Course Title: Agriculture Chemistry Date Adopted: **February 20, 2002**

Department: Agriculture UC/CSU Requirement: Yes

Pre-Requisite: Agriculture Biology with a C or Fulfills CSF Requirements: Yes

 better Algebra, or instructors

 permission

Length of Course: Two Semesters Fulfills H/S Graduation Credit As:

 Physical Science Elective: Yes

Semester Units/Credit: 5 Grade Level: 10-12

 Course Number: 01018

I. Course Description

Agriculture Chemistry is a laboratory science course designed for the college bound student with career interest in agriculture. Students will be involved in hands on laboratory study an receive in-depth look at various concepts in chemistry including: chemistry and its relationship to agriculture, matter and energy, the periodic table, bonding, chemical reactions, moles, gases and gas level.

II. Rationale

Chemistry is one of the building blocks upon which our technological society is based. An adequate understanding of the chemical nature of matter is necessary therefore to be an intelligent contributing member of our society. Chemistry is intended to provide an introductory foundation for those who intend to continue their study of chemistry and for those students who intend to study in related scientific, medical and agriculture fields. It is also intended to meet the needs of those students whose interest lies in other fields of study but required a knowledge of chemistry to function in that capacity.

Goals, Objectives, and Performance Indictors

Goal: Students will develop a knowledge of the basic concepts of the

 structure of the atom and the Atomic Theory of Matter.

Obj: Students will develop a knowledge of the evidence for the

 Atomic Theory of Matter.

 1.1.1: Students will state the Law of Conservation of Mass, Constant

 Proportions, and Multiple Proportions and indicate how they

 relate to the atomic theory.

 1.1.2: Given the results of Aristotle, Democritus, Dalton, Thomson,

 Millikan, Rutherford, and Chadwick, students will relate each

 scientists contribution to the atomic theory of matter.

Obj: Students will develop a knowledge of the basic atomic structu re

 of the atom.

 1.2.1: Given the Periodic Table of the Elements, students will identify

 each element by symbol and name and identify each element’s

 atomic mass and atomic number.

 1.2.2: Given the Periodic Table students will relate the position of an

 element to its atomic number and atomic mass.

 1.2.3: Given the Periodic Table students will identify metals,

 semimetals, nonmetals, and halogens.

 1.2.4: Given the Periodic Table students will identify alkali metals,

 alkaline earth metals, and transition metals, trends in

 ionization energy, electronegativity, and the relative size of

 ions and atoms.

 1.2.5: Given the Periodic Table students will determine the number

 of electrons available for bonding.

 1.2.6: Given the Periodic Table students will relate the position of

 an element in the periodic table to its quantum electron

 configuration and to its reactivity with other elements in the

 table.

 1.2.7: Given the Atomic notion of any element and/or the Periodic

 Table of the Elements, students will calculate the number of

 subatomic particles (protons, neutrons, and electrons) present

 in any element.

 1.2.8: Given the percentage abundance and isotopic masses of an

 element, students will calculate the average atomic mass of

 any element.

1.3: Obj: Students will develop a knowledge of the nature of the

 electromagnetic spectrum and its relationship to the distribution

 of electron in the atom.

 1.3.1: Given the complete electromagnetic spectrum, students will

 relate the visible spectrum to the other major divisions of the

 electromagnetic spectrum.

 1.3.2: Given the wavelength, students will calculate the frequency

 and its corresponding energy (E = hf and c = f \) and visa

 versa.

 1.3.3: Given Planck’s equation relating light and energy (E = hf),

 students will recognize the duel nature of light and apply the

 results to the distribution of energy level in the electron cloud

 of a hydrogen –like atom.

 1.3.4: Using the Bohr’s Equations (EN = -1312kj/n2) and the Bohr

 theory of the distribution of principle energy levels in the

 atom, students will calculate energy of the principal energy

 levels of hydrogen and/or hydrogen-like atoms.

