FATHER DUENAS MEMORIAL SCHOOL
SY 2015-2016
AP CHEMISTRY SYLLABUS

COURSE TITLE : AP CHEMISTRY
GRADE LEVEL : 11TH & 12TH
TEACHER : MRS. EVANGELINE R. MANGUNE

TEXTBOOKS : Chemistry The Central Science
Theodore L. Brown
H. Eugene Lemay, Jr.
Bruce E. Busten
Catherine Murphy
Patrick Woodward
Copyright 2012 Twelfth Edition
Prentice Hall Pearson

LABORATORY MANUAL : Advanced Chemistry with Vernier
Jack Randall

GRADING SYSTEM:

1. Homework/Classwork…….. 10%
2. Test (Lab & Lecture)…….. 25%
3. Lab. Work/ Lab. Reports…….. 30%
4. Quizzes ……10%
5. Quarter Exam……25%

CURRICULUM CONTENT MAP – EARLY AUGUST

Big Idea 2 : Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions or molecules and the forces between them. (**CR2**)
Learning Objectives: 2.7, 5.10
Textbook Chapter(s): 1

Units and Topics	Lab Activity Title and Science Practice Skills Acquired (**CR5b**) & (**CR6**)

Introduction to Chemistry Scientific Method Classification of Matter Separation of Science, example distillation and chromatography Physical and Chemical Properties Temperature and Density – Demos Meet the Elements Math Review, Significant Figures, and Statistical Techniques Dimensional Analysis and Proportions Units of Measurement 0. Conversion of units 1. Dimensional Analysis 2. Uncertainty in Measurements and Significant Figures 3. Length and Volume 4. Mass and Weight 5. Density and Specific Gravity-game 6. Temperature and its Measurements	**Guided-Inquiry**: The Scientific Method **SP 6.2** - Students determine the identity of an unknown solution using physical characteristics - Determine alternate method of recording temperature Meet the Elements **SP 6.1** - Students are given the opportunity to make observations on many different elements on the periodic table and based on their physical characteristics, determine periodic tendencies. Students research the properties using the internet. Each lab group member gives a short 5-minute presentation on an element. Resource: www.ptable.com Laboratory Equipment Technique **SP 3** - Students identify laboratory equipment and watch a demonstration of application. Determination of Bunsen Burner Flame Temperature Using Thermocouple Wire and a Voltage Conversion Chart **SP 3** Unit Conversions High temperature recording methods Types of burners Seebeck effect and thermocouple wire Voltage concept Use of volmeters Separation of Components of a Homogeneous Mixture Using Simple Distillation and Column Chromatography **SP 3** Use of volumetric glassware Use of ground glassware Methods of separation science

	Chromatography

CURRICULUM CONTENT MAP – LATE AUGUST/EARLY SEPTEMBER

Big Idea 1: The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions. (**CR2**)
Learning Objectives: 1.5, 1.6, 1.7, 1.8, 1.12, 1.13, 1.14
Textbook Chapter(s): 2, 6, 21.1-21.6

Unit and Topics	Lab Activity Title and Science Practice Skills Acquired (**CR5b**) & (**CR6**)
Nuclear and Atomic Structure Types of Subatomic Particles The Nucleus Mass Spectroscopy and Isotopes Stability of the Nucleus Atomic Structure Rutherford Experiment Cathode Ray Experiments Atomic Structure Terms Electromagnetic Radiation Quantization of Energy Photoelectric Effect PES data Bohr Atom Spectroscopy Orbital Model of Atom Aufbau Diagram Paramagnetism Quantum Model	**Guided-Inquiry**: Determination of Paramagnetism Using Electron Configuration and Magnetic Attractions **SP 4.2, 6.2** - Students design method of correlating electron configuration and paramagnetism. Flame Test of Salt Solutions **SP 1.5** - Emission spectroscopy and electronic transition - Predict the color of the flame produced when each of your test solutions is heated in a Bunsen burner Spectroscopy of gases using discharge tube **SP 3** - Determine the emission spectrum of various known gases from given gas discharge tubes - Determine what elements are in a fluorescent light bulb - Determine energy of emission

Student Activity – Students observe a demonstration of light emission and the voltage drop of various LED lights, then mathematically and graphically determine Plauk's constant. **LO 1.7 (CR3a)**

