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Enriched Chemistry

Unit 8 --Chemical Reactions

Relevant Textbook Reading:
Law of Conservation of Mass page 50
Reaction types pages 356-365
Activity Series page 360
Solubility pages 520-521
Predicting products page 356-365

Unit Learning Objectives/ Goals	By the end of this unit students should be able to: ● Explain the Law of Conservation of Mass. ● Classify and identify chemical reactions by the five reaction types. ● Interpret chemical equation symbols such as (s), (l), (aq), catalyst notation, and reversible reaction notation. ● Identify that combustion of a hydrocarbon produces carbon dioxide and water. ● Write balanced chemical equations to describe chemical reactions. ● Use the Activity Series to predict whether a single replacement reaction occurs. ● Predict the solubility of ionic compounds by using the solubility rules. ● Use the solubility rules to determine the precipitate in a double replacement reaction.Write balanced chemical equations from word equations. ● Predict the products in synthesis, decomposition, single replacement, double replacement and combustion reactions. ● Differentiate between nuclear reactions and chemical reactions based upon involved particles (electrons versus protons/neutrons) and stability (octet rule versus band of stability)

	• Define alpha, beta, and gamma radiation and explain penetrating capabilities of each. • Balance nuclear reaction equations. • Differentiate between nuclear fission and fusion • Understand common applications of nuclear chemistry. • Perform basic half-life calculations.
Performance Task- what are we working towards?	Chemical reactions can be described by 5 different types; synthesis, decomposition, single replacement, double replacement and combustion reactions. Students will be able to predict the products of a chemical reaction and balance the chemical equation so the Law of Conservation of Mass is followed. Students will be able to use the Activity Series and follow the Solubility Rules to predict if a reaction will occur. Students will be able to write the chemical equation from word equations keeping track of formula writing rules for compounds.
Unit Activities	
Day 1: Chemical and Physical Changes	Objective • Students will apply understanding of chemical/physical changes to classify processes as either chemical or physical changes. • Students will identify the types of chemical reactions (single replacement, double replacement, combustion, synthesis and decomposition) Activities • Discussion of chemical vs. physical changes • Discuss/demonstrate the indicators of chemical or physical changes. • Practice identifying changes and properties. Assignments • Watch optional video on Reaction types and Combustion, Synthesis, and Decomposition Reactions • Webassign on reaction types and Chemical/Physical Changes due day 2.

Day 2 : Law of Conservation of Mass Review of Balancing/Formula Writing and Introduction to combustion and synthesis reactions	Objectives • To write balanced equations including state symbols • To predict the products of combustion reactions • To predict products of a synthesis reaction, limited to a metal + a nonmetal -> a salt. Activities • Brief review of the reason for balancing chemical equations and going from word to formula. • Combustion of hydrocarbon as a compound of C and H or C, H and O reacting with oxygen to form CO_2 and H_2O. Assignments • WebAssign on reaction types due today • WebAssign Synthesis, Decomposition, and Combustion Reactions due Day 3
Day 3 : Decomposition reactions and single replacement.	Objectives • Students identify (not predict products of) decomposition reactions. • Use the Activity Series to predict whether a single replacement reaction occurs. Activities • Explanation of how to identify single replacement reactions and that single replacement reactions involve a transfer of electrons. • Introduction to the Activity series • Explain the differences between halogen and metal displacement reactions. Assignments • Optional video of Predicting Single Replacement Reactions • WebAssign Synthesis, Decomposition, and Combustion Reactions due tonight • WebAssign Single/Double Replacement Reactions due Day 5
Day 4: Single Replacement reactions	Objectives • Predict the solubility of ionic compounds by using the solubility rules. • Use the solubility rules to determine the precipitate in a double replacement reaction.Write balanced chemical equations from word equations. Activities • Students will predict the products of double replacement reactions.

