

Kenai Peninsula Borough School District
Science: Chemistry
Unit 2: ATOMIC STRUCTURE

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-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

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

HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).

HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

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
- consider the quantitative values, including units, for the numbers in a problem

MP.4 Model with mathematics. (HS-PS1-8)

- 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

HSA.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (HS-PS4-1),(HS-PS4-3)

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-PS1-7),(HS-PS1-8)(HS-PS2-6)

HSN-Q.2 Define appropriate quantities for the purpose of descriptive modeling. HS-PS1-7), (HS-PS1-8) (HS-PS2-6)

HSN-Q.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (HS-PS4-1), (HS-PS4-3)

HSA-SSE.1 Derive the formula for the sum of a finite series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.(HS-PS4-1),(HS-PS4-3)

HSA-SSE.3

HSA.CED.4

ELA STANDARDS:

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.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (HS-PS1-3)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (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. (HS-PS1-2)

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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.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering their search question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism 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.** What is the current model of the atom?
- 2.** Why do atoms interact with other atoms?
- 3.** What is the general atomic structure of an atom?

BIG IDEAS:

1. Current model of the atom
2. Octet Rule
3. Structure of atom

Vocabulary: Atom, Energy level, Protons, Neutrons, Electrons, Mass, Isotope, Nucleus, Mass number, Atomic number, Ion