Utah Science with Engineering Education (SEEd)

Grade 8

Adopted 2017

Matter and Energy Interact in the Physical World

1. **Develop a model to describe the scale and proportion of atoms and molecules. Emphasize developing atomic models of elements and their numbers of protons, neutrons, and electrons, as well as models of simple molecules. topics like valence electrons, bond energy, ionic complexes, ions, and isotopes will be introduced at the high school level.** 8.1.1
2. **Obtain information about various properties of matter, evaluate how different materials' properties allow them to be used for particular functions in society, and communicate your findings. Emphasize general properties of matter.** 8.1.2
3. **Plan and conduct an investigation and then analyze and interpret the data to identify patterns in changes in a substance's properties to determine whether a chemical reaction has occurred.** 8.1.3
4. **Obtain and evaluate information to describe how synthetic materials come from natural resources, what their functions are, and how society uses these new materials.** 8.1.4
5. **Develop a model that uses computational thinking to illustrate cause and effect relationships in particle motion, temperature, density, and state of a pure substance when heat energy is added or removed. Emphasize molecular-level models of solids, liquids, and gases to show how adding or removing heat energy can result in phase changes, and focus on calculating the density of a substance's state.** 8.1.5
6. **Develop a model to describe how the total number of atoms does not change in a chemical reaction, indicating that matter is conserved. Emphasize demonstrations of an understanding of the law of conservation of matter. Balancing equations and stoichiometry will be learned at the high school level.** 8.1.6
7. **Design, construct, and test a device that can affect the rate of a phase change. Compare and identify the best characteristics of competing devices and modify them based on data analysis to improve the device to better meet the criteria for success.** 8.1.7

Energy is Stored and Transferred in Physical Systems	1. **Use computational thinking to analyze data about the relationship between the mass and speed of objects and the relative amount of kinetic energy of the objects. Emphasis should be on the quantity of mass and relative speed to the observable effects of the kinetic energy.** 8.2.1
	2. **Ask questions about how the amount of potential energy varies as distance within the system changes. Plan and conduct an investigation to answer a question about potential energy. Emphasize comparing relative amounts of energy.** 8.2.2
	3. **Engage in argument to identify the strongest evidence that supports the claim that the kinetic energy of an object changes as energy is transferred to or from the object.** 8.2.3
	4. **Use computational thinking to describe a simple model for waves that shows the pattern of wave amplitude being related to wave energy. Emphasize describing waves with both quantitative and qualitative thinking.** 8.2.4
	5. **Develop and use a model to describe the structure of waves and how they are reflected, absorbed, or transmitted through various materials. Emphasize both light and mechanical waves.** 8.2.5
	6. **Obtain and evaluate information to communicate the claim that the structure of digital signals are a more reliable way to store or transmit information than analog signals. Emphasize the basic understanding that waves can be used for communication purposes.** 8.2.6
Life Systems Store and Transfer Matter and Energy	1. **Plan and conduct an investigation and use the evidence to construct an explanation of how photosynthetic organisms use energy to transform matter. Emphasize molecular and energy transformations during photosynthesis.** 8.3.1
	2. **Develop a model to describe how food is changed through chemical reactions to form new molecules that support growth and/or release energy as matter cycles through an organism. Emphasis is on describing that during cellular respiration molecules are broken apart and rearranged into new molecules, and that this process releases energy.** 8.3.2
	3. **Ask questions to obtain, evaluate, and communicate information about how changes to an ecosystem affect the stability of cycling matter and the flow of energy among living and nonliving parts of an ecosystem. Emphasize describing the cycling of matter and flow of energy through the carbon cycle.** 8.3.3
Interactions with Natural Systems and Resources	1. **Construct a scientific explanation based on evidence that shows that the uneven distribution of Earth's mineral, energy, and groundwater resources is caused by geological processes.** 8.4.1
	2. **Engage in argument supported by evidence about the effect of per capita consumption of natural resources on Earth's systems. Emphasize that these resources are limited and may be non-renewable.** 8.4.2

3. **Design a solution to monitor or mitigate the potential effects of the use of natural resources. Evaluate competing design solutions using a systematic process to determine how well each solution meets the criteria and constraints of the problem.** 8.4.3

4. **Analyze and interpret data on the factors that change global temperatures and their effects on regional climates.** 8.4.4

5. **Analyze and interpret patterns of the occurrence of natural hazards to forecast future catastrophic events, and investigate how data are used to develop technologies to mitigate their effects. Emphasize how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow prediction, but others, such as earthquakes, may occur without warning.** 8.4.5