Successful

8.

Objectives of Course

Unit detail including projects and activities including duration of

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Students will:
-understand and be able to explain Solvation and Electrolytes (Strong, Weak and Non)
-calculate and solve Molarity problems.
-complete and balance Precipitation Reactions (Molecular, Complete & Net Ionic).
-complete and balance Acid Base Reactions (Molecular, Complete & Net Ionic).
-solve Titration problems, including ones with Extra Acid or Base.
-determine and balance Oxidation/Reduction (Redox) Reactions.

Alkaline Earth Double Displacement Lab: Students test the solubility of the alkaline earths, find the solubility trend, and write double displacement reactions.

Acid Base Titration Lab: Students calculate an unknown concentration of NaOH, using standardized HCl and then calculate unknown HCl, using the unknown NaOH with burets.

IV. Gases (16 days)

CA Science Content Standards: Physics 2a, Chem 3d,4a,4b,4c,4d,4e,4f,4g,4h, 4i, Earth 4c,4d,5a,6d,8c.
NGSS/CA Frameworks: HS-ESS 2-4

Students will:
-calculate Pressure, using Manometers (Open/Closed).
-solve Ideal Gas Law problems, being able to, with any combination of variables, make the appropriate equation,

-calculate and solve Gas Density problems.
- solve problems with gas collected over water and problems with multiple gases mixed together.
-solve Gas Stoichiometry problems.
-know and understand the Kinetic Molecular Theory of Gases.
-solve problems using the Kinetic Energy for gases, the Root Mean Effusion equations..
-solve problems using the Van der Waals Equation for Real Gases.

Charles Law Lab: Students graph gas volume and temperature results and extrapolate to find the temperature at zero volume.

Molar Relationship between Mass and Volume Lab: Students do a gas stoichiometry, involving Mg and HCl, to calculate the theoretical volume of H_2 gas and then do a percent error analysis with the experimental amount of H_2 produced.

Acid Rain / Ozone Hole / Global Warming (3 days of the 16 days)
Students investigate the pollutants in car exhaust that produce smog and acid rain. The ozone produced from car

Students will:
-determine Bond Character.
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-solve Lattice Energy problems, including using lattice energy with ionization, electron affinity, sublimation and bond e
-understand the Localized Electron Model.
-understand the VESPR Model and draw the structures of chemical compounds, stating the molecular name and bond angles.
-draw structures with Resonance.
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-understand Colloids.

Boiling Point Elevation and Freezing Point Depression to Determine Molecular Mass Lab: Students determine molecular masses of KNO_3 and $C_6H_{12}O_6$, using boiling point elevation and freezing point depression.

IX. Chemical Kinetics/ Equilibrium (12 days)

CA Science Content Standards: Chem 7f,8a,8b,8c,8d,9a,9b,9c.
NGSS/CA Frameworks: HS-PS 1-5, 1-6

Students will:
-solve Reaction Rate problems and write Integrated Rate Laws.
-graph and solve problems for First, Second, Zero Order Rate Law Equations, ½ lives, and rate constants.
-determine rate laws from Reaction Mechanisms.
-understand the Chemical Kinetics/ Collision Model.
-solve Arrhenius Equation problems.
-understand Catalysis and types of catalysts.
-solve problems with Equilibrium Equations (Molarity and Pressure).
-understand the Applications of K_{eq} to determine which way the equilibrium needs to shift.
-solve K_{eq} problems using the quadratic, if necessary.
-solve Le Chatelier's Principle problems.
-solve K_{eq} problems, when given non-equilibrium concentrations for all compounds.

Determination of a Rate Law Lab: Students determine the rate law of a reaction and then calculate a rate, given certain conditions.

X. Acids/Bases & Aqueous Equilibrium (15 days)

CA Science Content Standards: Chem 5a,5b,5c,5d,5e,5f,5g.

