

Shenandoah Community School District
Chemistry I
Grade - 11

11.3 (SCSD) Physical Science

11.3.1 (SCSD) Understand the Structure of the Atom (I,D,M)

- Demonstrate and understanding of the atomic structure
 - Know and describe the location and relative distance between the component parts of the atoms (D, M)
 - Know the relative size, mass, and charge of the component parts of the atom (D, M)
 - Know and explain the development of the atomic models(I,D,M)
- Demonstrate an understanding of the nucleus of the atom (D,M)
 - Know that atoms of every element can exist in different forms called isotopes (D,M)
 - Know the relationship between mass number of isotopes and average atomic mass of an element (D,M)
- Understand and describe the role of electrons in atomic structure (I,D,M)
 - Know and describe the arrangement of the electrons in the atom (I,D,M)
 - Know and describe the valence and non valence electrons (I,D,M)
 - Know and explain the role of electrons ion formation (I,D,M)
- Understand and describe the patterns and trends in the periodic table (D,M)
 - Understand and identify the groups and periods of the periodic table (D,M)
 - Understand and demonstrate the use of periodic trends to predict chemical and physical properties of elements (D,M)

11.3.2 (SCSD) Understand Properties and States of Matter (I,D,M)

- Understand the physical properties of matter (D,M)
 - Understands the properties and classification of matter (D,M)
 - Elements (D,M)
 - Compounds (D,M)
 - Mixtures (D,M)
- Understand the use of the mole concept to calculate quantities in chemistry (I,D,M)
 - Convert between:
 - Particles (I,D,M)
 - Moles (I,D,M)
 - Mass (I,D,M)
 - Volume (I,D,M)
 - Calculate empirical and molecular formulas and percent composition (I,D,M)
- Understand the properties and measurements of gases (I,D,M)
 - Understands and explains the mathematical relationship between:
 - Pressure (I,D,M)
 - Volume (I,D,M)
 - Temperature (I,D,M)
 - Understands and applies Kinetic Molecular Theory (D,M)
- Demonstrate an understanding of solutions and concentrations
 - Calculate concentrations in terms of molarity and percent concentration (I,D,M)

- Know, compare, and contrast ionic and covalent bonding (I,D,M)
 - Understand and illustrate the role of valence electrons and electro-negativity in chemical bonding (D,M)
 - Know, explain, and use the Octet Rule (I,D,M)
- Know and use proper IUPAC chemical nomenclature(I,D,M)
 - Know and write, ionic formulas including those containing polyatomic ions (I,D,M)
 - Know and write covalent formulas (I,D,M)
- Know and describe structure of compounds (I,D,M)
 - Know and draw Lewis Structures (I,D,M)
 - Know and determine polarity of molecules and resulting intermolecular forces (D,M)
 - Know, compare, and contrast ionic and molecular properties and their structures(D,M)
 - Know and determine three-dimensional shape of molecules(I,D)

11.3.3 (SCSD) Understand chemical reactions (I,D,M)

- Know, identify, and recognize evidence of a chemical reaction (D,M)
 - Understand and describe specific evidence of a chemical reaction (D,M)
- Demonstrate an understanding of the law of conservation of matter and energy (I,D,M)
 - Express a written chemical reaction using proper symbols and chemical conventions for states of matter and experimental methods (I,D,M)
 - Use coefficients to balance a chemical equation (I,D,M)
 - Use a balanced chemical equation to show molar relationships (I,D,M)
- Know and classify chemical reactions by type (I,D,M)
 - Classify a chemical reaction as:
 - Synthesis (I,D,M)
 - Decomposition (I,D,M)
 - Single displacement (I,D,M)
 - Double displacement (I,D,M)
 - Combustion (I,D,M)
 - Oxidation and reduction (I,D)
 - Acid and base (I,D)
 - Know and describe acid/base reactions and the role of buffers (D,M)
 - Know and describe oxidation and reduction in specific reactions (I,D,M)
- Understand and recognize the importance of the mole concept in chemical reactions (I,D,M)
 - Understand and solve stoichiometry problems including:
 - Calculation of theoretical yield (I,D,M)
 - Percent yield of a reaction (I,D,M)
 - Understand and determine the limiting reactant in a chemical reaction when given quantitative data (I,D,M)
- Understand and recognize that reactions occur at different rates (D,M)
 - Know and identify important factors that affects reaction rates:
 - Temperature (D,M)
 - Nature of reactants (D,M)
 - Concentration (D,M)

11.3.4 (SCSD) Understand and use measurement in Chemistry (I,D,M)

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

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

11.4 (SCSD) Science as Inquiry

11.4.1 (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)

11.4.2 (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)

11.4.3 (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)

11.4.4 (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)

11.4.5 (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)

11.4.6 (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)

11.4.7 (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)

11.4.8 (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)

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

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