

## SC Chemistry II

The student will demonstrate the ability to use specific skills and processes (Core Learning Goal 1) and major chemistry concepts (Core Learning Goal 3) to explain the composition, structure, and interactions of matter in order to support the predictability of structure and energy transformations. CLG indicators marked with an asterisk may be tested on the Maryland High School Assessment.

- SC.CH2.10 Students will use the language and instruments of science to apply the skills of scientific inquiry to understand the nature of science.**
- SC.CH2.10.01 Demonstrate safety when conducting an investigation (CS1.12.5)  
SC.CH2.10.01a Recognize safe laboratory procedures (CLG 1.3.2\*)  
SC.CH2.10.01b Demonstrate safe handling of the chemicals and materials of science (CLG 1.3.3)
- SC.CH2.10.02 Demonstrate proficiency in using the metric system  
SC.CH2.10.02.a Appropriately apply the basic units of meter, liter, and gram **TA**  
SC.CH2.10.02.b Appropriately apply the metric system to measure mass, volume, length, and temperature **TA**
- SC.CH2.10.03 Apply the steps of the scientific method when given problem solving situations  
SC.CH2.10.03.a Access and process information from readings, investigations, and oral communications (CS1.12.1\*, CLG1.5.6\*, CLG1.3.4, CLG1.2.7\*) **TA**  
SC.CH2.10.03.b Formulate questions that lead to a testable hypothesis (CS1.12.2\*, CS1.12.3\*, CLG1.2.3\*, CLG1.2.1\*, CLG1.2.2, CLG1.2.4) **TA**  
SC.CH2.10.03.c Design logically sequenced, experimental approaches which appropriately control dependent and independent variables and answer scientific questions (CS1.12.4\*, CS1.12.7\*, CLG1.2.5\*, CLG1.2.6\*) **TA**  
SC.CH2.10.03.d Conduct scientific investigations to test a hypothesis (CS1.12.4, CLG1.3.1) **TA**
- SC.CH2.10.04 Demonstrate proficiency in the use of the appropriate language and instruments of science to appropriately collect, organize, and display data (CS1.12.7\*, CLG1.4.1\*) **TA**  
SC.CH2.10.04.a Collect data for mass, volume, length and temperature **TA**  
SC.CH2.10.04.b Create and interpret graphics (scale drawings, photographs, digital images, etc) analyze data and evaluate hypotheses (CS1.12.6\*) **TA**  
SC.CH2.10.04.c Design, construct, and use models to make predictions about and to visualize actual events (1.12.22, CLG1.4.8) **TA**  
SC.CH2.10.04.d Use mathematical process when conducting investigations, analyzing information, and displaying information (CS1.12.6\*, CLG1.6.1\*, CLG1.6.2, CLG1.6.3\*, CLG1.6.4, CLG1.6.5\*, CLG1.7.4) **TA**
- SC.CH2.20 Students will apply critical thinking skills to understand the nature of science.**
- SC.CH2.20.01 Demonstrate proficiency in evaluating scientific data in terms of bias, reliability and validity (SC1.12.8\*, CLG1.4.3\*, CLG1.4.5\*)  
SC.CH2.20.01.a Analyze appropriate data to classify, identify trends, and identify similarities and differences to form conclusions and apply what has been learned to evaluate the hypothesis (CS1.12.8\*, CS1.12.10\*, CS1.12.11\*, CLG1.4.2\*, CLG1.4.4\*, CLG1.4.6\*, CLG1.4.9\*, CLG1.5.7\*, CLG1.5.8\*)
- SC.CH2.20.02 Demonstrate proficiency in formulating conclusions (CS1.12.9\*, CLG1.5.1\*, CLG1.5.2\*, CLG1.5.9\*)  
SC.CH2.20.02.a Analyze the adequacy of supporting evidence used to form conclusions (CS1.12.13\*, CLG1.4.7\*)  
SC.CH2.20.02.b Provide supporting evidence when forming conclusions (CS1.12.14\*, CLG1.2.8\*)
- SC.CH2.20.03 Modify ideas based on new information (CS1.12.16\*, CLG1.1.2\*)  
SC.CH2.20.03.a Defend a position on a scientific issue (CS1.12.20\*)  
SC.CH2.20.03.b Recognize that real problems have more than one solution (CS1.12.21\*, CLG1.1.1\*)
- SC.CH2.20.04 Apply scientific principles and concepts to understand a new situation (CS1.12.18\*, CS1.12.19\*, CLG1.7.1\*)
- SC.CH2.20.05 Critique scientific information in order to detect bias and analyze the source of the bias (CS1.12.12\*, CLG1.1.3\*, CLG1.1.4\*, CLG1.1.5\*)