CURRICULUM MAP – LATE SEPTEMBER / EARLY OCTOBER

Big Idea 1: The chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions. (**CR2**)
Learning Objectives: 1.9, 1.10, 1.11, 2.14, 2.17, 2.19, 2.20, 2.22, 2.23, 2.24, 2.25, 2.26, 2.27, 2.28
Textbook Chapter(s): 7, 22, 23, 8.1-8.2

Unit and Topics	Lab Activity Title and Science Practice Skills Acquired (**CR5b**) & (**CR6**)
Periodicity and Introduction to Bonding Atomic Properties Periodic Law Elemental Properties Types of Bonds Metallic Bonding Properties of Group One Properties of Period Two Metals vs. Non-Metals Multiple Oxidation States of Transition Metals Ionic Bonding Ionic Bonding and Potential Energy Diagrams Energy of Formation of Ionic Compounds Lattice energy	**Guided-Inquiry**: Determination of Type of Bonding in Solids **SP 1.1, 1.4, 6.2, 6.4, 7.1**

Student Activity – Student enter data and construct graphs using Microsoft Excel to predict, demonstrate and identify periodic trends. Students will use graphs and data to justify exceptions to the identified trends and present such information in a class discussion. **LO 1.9 (CR3a)**

CURRICULUM CONTENT MAP – LATE OCTOBER

Big Idea 2: Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions or molecules and the forces between them. (CR2)
Learning Objectives: 2.11, 2.13, 2.18, 2.20, 2.21, 2.22, 2.29, 2.30, 2.31, 2.32, 5.9
Textbook Chapter(s): 8, 9, 11.7-11.8

Unit and Topics	Lab Activity Title and Science Practice Skills Acquired (CR5b) & (CR6)
Covalent Bonding and Molecules Types of Covalent Bonds Nonpolar Covalent Bonds Polar Covalent Bonds Coordinate Covalent Bonds – Lewis Acids and Lewis Bases Lewis Structures Resonance Hybridization Molecular Geometry Energy Effects on Molecules Isomerism Functional Groups Interactions of Functional Groups Classification of Molecules Intermolecular Interactions Dipole moments Dielectric Constants Types of Compounds Properties of Metallic, Molecular, Macromolecular and Ionic Compounds	Molecular Modeling Using Foam Balls and Sticks SP 1.4 - Predict the shapes of molecules by building a model of the molecule with a molecular modeling kit and applying the Valence Shell Electron Pair Repulsion theory. Guided-Inquiry: Intermolecular Attractions Lab SP 6.1, 6.2, 6.4, 7.1 - Students will make observations with various solutions to determine the connection between: molecular structure and polarity hydrogen bonding and structure capillary action to polarity Angle of curvature relationship to IMF Drop size and IMF Guided-Inquiry: Molecular Interactions SP 1.1, 6.2, 6.4, 7.1 - Students will make observations with

	various solutions to determine the connection between: - Random miscibility and solubility of given solutes and solvents - Relationship of structure to solubility - IMF effects, solubility, and extraction

Student Activity – Students are given structures of various compounds and must explain why they differ in physical state at various temperatures; then predict the type(s) of bonding present based on the atom's position on the periodic table. LO 2.1, 2.13, 2.17 & 2.19 (CR3b)

CURRICULUM CONTENT MAP – EARLY NOVEMBER

Big Idea 2: Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions or molecules and the forces between them. (CR2)
Learning Objectives: 1.15, 1.19, 2.10, 2.11, 3.3, 5.11
Textbook Chapter(s): 25, 12.6-12.7

Unit and Topics	Lab Activity Title and Science Practice Skills Acquired (CR5b) & (CR6)
Organic Chemistry A. Properties and Bonding in Carbon Compounds Introduction to organic chemistry: hydrocarbons and functional groups (structure, nomenclature, chemical properties). Physical and chemical properties of simple organic compounds B. Hydrocarbons 1. Petroleum 2. Fractional Distillation 3. Cracking 4. Alkanes 5. Alkenes 6. Alkynes	Saponification SP 3 - Students will use surfactants and develop a procedure to measure surface tension. Esterification (Banana oil and oil of wintergreen) SP 2 - Students will use a variety of solutions to go through the esterification process and will identify the completion of such a process through macroscopic observations. Polymerization and Polymer Identification SP 3

