

Kenai Peninsula Borough School District
Science: Physical Science
Unit 5: SOLUTIONS, ACIDS AND BASES

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-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

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-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

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-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

ELA/LITERACY :

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) (HS-PS1-5) (HS-PS2-6) (HS-PS3-3) (HS-PS3-4)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-2) (HS-PS1-5)

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)

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) (HS-PS1-6) (PS3-3) (HS-PS3-4)

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 the research 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) (HS-PS3-3)

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

SL.9-12.5 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) (HS-PS3-1) (HS-PS3-2)

MATHEMATICS:

MP.2 Reason abstractly and quantitatively. (HS-PS1-5) (HS-PS1-7) (PS3-3) (HS-PS3-4) (HS-PS3-1) (HS-PS3-2) (HS-PS3-3) (HS-PS3-4)

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) (HS-PS1-8) (PS3-3) (HS-PS3-4) (HS-PS3-1) (HS-PS3-2) (HS-PS3-3) (HS-PS3-4)

- 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-PS1-5) (HS-PS1-7) (HS-PS1-8) (HS-PS2-6) (HS-PS3-1) (HS-PS3-3)

HSN-Q.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-PS1-4) (HS-PS1-7) (HS-PS1-8) (HS-PS2-6) (HS-PS3-1) (HS-PS3-3)

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-PS1-5) (HS-PS1-7) (HS-PS1-8) (HS-PS2-6) (PS3-1) (PS3-3)

ESSENTIAL QUESTIONS:

1. Identify the various types of solutions.
2. How would you determine the pH of various types of solutions?

BIG IDEAS:

1. Acids and bases in our daily lives and on our planet.
2. The concept of pH and what effects the pH of solution has on matter.
3. Characteristics of solutions

Vocabulary: Acid, Base, Neutral, pH, solute, solvent, solution, mixture, soluble, insoluble, concentration, heterogeneous, homogenous