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2. ETM = Education That (is) Multicultural

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- SC.CH2.30 Students will connect the various aspects of technology to the nature of science.**
- SC.CH2.30.01 Use computational tools and technologies in data collection, analysis and modeling (CS 1.12.9\*, CS 1.12.17\*, CLG 1.5.3\*) **TA**
- SC.CH2.30.02 Demonstrate and explain how using existing tools extend knowledge and identify the limitations, which drive the need for new technologies (CS1.12.23\*, CLG1.7.6) **TA**
- SC.CH2.30.03 Interpret and communicate findings using developmentally appropriate technology and telecommunications (CS1.12.9\*, CLG1.5.5\*) **TA**
- SC.CH2.40 Students will use appropriate methods to communicate, in writing and orally, the processes and results of scientific investigation.**
- SC.CH2.40.01 Interpret and communicate findings through speaking, writing, and drawing (CS1.12.9\*, CS1.12.17\*, CLG1.5.3) **TA**
- SC.CH2.45 Students will use mathematical processes.**
- SC.CH2.45.01 Students will report measurements and perform calculations to the correct number of significant figures (precision) **TA**
- SC.CH2.45.02 Students will determine the sources of error that limit the accuracy or precision of experimental results and calculate the percent error. (CLG 1.4.7) **TA**
- SC.CH2.45.03 Students will perform calculations using numbers written in scientific notation (CLG 1.6.3) **TA**
- SC.CH2.50 Students will apply their understanding of phases of matter and gas laws.**
- SC.CH2.50.01 Pressure **TA**
- SC.CH2.50.02 Intermolecular Forces **TA**
- SC.CH2.50.03 Graham's law of Diffusion, Kinetic Theory **TA**
- SC.CH2.50.04 Phase and Phase Change **TA**
- SC.CH2.50.05 Gas Laws **TA**
- SC.CH2.50.05a Boyle's Law **TA**
- SC.CH2.50.05b Charles' Law **TA**
- SC.CH2.50.05c Combined Gas Law **TA**
- SC.CH2.50.05d Ideal Gas Law
- SC.CH2.50.05e Dalton's law of Partial Pressure (gases collected over water) **TA**
- SC.CH2.55 Students will use their knowledge of gas laws to perform stoichiometric calculations.**
- SC.CH2.55.01 Chemical reactions between gases at standard and non-standard conditions.
- SC.CH2.55.02 Problems involving
- SC.CH2.55.02.a Volume - volume
- SC.CH2.55.02.b Mass – volume
- SC.CH2.55.02.c Limiting reactant
- SC.CH2.55.02.d Gases collected over water
- SC.CH2.55.02.e Conditions other than STP
- SC.CH2.60 Students will demonstrate an understanding of metathesis reactions.**
- SC.CH2.60.01 Electrolytes and nonelectrolytes **TA**
- SC.CH2.60.02 Ionic and net ionic equations
- SC.CH2.60.03 Solubility rules **T**
- SC.CH2.60.04 Solution stoichiometry
- SC.CH2.60.05 Limiting reactant stoichiometry involving the determination of the mass of a precipitate formed and the concentration of the ions remaining in solution after the reaction has taken place.
- SC.CH2.65 Equilibrium**
- SC.CH2.65.01 Le Chatelier's principle, the nature of equilibrium **TA**
- SC.CH2.65.02 Law of mass action
- SC.CH2.65.03 Solubility Product **TA**
- SC.CH2.65.04 Molar concentrations and molar solubility from  $K_{sp}$
- SC.CH2.65.05 Ions remaining in solution **TA**