7. Benzene Series 8. General Formulas 9. Structural Formulas 10. Saturated/unsaturated Compounds C. Nonmenclature 1. Alkyl Groups 2. IUPAC Nonmenclature 3. Isomers D. Other Organic Compounds 1. Alcohols - Primary, Secondary and Tertiary Alcohols - Diols and Triols 2. Aldehydes 3. Ketones 4. Acids 5. Esters 6. Ethers 7. Amines 8. Polymers - Addition Polymerization - Condensation Polymerization - Natural Polymers E. Organic Reactions	- Students will use a variety of solutions to go through the polymerization process and will identify the completion of such a process through macroscopic observations. Aspirin Synthesis and Analysis SP 2.2, 4.1, 4.2, 5.1, 6.2, 6.4 - Students will perform an esterification synthesis and prove such synthesis with the following procedures and calculations: Thin layer chromatography Quantitative analysis Theoretical yield calculations Percent yield calculations IR spectroscopy

CURRICULUM CONTENT MAP – LATE NOVEMBER

Big Idea 3: Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer for electrons. (CR2)
Learning Objectives: 2.1, 3.1, 3.2, 3.8, 3.9, 3.10, 5.10
Textbook Chapter(s): 4.3, 16.2, 16.11 Sections 4.2, 4.4, 20.1, 4.4, 8.5, 20.6

Unit and Topics	Lab Activity Title and Science Practice Skills Acquired (CR5b) & (CR6)

Predicting Reactions Naming Compounds Balancing Chemical Equations Types of Chemical Equations Types of Chemical Reactions Predicting based on Stability Predicting based on Type Chemical reactivity and products of chemical reactions Reaction types – Organic Functional Group Reactions, Acid-base reactions; concepts of Arrhenius, Bronsted-Lowry and Lewis; coordination complexes; amphoterism - Precipitation reactions, Oxidation-reduction reactions, Oxidation number, the role of the electron in oxidation-reduction	Chemical Reactions Using Crystal Growth SP 1.5, 6.1, 6.4, 7.1 - Students will be provided with several solutions to perform several reactions and predict what possible reactions can occur with such solutions. Students will use macroscopic observations to confirm predictions. Solubility Rule Development SP 1.4, 6.1 - Students will predict double replacement reactions in solutions based on solubility rules. Redox Titration SP 4.2, 5.1 - Students will perform a redox standardization of H_20_2 using potassium permanganate.

Student Activity – Students observe a series of chemical reactions using video demonstrations from websites. For each they will: 1. Classify the type of reaction, 2. Write a balanced net ionic chemical equation, 3. Write a brief description for each reaction, and 4. Determine the driving force towards thermodynamic favorability for the reaction. LO 3.1 & 3.2 (CR3c)

CURRICULUM CONTENT MAP – LATE NOVEMBER

Big Idea 3: Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons. (CR2)
Learning Objectives: 1.1, 1.2, 1.3, 1.4, 1.17, 1.18, 1.19, 3.4, 3.5, 3.6
Textbook Chapter(s): 4.2, 3.1, 3.6 Section 20.2, 2.6, 3.4, 3.5, 3.7, 10.4

Unit and Topics	Lab Activity Title and Science Practice Skills

	Acquired (CR5b) & (CR6)
Measurement and Stoichiometry Law of Constant Composition and Calculations based on Law Using Moles to find a Quantity Stoichiometry Limiting Reagents Using Density Solutions Terms Stoichiometry - Solutions	Percent Oxygen In a Chlorate SP 2.2, 6.1 - Students will use a prescribed procedure and series of calculations to determine the percent of oxygen in a chlorate. Percent of Water in a Hydrate SP 2.2, 6.1 - Students will use a prescribed procedure and series of calculations to determine the percent of water and the formula of a hydrate. Empirical Formula SP 2.2, 5.1, 6.4 - Students will use a prescribed procedure and series of calculations to determine the empirical formula of manganese chloride. Molar Mass of Gas SP 7.1 - Students will use a prescribed procedure and series of calculations to determine the molecular mass of an unknown gas. Atomic Mass **SP 1.4, 1.5** - Students will use a prescribed procedure and series of calculations to determine the atomic mass of aluminum. Standardization of an Acid Solution **SP 2.2, 5.1, 6.4** - Students will use a prescribed procedure and series of calculations to prepare solutions of standardized salicylic acid solution.