 1.3.5: Given the results of Quantum Mechanics developed by

 Schrodinger and applying Hund’s rule and the Pali exclusion

 principle, students will translate these results, rules, and

 principles into the principal energy levels in an atom’s

 electron cloud, their sublevels, and related atomic orbital

 (s,p,d,f) and the distribution of electrons in the electron cloud

 in the atomic orbital.

 1.3.6: Given the electron configuration of an element, students will

 identify that element.

1.4: Obj: Students will develop a knowledge of the periodic relationship

 inherent in the organization of the Periodic Table of the

 Elements.

 1.4.1: Given the Periodic Table of the Elements, students will

 identify the main periods, subperiods, and families of the

 table.

 1.4.2: Given the periodic Table of the Elements. Students will relate

 the periods, subperiods, and families of the periodic table to

 the quantum mechanical atom.

 1.4.3: Given the Periodic Table of the elements, students will

 identify the valence electron of each family and the elements

 in that family and express that distribution by writing correct

 electron configurations for each element.

 1.4.4: Given a Periodic Table of the elements and the Periodic Law,

 students will predict periodic trends of a family of elements

 and of a period of elements with respect to atomic mass,

 atomic numbers, electron number, atomic radii, ionization

 energy, electron affinity, melting point, chemical reactivity,

 and electronegativity.

Obj: Students will develop a knowledge of the nature of nuclear

 chemistry.

 1.5.1: Given the identities of all but one of the reactants and products,

 students will balance equations for nuclear decay.

 1.5.2: Given the identities of all but one of the reactants and products,

 students will identify the type of radioactive decay occurring:

 alpha, beta, positron, fission, fusion.

Goal: Students will gain an understanding of the conservation of atoms in

 chemical reactions leads to the principal of conservation of matter and

 the ability to calculate the mass of products and reactants.

Obj: Students will develop a knowledge of the mole as a number and

 as a mass.

 2.1.1: Given the term mole, students will recognize that it as equal to

 Avogadro’s number of particles ( 6.023 x 10).

 2.1.2: Given the atomic mass of an element, students will recognize

 it as the mass in grams equal to Avogadro’s number of

 particles ( 1 mole).

 2.1.3: Given the term molar mass, students will recognize it as the

 mass in grams equal to ne mole of a substance ( atomic,

 formula, or molecular).

 2.1.4: Given the Periodic Table of the Elements, students will

 identify each element and its molar mass.

 2.1.5: Given the chemical formula for a compound and the

 Periodic Table of the Elements, students will determine its

 molar mass.

 2.1.6: Given the chemical formulas for several compounds, students

 will identify those which are empirical formulas and those

 which are molecular formulas.

 2.1.7: Given appropriate data, students will calculate the molecular

 formula of a substance.

 2.1.8: Students will understand the quantity one mole is set by

 defining, one mole of carbon 12 atoms to have a mass of

 exactly 12 grams.

2.2: Obj: Students will develop a knowledge of the importance of

 balanced equations in chemistry.

 2.2.1: Given a balanced equation, students will identify the reactants

 and products.

 2.2.2: Given an unbalanced equation. Students will balance the

 equation by inspection.

 2.2.3: Given the reactants, products, and chemical formulas for a

 reaction, students will write and balance an equation for the

 described reaction.

 2.2.4: Given a balanced chemical equation, students will verify

 that it obeys the Law of Conservation of Mass.

 2.2.5: Given a balanced equation, students will identify the

 equations as acid-base neutralization, precipitation,

 synthesis, decomposition, etc.

 2.2.6: Given a chemical reaction students will calculate percent

 yield.

 2.2.7: Given a chemical reaction students will identify reactions

 that involve oxidation and reductions and how to balance

 oxidation-reduction reactions.

 2.2.8: Given a balanced equation and appropriate data, students

 will calculate using the mole method the stoichiometric

 relationships of reactants to reactants, reactants to

 products, or products to products, ( weight/weight,

 weight/volume, and volume/volume problems)

Goal: Students will gain an understanding of the biological, chemical, and

 physical properties of matter result from the ability of atoms to form

 bonds from electrostatic forces between electrons and protons and

 between atoms and molecules, and the nomenclature of inorganic

 compounds.

 3.1: Obj: Students will develop a knowledge of the types of chemical bonds.