	• Predicting both single replacement reactions of metals and halogens. Assignments • Optional video Predicting Double Replacement Reactions • Webassign Single/Double Replacement Reactions due Day 5
Day 5: Double Replacement reactions	Objectives: • Use the solubility rules to determine the precipitate in a double replacement reaction.Write balanced chemical equations from word equations. • Predict the products in synthesis, decomposition, single replacement, double replacement and combustion reactions. Activities • Use the solubility rules to predict precipitate formation • Identify Acid Base Neutralization as double replacement. Assignments • Webassign Single/Double Replacement Reactions due tonight • OPTIONAL WebAssign Review due Day 6
Day 6: Mixed Single and Double Replacement Reactions	Objectives • To practice both single and double replacement reactions. Activities • Students will practice on Single and Double Replacement Reactions in class via worksheets or by working on the WebAssign Review. Assignments • Webassign Review OPTIONAL due tonight • Do Now quiz on single and double replacement reactions day 7
Day 7: Nuclear Decay	Objectives • Students will explain that a nuclear change alters the nucleus, and if the atomic number changes, then the element does also. • Students will identify alpha, beta and gamma decay processes and write decay equations.

	• Students will identify the relative penetration power of different types of radiation. Activities • Do Now quiz on single and double replacement reactions • Introduction to nuclear decay. Explain that unstable nuclei will decay (either rapidly or slowly) to other nuclei. • Introduce alpha, beta and gamma decay. The rules for conserving atomic and mass number will be explained, and some nuclear equations will be practiced. Assignments • WebAssign nuclear reactions due Day 8
Day 8: Half-life	Objectives • Students will calculate how much of a radioactive isotope will remain after a certain amount of time based on its half life. Activities • Some direct instruction on half life as the amount of time it takes for a sample of a radioactive isotope to decay to one-half its original value. • Misconception--Explain how the rate of decay is faster when more radioactive material is present. Explain how half lives of radioactive materials are used to date different objects. We will then perform a couple of half life problems using carbon 14 and uranium 238. Assignments • Webassign half-life due on Day 9 • Do now quiz on half-life Day 10
Day 9: Fission, Fusion and Nuclear Power	Objectives • Students will relate fission and fusion to their nuclear equations. • Students will explain how fission is used in early atomic weapons and nuclear power plants. • Students will explain that fusion is the reaction that powers the sun and it is the process in H-bomb. Activities • Instruction on the process of fission and the first controlled nuclear chain reaction. • Explain how fission releases massive amounts of energy and relate to practical purposes. • Explain how fusion is cleaner nuclear process because there are no daughter nuclei with dangerous decay processes. It also gives off more energy. Gravity is the force that allows

	H and He nuclei to fuse in the sun. Assignments • WA fission, fusion and nuclear power due Day 10.
Day 10: and Bombardment Reactions	Objectives • Students will explain that a nuclear change alters the nucleus, and if the atomic number changes, then the element does also. • Students will explain how transuranium elements are synthesized. Activities • Do now quiz on half-life. • Finish explaining nuclear power. • Practice Balancing nuclear reactions. • Class time for WA work if there is sufficient time. Assignments • WebAssign fission, fusion, and nuclear power due tonight • Do-now quiz on Nuclear equations on Day 11
Day 11: Assessment	
Lab 1: Physical Changes and Properties Versus Chemical Changes and Properties	Objectives • Differentiate between physical change and chemical change • Differentiate between physical properties and chemical properties Activities • Students use observations in changes (or lack thereof) in physical properties in chemical reactions to determine whether a physical change occurred or a chemical change occurred Assignments • Finish lab write-up
Lab 2: Types of Reactions	Objectives • Students will be able to differentiate between 5 general type of chemical reactions based on examining their reactants and products Activities • Students perform each type of chemical reaction and make observations Assignments

	• Finish lab write-up
Lab 3: Half-life	Objectives • Predict half-life based on data • Use data to determine half-life Activities • Students use objects like pennies or die in order to simulate the process of half-life Assignments • Finish lab write-up
Optional Lab 1: Activity Series	Objectives • Students will be able to develop an activity series based on reactions they observe with solid metals and aqueous salts Activities • Students perform chemical reactions and develop an activity series based on their results Assignments • Finish lab write-up
Optional Lab 2: Double Replacement Reaction Lab	Objectives • Students will be able to predict and verify solubility based on solubility rules • Differentiate between formation of a precipitate and when products remain aqueous Activities • Students mix chemicals in patterns by rows and columns on a well plate and determine which form precipitates and which do not Assignments • Finish lab write-up
Optional Lab 3: Nuclear Fission Simulation	Objectives • Examine what causes the fission process utilized in fission nuclear reactors and nuclear bombs • Differentiate between controlled fission and uncontrolled • Describe critical mass Activities • Students use a PhET simulation in 3 phases to first see what causes fission of one atom,

	then see a fission chain reaction, and then see fission in a nuclear reactor Assignments ● Finish lab write-up