UC Doorways Online Update Template

(Required Information needed to prepare for course submission)

- **District Information**

NOTE: The School Information must be updated / verified as accurate at the start of each submission cycle. This must be completed before the system will allow any course submissions.

District Information

High School District: *Santa Maria Joint Union High School District*

City: *Santa Maria, California*

District Course List Contact Information

First Name: John

Last Name: Davis

Position/Title: Assistant Superintendent of Curriculum and Instruction

Phone Number: (805) 922-4573 Ext.: 4211

E-mail: jdavis@smjuhsd.org

Teacher Contact Information

First Name: *Marc*

Last Name: *DeBernardi*

Position/Title: *Agriculture Department Head*

Phone Number: *(805) 925-2567* Ext.: *3330*

E-mail: *mdebernardi@smjuhsd.org*

- **Previously Approved Courses**

NOTE: Complete outlines are not needed for courses previously approved by UC. Courses that are defined as "previously approved" are courses from programs (Advanced Placement, International Baccalaureate, ROP courses, etc.) and courses from UC-approved online providers. Courses modeled after courses from outside the school district are also defined as "previously approved" but a complete course description will be required for submission. Each section below represents an individual page on the electronic submission site.

Was this course "Previously Approved" by UC? *X* Yes _____ No

If "No", proceed to the **Course Description** section.

If "Yes," please indicate which category applies:

Is this course modeled after a UC-approved course from another school outside your district?

X Yes _____ No

NOTE: If "Yes," you will be required to submit a complete course description. UC will review the previous submission, if available, to assist in our review process.

If "Yes," which school and ATP code? *Liberty Ranch High School*

Exact Course Title: *Ag Chemistry*

Has this course been provided program status, is not an online course, and is it listed below?

_____ Yes __X__ No

If "Yes," select an option from the Program Status list:

_____ AVID Program

_____ Advanced Placement (AP)

_____ CDE Agricultural Education

_____ CSU Early Assessment Program (EAP)

_____ Center for Advanced Research and Technology (CART)

_____ International Baccalaureate (IB) Program

_____ Project Lead the Way

_____ ROP/C Organization Name of ROP/C: _____

If "Advanced Placement", has it been authorized by the College Board through the AP Audit Process?

_____ Yes _____ In Progress

NOTE: UC will only allow Advanced Placement courses that have passed or are in the AP Audit process. UC requires all AP courses on your list, including those approved in prior years, to be verified via the College Board AP Audit process. UC will run quarterly reports based in AP Audit data; AP courses not listed on the AP Audit list will be removed.

If "In Progress," date submitted to AP: _____ (MM/DD/YY)

Exact Program Course Title: _____

Is this course provided by a UC-approved online curriculum provider listed below?

_____ Yes __X__ No

Have you signed the appropriate partnership agreement with the provider regarding methods of delivery and instruction?

_____ Yes __X__ No

NOTE: You must have signed an agreement with the appropriate provider and filed with UC in order to use their courses.

If "Yes" to both questions, select an option from the Online Provider list:

_____ Apex Learning Virtual School

_____ Brigham Young University Independent Study

_____ Connections Academy

_____ Education Program for Gifted Youth Online High School at Stanford University (EGPY)

_____ K12, Inc.

_____ Laurel Springs School (LSO)

_____ National University Virtual High School

_____ PASS Program / Cyber High

_____ UC College Prep Online (UCCP)

Exact Course Title: *Agriculture Chemistry*

- **Course Description**

Course Title: *Ag Chemistry*

NOTE: Courses that are "previously approved" must use the same exact course title as the previously approved course.

Selected Schools: *Santa Maria High School, Pioneer Valley High School, Ernest Righetti High School*

Transcript Title(s)/Abbreviation(s): _____

Course Code(s): _____

Seeking "Honors" Distinction

NOTE: To receive "honors" distinction, the course submission must satisfy certain requirements. For information about these requirements, please visit the a-g Guide: http://www.ucop.edu/a-gGuide/ag/a-g/honors.html. For "previously approved" courses (including AP and IB), the honors information will be pre-populated as applicable.

__X__ No

_____ Yes, AP

_____ Yes, IB (Higher Level)

_____ Yes, IB (Standard Level)

_____ Yes, Other Honors

NOTE: Defined as a course specifically designed by the school with distinctive features which sets it apart from regular high school courses in the same discipline areas. Course should be seen as comparable in terms of workload and emphasis to AP, IB, or introductory college courses in the subject. Honors courses must be designed for the 11th and 12th grade level and require a comprehensive, year-long, written final exam. In addition to AP and IB higher level courses, high schools may certify as honors level courses *not more than one unit in each of the following subject areas only*: history, English, advanced mathematics, each laboratory science, each language other than English, and each of the four VPA disciplines. If there are no AP or IB higher level courses in a given subject area, the high school may certify up to, but not more than, two units at the honors level in that area.