 3.1.1: Given the terms ionic, covalent, metallic, hydrogen bonding, and

 Van der Waals dispersion forces, students will describe how each

 type of bond is formed.

 3.1.2: Given the Periodic Table of the Elements and/or the

 electronegativities of the elements, students will determine which

 elements are likely to combine to for ionic bonds and which

 elements are likely to combine to form covalent bonds.

 3.1.3: Given the Periodic Table of the Elements and using the octet rule,

 students will write the Lewis electron dot structure of the

 representative elements.

 3.1.4: Given the Periodic Table of the elements, students will write

 Lewis electron dot structure for simple molecules and polyatomic

 ions.

 3.1.5: Given the Periodic Table of Elements, students will write the

 repeating patterns of negative and positive ions held together by

 electrostatic attraction.

 3.1.6: Using only the Periodic Table, students will describe

 electronegativity and ionization energy trends and compare the

 relative polarity of different bonds,

Obj: Students will develop a knowledge of the structure and geometry

 of molecules, ions, and complex ions.

 3.2.1: Given or having derived the Lewis structure of a simple

 molecule or polyatomic ion, students will use valence shell

 electron pair repulsion (VSEPR) and/or valence bond theory

 (Atomic orbital and orbital hybridization) to predict the

 geometric arrangement of the elements of a molecule,

 polyatomic ion, or complex ion, and describe its shape using a

 descriptive term (linear, bent pyamidal, trigonal planer,

 tetrahedral).

 3.2.2: Given or having derived the molecular structure of a molecule

 using VSEPR or the valence bond theory, students will identify

 the type of bonding orbitals or hybridization of bonding

 orbitals used by the combined atoms which result in the

 determination of the shape of the molecule.

Obj: Students will develop a knowledge of the nomenclature of

 inorganic compounds.

 3.3.1: Given the definition of an acid, base, and salt, students will

 identify each form-their formula or their name.

 3.3.2: Given the rules (traditional and/or IUPAC) for naming binary

 inorganic compounds, students will name and/or write the

 formula for binary inorganic acids, bases, salts, complex ions,

 and nonmetal compounds.

 3.3.3: Given the rules (traditional and/or IUPAC) for naming ternary

 inorganic compounds, students will name and/or write the

 formula for ternary inorganic acids, salts, coordination

 compounds, complex ions and polyatomic ions.

Obj: Students will develop a knowledge of the nomenclature and

 structure of simple organic compounds. (optional)

 3.4.1: Given the structural formula of a simple organic compound,

 students will classify it as a hydrocarbon, aromatic, alkylhalide,

 aldehyde, ketone, acid, amine, etc.

 3.4.2: Given the molecular formula of a simple organic compound

 students will write its structural formula.

 3.4.3: Given the IUPAC name of a simple organic compound,

 students will write its structural formula.

 3.4.4: Given the structural formula of a simple organic compound,

 students will give its IUPAC name.

Goal: Students will gain an understanding of the kinetic molecular theory

 describes the motion of atom and molecules and explain the properties

 of gases.

Obj: Students will develop a knowledge of the nature of the gaseous

 state.

 4.1.1: Given the physical characteristics of the gaseous state, students

 will classify a substance as a gas.

 4.1.2: Given the kinetic theory of matter, students will explain the

 observed physical characteristics of the gaseous state.

 4.1.3: Given appropriate data and the kinetic theory of matter,

 students will recognize the significance of absolute zero.

 4.1.4: Given appropriate data, students will use Graham’s Law to

 calculate the relative velocities of gaseous species and relate

 these to the kinetic theory of matter.

 4.1.5: Given the Kelvin temperature scale, students will interconvert

 Celsius and Kelvin temperatures.

 4.1.6: Given observable pressure on the surface, students will

 identify that random motion of molecules and their collisions

 with a surface create that observable pressure on that surface.

 4.1.7: Given appropriate data students will explain the random

 motion of molecules in correlation with the diffusion of gases.

