

**Kenai Peninsula Borough School District**  
**Science; Chemistry**  
**Unit 3: THE PERIODIC TABLE AND THE PERIODIC LAW, ELEMENTS**

**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-ESS3-2** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

**Math Standards:**

**MP.2** Reason abstractly and quantitatively. (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4)(HS-PS1-3)

**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-ESS3-3) (HS-PS1-3)

**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

**N-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)

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

**ELA STANDARDS:**

**RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-ESS3-2)

**RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. (HS-PS1-1)

**RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS1-3) (HS-ESS3-2)

**WHST.9-10.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-3)

**WHST.9-10.5** 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. (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)

### Essential Questions

1. Describe the development of the modern periodic table.
2. Sketch a simplified version of the periodic table and indicate the location of groups, periods, metals nonmetals and metalloids.
3. Describe the general characteristics of metals, nonmetals and metalloids.
4. Explain why elements in the same group have similar chemical characteristics.
5. Describe how group number and valence electrons are related.
6. Describe how period is related to energy levels.
7. Sketch a simplified periodic table and use arrows and label to compare period and group trends in atomic and ionic radii, ionization energies and electronegativities.
8. Explain how the period and group trends are related to electron configuration.
9. Why are the elements in groups 1A through 8A called the representative elements?
10. What determines the chemical behavior of an element?
11. In general how do s, p, d and f blocks differ?
12. What is an allotrope? Describe the allotropes of carbon.
13. How do a mineral and ore differ?
14. What factor determines the magnetic properties of an element and the color of its compounds?
15. What is metallurgy?
16. Compare and contrast the actinide and lanthanide series.

### Big Ideas:

1. Periodic law states that when the elements are arranged by increasing atomic number there is a periodic repetition of their chemical and physical properties.
2. History of the development of the periodic table.
3. Organization of the periodic table into groups and periods.
4. Element classification by element type.
5. Elements in the same group on the periodic table of similar chemical properties due to their electron configuration.
6. How the periodic table is organized.
7. The energy level of an atom's valence electrons equals its period number.
8. For group A elements, an atom's group number equals its number of valence electrons.
9. Periodic trends of atomic radii, ion size, ionization energy, valence electrons, electronegativity and bond type.
10. The octet rule states that atoms gain, lose or share electrons in order to acquire the stable electron configurations of a noble gas.
11. The number and location of valence electrons determines an element's position on the periodic table and its chemistry.
12. Properties and uses of s, p, d and f- block elements.
13. Know the most abundant elements of the earth's crust.

**Vocabulary:** Alkali metal, Alkaline earth metal, Electronegativity, Group, Metallurgy, Mineral, Ore, Halogen, Inner transition metal, Ion, Ionization energy, Metal, Metalloid, Noble gas, Nonmetal, Octet

rule, Period, Periodic law, Representative elements, Transition element, Transition metal, Actinide series, Allotrope, Diagonal relationship, Ferromagnetism, Lanthanide series