Subject Area and Category

_____ "a" – History / Social Science

_____ U.S. History

_____ American Government / Civics

_____ World History / Geography / Cultures

_____ "b" – English

_____ English

_____ English-ESL/ELD

_____ "c" – Mathematics

_____ Algebra 1; Yr 1 of 2

_____ Algebra 1; Yr 2 of 2

_____ Algebra 1

_____ Integrated Math 1

_____ Geometry; Yr 1 of 2

_____ Geometry; Yr 2 of 2

_____ Geometry

_____ Integrated Math 2

_____ Algebra 2; Yr 1 of 2

_____ Algebra 2; Yr 2 of 2

_____ Algebra 2

_____ Integrated Math 3

_____ Algebra 2/Trigonometry

_____ Advanced Mathematics

_____ Statistics

__X__ "d" – Laboratory Science

_____ Biological Science

__X__ Chemistry

_____ Physics

_____ Integrated Science

NOTE: Students electing to enroll in an integrated-science program (ISP) are strongly advised to complete the entire three-year sequence. In most cases, the first year of an integrated-science sequence fulfills only the "g" elective requirement; the second and third years of the sequence then fulfill the two-year "d" laboratory science requirement. Accordingly, if only ISP I is successfully completed, then two courses from the categories of Biology, Chemistry, or Physics in the "d" subject area must be completed. If ISP I and only one of ISP II or ISP III are completed, then one additional course from the categories of Biology, Chemistry, or Physics from the "d" subject area must be taken to fulfill the "d" requirement.

_____ Interdisciplinary Science

NOTE: This category demonstrates that the course is cross-disciplinary and is often used for advanced science courses such as AP Environmental Science or Biochemistry.

_____ "e" – Language Other than English

_____ LOTE Year 1

_____ LOTE Year 2

_____ LOTE Year 3

_____ LOTE Year 4+

Language:

_____ ASL

_____ Chinese

_____ French

_____ German

_____ Hebrew

_____ Italian

_____ Japanese

_____ Latin

_____ Other

_____ Russian

_____ Spanish

_____ "f" – Visual & Performing Arts

_____ Dance (Intro)

_____ Dance (Advanced)

_____ Music (Intro)

_____ Music (Advanced)

_____ Theater Arts (Intro)

_____ Theater Arts (Advanced)

_____ Visual Arts (Intro)

_____ Visual Arts (Advanced)

_____ "g" – Elective

_____ History / Social Science

_____ English

_____ English-ESL/ELD

_____ Math

_____ Statistics

_____ Science-Biological

_____ Science-Integrated

_____ Science-Physical

_____ LOTE

_____ VPA

_____ Interdisciplinary

_____ Other

Grade Level: _____ 9 __X__ 10 __X__ 11 __X__ 12

NOTE: Grade level pertains to which grades the course has been designed. 9th grade cannot be selected for Advanced VPA. 9th and 10th grades cannot be selected for honors courses.

Unit Value: _____ 0.5 (half year or semester equiv.) __X__ 1.0 (one year, 2 semesters, or 3 trimesters equiv.)

- **Course Attributes**

Is this course classified as a Career Technical Education course?

__X__ Yes _____ No

If "Yes," please select the name of the Industry Sector and Career Pathway:

__X__ Agriculture and Natural Resources

_____ Agricultural Business

_____ Agricultural Mechanics

__X__ Agriscience

_____ Animal Science

_____ Forestry and Natural Resources

_____ Ornamental Horticulture

_____ Plant and Soil Science

_____ Arts, Media, and Entertainment

_____ Media and Design Arts

_____ Performing Arts

_____ Production and Managerial Arts

_____ Building and Construction

_____ Cabinetmaking and Wood Products

_____ Engineering and Heavy Construction

_____ Mechanical Construction

_____ Residential and Commercial Construction

_____ Education, Child Development and Family Services

_____ Child Development

_____ Consumer Services

_____ Education

_____ Family and Human Services

_____ Energy and Utilities

_____ Electromechanical Installation and Maintenance

_____ Energy and Environmental Technology

_____ Public Utilities

_____ Residential and Commercial Energy and Utilities

_____ Engineering and Design

_____ Architectural and Structural Engineering

_____ Computer Hardware, Electrical, and Networking Engineering

_____ Engineering Design

_____ Engineering Technology

_____ Environment and Natural Science Engineering

_____ Fashion and Interior Design

_____ Fashion Design, Manufacturing, and Merchandising

_____ Interior Design, Furnishings, and Maintenance

_____ Finance and Business

_____ Accounting Services

_____ Banking and Related Services

_____ Business Financial Management

_____ Health Science and Medical Technology

_____ Biotechnology Research and Development

_____ Diagnostic Services

_____ Health Information

_____ Support Services

_____ Therapeutic Services

_____ Hospitality, Tourism, and Recreation

_____ Food Service and Hospitality

_____ Food, Science, Dietetics, and Nutrition

_____ Hospitality, Tourism, and Recreation

_____ Information Technology

_____ Information Support and Services

_____ Media Support and Services

_____ Network Communications

_____ Programming and Systems Development

_____ Manufacturing and Product Development

- _____ Graphic Arts Technology
- _____ Integrated Graphics Technology
- _____ Machine and Forming Technology
- _____ Welding Technology

_____ Marketing, Sales, and Service

- _____ E-Commerce
- _____ Entrepreneurship
- _____ International Trade
- _____ Professional Sales and Marketing

_____ Public Services

- _____ Human Services
- _____ Legal and Government Services
- _____ Protective Services

_____ Transportation

- _____ Aviation and Aerospace Transportation Services
- _____ Collision Repair and Refinishing
- _____ Vehicle Maintenance, Service, and Repair

- **Catalog Description**

Brief Course Description

NOTE: Briefly (in a short paragraph) describe the course, focusing on content, rather than instructional strategies, assessments, or rationale. If school has a catalog, enter the description that is in the catalog.

