

Shenandoah Community School District
Science
Grade - 8

8.3 Physical Science

8.3.1 (SCSD) Understand and apply knowledge of:

1) elements, compounds, mixtures, and solutions based on the nature of their physical and chemical properties, and 2) physical and chemical changes and their relationship to the conservation of matter and energy (I,D,M)

- Know that a substance has characteristic properties (Physical or chemical property that helps identify and classify substances) (I,D,M)
 - A substance's atomic structure determines its physical and chemical properties (I,D,M)
 - All of which are independent of the amount of the sample (I,D,M)
 - A mixture of substances often can be separated into the original substances using one or more of the characteristic properties (I,D,M)
 - Freezing/melting point (I,D,M)
 - Boiling/condensing point (I,D,M)
 - Density (I,D,M)
 - Magnetism (I,D,M)
 - Solubility (I,D,M)
- Know that substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties (I,D,M)
 - Chemical reactions form new substances (compounds) by breaking and making chemical bonds (I,D,M)
 - The properties of compounds depend on their atoms and chemical bonds (I,D,M)
 - When substances dissolve to form a solution, the properties of the mixture Changes (I,D,M)
 - In chemical reactions the total mass is conserved (I,D,M)
 - Identify chemical changes (I,D,M)
 - Chemical reactions can release heat (I,D,M)
 - Describe temperature and heat (I,D,M)
 - Substances often are placed in categories or groups if they react in similar Ways (I,D,M)
 - Metals (I,D,M)
- Know that chemical elements do not break down during normal laboratory reactions involving such treatments as: (I,D,M)
 - Heating (I,D,M)
 - Exposure to electric current (I,D,M)
 - Reaction with acids (I,D,M)
- Understand the difference between physical and chemical changes (I,D,M)
 - Physical changes can be reserved. The materials undergoing a physical change can be removed (I,D,M)
 - Chemical changes cannot be reserved. A new type of matter is formed (M)
- Know the building blocks of matter (atoms, elements, molecules and compounds) (I,D,M)
 - Matter changes form and moves from place to place (I,D,M)
 - States of matter include: solids, liquids and gases (I,D,M)
 - The state that matter exists depends upon the amount of heat present in the system (I,D,M)

- when heat, light, sound, and chemical changes are produced (I,D,M)
- Describe circuits (I,D,M)
- Understand magnetism and static electricity (I,D,M)
- Know that electrical energy is measured in a unit called watts (measured)
 - Hydroelectric plants change the energy of falling water to electrical energy (created) (I,D,M)
- Know that in most chemical and nuclear reactions, energy is transferred into or out of a system (I,D,M)
 - Heat, light, mechanical motion or electricity might all be involved in such Transfer (I,D,M)
- Know that the sun is a major source of energy for changes on the Earth's Surface (I,D,M)
 - The sun loses energy by emitting light (I,D,M)
 - A tiny fraction of the sun's light reaches the earth (I,D,M)
 - Transferring energy from the sun to the earth (I,D,M)
 - The sun's energy arrives as light with a range of wavelengths, consisting of:
 - ✚ Visible light (I,D,M)
 - ✚ Infrared (I,D,M)
 - ✚ Ultraviolet radiation (I,D,M)
- Know that the vital process of photosynthesis (process of converting light energy to chemical energy and storing it in the bonds of sugar) provides energy to sustain life on Earth (I,D,M)
 - Waves transfer energy and interact in predictable ways (I,D,M)
- Know how chemical energy changes to heat energy (I,D,M)
 - Chemical energy in food can change to heat energy through digestion (I,D,M)
 - Fossil fuel can change to heat energy through combustion (burning) (I,D,M)

8.3.3 (SCSD) Understand and apply knowledge of motions and forces (I,D,M)

- Know that the motion of an object can be described (I,D,M)
 - Position (I,D,M)
 - Direction (I,D,M)
 - Motion (I,D,M)
 - Speed (I,D,M)
- Know that motion can be measured and represented on a graph (I,D,M)
- Know that physical forces affect the movement of all matter on Earth and throughout the universe (I,D,M)
- Forces change the motion on objects in predictable ways (I,D,M)
- Know that unbalanced forces will cause changes in speed or direction of an object's motion (Newton's first law) I,D,(M)
- Know that changes in speed or direction are caused by force (I,D,M)
 - The greater the force, the greater the change in motion (I,D,M)
 - The more massive an object the greater the amount of force is needed to accelerate the object (Newton's second law) (I,D,M)
- Know that an object that is not being subjected to a force will continue to move at a constant speed and in a straight line (I,D,M)
- Know that for every action there is an equal and opposite reaction (Newtons's third law) (I,D,M)
- Know that if more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude (I,D,M)
- Know and understand the types of forces
 - Gravitational (I,D,M)
 - Frictional (I,D,M)
 - Electrical (I,D,M)

- Magnetic (I,D,M)
- Buoyant (I,D,M)
- Elastic (I,D,M)
- Understand and can apply the principles of gravitational force (I,D,M)
 - Gravitational force acts as a downward pull (I,D,M)
 - As the distance between two objects increases, the gravitational force between those two objects decreases (I,D,M)
 - On the moon gravitational forces is 1/6 the G force on earth (I,D,M)

