edu Simulation labs
-Notes on Reaction types
-Notes on Conservation of Matter and Mass
-Notes on Balancing Equations
-Notes on Limiting Reactants
-Notes on Stoichiometry
-Candy Lab to model balancing equations with M&M's
-Practice Problems for Balancing Equations, Stoichiometry, and Differentiating Between the Types of Chemical Reactions

Models

Recommended models for implementation. (ie flex, station rotation, lab rotation, flipped, individual, A La Carte, enriched virtual)

Stations rotations, Flipped,

Instruction and Activities

Based on what you have learned so far what instruction and activities will students engage with in the face-to-face (F2F) environment? Which will you now move to the online environment? For more support in planning this way, watch this video.

F2F	Online
1. Demo of the 5 different Reaction Types - To get students excited about the chemical reactions- 1. Burning Methane, 2. Synthesis of Water from Hydrogen Gas, 3. Decomposition of Hydrogen Peroxide, 4. Ammonium dichromate reaction - Students take notes and draw models of reactions 2. Reactions Minilab - Investigate a synthesis and decomposition 3. Replacement Reaction Demo 4. Replacement Reactions Lab 5. Combustion Reaction Demo	1. Reaction Type and Interpretation Practice (Google Docs) 2. Phet Simulation (Phet.colorado.edu), Lab Sheet (google doc) 3. Interpreting Reactions Quiz (Google Form Quiz) 4. Replacement Reactions Edpuzzle 5. Replacement Reaction Practice (Google Docs) 6. Improving Observation Skills (google slides and doc) 7. Types of Chemical Reactions (Google Doc) 8. Balancing Equations (quizlet) and practice (google doc) 9. Review Chemical Reactions Vocabulary (quizlet)

6. Balancing Chemical Reactions Model with Candy 7. Chemical Reactions Unit Test	10. Chemical Reactions Review (Google Docs)

Assessments

Based on what you have learned so far what instruction assessments will students engage with in the face-to-face (F2F) environment? Which will you now move to the online environment? Think about how you balance your assessment strategies (formative and summative).

F2F	Online
1. Synthesis and Decomposition reaction Minilab (formative) 2. Replacement Reaction Lab (formative) 3. Balancing Equations Practice WS (formative) 4. Modeling Balancing Chemical Reactions w/ Candy Lab (Formative) 5. Chemical Reactions Unit Test (Summative)	1. Phet Simulations (formative) - Students complete lab reports through google docs 2. Interpreting Reactions Quiz (summative) - Quiz completed through google forms 3. Balancing Equations (edpuzzle) and Ws on google docs (formative)

Resources

A selected repertoire of high quality resources that would equip a teacher to teach the unit is listed here.

F2F	Online
Chemicals and glassware for reaction labs, candy and materials for modeling balancing equations activity,	Edpuzzle, Google Drive,

TO-DO*

What items must you complete in order to finish the creation of this unit. If any of the items to the right must be modified for online delivery list it here. For example, create a short podcast, find a YouTube video, write a discussion question, re-write directions for an activity so it can take place online.

Order needed chemicals, clean glassware and equipment for labs, prepare quizlet for reaction unit, select videos for edpuzzle, upload lab forms and practice worksheets onto google drive, re-write labs so students can complete them online, Rewrite quizzes for google forms so they can be taken online.