This is a college preparatory course for students interested in pursuing agricultural science programs in college, with emphasis on chemistry's applications to the environment and agricultural practices. Students will spend approximately 30% of this course engaged in laboratory exercises. Since this is an agricultural education course, students will also participate in leadership development and create a supervised agricultural experience program. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. As a culminating component to the class, students will also develop and present a content-relevant research project for the state Agriscience Fair. Students must have received satisfactory grades in Algebra as well as Agriculture Biology.

Pre-Requisites: *Ag Biology, Algebra* Required *X* Recommended _____

NOTE: Laboratory science and Advanced VPA courses require a pre-requisite. Submissions will not be allowed if this is not included. Some courses, particularly in the mathematics subject areas, require appropriate pre-requisites. For further explanation, refer either to the "Guide to a-g Requirements" document or the a-g Interactive Guide web site at www.ucop.edu/a-gGuide.

Co-Requisites: _____ Required _____ Recommended _____

- **Background Information**

NOTE: Do not include information that could identify your school or district.

Context for Course (optional) **REQUIRED FOR CTE COURSES**

NOTE: In order to understand the context for a new course, sometimes it is helpful for UC to understand the broader educational program and/or reform efforts of the school. How does this course fit into broader departmental and/or pathway structure? How does it fit into the overall school restructuring plans? Is the course intended to be a core course or supplemental? What are the student/school/community needs met by this course?

The Agricultural Chemistry is the third course in our core agricultural science pathway. Our campus has striven to incorporate academic rigor in our courses and pathways, and this course helps our department to align with this vision. This course helps build upon the biological principles taught in the Agricultural Biology course by providing students with an understanding of the physical nature of agricultural science.

History of Course Development (optional) **REQUIRED FOR CTE COURSES**

NOTE: Likewise, it is sometimes helpful for UC to know the origins of a course and who was involved in its development. Did you consult with UC Admissions personnel or UC professors? If so, what was the nature of such consultation and what was the result? Was this course modeled after another course at another school? If so, is that course UC approved? How does the course being submitted differ from the course after which it was modeled? Has this course received any special recognitions, designations or awards? Has it been articulated to local community colleges or universities?

The idea of the course is derived from the continued scientific research and advancements made in the Agriscience field. With these advancements come new career fields, which will need competent and prepared individuals to occupy. In many cases, multiple chemistry courses are required as a part of most post-secondary agricultural science educational programs, and so it is important to prepare students for such courses. A few high schools in California have paved the way and we have used their curriculum and resources to craft ours. The courses have been approved by UC. The help and expertise of many individuals were used to create and shape this course, including Agriscience teachers in our department, individuals from our campus science department, Agriscience professors from the CSU system, and a member of the UC Davis doctorate program in plant and soil science.

- **Textbooks**

NOTE: Include list of Primary and Secondary Texts. Make sure to note the books that will be read entirely and those that will be as excerpts. Textbook information is not necessary if your course is a Visual and Performing Arts, Advanced Placement or an International Baccalaureate course. Online texts or non-standard text materials should include a link to the online text.

Textbook

Title: *Chemistry*

Edition: *2008*

Publication Date: *August 6, 2004*

Publisher: *Peasron Prentice Hall*

Author(s): *Wilbraham, Staley, Matta and Waterman*

URL Resource(s): _____

Usage: *X* Primary Text *X* Read in entirety or near entirety

(Be sure to list any additional textbooks that are used for the class.)

Supplemental Instructional Materials: *Please describe. If using online text or non-standard material, please provide the title of the material or webpage and the URL link.*

- *California Department of Education FFA Curricular Code for the Agriscience Fair Contest*
- *California FFA Recordbook Manual*
- *California Career Technical Education Online Model Lessons*
- *Chemists at Work (The World of Chemistry Series):*
  - *Measurement (TWoC)*
  - *The Atom Revealed*
  - *Quantum Universe*
  - *Uncertainty*
  - *Kaboom!*
  - *The Precious Envelope (TWoC)*
  - *Dynamic Equilibriuim*
  - *Polyethylene*
  - *Carbon (TWoC)*
  - *Brief History of Time*
- *Videos and CDs*