8.4 (SCSD) Science as Inquiry

8.4.1 (SCSD) Identify and generate questions that can be answered through scientific investigations (M)

- Know how to refine and refocus broad and ill-defined questions (M)
 - Develop the ability to:
 - Clarify questions and inquiries and direct them toward objects and phenomena that can be (M)
 - 🚧 Described (M)
 - 🚧 Explained (M)
 - 🚧 Predicted (M)
- Know how to connect their questions with scientific
 - Ideas (M)
 - Concepts (M)
 - Quantitative relationships (M)
- Know that scientific investigations involve asking and answering a question and comparing the answer to what a scientist already knows about the world(M)
 - Explain the “Scientific Method” (M)
 - Ask a question (M)
 - Do background research (M)
 - Construct a Hypothesis (an educated guess about how things work) (M)
 - Test your hypotheses by doing an experiment (M)
 - Analyze your data and draw a conclusion (M)
 - Communicate your results (M)
- Know that all scientific knowledge is in principle subject to change, as new evidence becomes available (M)
 - As technology advances, it enables scientists to view the world in a different way (M)

8.4.2 (SCSD) Design and conduct different kinds of scientific investigations (M)

- Know how to recognize that different questions lead to different types Investigations (M)
- Know how to:
 - Make systematic observations (M)
 - Take accurate measurements (M)
 - Identify controlling variables (M)
- Know how to clarify ideas that are influencing and guiding inquiry and to understand how those ideas compare with current scientific knowledge (M)
- Know how to:
 - Formulate questions (M)
 - Design investigations (M)
 - Execute Investigations (M)
 - Interpret data (M)
 - Use evidence to generate explanations (M)
 - Propose alternative explanations (M)

- Critique explanations and procedures (M)
- Know how to use appropriate safety procedures when conducting investigations (M)

8.4.3 (SCSD) Understand that different kinds of questions suggest different kinds of scientific investigations (M)

- Know that some investigations:
 - Involve observing and describing (M)
 - Objects (M)
 - Organisms (M)
 - Events (M)
 - Involve collecting specimens (M)
 - Experiments (M)
 - Seeking more information (M)
 - Discovery of new objects and phenomena (M)
 - Making models (M)

8.4.4 (SCSD) Select and use appropriate tools and techniques to gather, process and analyze data (M)

- Know that the use of tools and techniques (including computers) will be guided by the questions and the investigations designed (M)
- Know how to use technology, equipment and tools (to access, gather, store, retrieve, and organize data) (M)
 - Rulers (M)
 - Thermometers (M)
 - Magnifiers (M)
 - Microscopes (M)
 - Telescopes (M)
 - Calculators (M)
 - Cameras (M)
 - Computers (hardware and software) (M)
- Know that technology:
 - Advances enables us to investigate in different ways than before (M)
 - Provides scientific observations which otherwise would be limited (M)
 - New advances drives scientific inquiry (M)
 - And science can neither answer all questions nor solve all problems of mankind (M)

8.4.5 (SCSD) Incorporate mathematics in scientific inquiry (M)

- Know that mathematics is used to:
 - Gather, organize and present data (M)
 - Construct convincing explanations (M)

8.4.6 (SCSD) Use evidence to develop descriptions, explanations, predictions, and models (M)

- Know that explanations should be based on observations (M)
- Know how to differentiate between description and explanations (M)
- Know that developing explanations establishes connections between the content of science and the contexts in which students develop new knowledge (M)
- Know that models are often used to think about processes that:
 - Happen too slowly (M)
 - Happen too quickly (M)
 - Are on too small a scale to observe directly (M)
 - Are too vast to be changed deliberately (M)

- Are potentially dangerous (M)
- Know that different models can be used to represent the same thing (M)

8.4.7 (SCSD) Think critically and logically to make the relationships between evidence and explanations (M)

- Know how to decide what evidence should be used and develop the ability to account for data that is inconsistent from what is normal (M)
- Know how to:
 - Review data from an experiment (M)
 - Summarize the data (M)
 - Form a logical argument between cause and effect relationships (M)
- Know how to state some explanations in terms of relationships between two or more variables (M)

8.4.8 (SCSD) Recognize and analyze alternative explanations and predictions

- Know how to:
 - Listen (M)
 - Respect the explanations proposed by students (M)
 - Remain open to and acknowledge different ideas and explanations (M)
 - Be able to accept the skepticism of others (M)
 - Consider alternative explanations (M)

8.4.9 (SCSD) Communicate and defend procedures and explanations

- Have the skills to be:
 - Competent in communicating experimental methods (M)
 - Describing observations (M)
 - Summarizing the results of investigations (M)
- Know that explanations can be communicated through various methods (M)
- Know that scientific information can be gathered by a team and shared with others (M)
 - Communication in a team (M)
 - Use quality team process (M)
- Know that individuals with varied backgrounds, interests, and work settings communicate to encourage scientific inquiry (M)
 - Understand that different populations have different ethical viewpoints which make it difficult to maintain a world wide standard (M)