 4.1.8: Given the appropriate data, students will recognize the

 mathematical relationship between moles, pressure, volume,

 and temperature for a gas (Boyles and Charles Laws,

 Avogardro’s Hypothesis, etc).

 4.1.9: Given the standard temperature and pressure ( STP) students

 will define the values and meaning.

 4.1.10: Given the ideal gas law in the form PVU=nRT students will

 solve problems.

 4.1.11: Given Daltons Laws of Partial Pressure, students will

 calculate the partial pressure of each gas in the mixture

 and/or total pressure of a mixture of gases.

Obj: Students will develop a knowledge of the condensed phases of

 matter-liquids and solids.

 4.2.1: Given the physical properties of the liquid and solid states,

 students will identify a substance as a liquid or a solid.

 4.2.2: Given the heat capacity of each state of matter and heats of

 fusion and vaporization for a pure substance, students will

 calculate the quantity of heat required for the conversion of a

 substance form one state to another.

 4.2.3: Given appropriate data, students will construct graphically

 a cooling curve and/or heating curve and identify the

 significant region of the graph: solid state, liquid state,

 gaseous state, fusion curve, vaporization curve.

Obj: Students will develop a knowledge of the effect of chemical

 bonds on the type of solid formed.

 4.3.1: Given appropriate data, students will determine the type of

 solid ( ionic, molecular, metallic, covalent network) formed

 by a substance and relate its formation to the type of

 intermolecular, interatomic, and interionic bonding ( ionic,

 covalent, metallic, hydrogen, Van Der Waal’s).

 4.3.2: Given the physical properties of various solids, students will

 distinguish among ionic, molecular, covalent network, and

 metallic solids with regard to particle structure ( molecular,

 ion, or atomic).

 4.3.3: Given the physical properties of various solids, students will

 compare different molecular substances with respect to the

 types of intermolecular forces ( dipole forces, hydrogen

 bonding, dispersion (Van Der Waal’s).

Goal: Students will gain an understanding that acids, bases, and salts are three

 classes of compounds that form ions in water solutions.

Obj: Students will develop a qualitative understanding of the concept

 of chemical equilibrium.

 5.1.1: Given the definition of equilibrium, students will relate the

 definition to the reversibility of chemical reactions and reaction

 rates.

 5.1.2: Given the definition of equilibrium, students will recognize that

 the process is dynamic.

 5.1.3: Given La Chatelier’s principal, students will predict the effect

 of changes in temperature, concentration and pressure will have

 of the chemical state of equilibrium in homogeneous and in

 heterogeneous systems.

Obj: Students will develop a quantitative understanding of

 equilibrium in the gaseous state.

 5.2.1: Given a balanced chemical equation, students will recognize

 the relationship between equilibrium, the Law of Mass Action,

 and La Chatelier’s principle.

 5.2.2: Given balanced chemical equations, students will write a

 equilibrium law expression for each equilibrium system.

 5.2.3: Given appropriate data, students will calculate the value of the

 equilibrium constant either as Kp or Kc of the concentrations

 of the species in equilibrium using the equilibrium law

 expression.

 5.2.4: Given several sets of appropriate data of the same equilibrium

 system, students will recognize the relationship between

 shifting equilibria ( La Chatelier’s Principal), the equilibrium

 law expression, and the value of the equilibrium constant.

Obj: Students will develop a quantitative understanding of solubility

 equilibrium.

 5.3.1: Given or having developed graphic data, students will

 recognize the relationship of the solubility of a substance to

 the Celsius temperature.

 5.3.2: Given a solubility table, students will predict the solubility of

 a variety of compounds.

 5.3.3: Given a solubility table, students will predict whether a

 precipitate will form when tow electrolytes are mixed and will

 write a balanced net ionic equation expressing what they

 believed to have occurred.

 5.3.4: Given the formula for a slightly soluble ionic compound,

 students will write an equation for its dissociation in water to

 form ions.

 5.3.5: Given the formula for a slightly soluble ionic compound and

 the balance equation for its dissociation in water, students

 will write the solubility law expression, Ksp.

 5.3.6: Given appropriate data, students will calculate the value of

 the Ksp or the concentrations (molarity or solubility) of the

 ionic or formula species in solution using the solubility law

 expression.