Course Outline

The course begins with the study of matter and change, in which students will be introduced to the subject of chemistry, and review the scientific method and how scientists actually work. In a fairly brief manner, students will also examine the properties of matter, mixtures, elements, compounds, and chemical reactions. Students will use the required to text to study the history of chemistry and build a foundation for the coming concepts. Students will then focus on scientific method and the structure of matter, which will challenge them to review the origins and purpose of the System of International Units. Students will then study volume, mass, and density; and start building students understanding of dimensional analysis and conversion problems which will culminate in the use of stoichiometry. A historical perspective is studied of the atomic model and the discovery of the parts of the atom. Concepts such as atomic number, atomic mass number are reviewed. Students will use the text to help visualize some very spatial concepts introduced as a part of this unit. Next students will examine electrons in atoms, which will require them to understand the development of atomic models that led to the quantum theory of the atom. Key to this portion of the course is students ability to write electron configurations for atoms and be able to relate that to the atom's structure, position on the periodic table and their spectra. Once students are equipped with this knowledge, the next part of the course will focus on the Periodic Table. Students will be asked to discuss the development of the modern periodic table and understand trends in the periodic table and how elements are classified. The text will serve as a vital resource for this unit, as it will be critical for every student to have access to the periodic table. Once students have mastered the Periodic Table, the focus will shift to bonding, which will challenge students to understand and be able to distinguish the different types of chemical bonds and how they work on the atomic level. Students will be asked to identify the type of bonding exhibited by compounds by their characteristic properties. The text provides specific procedure for making such calculations and will again be a vital resource for this unit. Next in the outline of this course will be the study of chemical Names and Formulas, so that students understand and are able to use the rules for naming ionic and molecular compounds as well as acids and bases. The next unit heavily focuses on the mathematical component of chemistry through the study of chemical quantities. Students will be presented with the concepts of the mole as the chemical measurement of matter, and understand how it relates to mass on the periodic table. Students will be challenged to demonstrate the ability to calculate percent composition of elements in a compound and how empirical and molecular formulas relate. Once students have mastered these skills, the next topic will be chemical reactions. The objective is that students understand how to write and balance chemical equations and be able to characterize chemical reactions as single replacement, double replacement, combination, decomposition, or combustion. The next area of focus is stoichiometry, which will allow students to discuss and practice the arithmetic of equations and integrate all the concepts of mole ratios, dimensional analysis and algebra to solve chemical problems. Next is the study of the states of matter and behavior of gases, which will challenge students to compare the natures of gases and liquids. Students will also practice solving gas law problems, and discuss kinetic molecular theory as it relates to real and ideal gases. Next students will examine aqueous systems and solutions, which focus on the characteristics of aqueous solutions and the calculation of solution concentration, will be discussed. Once students have mastered these concepts, the focus will shift to thermochemistry, reaction rates, and equilibrium. In this unit, students will explore the flow of energy (heat) and rates of reactions, and the concept of chemical equilibrium. Next, students will take a close look at acids, bases and salts. As a part of this unit, students will focus on the three main theories of acids and bases, and the real-life characteristics of acids, bases and salts. Next students will examine hydrocarbon compounds, which will challenge them to relate the bonding and structure of simple carbon compounds to their characteristics. Simple organic nomenclature will be practiced. From there, Nuclear Chemistry will be the focus allowing students to explore nuclear radiation, as well as the fission and fusion processes. Lastly, ideal gases and mixture of gases will be examined. which entails studying the Ideal Gas Law and Dalton's Law of partial pressures.

Laboratory Activities

UNIT 1: Introduction/Matter and Change

Separating Mixtures by Filtration
In this experiment, the components of a mixture will be separated using a combination of chemical and physical changes. The mixture to be separated consists of iron oxide, more commonly known as rust, and salicylic acid, an organic compound used in drug manufacture. The purpose of this experiment is to separate a mixture of iron oxide and salicylic acid and to determine the percent composition of each component in the mixture. The students will carefully follow the procedure which involves filtering two substances, recording initial and final weights of the substances, and calculating the percent composition and percent error.

UNIT 2: Scientific Method/Atomic Structure

Measurement Challenge
Students will practice how to measure length, width, and height using a metric ruler on plastic blocks provided by the teacher. They will then calculate density of the objects. Once this is accomplished, the students will measure length, width, height, and calculate density of various agriculture objects such as a stick of butter, a bag of livestock feed, a bale of hay, and a bucket of soil. On all measurements and calculation, students will practice using significant figures. The purpose of this lab is to get students acquainted with scientific measurement and learn how to properly record accurate information.

Scientific Method
When given a roll of bubble tape bubble gum, students must develop a hypothesis, run an experiment, record data, and analyze results. After students are taught the scientific method, they must create their own testable experiment that includes a hypothesis, purpose, and independent/dependent variables. This lab allows students to apply the scientific method in a real and understandable way. Once the hypothesis has been tested, the students must graph the data, analyze the results, and make recommendations for future experiment replications.

Agriculture Science Fair Project
Students will create a hypothesis, design and run a well-balanced experiment, record data, and analyze results of an agriculture related experiment. The students will have four months to run an experiment, record results, write a paper, create a display board, and compete in a school wide science fair competition. The purpose of this project is to give students a chance to use the scientific method in an agriculturally related manner while giving them hands on experience.