Student Activity: Students determine optimum hydrocarbon fuel to oxygen ratio to achieve complete combustion in a 60 mL volume. **LO 3.3 & 3.4 (CR3c)**

CURRICULUM CONTENT MAP – EARLY DECEMBER

Big Idea 5: The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter. (**CR2**)	
Learning Objectives: 3.11, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.12, 5.13, 5.14	
Textbook Chapter(s): Section 5.6, 5.7, 13.1, 19.2, 7.8, 8.4	
Units and Topics	Lab Activity Title and Science Practice Skills Acquired **(CR5b) & (CR6)**
Thermochemistry Introduction to thermodynamics Conservation of energy State Functions Potential Energy Kinetic Energy Calorimetry Heat of Fusion Heat Vaporization Specific Heat Heat of Dilution Heat of Solution Hess's Law – direct and indirect Bond Dissociation Energies Gibbs Free Energy Equation	Heat of Neutralization **SP 7.1** Students will use a prescribed procedure to perform a chemical reaction and use a series of calculations to determine the heat of neutralization for that reaction. Heat of Dissolution **SP 7.1** Students will use a prescribed procedure to perform a chemical reaction and use a series of calculations to determine the heat of dissolution for that reaction. Heat of a Reaction **SP1.1, 1.4, 7.2, 1.5, 4.4, 5.1** Students will use a prescribed procedure to perform a chemical reaction and use a series of calculations to determine the heat of a reaction: Mg-HCL. Relate energy changes associated with a chemical reaction to the enthalpy of the reaction, and relate energy changes to PdeltaV work. Guided-Inquiry: Stoichiometry Rockets **SP 1.4, 2.2, 2.3, 7.1, 7.2**

	- Students will relate energy changes associated with a chemical reaction to the enthalpy of the reaction, and relate energy changes to PdeltaV work.
Student Activity – Pre Lab Activity: Students calculate the needed volume of oxygen to react with volume of gases in a reaction, determine the heat of the reaction, and then determine the amount of work produced using the distance the rocket traveled and heat produced from the reaction. **LO 5.3 & 5.4 (CR3e)**	

CURRICULUM CONTENT MAP – LATE DECEMBER

Big Idea 2: Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them. **(CR2)**	
Learning Objectives: 2.3, 2.4, 2.5, 2.6, 2.12, 2.16, 2.22, 2.29, 2.31	
Textbook Chapter(s): 10, 11	
Unit and Topics	Lab Activity Title and Science Practice Skills Acquired **(CR5b) & (CR6)**
Gas, Liquid and Solids Real Gases versus Ideal Gases Ideal Gas Equation Derivations based on Ideal Gas Equation Gases collected Over Water Kinetic Molecular Theory Van Der Waals Equation Molecular Speeds Diffusion and Effusion Molecular Theory related to Phase Phase Changes Entropy Heating and Cooling Curves Interfaces Pressure Vapor Pressure Boiling Point and Freezing Points Vapor Pressure Curves	Molar Mass of a Gas **SP1.3, 2.2, 2.3, 5.1, 6.4, 6.5, 7.2** - Students will use a prescribed procedure to perform a chemical reaction and use a series of calculations to determine the molecular mass of butane. Freezing Point of a Pure Material **SP 1.4, 6.4** - Students will use a prescribed procedure to perform a chemical reaction and use a series of calculations to determine the freezing point of phenyl salicylate.

Phase Diagrams – Triple point, critical point Energy change during phase changes Viscosity Surface Tension Types of Solids and Crystal Structure	