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- SC.CH2.70 Students will demonstrate an understanding of solutions.**  
 SC.CH2.70.01 Concentration units: molarity, normality, % by weight, % by volume, molality  
 SC.CH2.70.02 Equivalent weight  
 SC.CH2.70.03 Colligative properties **TA**  
     SC.CH2.70.03a Freezing point depression **TA**  
     SC.CH2.70.03b Boiling point elevation **TA**  
 SC.CH2.70.04 Vapor pressure (Raoult's Law) **TA**  
 SC.CH2.70.05 Qualitative analysis
- SC.CH2.75 Students will demonstrate an understanding of chemical thermodynamics.**  
 SC.CH2.75.01 Heat of reaction and solution **TA**  
 SC.CH2.75.02 Hess' Law of summation of heats **TA**  
 SC.CH2.75.03 Entropy  
 SC.CH2.75.04 Gibb's Free Energy
- SC.CH2.80 Students will demonstrate an understanding of acids, bases and pH**  
 SC.CH2.80.01 Properties of acids and bases **TA**  
 SC.CH2.80.02 Definitions; Arrhenius, Bronsted Lowry, Lewis  
 SC.CH2.80.03 Strong and weak acids and bases **TA**  
 SC.CH2.80.04 pH and pOH calculations **TA**  
     SC.CH2.80.04a Equilibrium of hydronium and hydroxide in water **TA**  
     SC.CH2.80.04b Determining pH from mole problems **TA**  
     SC.CH2.80.04c Determining pH from equilibrium calculations **TA**  
 SC.CH2.80.05 Neutralization  
 SC.CH2.80.06 Titration **TA**  
 SC.CH2.80.07 Common ion effect **TA**  
 SC.CH2.80.08 Buffers **TA**
- SC.CH2.85 Students will investigate oxidation and reduction reactions.**  
 SC.CH2.85.01 Oxidation and reduction  
 SC.CH2.85.02 Oxidation number  
 SC.CH2.85.03 Oxidizing and reducing agents  
 SC.CH2.85.04 Balancing redox equations  
     SC.CH2.85.04a Oxidation number change method  
     SC.CH2.85.04b Ion-electron (half cell) method
- SC.CH2.90 Electrochemistry**  
 SC.CH2.90.01 Anode, cathode, anion, cation **TA**  
 SC.CH2.90.02 Electrochemical cell, electrolytic cell **TA**  
 SC.CH2.90.03 Electromotive forces  
 SC.CH2.90.04 Standard cell potential **TA**
- SC.CH2.91 Laboratory Techniques**  
 SC.CH2.91.01 Melting point determination **TA**  
 SC.CH2.91.02 Recrystallization  
 SC.CH2.91.03 Vacuum filtration  
 SC.CH2.91.04 Fractional distillation **TA**  
 SC.CH2.91.05 Extraction

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**SC.CH2.92 Hydrocarbons**  
SC.CH2.92.01 Nomenclature and uses  
SC.CH2.92.01a Alkanes, alkenes, alkynes  
SC.CH2.92.01b Aromatics  
SC.CH2.92.01c Functional groups  
SC.CH2.92.01d isomers

**SC.CH2.93 Structural Geometry and Resonance**

**SC.CH2.94 Reactions**  
SC.CH2.94.01 Combustion  
SC.CH2.94.02 Substitution  
SC.CH2.94.03 Addition  
SC.CH2.94.04 Formation of esters  
SC.CH2.94.05 Production of soap

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