UNIT 3: Electrons in Atoms

Atomic Emissions Spectra and Flame Test
Students will see the atomic emissions spectra of various elements using a spectroscope. Each element will emit a different spectrum of colors. Students will record the spectra by coloring them on a piece of paper. The purpose of this activity is to review how electrons behave within an atom and how photons play a role in the emissions of light. The purpose of the flame test is to determine the identity of the cation in an unknown substance based on its characteristic color in a flame. Sodium Chloride, Calcium Chloride, Lithium Chloride, Copper Chloride, and Potassium Chloride will be tested. Each substance will be tested and students must speculate on how the modern view of the atom supports the different colors each cation produces.

UNIT 5: Bonding

Chemical Pollution in Water: A Qualitative Ion Test Kit
The presence of eight different types of polluting ions in water will be tested. To test for typical pollution ions in water, students will mix the pollution ion with its indicating liquid, which yields vibrant chemical reactions. Students will mix the appropriate chemicals, record their observations, and discuss ways in which society can prevent water pollution. The phosphate ion will be discussed more in depth due to its relation to the agriculture industry. The purpose of this activity is to review the nature of ionic compounds, practice using indicating fluids, and discuss a real and prevalent environmental issue.

Paper Chromatography of Food Dyes

Students will use paper chromatography to separate and identify food dyes in various samples. This will display the separation of polar covalent compounds on the basis of their relative polarities. After allowing chromatography paper to reach the top of the paper when immersed in a sodium chloride solution, students will discuss which samples of food color are pure compounds and which are not. Students will identify which food dyes are most polar and least polar.

UNIT 6: Chemical Names and Formulas

Names and Formulas for Ionic Compounds
The purpose of this lab is to observe the formation of compounds and to write their names and formulas. Using a reaction surface, students will mix various chemicals including silver nitrate with sodium carbonate, lead nitrate with sodium phosphate, and calcium chloride with sodium hydroxide. The students will describe each precipitate that forms and write the formulas and names of the chemical compounds produced in the mixture.

Making Ionic Compounds
Students will mix solutions containing cations and anions to make ionic compounds. Students will create compounds such as iron carbonate, silver phosphate and lead hydroxide. Students will write the formula for each compound formed and discuss which compounds will be soluble in water.

UNIT 7: Chemical Quantities

Micro Mole Rockets: Hydrogen and Oxygen Mole Ratio
Microscale quantities of hydrogen and oxygen will be obtained to test their explosive nature, first separately, then in mixtures of various proportions. The goal is to find the most powerful gas mixture and use it to launch a rocket across the room. The purpose of this activity is to generate hydrogen and oxygen to determine the optimum ratio for their combustion reaction to give water. The optimum ratio will be used to calculate the mole ration for the reaction of hydrogen and oxygen in a balanced chemical equation. The concept of limiting reactants will be used to explain the results obtained with various hydrogen/oxygen gas mixtures. In this lab, students will practice stoichiometry, limiting reactants, mole ratios, and the act of combustion.

Boning Up on Calcium: Microanalysis of Calcium in Milk
Students will explore the chemistry behind nutrition with this experiment that measures the amount of calcium in milk. In a microscale titration analysis of calcium in milk, the number of drops of EDTA (of known molarity) needed for complete reaction with a measured volume of milk are counted. Sodium hydroxide is then added to milk to keep the solution basic, and a metal-ion indicator is added to show when all of the calcium in the milk sample has reacted with the EDTA. Parallel titrations are carried out using both control solutions and a reference solution. Students will practice using titration and calculating molarity while discussing the importance of calcium in the diet.

UNIT 8: Chemical Reactions

Chemical Reactions
Students will perform five chemical reactions: synthesis, decomposition, single replacement, double replacement, and combustion. After performing each chemical reaction, students will record their observations, write the evidence that a chemical reaction occurred, write the balanced chemical equation, and identify the type of reaction.

Soil Chemistry Lab
Students will test the acidity of soil relative to practices common in annual crop production, including soil liming. Students will examine the reactions present in soil when limed and write the balanced chemical equation for the reaction. Students will also obtain an alfalfa plant with intact roots and nodules. The class will discuss the chemical reaction that takes place in the root nodules to produce Nitrogen. Students will write the balanced chemical equation and identify the type of chemical reaction taking place in root nodules of legumes.

Chemistry of Food Additives: Fruit Facts
Students will test methods of preventing browning in various perishable foods such as apples and potatoes. Students will test the effectiveness of ascorbic acid on slices apples submerged in water versus sliced apples submerged in water with no acid. The purpose of this activity is to visualize and discuss the oxidation of phenolic compounds due to the action of polyphenol oxidase enzyme. Ascorbic acid is often used to prevent the discoloration of several foods. When added to distilled water, it lowers the pH of the solution, therefore inhibiting phenol oxidase activity. In the lab, student will discuss the ways in which produces package various agriculture

commodities such as sliced apples, and how chemistry can help producers preserve food.

UNIT 9: Stoichiometry

Leftover Aluminum Wire: A Stoichiometry Lab
The redox experiment between copper(II) chloride and aluminum metal gives an impressive visual reaction. In this lab, students will use a balanced chemical equation and stoichiometry calculations to predict the amount of aluminum that should react with copper(II) chloride and compare this to the actual amount of leftover aluminum wire. This lab will cover oxidation-reduction reactions, limiting reactants, stoichiometry, and yield calculations.