 Obj: Students will develop a quantitative understanding of acid-base

 chemistry and acid-base equilibrium.

 5.4.1: Given the definition of an Arrhenius acid and base and/or a

 Bronsted-Lowry acid and base, students will identify each

 acid and base from a variety of inorganic compounds.

 5.4.2: Given the equation of an acid-base reaction, students will

 identify the Arrhenius acid and base and/or the Bronsted-

 Lowry acid-base conjugate pairs.

 5.4.3: Given the chemical properties of Arrhenius acids and bases,

 students will predict the chemical behavior of several

 Arrenius acids and bases.

 5.4.4: Given an Arrhenius acid and base, students will write a

 balanced chemical reaction for their neutralization forming

 a salt water.

 5.4.5: Given the definition of an acid-base titration, students will

 recognize the relationship between reactants and products.

 5.4.6: Given the definition and chemical characteristics of an

 acid-base indicator, students will recognize their use in

 acid-base titrations.

 5.4.7: Given appropriate data for an acid-base titration, students

 will calculate stoichiometrically using the mole method,

 the molarity of a solution.

 5.4.8: Given acids and bases students will know that acids are

 hydrogen-ion-donating and bases are hydrogen-ion-

 accepting substances.

 5.4.9: Given the formula for an acid or a base, students will write

 the equation for their dissociation in water.

 5.4.10: Given the PH scale students will characterize acid and

 base solutions.

 5.4.11: Given the relationship between PH and the hydrogen ion

 concentration of a solution (pH equation), students will

 calculate the pH or the hydrogen ion concentration of a

 solution.

 5.4.12: Given the equation for the dissociation of water, students

 will write the ion product expression for water, Kw.

 5.4.13: Given the Kw for water, students will calculate the

 hydroxide concentration of an acidic solution or the

 hydrogen ion concentration of a basic solution.

 5.4.14: Given the equation pH + pOH = 14 and appropriate data,

 students will calculate the pH, the pOH, the hydrogen ion

 concentration, and/or the hydroxide ion concentration of a

 solution.

 5.4.15: Given buffers students will stabilize pH in acid base

 reactions.

 5.4.16: Given an equation for the dissociation of a weak acid or

 base in water, students will write the ion product

 expression of an acid (ka) or a base (Kb).

Goal: Students will gain an understanding that solutions are homogenous

 mixture of two or more substances and the nature of chemical

 solutions.

Obj: Students will develop a knowledge of the chemical methods of

 expressing the concentration of a solution.

 6.1.1: Given the definition of a mixture, students will identify

 solutions as mixtures.

 6.1.2: Given the definition of the components of a mixture,

 students will identify the solute and the solvent of several

 solutions.

 6.1.3: Given the appropriate data, students will describe how to

 prepare a solution to a desired molarity, molality, mole

 fraction, and/or mass percentage concentration.

 6.1.4: Given the equation for the mole fraction of a solution and

 appropriate data, students will calculate the fraction of a

 solution that is solute and the fraction of a solution that is

 solvent.

 6.1.5: Given the equation for the molarity of a solution, and

 appropriate data, students will calculate the molarity of the

 solution, mass of solute, moles of solute, or volume of

 solution/solvent required to prepare the solution.

 6.1.6: Given the concept of random molecular motion students

 will describe the dissolving process at the molecular level.

 6.1.7: Given the equation of the molality of a solution and

 appropriate data, students will calculate the molality of the

 solution, mass of solute, moles of solute, or mass of solvent

 required to prepare the solution.

 6.1.8: Given the equation for the percentage by mass

 concentration of a solution and appropriate data, students

 will calculate the percentage concentration of the solution,

 mass of solute, or mass of solvent required to prepare the

 solution.

 6.1.9: Given the appropriate data students will describe how

 temperature, pressure, and surface area affect the dissolving

 process.

 6.1.10: Given the appropriate data students will describe how to

 calculate the concentration of a solute in terms of grams

 per liter, molarity, parts per million, and percent

 composition.

