

# Course SLOs aligned with Program SLOs

## San Mateo CCCD

### CAN Program - Physical Sciences

**Use the scientific method and appreciate its importance to the development of scientific thought.**

#### CAN Dept - Chemistry

CAN CHEM 192 - Elementary Chemistry

*Course Outcomes:*

- \* Matter - The student will understand the three states of matter as well as the difference between a pure substance and a mixture. (Created By CAN Dept - Chemistry)

CAN CHEM 210 - General Chemistry I

*Course Outcomes:*

- \* Chemical Structure - Draw Lewis structures of simple and complex molecules including multiple bonds and lone pairs and use VSEPR theory to predict the three-dimensional shape of any molecule (or polyatomic ion) when given the formula. (Created By CAN Dept - Chemistry)
- \* Gases - Apply the gas laws to solve for initial or final conditions after changes in temperature, volume, pressure or number of moles. (Created By CAN Dept - Chemistry)
- \* Lab report - Write laboratory reports, applying the scientific method. (Created By CAN Dept - Chemistry)
- \* Limiting reactant - Determine the limiting reactant and the amount of excess reactant(s) remaining after the reaction from stoichiometry. (Created By CAN Dept - Chemistry)
- \* Matter - Recognize states of matter, classes of matter, properties of matter and discuss units of measurements of mass, length and volume and perform conversions between units using the metric system, the English system, or between both. (Created By CAN Dept - Chemistry)
- \* Moles - Recognize chemical reactions and discuss moles and molar mass of elements and compounds. (Created By CAN Dept - Chemistry)
- \* Stoichiometry - Balance chemical equations and perform calculations that may involve stoichiometric conversions (e.g., mol-mol, gram-mol, gram-gram, gram-molecules, gram-liters of solution, determine the limiting reactant and the amount of excess reactant(s) remaining after the reaction from stoichiometry etc.). (Created By CAN Dept - Chemistry)
- \* Unit conversion - Perform conversions between units using the metric system, the English system, or between both. (Created By CAN Dept - Chemistry)

CAN CHEM 220 - General Chemistry II

*Course Outcomes:*

- \* Acid- Base Equilibrium - Apply  $K_a$ ,  $K_b$ ,  $pK_a$ ,  $pK_b$ , and pH concepts on complex equilibrium calculations (Created By CAN Dept - Chemistry)
- \* Buffers - Describe the behavior of buffers (Created By CAN Dept - Chemistry)
- \* Equilibrium - Discuss chemical equilibrium and apply the concept to acid-base reactions and buffer solutions (Created By CAN Dept - Chemistry)
- \* Thermodynamics - Describe enthalpy, entropy and free energy as it applies to spontaneous processes (Created By CAN Dept - Chemistry)
- \* Voltaic Cells - Construct simple voltaic cells and perform calculations involving reduction potentials (Created By CAN Dept - Chemistry)

CAN CHEM 231 - Organic Chemistry I

*Course Outcomes:*

- \* Handling Chemicals - Use appropriate procedures for safe handling and disposal of organic materials. (Created By CAN Dept - Chemistry)
- \* Infrared Spectroscopy - Collect and interpret infrared spectra. (Created By CAN Dept - Chemistry)
- \* Reaction mechanisms - Illustrate reaction mechanisms by using the curved arrow notation (Created By CAN Dept - Chemistry)
- \* Solubility - Predict the solubility of organic compounds in organic and inorganic solvents based on their molecular structure. (Created By CAN Dept - Chemistry)
- \* Structure and hybridization - Predict molecular structure based on molecular orbital hybridization. (Created By CAN Dept - Chemistry)

CAN CHEM 235 - Organic Chemistry II

*Course Outcomes:*

- \* Acidity and Structure - Justify the relative acid strength of a variety of organic acids using inductive and resonance effects (Created By CAN Dept - Chemistry)
- \* IR and Functional Groups - Identify functional groups on infrared spectra. (Created By CAN Dept - Chemistry)
- \* Organic Reactions - Carry out a variety of organic chemistry reactions such as electrophilic aromatic substitution reactions, aldol condensation reactions, ester saponification reactions, etc. (Created By CAN Dept - Chemistry)
- \* Relative Basicity - Predict the relative basicity of a series of amine based on molecular structure (Created By CAN Dept - Chemistry)
- \* Synthetic Methods - Apply a variety of synthetic methods to identify the most appropriate synthetic route to obtain given organic molecules. (Created By CAN Dept - Chemistry)

