

Shenandoah Community School District
Physics
Grade -12

12.3 (SCSD) Physical Science

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

- Understand and apply kinematics (I,D, M)
 - Understand and apply one and two dimensional motion (I,D,M)
 - Understand, construct, and interprets graphical representations of motion (I,D,M)
- Understand and apply dynamics (D,M)
 - Understand and apply Newton's Laws (D,M)
 - Understand and apply circular motion (D,M)
- Understand and apply fundamental forces (D,M)
 - Understand and apply electromagnetic force (D,M)
 - Understand and apply gravitational force (D,M)
- Understand and apply law of conservation of momentum (I,D,M)
 - Understand and apply impulse and momentum relationships (I,D,M)
 - Understand and apply elastic and inelastic collisions (I,D,M)

12.3.7 (SCSD) Understand and apply knowledge of conservation of energy and increase in disorder (I,D,M)

- Understand and apply mechanical energy (I,D,M)
 - Understand and apply work-energy theorem (I,D,M)
 - Understand and apply potential and kinetic energy (D,M)
- Understand and apply electromagnetic energy (I,D,M)
 - Understand and electric and magnetic forces and fields (D,M)
 - Understand and apply concepts and mathematical representations of electric circuits (I,D,M)
- Understand and apply thermal energy and thermal properties of matter (I,D,M)
 - Understand and apply laws of thermodynamics (I,D,M)
 - Understand and apply kinetic theory of matter (I,D,M)

12.3.8 (SCSD) Understand and apply knowledge of interactions of energy and matter (I,D,M)

- Understand and apply energy transfer (D,M)
 - Understand and apply energy transfer through waves (D,M)
 - Understand and apply transfer of energy through particle motion (D,M)
- Understand and apply wave phenomena (D,M)
 - Understand and apply wave properties (D,M)
 - Understand and apply wave behaviors (I,D,M)

12.3.9 (SCSD) Understand and use mathematical applications in physics (I,D,M)

- Application of mathematics including:
 - Vector analysis (I,D,M)
 - Dimensional analysis (I,D,M)
 - Algebraic manipulations (I,D,M)
 - Trigonometry (I,D,M)
 - Geometry (I,D,M)
 - Scientific notation (I,D,M)
- Measurements in physics are:
 - Given in proper significant figures (I,D,M)
 - With proper units (I,D,M)

- Following correct mathematical rules (I,D,M)

12.3.10 (SCSD) Understand and use proper procedures and follow all safety rules in physics (D,M)

12.4 (SCSD) Science as Inquiry

12.4.1 (SCSD) Identify questions and concepts that guide scientific investigations (M)

- Understand hypothesis and formulate a testable Hypothesis, demonstrating;
 - Logical connections between the scientific concepts guiding:
 - A hypothesis (M)
 - The design of an experiment (M)
- Understand scientific investigations and demonstrate:
 - Appropriate procedures (M)
 - A knowledge base (M)
 - Conceptual understanding (M)

12.4.2 (SCSD) Design and conduct scientific investigations (M)

- Requires:
 - Understanding of the major concepts in the area being investigated (M)
 - Proper equipment (M)
 - Safety precautions (M)
 - Understanding of methodological problems (M)
 - Use of technologies (M)
 - Scientific knowledge obtained from sources other than the actual investigation (M)
 - Clarification of :
 - Ideas that guide the inquiry (M)
 - Question (M)
 - Method (M)
 - Controls (M)
 - Variables (M)
 - Organization and display of data (M)
 - Revision of methods and explanations (M)
 - Public presentation of the results with a critical response from peers (M)
- Must:
 - Use evidence (M)
 - Apply logic (M)
 - Construct an argument for their proposed explanations (M)

12.4.3 (SCSD) Use technology and mathematics to improve investigations and communications (M)

- A variety of technologies are an integral component of scientific investigations (M)
 - Hand tools (M)
 - Measuring instruments (M)
 - Calculators (M)
 - Computers for data (M)
 - Collection (M)
 - Analysis (M)
 - Display (M)
- Mathematics plays an essential role in all aspects of an inquiry investigation (M)
 - Measurement (M)
 - Posing questions (M)

- Formulas are used for developing explanations (M)
- Charts and graphs are used for communicating results (M)

12.4.4 (SCSD) Formulate and revise scientific explanations and models using logic and evidence (M)

- Inquiries culminate in formulating an explanation or model (M)
 - Model
 - Physical (M)
 - Conceptual (M)
 - Mathematical (M)
- Process of answering the questions involves:
 - Discussions (M)
 - Arguments (M)
 - Revisions of explanations (M)
 - Based on:
 - Scientific knowledge (M)
 - Use of logic (M)
 - Evidence from investigation (M)

12.4.5 (SCSD) Think critically and logically to make the relationship between evidence and explanations (M)

- Think critically about evidence includes:
 - Deciding what evidence should be used (M)
 - Accounting for anomalous data (M)
- Process
 - Review data from a simple experiment (M)
 - Summarize the data (M)
 - Form a logical argument about the cause-and-effect relationship in the experiment (M)

12.4.6 (SCSD) Recognize and analyze alternative explanations and predictions (M)

- Develop critical abilities of analyzing an argument by reviewing:
 - Current scientific understanding (M)
 - Weighing the evidence (M)
 - Examining the logic (M)
- Develop the ability to decide which explanations and models are best (M)
 - There may be several plausible explanations, they do not all have equal weight (M)
 - Use scientific criteria to find the preferred explanations (M)
- Know that scientific knowledge is based on repeatable standards to ensure accuracy of the information. This knowledge may be constantly updated or corrected as the world tests and makes new advances in science (M)

12.4.7 (SCSD) Communicate and defend scientific procedures and explanations

- Develop the abilities associated with accurate and effective communication these include:
 - Writing and following procedures (M)
 - Expressing concepts (M)
 - Reviewing information (M)
 - Summarizing data (M)
 - Using language appropriately (M)
 - Developing diagrams and charts (M)
 - Explaining statistical analysis (M)

- Speaking clearly and logically (M)
- Constructing a reasoned argument (M)
- Responding appropriately to critical comments (M)

12.4.8 (SCSD) Use mathematics in all aspects of scientific inquiry (M)

- Use mathematics to ask and answer questions about the natural world (M)
- Mathematics is used to:
 - Ask questions (M)
 - Gather data (M)
 - Organize data (M)
 - Present data (M)
 - Structure convincing explanations (M)

12.4.9 (SCSD) Know that a code of ethics governing testing, funding, and the disclosure of scientific information bind progress in science and technology (M)

12.4.10 (SCSD) Know that advances in science involve technology and research that are bound by the laws of our society (M)