 6.1.11: Given the chemical formula of a solute, students will write

 a balanced equation illustrating the formation of ions

 (dissociation of the solute) in water.

 6.1.12: Given a balanced equation of the dissolving of an ionic

 compound in water, students will identify the steps on the

 solution process: ionization and/or dissociation and

 hydration.

 6.1.13: Given the appropriate data students will describe how

 molecules in a solution are separated or purified by the

 methods of chromatography and distillation.

 Obj: Students will develop a knowledge of the colligative properties

 of solutions.

 6.2.1: Given the definition of a colligative property of a solution,

 students will recognize the following as colligative

 behavior; freezing point depressions, boiling point

 elevations, and vapor pressure depressions.

 6.2.2: Given the definition and chemical properties of electrolytes,

 students will identify several compounds as either

 electrolytes or nonelectrolyte.

 6.2.3: Given several solutes, students will compare the colligative

 properties of electrolytes to those of nonelectrolyte.

 6.2.4: Given appropriate data and freezing point depression

 equation, students will calculate the freezing point of a

 solution, the molar mass of the solute, or the molality of the

 solution.

 6.2.5: Given appropriate and the boiling point elevation equation,

 students will calculate the boiling point of a solution, the

 molar mass of the solute, or the molality of the solution.

Goal: Students will gain an understanding that energy is exchanged or

 transformed in all chemical reactions and physical changes of matter.

Obj: Students will develop an understanding of chemical

 thermodynamics.

 7.1.1: Given the appropriate data, students will describe

 temperature and heat flow in terms of the motion of

 molecules or atoms.

 7.1.2: Given the appropriate data, students will describe that

 chemical processes can either release ( exothermic) or

 absorb ( endothermic) thermal energy.

 7.1.3: Given the appropriate data, students will describe energy is

 released when a material condenses or freezes and is

 absorbed when a material evaporates or melts.

 7.1.4: Given the appropriate values for specific heat and heat of

 phase change students will solve problems involving heat

 flow and temperature changes.

 7.1.5: Given Hess’s law students will calculate enthalpy change in

 a reaction.

 7.1.6: Given Gibbs free energy equation students will determine

 whether a reaction would be spontaneous.

Goal: Students will gain an understanding of the concept of thermochemistry

 and chemical thermodynamics.

Obj: Students will develop a knowledge of the relationship between

 heat and chemical reaction.

 8.1.1: Given the definition of heat, energy, and temperature

 students will relate each to a chemical system.

 8.1.2: Given the definition of kinetic and potential energy,

 students will relate these definitions to chemical compounds

 and chemical processes and differentiate between specific

 examples of each.

 8.1.3: Given the Law of Conservation of Energy, students will

 apply the concept to chemical processes and verify its

 conclusion.

 8.1.4: Given the appropriate data and chemical formulas, students

 will write a balanced thermochemical equation including the

 enthalpy of reaction.

 8.1.5: Given the terms of endothermic and exothermic, students

 will relate the direction of heat flow to the chemical reaction

 to the sign of ^H.

 8.1.6: Given a thermochemical equation, students will express the

 heat in ^H notation.

 8.1.7: Given specific thermochemical equations and their ^H,

 students will identify them as enthalphies of formation

 and/or combustion.

 8.1.8: Given a thermochemical equation, students will calculate

 stoichiometrically using the mole method, the quantitative

 relationship between mass, mole, and heat.

Goal: Students will gain an understanding that chemical reaction rates depend

 on factors that influence the frequency of collision of reactant

 molecules.

Obj: Students will develop knowledge of chemical reaction.

9.1.1: Given the appropriate data students will describe the rate of

 reaction is the decrease in concentration of reactants or the

 increase in concentration of products with time.

9.1.2: Given the appropriate data students will describe how

 reaction rates depend on such factors as concentration,

 temperature, and pressure.

9.1.3: Given the appropriate data students will describe the role a

 catalyst plays in increasing the reaction rate.

9.1.4: Given the appropriate data students will know the

 definition and role of activation energy in a chemical

 reaction.

