Next Generation Science Standards:
Chemistry
11th Grade

SCI 501-502 General Chemistry

1 laboratory science credit
5 days per week; 1-year course
Taught in English

This is a ***required course for 11th grade students*** in the Mexican/U.S. program. This is a one-year high school laboratory science course. The first semester will cover chemical foundations including use of the Periodic Table, nomenclature, measurements and calculations, chemical composition, and chemical stoichiometry. The second semester includes chemical bonding, solutions, acids and bases, reaction rates and equilibrium, oxidation-reduction reactions, and an introduction to organic chemistry. Laboratories are completed on a regular basis and a formal laboratory report is a requirement for each lab completion. A third quarter project is also a requirement.

Textbook: *World of Chemistry*; Zumdahl; Houghton Mifflin Co; 2007
Prerequisite: General Biology or other High School Laboratory science; Algebra-1 completion

Strand 1: Structure and Properties of Matter
Strand 2: Chemical Reactions
Strand 3: Energy
Strand 4: Matter and Energy in Organisms and Ecosystems
Strand 5: Earth's Systems
Strand 6: Human Sustainability
Strand 7: Weather and Climate
Strand 8: Engineering Design

Strand 1: Structure and Properties of Matter

Standard 1: Structure and Property of Matter

Benchmark Code	Benchmark
HS-PS1-1	The student will use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
HS-PS1-3	The student will plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (also in Strand 2)

Standard 2: Nuclear Processes

HS-PS1-8	The student will develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

Standard 3: Types of Interactions

HS-PS2-6	The student will communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Strand 2: Chemical Reactions	
Standard 1: Structure and Property of Matter	
Benchmark Code	Benchmark
HS-PS1-2 Repeat	The student will construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. (also in Strand 2, Standard 2)
HS-PS1-4 Repeat	The student will develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
Standard 2: Chemical Reactions	
Benchmark Code	Benchmark
HS-PS1-2 Repeat	The student will construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. (also in Strand 2, Standard 1)
HS-PS1-5	The student will apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS1-6	The student will refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. (also in Strand 2, Standard 3)
HS-PS1-7	The student will use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
Standard 3: Developing Possible Solutions/Optimizing the Design Solution	
Benchmark Code	Benchmark
HS-PS1-6	The student will refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. (also in Strand 2, Standard 2)
Strand 3: Energy	
Standard 1: Definitions of Energy/Conservation of Energy and Energy Transfer	
Benchmark Code	Benchmark
HS-PS3-1	The student will create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
HS-PS3-3	The student will design, build and refine a device that works within given constraints to convert one form of energy into another form of energy.
HS-PS3-4 Repeat	The student will plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).

Standard 2: Energy in Chemical Reactions	
Benchmark Code	Benchmark
HS-PS3-3	The student will design, build and refine a device that works within given constraints to convert one form of energy into another form of energy. (also in Strand 3, Standard 1)
HS-PS3-4 Repeat	The student will plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). (also in Strand 3, Standard 1)
Strand 4: Matter and Energy in Organisms and Ecosytems	
HS-LS1-6	The student will construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
Strand 5: Earth's Systems	
Standard 1: The Roles of Water in Earth's Surface Processes	
Benchmark Code	Benchmark
HS-ESS2-5	The student will plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
Strand 6: Human Sustainability	
Standard 1: Global Climate Change	
Benchmark Code	Benchmark
HS-ESS2-5	The student will plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
Strand 7: Weather and Climate	
Standard 1: Earth Materials and Systems	
Benchmark Code	Benchmark
HS-ESS2-4	The student will use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
Strand 8: Engineering Design	
Standard 1: The student asks and defines a problem, develops and uses models, plans, and carries out investigations, analyzes and interprets data, uses mathematics and computer technology, constructs explanations, and designs solution, engages in argument from evidence and obtains, evaluates, and communicates information.	
Benchmark Code	Benchmark
HS-ETS1-1 Repeat	The student will analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. (Use ETS1-C Optimizing the Design Solution to connect to PS1-6: Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others may be needed.)

HS-ETS1-2 Repeat	The student will design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3 Repeat	The student will evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
HS-ETS1-4	The student will use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.