Students will:
-understand and be able to explain the 3 Theories of Acids/Bases.
-solve pH problems for Strong Acids/Bases.
-solve pH problems for Weak Acids/Bases.
-solve pH problems for Polyprotic Acids.
-solve pH problems given Acid/Base Salts.
-solve pH problems, using the Common Ion Effect.
-solve pH problems, using the Henderson/Hasselbach Equation.
-solve pH problems for Buffered Solutions (Weak Acid with Strong Base & Weak Base with Strong Acid).
-solve Solubility Equilibria/ Precipitation Reaction problems.
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Effect of Temperature on Solubility Lab: Student lab groups

Ksp Solubility Lab: Students predict (calculate) whether a solid will form, and then carry out the reaction, calculating the % error for the amount of solid formed.

XI. Electrochemistry/ Radiochemistry (10 days)

CA Science Content Standards: Chem 1f,11a,11b,11c,11d,11e,11f, 11g, Earth 1e.
NGSS/CA Frameworks: HS-PS 1-8

Students will:
-draw Galvanic Cells and calculate the Electrical Work/Free Energy.
-solve Electrolysis Stoichiometry problems.
-write out Nuclear Decay/ Bombardment Reactions.
-solve First Order Rate Reaction problems, including Half-Lives.
-understand Nuclear Fission/Fusion.
-calculate the Binding Energy for nuclei and the Energy Released in Fission/Fusion reactions.
-understand how a Nuclear Power Plant works.

XII. Organic Chemistry/ Biochemistry (5 days)

CA Science Content Standards: Chem 10a,10b,10c,10d,10e,10f.

Students will:
-be able to name Alkanes with substituents and other groups.
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-be able to name and recognize Alkynes, Alcohols, Ethers, Aldehydes, Ketones, Carboxylic Acids, Esters, Amides, and Amines.

Projects:

First Semester:

Element Project: Students describe step by step how their element is separated from ore, separated from air or made (if man-made). Students discuss physical and chemical properties of their element relating to uses/dangers etc. of their element. Students

Second Semester:

College Project: Students pick a college and an undergraduate major. Students list all courses they would need to take to graduate, picking courses, when options arise. This list includes their General Education courses as well as those for their major. The list will also include course descriptions. Honors Chemistry also does the same for a graduate major. For both undergraduate and graduate degrees, the students research careers relating to their majors and degree attained. Students find average salaries for those careers.

Evaluation/ Assessment/ Rubrics including Attainment for Student to Pass Physical Science

"A"-level work (90-100%): (Excellence overall; no major weaknesses).
This student demonstrates real achievement in grasping scientific thinking, along with development of specific physical science thinking skills and abilities. This student's work is clear, precise, and well reasoned.

"B"-level work (80-89%): (Moderate level of understanding and skill in scientific thinking with some distinctive weaknesses, showing more strengths than weaknesses).
This student demonstrates a good level of achieving scientific thinking with occasional areas of weakness. This student's work is essentially clear and precise with occasional lapses into weak reasoning.

"C"-level work (70-79%): (More than a minimum level of understanding and skill in scientific thinking, but highly inconsistent with as many weaknesses as strengths.)
This student demonstrates a mediocre level of achieving scientific thought with pronounced areas of weakness. This student's work is inconsistent, showing only modest skills and reasoning.

"D"-level work (60-69%): (Minimal level of understanding and skill in scientific thinking).
This student demonstrates a lack of clarity and discipline. This student's work does not show good scientific reasoning and skills, only rarely showing any attempt to take charge of ideas.

"F"=level work (<59%): (Far below the minimal level of understanding and skill in scientific thinking).
This student does not display any discernible scientific reasoning. This student failed to do the required work of the course.

Requirement for Honors UCOP Designation:

Students will have already completed a previous year of laboratory science. The course will be built around lectures coordinated with laboratory exercises, involving a lab report for each lab. The curriculum will be covered at a more rapid pace and in greater depth than might be expected in a regular chemistry course, involving in depth and advanced analysis and research. There will be a comprehensive written final exam, including laboratory concepts and skills.