UNIT 10: States of Matter and Behavior of Gases

Boyle's law in a bottle
The purpose of this experiment is to perform a modern version of Boyle???s classic experiment without the hazards associated with the use of mercury. The experiment will be carried out using air trapped inside a sealed syringe within a pressure bottle. The bottle will be pressurized by pumping in air to obtain a pressure several times greater than the surrounding air. As some of the excess pressure within the bottle is released, the volume of the trapped air inside the syringe will change. Volume measurements will be made at several different pressures and the results will be analyzed by graphing to derive the mathematical relationship between pressure and volume.

UNIT 11: Aqueous Systems and Solutions

Making a Solution
Student will make a solution and use carefully measured date to calculate the solution???s concentration by filling a flask with sodium chloride, then dissolving it in water. After taking initial and final weights, the percent mass, mole fraction, molarity, and density of the solution will be calculated.
Observing Agriculture Solutions
Students will examine and discuss various solutions used in agriculture including liquid fertilizers such as anhydrous ammonia, pesticide applications, livestock feed additives, and different milk products. Students will then calculate the fertilizer to water ratio needed to spray a 100 acre field of pre-emergent corn seed.

UNIT 12: Thermochemistry, Reaction Rates, and Equilibrium

Hot and Cold Equilibrium
Students will visualize the effect of change in temperature on a system at equilibrium, reinforcing LeChateliers Principle. In this experiment, cobalt(II) chloride is dissolved in water to form a pink cobalt(II) chloride water complex ion. When alcohol is added to the aqueous cobalt chloride, three of the water molecules are removed, forming a blue species. This process is an endothermic reaction and heat is considered a reactant. Students will discuss how an increase of decrease in temperature affects a system at equilibrium.

Instant Hot/Cold Pack
Students investigate the concepts of thermochemistry by creating their own instant hot and cold packs. By using a heavy duty zip lock bag and various chemicals, each activity will demonstrate a different type of thermodynamic process or reaction. The cool reaction is an example of an endothermic reaction, the instant cold pack is an example of an endothermic process and the hot bag is an exothermic reaction. Students will create the hot and cold packs, record their observations, discuss the flow of heat in each reaction, and determine if they are an endothermic or exothermic reaction.

Phase Change of Water
Students will change the phase of water from solid, to liquid, to vapor by melting ice on a hot plate. Students will record the temperature in degrees Celcius every minute and plot time versus temperature on a graph. The purpose of this lab is to understand the flow of energy and change of temperature when a substance changes state.

Preparation and Properties of Biodiesel
Biodiesel is an alternative, processed fuel for cars and trucks that is obtained from biological sources. The purpose of this activity is to prepare biodiesel fuel and to investigate the amount of energy it releases when burned. Students will calculate the change in temperature, amount of energy absorbed, and the heat of combustion of the fuel from the change in energy of the water and the mass of fuel consumed. Students will then discuss the potential for using biodiesel in agriculture settings and how it can benefit the environment.

UNIT 13: Acids, Bases and Salts

Titration Lab
Students will determine if fresh or frozen orange juice contains more vitamin C. This will be determined by using a known amount of vitamin C as a standard solution then titrating the vitamin C sources into a dichloroindophenol solution. Students will then calculate the amount of vitamin C in milligrams when comparing it to the known amount.

Disappearing Ink: Thymolphthalein, an Acid-Base Indicator lab
In this activity, students will explore the properties of a characteristic acid-base indicator, thymolphthalein, and to extend their understanding of pH and acid-base concepts. Students will write a message using the thymolphthalein solution on a large piece of chromatography paper. After the message has disappeared, students will mist the paper of sodium hydroxide solution, allowing the message to reappear. Students will then experiment with other substances to determine the conditions which make the ink color disappear. Students will then estimate the pH range at which the indicator transition takes place. Students will describe what happened in this lab, and explain what cause the ink to disappear and reappear. This lab is intended to overview concepts of pH, acids and bases, and indicators.

Soil pH
Students will bring in soil samples from various locations around the county. Students will record the place in which each sample was taken and note any agriculture or industrial activity that has taken place in the soil's surroundings. They will then dilute them in water and test the pH of each soil using pH test strips. After recording their observations, students will make inferences about how the use of each soil impacts its pH and the effect agriculture has on soil pH.

Cheese-Making
The purpose of this activity is to examine the effects of enzyme activity and the different densities of milk components. Students will create cheese from powdered milk, age it for 48 hours and record observations of the final product. Students will discuss how pH, temperature, and bacteria type affect the cheese-making process.

UNIT 14: Organic Chemistry

Organic Models Lab
Students will build models of organic molecules and name the nine structural isomers of heptane. Using a ball and stick kit, students will use colors to represent certain elements. They will build a model for a straight chain isomer of heptanes followed by the eight other structural isomers. Students will determine which is the shortest possible straight carbon chain in the isomer and why each one has its own unique name.

Milk is a Natural
The purpose of this lab is to separate the protein and carbohydrate components of skim milk and verify their identity. This lab activity involves the separation, identification, and quantitative analysis of the protein and carbohydrate fractions of skim milk. The experimental results will be compared against the information provided on the nutritional label for the amount of protein and carbohydrate in milk.