CAN CHEM 237 - Organic Chemistry Lab I

*Course Outcomes:*

- \* Handling Chemicals - Use appropriate procedures for safe handling and disposal of organic materials. (Created By CAN Dept - Chemistry)
- \* Infrared Spectroscopy - Collect and interpret infrared spectra. (Created By CAN Dept - Chemistry)
- \* Solubility - Predict the solubility of organic compounds in organic and inorganic solvents based on their molecular structure. (Created By CAN Dept - Chemistry)

CAN CHEM 238 - Organic Chemistry Lab II

*Course Outcomes:*

- \* IR and Functional Groups - Identify functional groups on infrared spectra. (Created By CAN Dept - Chemistry)
- \* Organic Reactions - Carry out a variety of organic chemistry reactions such as electrophilic aromatic substitution reactions, aldol condensation reactions, ester saponification reactions, etc. (Created By CAN Dept - Chemistry)
- \* Separation Scheme - Formulate a separation and purification scheme for a given multicomponent mixture of organic compounds. (Created By CAN Dept - Chemistry)

CAN CHEM 410 - Chem For Health Sciences

*Course Outcomes:*

- \* acid base - Describe the effect of altering the pH of the environment on a weak acid or weak base. (Created By CAN Dept - Chemistry)
- \* Compounds - Identify and name elements, ionic compounds and covalent compounds and differentiate between symbols and formulas. (Created By CAN Dept - Chemistry)
- \* ID - Identify functional groups on large complex biochemical molecules. (Created By CAN Dept - Chemistry)
- \* Information - Gather and assess information about the chemical properties of pharmaceutical agents. (Created By CAN Dept - Chemistry)
- \* Reactivity - Communicate the basic reactivity of the functional groups on biochemical molecules. (Created By CAN Dept - Chemistry)

CAN CHEM 695 - Independent Study

*Course Outcomes:*

- \* Experimental Design - Design a scientifically sound and experimental testable procedure. (Created By CAN Dept - Chemistry)
- \* Hypothesis Evaluation - Apply the scientific method to experimentally evaluate a hypothesis. (Created By CAN Dept - Chemistry)
- \* Literature Research - Gather relevant information on a specific chemistry research topic by critically reading printed and online resources (Created By CAN Dept - Chemistry)
- \* Results Analysis - Analyze experimental data and make appropriate modifications to the experimental design. (Created By CAN Dept - Chemistry)

CAN CHMT 310 - Intro. to Chem. Lab. Techn.

*Course Outcomes:*

- \* Data Analysis - Graph and analyze data collected experimentally (Created By CAN Dept - Chemistry)
- \* Interpretation of information - Interpret information gathered from reference handbooks and technical manuals. (Created By CAN Dept - Chemistry)
- \* Safety Regulations - Select the appropriate safety and environmental health regulations applicable to the chemical laboratory (Created By CAN Dept - Chemistry)

CAN CHMT 340 - Introduction to Chemical Laboratory Instrumentation

*Course Outcomes:*

- \* Calibration curves - Prepare standard solutions and create UV-Vis calibration curves. (Created By CAN Dept - Chemistry)
- \* GC - Select appropriate experimental chromatographic conditions to separate a mixture of analytes using a gas chromatograph, GC. (Created By CAN Dept - Chemistry)
- \* IR - Identify functional groups present in a given compound based on comparison of experimental IR spectra to literature reference libraries. (Created By CAN Dept - Chemistry)

**Document and communicate their work effectively.**

**CAN Dept - Chemistry**

CAN CHEM 210 - General Chemistry I

*Course Outcomes:*

- \* Elements - Identify and name atoms, elements, ions, molecules, ionic compounds and molecular compounds. (Created By CAN Dept - Chemistry)

\* Lab report - Write laboratory reports, applying the scientific method. (Created By CAN Dept - Chemistry)

\* Moles - Recognize chemical reactions and discuss moles and molar mass of elements and compounds. (Created By CAN Dept - Chemistry)

#### CAN CHEM 231 - Organic Chemistry I

##### *Course Outcomes:*

\* IUPAC naming - Apply the IUPAC system to name several classes of organic compounds (Created By CAN Dept - Chemistry)

\* Reaction mechanisms - Illustrate reaction mechanisms by using the curved arrow notation (Created By CAN Dept - Chemistry)