 10.0 Goal: Students will gain an understanding of the concept of chemical kinetics.

Obj: Students will develop a knowledge of the Collision Theory and

 its relationship to chemical kinetics.

 10.1.1: Given the Collision Theory, students will relate each factor

 in the theory to its effect on the rate of a chemical

 reaction.

 10.1.2: Given the Collision Theory, students will predict the effect

 of temperature, pressure, and concentration changes and

 catalysts.

 10.1.3: Given appropriate data, students will construct a reaction

 coordinate diagram and label the significant region of the

 diagram: reactants products, activation energy forward

 and reverse, activated complex, and enthalpy of reaction.

 10.1.4: Given the chemical and physical characteristics of a

 catalyst, students will relate a catalysts chemical activity to

 the Collision Theory and reaction kinetics.

 10.1.5: Given a reaction coordinate diagram, students will note

 changes in the diagrams form with the addit ion of a

 catalyst to the reaction.

 Goal: Students will gain an understanding of chemical equilibrium is a

 dynamic process at the molecular level.

 Obj: Students will develop a knowledge of chemical equilibrium.

11.1.1: Given LeChatelier’s principal students will be able to

 predict the effect of changes in concentration, temperature,

 and pressure.

 11.1.2: Given the appropriate data, students will describe forward

 and reverse reaction rates are equal when equilibrium

 established.

 11.1.3: Given the appropriate data, students will write and

 calculate an equilibrium constant expression for a reaction.

 Goal: Students will gain an understanding of oxidation, reduction, and

 electrochemical processes.

 Obj: Students will develop a knowledge of oxidation numbers,

 oxidation, and reduction and the process by which redox

 reactions are balanced.

 12.1.1: Given the rules for assigning oxidation numbers, students

 will assign oxidation numbers to each elements of a

 compound, ion, or polyatomic ion.

 12.1.2: Given the definition of oxidation, students will identify the

 reducing agent in a chemical reaction.

 12.1.3: Given the definition of reduction, students will identify the

 oxidizing agent in a chemical reaction.

 12.1.4: Given the rules for balancing redox reactions, students will

 balance redox reactions by inspection or by the half-

 reaction method in acid, basic, and neutral solutions.

 12.1.5: Given a balanced redox reaction and appropriate data from

 a redox titration, students will calculate stoichiometrically

 using the mole method, the molarity of a solution.

 Obj: Students will develop knowledge of electrolytic cells.

12.2.1: Given a diagram of an electrolytic cell, students will label

 the important compounds.

12.2.2: Given a diagram of an electrolytic cell, students will

compare and contrast it with a diagram of an electrochemical cells.

12.2.3: Given Faraday’s Law of Electrolysis, students will

 recognize the relationship between a faraday of electrons

 and a mole of electrons.

12.2.4: Given Faraday’s Laws of Electrolysis and appropriate

 data, students will calculate the quantity of current

 required, the time required, the number of faradays of

 electrons, the number of moles of electrons, or the mass

 (Volume) of substance oxidized or reduced during an

 electrolytic process.

 Obj: Students will develop a knowledge of standard electrode

 potentials.

12.3.1: Given a table of standard electrode potentials, students will compare the relative strengths of substances as oxidizing and reducing agents.

12.3.2: Given a table of standard electrode potentials, students will predict the spontaneity of a redox reaction form the total

 voltage of the reaction.

 Obj: Students will develop a knowledge of electrochemical cells.

12.4.1: Given a diagram of an electrochemical cell, students will

 label the importance components.

12.4.2: Given a diagram of an electrochemical cell, students will

 compare and contrast it with an electrolytic cell.

12.4.3: Given a table of standard electrode potentials, students will

 determine the anode and cathode and calculate the cell

 voltage at standard conditions.

 Goal: Students will gain understanding of bonding characteristics of carbon

 allow the formation of many different organic molecules of varied

 sizes, shapes, and chemical properties and provide the biochemical

 basis of life.

 Obj: Students will develop an understanding of the bonding

 characteristics.

 13.1.1: Given the structural formula of a large molecules

 (Polymers) such as proteins, nucleic acids, and starch

 students will write the repetitive combination of simple

 subunits.

