Meet these California Science Content Standards for Grades 9-12 with the Sewer Science Laboratory!

Chemistry

Acids and Bases

- 5. Acids, bases, and salts are three classes of compounds that form ions in water solutions. As a basis for understanding this concept, students know:
 - a. the observable properties of acids, bases, and salt solutions.
- b. acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances.
 - d. how to use the pH scale to characterize acid and base solutions.
 - g. buffers stabilize pH in acid-base reactions.

Solutions

- Solutions are homogenous mixtures of two or more substances. As a basis for understanding this concept, students know:
- * a. definitions of solute and solvent
 - b. how to describe the dissolving process as a result of random molecular motion.
- * d. how to calculate the concentration of a solute in terms of grams per liter, molarity, parts per million and percent composition.

Chemical Thermodynamics

- 7. Energy is exchanged or transformed in all chemical reactions and physical changes of matter. As a basis for understanding this concept, students know:
- * b. chemical processes can either release (exothermic) or absorb (endothermic) thermal energy.

Reaction Rates

- 8. Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules. As a basis for understanding this concept, students know:
- * a. the rate of reaction is the decrease in concentration of reactants or the increase in concentration of products with time.

Biology/Life Sciences

Ecology

- 6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept, students know:
 - a. biodiversity is the sum total of different kinds of organisms, and is affected by alterations of habitats.
 - b. how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of non-native species, or changes in population size.

Physiology

- 10. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response, students know:
- d. there are important differences between bacteria and viruses, with respect to their requirements for growth and replication, the primary defense of the body against them, and effective treatment of infections they cause.

Investigation and Experimentation

- 1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content of the other four strands, students should develop their own questions and perform investigations. Students will:
 - a. select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphic calculators) to perform tests, collect data, analyze relationships, and display data.
- b. identify and communicate sources of unavoidable experimental error.
 - c. identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.
 - d. formulate explanations using logic and evidence.
- f. distinguish between hypothesis and theory as science terms.
 - g. recognize the use and limitations of models and theories as scientific representations of reality.
- i. recognize the issues of statistical variability and the need for controlled tests.
- m. investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

Note: Those marked with an asterisk (*) deal with content related to the lab and can be achieved with relatively minor supplements to the curriculum.