#### CAN CHEM 235 - Organic Chemistry II

##### *Course Outcomes:*

\* Acid-base Strength - Predict and justify the relative acid strength and the relative basicity of a variety of organic acids and bases based on molecular structure, inductive effects and resonance effects. (Created By CAN Dept - Chemistry)

\* Acidity and Structure - Justify the relative acid strength of a variety of organic acids using inductive and resonance effects (Created By CAN Dept - Chemistry)

\* Relative Basicity - Predict the relative basicity of a series of amine based on molecular structure (Created By CAN Dept - Chemistry)

\* Separation Scheme - Formulate a separation and purification scheme for a given multicomponent mixture of organic compounds. (Created By CAN Dept - Chemistry)

#### CAN CHEM 238 - Organic Chemistry Lab II

##### *Course Outcomes:*

\* Separation Scheme - Formulate a separation and purification scheme for a given multicomponent mixture of organic compounds. (Created By CAN Dept - Chemistry)

#### CAN CHEM 410 - Chem For Health Sciences

##### *Course Outcomes:*

\* acid base - Describe the effect of altering the pH of the environment on a weak acid or weak base. (Created By CAN Dept - Chemistry)

\* Information - Gather and assess information about the chemical properties of pharmaceutical agents. (Created By CAN Dept - Chemistry)

\* Reactivity - Communicate the basic reactivity of the functional groups on biochemical molecules. (Created By CAN Dept - Chemistry)

#### CAN CHEM 680CH - Honors Colloquium in Chemistry

##### *Course Outcomes:*

\* Critical Evaluation - Critically evaluate information from literature research employing a chemistry focus. (Created By CAN Dept - Chemistry)

\* Discussion Topics - Select appropriate discussion topics in drug discovery. (Created By CAN Dept - Chemistry)

\* Literature Research - Conduct literature research from printed and on-line resources.

(Created By CAN Dept - Chemistry)

#### CAN CHEM 695 - Independent Study

##### *Course Outcomes:*

\* Experimental Design - Design a scientifically sound and experimental testable procedure. (Created By CAN Dept - Chemistry)

\* Reporting - Write and or present a report based on experimental procedure, data analysis and conclusions. (Created By CAN Dept - Chemistry)

**Demonstrate critical thinking to analyze physical systems in terms of scientific concepts.**

### **CAN Dept - Chemistry**

#### CAN CHEM 192 - Elementary Chemistry

##### *Course Outcomes:*

\* Density - The student will understand the concept of density. (Created By CAN Dept - Chemistry)

\* Equations - The student will be able to complete, balance, and apply chemical equations. (Created By CAN Dept - Chemistry)

#### CAN CHEM 210 - General Chemistry I

##### *Course Outcomes:*

\* Matter - Recognize states of matter, classes of matter, properties of matter and discuss units of measurements of mass, length and volume and perform conversions between units using the metric system, the English system, or between both. (Created By CAN Dept - Chemistry)

\* Moles - Recognize chemical reactions and discuss moles and molar mass of elements and compounds. (Created By CAN Dept - Chemistry)

CAN CHEM 220 - General Chemistry II

*Course Outcomes:*

- \* Acid- Base Equilibrium - Apply  $K_a$ ,  $K_b$ ,  $pK_a$ ,  $pK_b$ , and pH concepts on complex equilibrium calculations (Created By CAN Dept - Chemistry)
- \* Buffers - Describe the behavior of buffers (Created By CAN Dept - Chemistry)
- \* Equilibrium - Discuss chemical equilibrium and apply the concept to acid-base reactions and buffer solutions (Created By CAN Dept - Chemistry)
- \* Gibbs Equation - Using the Gibbs equation, calculate the free energy change,  $\Delta G$ , from enthalpy,  $\Delta H$ , and entropy,  $\Delta S$ , changes. (Created By CAN Dept - Chemistry)
- \* Thermodynamics - Describe enthalpy, entropy and free energy as it applies to spontaneous processes (Created By CAN Dept - Chemistry)
- \* Voltaic Cells - Construct simple voltaic cells and perform calculations involving reduction potentials (Created By CAN Dept - Chemistry)

CAN CHEM 231 - Organic Chemistry I

*Course Outcomes:*

- \* Structure and hybridization - Predict molecular structure based on molecular orbital hybridization. (Created By CAN Dept - Chemistry)

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*Course Outcomes:*

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CAN CHEM 238 - Organic Chemistry Lab II

*Course Outcomes:*

- \* Separation Scheme - Formulate a separation and purification scheme for a given multicomponent mixture of organic compounds. (Created By CAN Dept - Chemistry)