

Shenandoah Community School District
Chemistry II
Grade - 12

12.3 (SCSD) Physical Science

12.3.1 (SCSD) Understand the Structure of the Atom (M)

- Demonstrate an understanding of the nucleus of the atom (M)
 - Know that atoms of every element can exist in different forms called isotopes (M)
 - Know the relationship between mass number of isotopes and average atomic mass of an element (M)
 - Know that nuclear forces hold the nucleus together with a force stronger than electric forces (M)
 - Know that nuclear reactions release much more energy than any chemical reaction (M)
 - Know that fission is splitting a nucleus and fusion is joining two nuclei together (M)
 - Know that fission is used to produce electricity while fusion is responsible for the energy on the sun (M)
 - Know that radioactive isotopes are unstable and undergo spontaneous nuclear reactions at a predictable rate (M)
 - Know sources of background nuclear radiation and applications of nuclear reactions (M)

12.3.2 (SCSD) Understand Properties and States of Matter (M)

- Demonstrate an understanding of structure of compounds (M)
 - Know and draw structures of molecules (M)
 - Know and determine polarity of molecules and resulting intermolecular forces (M)
 - Know, compare, and contrast polar and nonpolar molecular properties and their structures (M)
 - Know, determine, and draw three-dimensional shape of molecules (M)
 - Know and draw resonance structures (M)
- Demonstrate an understanding of structure of hydrocarbons (M)
 - Know, describe, draw, and name hydrocarbons with single, double, and triple bonds (M)
 - Know the properties of alkanes, alkenes, and alkynes (M)
 - Know the difference between saturated and unsaturated hydrocarbons (M)
 - Know, describe, draw, and name structural isomers and stereoisomers (M)
 - Know, describe, name and draw substituted hydrocarbons including ketones, alcohols, aldehydes, and ethers (M)

12.3.3 (SCSD) Understand chemical reactions (M)

- Demonstrate an understanding of acid base reactions (M)
 - Know the physical and chemical properties of acids and bases (M)
 - Know and describe various models of acids and bases (M)
 - Know the meaning of pH and pOH (M)
 - Write chemical equations for acid base neutralization reactions (M)
 - Know how acid base neutralization reactions are used in titrations (M)

12.3.4 (SCSD) Understand and use measurement in Chemistry (M)

- Understand that measurements in chemistry are given in proper significant figures, with proper units and follow correct mathematical conventions (M)

12.3.5 (SCSD) Understand and use proper procedures and follow all safety rules in chemistry (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)