13.1.2: Given the appropriate data students will write the bonding

 characteristics of carbon that results in the formation of a

 large variety of structures ranging from simple

 hydrocarbons to complex polymers and biological

 molecules.

13.1.3: Given the appropriate data students will describe amino

 acids are the building blocks of proteins.

13.1.4: Given the appropriate data students will describe the

 system for naming the ten simplest liner hydrocarbons and

 isomers that contain single bonds, simple hydrocarbons

 with double and triple bounds, and simple molecules that

 contain a benzene ring.

13.1.5: Given the functional groups students will identify that

 which forms the basis of alcohols, ketones, ethers, amines,

 esters, aldehydes, and organic acids.

13.1.6: Given the R-group structure of amino acids students will

 combine them to form the polypeptide backbone structure

 of proteins.

14.0 Goal: Students will develop an understanding of Nuclear processes those in

 which an atomic nucleus changes, including radioactive decay of

 naturally occurring and human-made isotopes, nuclear fission, and

 nuclear fusion.

Obj: Students will develop an understanding of nuclear processes.

14.1.1: Given the appropriate data students will explain how

 protons and neutrons in the nucleus are held together by

 nuclear forces that overcome the electromagnetic repulsion

 between the protons.

14.1.2: Given the appropriate data students will calculated by using

 ( EU = mc2) the energy released per gram of materials is

 much larger in nuclear fusion or fission reactions than in

 chemical reactions. The change in mass is small but

 significant in nuclear reaction.

14.1.3: Given the appropriate data students will describe naturally

 occurring isotopes of elements are radioactive, as are

 isotopes formed in nuclear reactions.

14.1.4: Given the appropriate data students will describe the three

 most common forms of radioactive decay (alpha, beta, and

 gamma) and know how the nucleus change in each type of

 decay.

14.1.5: Given the appropriate data students will describe alpha,

 beta, and gamma radiation produce different amounts and

 kinds of damage in matter and have different penetrations.

14.1.6: Given the appropriate data students will know how to

 calculate the amount of a radioactive substance remaining

 after an integral number of half lives have passed.

14.1.7: Given the appropriate data students will describe how

 protons and neutrons have substructures and consist of

 particles called quarks.

 Goal: Students will gain an understanding of the basic concepts of

 measurement and mass.

 Obj: Students will develop an understanding of the system of

 measurement.

 15.1.1: Given the conversion (equivalent factors) between the

 metric system of measurement and the English system of

 measurement conversions in length, volume, and mass

 between the two systems.

 15.1.2: Given the formula expressing the relationship of Fahrenheit

 and Celsius temperatures, students will make mathematical

 conversions between the two temperature scales.

 15.1.3: Given appropriate laboratory glassware and apparatus,

 students will identify the items by name.

 15.1.4: Given appropriate directions and rules for the use of

 laboratory glassware and apparatus and for expected

 laboratory behavior, students will conduct laboratory

 experimentation in a safe and prudent manner.

 Obj: Students will develop a knowledge of the basic nature of

 matter.

 15.2.1: Given the definition of homogeneous and heterogeneous,

 students will differentiate between pure substances and

 mixture.

 15.2.2: Given specific properties of elements or compounds,

 students will identify the properties as physical or

 chemical.

 15.2.3: Given the equation for density (D=M/V), students will

 recognize the relationship between mass and volume.

 Goal: Students will gain an understanding of the basic concepts of

 Agriculture Chemistry.

Obj: Students will develop an understanding of what agriculture

 chemistry is and why it is important.

 16.1.1: Given the appropriate data students will describe the

 importance of agriculture chemistry in out society.

 16.1.2: Given the appropriate data students will describe how

 agriculture chemistry impacts their live.

 16.1.3: Given the appropriate data students will describe how

 agriculture chemistry has career opportunities.

 Obj: Students will incorporate scientific principals with modern

 agriculture practices.

 16.2.1: Given the appropriate data students will describe how

 agriculture chemistry research is important.

 16.2.2: Given the appropriate data students will conduct an

 agriculture chemistry research project.

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