

Kenai Peninsula Borough School District
Science; Chemistry
Unit 4: Ionic Compounds and Covalent Bonding

Pacing:

NGSS Standards:

HS-PS1-1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms

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

HS-PS1-3 Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles

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

HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [

ELA/LITERACY :

RST.11-12.7 Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. (HS-PS1-1)

RST.11-12.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain. (HS-PS1-3)

WHST.9-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. (HS-PS1-2)

WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11–12.) (HS-PS1-2)

WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-PS1-3)

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS1-3)

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-PS1-3)

SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-PS1-4)

MATHEMATICS :

MP.2 Reason abstractly and quantitatively. (HS-PS1-7)

- a. decontextualize to abstract a given situation and represent it symbolically and manipulate the representing symbols.
- b. reflect during the manipulation process in order to probe into the meanings for the symbols involved
- c. create a coherent representation of the problem
- d. make sense of quantities and their relationships in problem situations
- e. attend to the meanings of quantities
- f. use flexibility with different properties of operations and objects
- g. translate an algebraic problem to a real world context
- h. explain the relationship between the symbolic abstraction and the context of the problem
- i. compute using different properties
- j. consider the quantitative values, including units, for the numbers in a problem

MP.4 Model with mathematics. (HS-PS1-4),

- a. apply mathematics to solve problems in everyday life, society, and workplace
- b. identify important quantities in a practical situation and map the relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas
- c. consistently interpret mathematical results in the context of the situation and reflect on whether the results make sense
- d. apply knowledge, making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later
- e. make assumptions and approximations to simplify a situation, realizing the final solution will need to be revised
- f. identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, and formulas
- g. analyze quantitative relationships to draw conclusions
- h. improve the model if it has not served its purpose

HSN-Q.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-PS1-3),(HS-PS1-4),(HS-PS1-7)

HSN-Q.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-PS1-4),(HS-PS1-7)

HSN-Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS1-2),(HS-PS1-3),(HS-PS1-4), (HS-PS1-7)

Essential Questions:

1. What is a chemical bond?
2. Why do ions form?
3. What family of elements is relatively unreactive and why?
4. Describe the formation of both positive and negative ions.
5. What is an ionic bond and how does it form?
6. List three physical properties associated with an ionic bond.
7. What is lattice energy and how is it involved in an ionic bond?
8. What is the difference between a monoatomic and polyatomic ion? Give an example of each.
9. How do you determine the correct subscripts in a chemical formula?
10. How are metals name in an ionic compound? Nonmetals? polyatomic ions? Oxyanions?
11. What is a metallic bond?
12. Explain the properties of metals based on metallic bonding.
13. What is an alloy?
14. What is a covalent bond and how does it form?
15. What is a binary molecular compound?
16. Compare and contrast naming binary acids and other binary covalent molecules.
17. What is the role of the central atom when drawing the Lewis structure for a molecule?
18. What is resonance?
19. What is the VSEPR model and how is it used to determine molecular shape?
20. Define electronegativity?
21. How is electronegativity used to determine bond type?
22. What is a polar molecule?
23. List three properties of a covalent compound.

Big Ideas:

1. A chemical bond is the force that holds two atoms together.
2. Formation of ions.
3. The formation and nature of ionic bonds.
4. Lattice energy is needed to break the force of attraction between oppositely charged ions.
5. Physical properties of ionic solids.
6. Names and formula for ionic compounds.
7. Metallic bonds and properties of metals
8. The electron sea model can explain the properties of metallic solids.
9. Metal alloys are formed when a metal is mixed with one or more other elements.
10. Formation of a covalent bond and its properties.

11. Naming molecules.
12. The Lewis structure is used to show the distribution of shared and lone pairs in a molecule.
13. Resonance occurs when more than one valid Lewis structure exists for the same molecule.
14. VSEPR and how it determines the shape of a molecule.
15. How electronegativity can help determine the polarity of a molecule.

Vocabulary: Alloy, Anion, Cation, Chemical bond, Delocalized electrons, Electrolyte, Electron sea model, Formula unit, Ionic bond, Lattice energy, Metallic bond, Monoatomic ion, Oxidations number, Oxyanion, Polyatomic ion, Covalent bond, Endothermic, Exothermic, Hybridization, Lewis structure, Molecule, Oxyacid, Resonance, Structural formula, VSEPR model