Subject: Physical Science
Grade Level: 9-12
Unit Title: Chemical Bonding and Chemical Interactions

Timeframe Needed for Completion: 20 days

Grading Period: 2nd nine weeks

Big Idea/Theme: Chemical Bonding and Chemical Interactions
Understandings:

- Understand types, properties, and structure of matter.
- Understand the role of the nucleus in radiation and radioactivity.

Essential Questions:

- What is a chemical reaction?
- Why is balance important?
- Why does bonding occur in nature?
- What can we learn from names?
- Is radioactivity a blessing or a curse?

Essential Skills/Vocabulary: (Essential vocabulary is in bold)
PSc.2.2.1
• Predict the number of **valence electrons** of **representative elements** (A Groups or 1, 2, 13-18) based on its location in the **periodic table**.
• Predict an element's **oxidation number** based on its position in the periodic table and valence electrons. (Representative groups including multiple oxidation states for tin and lead.)
• Predict **reactivity** of metals and nonmetals from general **periodic trends**.

PSc.2.2.2
• Describe how **ionic, covalent, and metallic bonds** form and provide examples of substances that exhibit each type of bonding.
• Predict the type of bond between two **elements** in a **compound** based on their positions in the periodic table.

PSc.2.2.3

Essential Standards:
PSc.2.2.1:

- Infer valence electrons, oxidation number, and reactivity of an element based on its location in the Periodic Table.

PSc.2.2.2:

- Infer type of chemical bond that occurs, whether covalent, ionic, or metallic, in a given substance.

PSc.2.2.3:

- Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions.

PSc.2.2.4:

- Exemplify the law of conservation of mass by balancing chemical equations.

PSc.2.2.5:

- Classify types of reactions such as synthesis, decomposition, single replacement, or double replacement.

PSc.2.2.6:

- Summarize the characteristics and interactions of acids or bases.

Assessment Tasks/Activities:

- Cornell Notes

• Name and write **formulas** for simple **binary compounds** containing a **metal** and **nonmetal** using representative elements (A Groups or 1, 2, 13-18) and compounds involving common **polyatomic ions**: ammonium ($NH4^+$), acetate ($C2H3O2^-$), nitrate ($NO3^-$), hydroxide (OH^-), carbonate ($CO32^-$), sulfate ($SO42^-$), phosphate ($PO43^-$). • Name and write formulas for binary compounds of two **nonmetals** using Greek prefixes (mono-, di-, tri-, tetra-, etc.). **PSc.2.2.4** • Use **coefficients** to balance simple **chemical equations** involving elements and/or binary compounds. • Conclude that chemical equations must be balanced because of the **law of conservation of matter**. **PSc.2.2.5** • Classify chemical reactions as one of four types: **single replacement**, **double replacement**, **decomposition** and **synthesis**. (**Neutralization reaction** is a type of double replacement reaction.) • Summarize reactions involving **combustion** of hydrocarbons as *not* fitting into one of these four types. Hydrocarbon + oxygen → carbon dioxide + water. **PSc.2.2.6** • Recognize common **inorganic acids** including **hydrochloric (muriatic) acid**, **sulfuric acid**, **acetic acid**, **nitric acid** and **citric acid**. • Recognize common **bases** including **sodium bicarbonate**, and **hydroxides of sodium, potassium, calcium, magnesium, barium and ammonium**. • Define **acids** and **bases** according to the **Arrhenius theory**.	• Predict valence and oxidation numbers • Writing Prompt: What do you do to get ready for the day at school? What makes them feel prepared for their daily tasks? How do they feel if they are not prepared? How might this relate to chemical reactivity? • Reactivity Practice worksheet • Reactivity Lab • Quick Write: Why does bonding occur in nature? • Names and Formulas of Ions chart • Create models of ionic, covalent, and metallic bonding • Writing Prompt: Explain the types of bonding that can occur. • Bonding Types Identification Practice • Find Your Partner's Activity • Writing Names and Formulas of Binary Ionic Compounds Practice • Use the following website to create rules for naming Binary Molecular Compounds http://www.800mainstreet.com/5/0005-0010-naming.htm • Molecular Compounds Learning Guide • Binary Formulas Practice • Quick Write: What do you think a polyatomic ion is? • Predict polyatomic formulas • Ternary Formulas Practice • Foldable: summarize bonds and naming and writing formulas • Chemical Bonds mini-test • Candy Chemistry activity • Balancing Equations online activity

- Develop an understanding of the **pH scale** and the classification of substances therein.
- Generalize common characteristics of acids and bases– pH range, reactivity with metals and carbonates (acids) or fats/oils (bases), conductivity.
- Relate general household uses of acids and bases with their characteristic properties.
- Explain what happens in a neutralization reaction, identifying each component substance.

http://www.middleschoolscience.com/balance.html

- Balancing Equations Practice
- The Nuts and Bolts of Chemical Reactions Activity
- Dancing Partners activity
- Cartoon Chemistry
- Identifying Types of Reactions practice
- Types of Reactions Lab
- Writing Prompt: What happens during a chemical reaction?
- Quick Write: How do you know if a chemical reaction has occurred?
- Writing Prompt: Explain evidences of chemical reactions in your daily life.
- Chemical Reactions mini-test
- Taste Bud Teasers
- Acid, Base, and pH scale Lab
- Create Acid & Base mini-posters
- Quick Write: What does it mean to neutralize something?
- Neutralization Salts Chart
- Acids, Bases, and Salts mini-test
- Chemical Interactions Unit Test

21st Century Skills	Activities
Communication Skills	
Conveying thought or opinions effectively	
When presenting information, distinguishing between relevant and irrelevant information	

Explaining a concept to others	
Interviewing others or being interviewed	
Computer Knowledge	
Using word-processing and database programs	
Developing visual aides for presentations	
Using a computer for communication	
Learning new software programs	
Employability Skills	
Assuming responsibility for own learning	
Persisting until job is completed	
Working independently	
Developing career interest/goals	
Responding to criticism or questions	
Information-retrieval Skills	
Searching for information via the computer	
Searching for print information	
Searching for information using community members	
Language Skills - Reading	
Following written directions	
Identifying cause and effect relationships	
Summarizing main points after reading	
Locating and choosing appropriate reference materials	
Reading for personal learning	
Language Skill - Writing	
Using language accurately	
Organizing and relating ideas when writing	
Proofing and Editing	
Synthesizing information from	

several sources	
Documenting sources	
Developing an outline	
Writing to persuade or justify a position	
Creating memos, letters, other forms of correspondence	
Teamwork	
Taking initiative	
Working on a team	
Thinking/Problem-Solving Skills	
Identifying key problems or questions	
Evaluating results	
Developing strategies to address problems	
Developing an action plan or timeline	

Materials Suggestions:

- Lab supplies