Key Assignments

UNIT 1: Introduction/Matter and Change

Chemistry, 2007. Section 1.3 of chapter 1; all of chapter 2.
Students answer questions from the assigned reading.

UNIT 2: Scientific Method/Atomic Structure

Chemistry, 2007. All of chapters 3 and 4
Students will read text sections as noted in Resources section.

Safety Equipment Demo
Students take notes from teacher demonstration on lab safety.

AIM Chemistry Activity
Students will review the parts of the atom.

UNIT 3: Electrons in Atoms

Chemistry, 2007. Chapter 5
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint.

The Atom Revealed, Quantum Universe, Uncertainty Videos
Students watch and take notes on videos to reinforce difficult to visualize concepts.

Element Advertisement
Students will create a billboard that advertises an element and its electron configuration and uses.

Ag Chemistry Advancement Assignment
Students will be assigned a topic to research related to historical advances in agricultural chemistry about which they will write a two page paper and present it to the class.

UNIT 4: The Periodic Table

Chemistry, 2007. Chapter 6, and wall periodic table
Students will read text sections as noted in Resources section. Students take notes from teacher generated PowerPoint and lecture.

Group Element Project
Students will research, create and present a poster highlighting the role of one element in modern or historical agricultural practice.

UNIT 5: Bonding

Chemistry, 2007.Sections 7.1 and 7.2 of chapter 7. Sections 8.1; 8.2; and 8.3 of chapter 8.
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint. Students answer questions from the assigned reading.

UNIT 6: Chemical Names and Formulas

Chemistry, 2007. Chapter 9
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint. Students answer questions from the assigned reading.

Sell that Compound Assignment
Students will draw a poster to sell the uses and characteristics of an assigned compound to an agricultural producer.

UNIT 7: Chemical Quantities

Chemistry, 2007. Chapter 10
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint. Students answer questions from the assigned reading.

UNIT 8: Chemical Reactions

Chemistry, 2007. Sections 11.1 and 11.2 of chapter 11.
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint. Students answer questions from the assigned reading.

Reaction Demonstrations
Students watch teacher reactions demonstrations, characterize each reaction and balance the resulting equation.

KaBoom! Video
Students will watch and take notes on a video describing the chemical reactions involved in explosives.

UNIT 9: Stoichiometry

Chemistry, 2007.Sections 12.1 and 12.2 of chapter 12.
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint.
Students answer questions from the assigned reading.

UNIT 10: States of Matter and Behavior of Gases

Chemistry, 2007. Sections 13.1 and 13.2 of chapter 13 and 14.1 and 14.2 of chapter 14.
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint.
Students answer questions from the assigned reading.

Gas Law Project
Students make a Power Point and do a presentation to explain a gas law.

UNIT 11: Aqueous Systems and Solutions

Chemistry, 2007. Sections 15.2 and 15.3 of chapter 15 and sections 16.1 and 16.2 of chapter 16.
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint.
Students answer questions from the assigned reading.

UNIT 12: Thermochemistry, Reaction Rates, and Equilibrium

Chemistry, 2007. Section 17.1 of chapter 17 and 18.1 of chapter 18.
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint.
Students will answer questions from the assigned reading.

Dynamic Equilibrium Video
Students will watch and take notes on a video describing the dynamic nature of equilibrium.

Thermochemistry Project
Student will write a two page essay, produce a visual aide, and present to the class on a real-life application of Thermochemistry as it relates to food processing.

UNIT 13: Acids, Bases and Salts

Chemistry, 2007. Section 19.1 of chapter 19.
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint.
Students will answer questions from the assigned reading

Acids and Bases Essay
Students will write two page essay on uses, characteristics and sources of acids and bases in soil science and their effects on agricultural productivity.

UNIT 14: Hydrocarbon Compounds

Chemistry, 2007. Sections 22.1 and 22.2 or chapter 22
Students will read text sections as noted in Resources section, and take notes from teacher generated notes on Powerpoint.
Students will answer questions from the assigned reading.

Draw That Hydrocarbon Game
Students will compete as teams to correctly draw the structural formulas of hydrocarbons and substituted hydrocarbons.

UNIT 15: Nuclear Chemistry

Chemistry, 2008. Sections 25.1 and 25.3 in chapter 25
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint.
Students answer questions from the assigned reading.

Albert Einstein Video
Students will watch and take notes on video to add a historical insight to their understanding of fission.

UNIT 16: Ideal Gases and Mixtures of Gases

Chemistry, 2007. Sections 14.3 and 14.4 of chapter 14.
Students will read text sections as noted in Resources section, take notes from teacher generated PowerPoint.
Students answer questions for the assigned reading.

Liquid Nitrogen/Vacuum Demonstration
Students watch teacher perform demonstrations and answer questions verbally posed by teacher.

The Precious Envelope video
Students will watch and take notes on a video regarding the atmospheric gases.

Atmospheric Gases Essay
Students will investigate the effects of atmospheric gases on weather and weather's effect on agricultural production. They will write a 3-page essay on the subject.

UNIT 17: Agriscience Fair

Chemistry, 2007. Section 1.1 of chapter 1.
Art supplies.
Students will prepare a poster detailing the importance of research in the development of agriculture.
Students will develop an agriculturally related science fair experiment and construct a research paper utilizing course knowledge as well as larger scientific principles.

Instructional Methods and/or Strategies

Being that chemistry is a laboratory science area, the primary instructional strategy used to deliver curriculum are hands-on labs or Experiential Learning. This method of instruction allows to students to practice the concepts and see them in action, which research suggests leads to improved retention and ability for application. Also, included in this area of Experiential Learning and used as a part of this course are research projects and assigned questions. Every unit within the content outline is supported by one or more experiential learning strategies.

Another key instructional strategy used is Interactive Learning, which allows students to manipulate content in various ways and form cognitive anchors. For example, there are opportunities for students to engage in role-playing, debates, discussion, and group projects. The following concepts within the content outline are supported by Interactive Learning; elements, compounds, ionic nomenclature, and the structure of gases.

Direct instruction is a foundational instructional strategy used as a par to this curriculum. Every unit provides students with direct instruction through teacher-lead discussion and lecture. Students are able to build a foundation of knowledge which will then be built upon through labs and other interactive methods.

The last strategy used is Indirect Instruction through activities such as essays, homework, and reading methods.

Assessment Methods and/or Tools

UNIT 1: Introduction/Matter and Change

To assess students understanding of the properties of matter, mixtures, elements and compounds, and chemical reactions, students will demonstrate their knowledge through a constructed response summative assessment.

UNIT 2: Scientific Method/Atomic Structure

To assess students understanding of volume, mass, density; dimensional analysis and conversion problems which will culminates in the use of stoichiometry, students will demonstrate their knowledge through a selected response assessment. To assess student understanding of atomic model and the discovery of the parts of the atom, students will demonstrate their knowledge through a lab report.

UNIT 3: Electrons in Atoms

To assess student understanding of atomic models and how they led to the quantum theory of the atom, students will demonstrate their knowledge through selected response formative assessment. To assess student ability to write electron configurations for atoms and be able to relate that to the atom's structure, position on the periodic table and their spectra, students will demonstrate their knowledge through a lab report.

UNIT 4: The Periodic Table

To assess student understanding of the development of the modern periodic table and trends in the periodic table and how elements are classified, students will demonstrate their knowledge through a selected response summative assessment.

UNIT 5: Bonding

To assess student ability to distinguish the different types of chemical bonds and how they work on the atomic level, students will demonstrate their knowledge through a lab report. To assess student ability to identify the type of bonding exhibited by compounds by their characteristic properties, students will demonstrate their knowledge through a constructed response summative assessment.

UNIT 6: Chemical Names and Formulas

To assess student ability to use the rules for naming ionic and molecular compounds as well as acids and bases, students will demonstrate their knowledge through several means of assessment, including a performance, lab reports, and constructed response assessments.

UNIT 7: Chemical Quantities

To assess student understanding of the concept of the mole as the chemical measurement of matter, and understand how it relates to mass on the periodic table, students will demonstrate their knowledge through several lab reports and a selected response summative assessment.

UNIT 9: Stoichiometry

To assess student understanding of arithmetic of equations and the concepts of mole ratios, dimensional analysis and algebra to solve chemical problems, students will demonstrate their knowledge through a lab report and selected response summative assessment.

UNIT 10: States of Matter and Behavior of Gases

To assess student ability to compare the natures of gases and liquids, then examine the properties of gases in more detail, students will demonstrate their knowledge through a series of lab reports and performance assessments. To assess student ability to solve gas law problems, and discuss kinetic molecular theory as it relates to real and ideal gases, students will demonstrate their knowledge through constructed response summative assessment.

UNIT 11: Aqueous Systems and Solutions

To assess student understanding of mixtures with an emphasis on solutions and the characteristics of aqueous solutions and the calculation of solution concentration, students will demonstrate their knowledge through a lab report and selected response summative assessment.

UNIT 12: Thermochemistry, Reaction Rates, and Equilibrium

To assess student understanding of the flow of energy (heat) and rates of reactions, and the concept of chemical equilibrium, students will demonstrate their knowledge through a performance assessment project, a series of lab reports, and a constructed response summative assessment.

UNIT 13: Acids, Bases and Salts

To assess student understanding of the three main theories of acids and bases, and the real-life characteristics of acids, bases and salts, students will demonstrate their knowledge through a lap report and selected response summative assessment.

UNIT 14: Hydrocarbon Compounds

To assess student understanding of the bonding and structure of simple carbon compounds, students will demonstrate their knowledge through a series of lab reports and a constructed response summative assessment.

UNIT 15: Nuclear Chemistry

To assess student understanding of nuclear radiation, as well as the fission and fusion processes, students will demonstrate their knowledge through a selected response summative assessment.

UNIT 16: Ideal Gases and Mixtures of Gases

To assess student understanding of the applications of the Ideal Gas Law and Dalton's Law of partial pressures, students will demonstrate their knowledge through a constructed response summative assessment, as well as a series of lab reports.