CURRICULUM CONTENT MAP – EARLY JANUARY

Big Idea 2: Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them. **(CR2)**	
Learning Objectives: 1.16, 2.8, 2.9	
Textbook Chapter(s): 13	
Units and Topics	Lab Activity Title and Science Practice Skills Acquired **(CR5b) & (CR6)**
Solutions Types of Solutions Electrolytes Miscibility and Immiscibility Process of Dissolution Dissolution versus Ionization Solubility Terms Solubility Curves Henry's Law Concentration Terms – Molarity, Molality, %, mole fractions Dilution Problems Stoichiometry Problems with Solutions – Review Raoult's Law Freezing and Boling points of Solutions – Colligative Properties Van't Hoff factor Osmosis Deviation from Raoult's Law Colloids	Freezing-point Depression **SP 1.1, 1.2, 1.4, 6.2, 6.4** - Students will use freezing-point despression to find molecular weight of a given substance. Spectrophotometry **SP 4.2, 5.1** - Students will use spectrophotometry and Beer's Law to determine the concentration of a given cobalt chloride solution. **Guided-Inquiry**: Spectroscopic Determination of the Percent of Salicylic Acid in Aspirin **SP 4.2, 5.1** - Students prepare standard salicylic acid solutions and use spectroscopy to determine % salicylic acid in expired aspirin tablets. - Given past methods of spectroscopy and preparation of standard solutions,

	students design an experiments to determine % salicylic acid in expired aspirin tablets.

CURRICULUM CONTENT MAP – LATE JANUARY-EARLY FEBRUARY

Big Idea 4: Rates of chemical reactions are determined by details of the molecular collisions. **(CR2)**	
Learning Objectives: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9	
Textbook Chapter(2): 14	
Unit and Topics	Lab Activity Title and Science Practice Skills Acquired **(CR5b) & (CR6)**
Kinetics Rates relationship to collisions Reaction Mechanisms Activation energy Nature of Reactants and Interfacial Surface Area Temperature and Pressure effects on Rates Catalyst – Homogeneous and Heterogeneous Potential Energy Diagrams – Review Activated Complex and Intermediates Arrhenius Equation Maxwell-Boltzman Diagram Average Rate Rates relationship to Stoichiometry Graphical determination of Instantaneous Rate Rate Laws Determination of Rate Laws Determination of Mechanisms Order of Reactions Calculations based on Order	Kinetics of the Acid Decomposition of Thiosulfate **SP 2.1, 2.2, 4.2, 5.1, 6.5, 7.1** - Students will use a prescribed procedure to perform the acid decomposition of thiosulfate and use a series of calculations to determine the rate law of the reaction. - Students will perform graphical determination of order. - Students will use differential rate laws to determine order of reaction. - Students will determine the rate constant from experimental data. Kinetics of Decomposition of Hydrogen Carbonate **SP 1.4, 6.4** - Students will determine the variables that affect reaction rate: Nature of reactants Surface area effects Concentration effects Temperature effects

	The Kinetics of Bleach Reaction **SP 2.1, 2.2, 4.2, 5.1, 6.5, 7.1**
	
	- Students use results to determine the order of the reaction.
	  - Consider the bleach to be in excess, write a rate law for the reaction, substitute the appropriate digit for the value of x in the rate law.
	  - Calculate a value for the rate constant, k.
	  - Determine the rate of the reaction during the first ten seconds.
	  - Determine graphically the initial rate of reaction.
	  - Graphically determine the rate at 15 seconds.

Student Activity – Students orally present the solution to a problem given a set of data of the change of concentration versus time to the class, indicating the order of the reaction and the rate constant with appropriate units. **LO 4.2 (CR3d)**	

CURRICULUM CONTENT MAP – LATE FEBRUARY

Big Idea 6: Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations. **(CR2)**	
Learning Objectives: 5.16, 5.17, 5.18, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 6.21, 6.22, 6.23, 6.24, 6.25	
Textbook Chapter(s): 15	
Unit and Topics	Lab Activity Title and Science Practice Skills Acquired **(CR5b) & (CR6)**
Equilibrium Reversible processes and Reactions Types of systems Kinetics relationship to Equilibrium	Le Chatelier's Principle Using Cobalt Complexes and Chemical Equilibrium Lab **SP 1.4, 6.4** - Students will perform a variety of

Equilibrium Expressions Equilibrium Constants Le Chatelier's Principle Equilibrium Stresses Equilibrium Calculations Molar Solubility Common Ion Effects Reaction Quotients	stresses on a given system in equilibrium to demonstrate Le Chatelier's Principle. Solubility Constant of Calcium Hydroxide SP 2.1, 2.2, 2.3 - Students will use a prescribed procedure to perform a chemical reaction and use a series of calculations to determine the solubility constant of calcium hydroxide using micro-titration techniques. Determine the Equilibrium Constant **SP 1.3, 2.2, 6.2, 7.2** - Students will use a prescribed procedure to perform a chemical reaction and use a series of calculations to determine the equilibrium constant for a system at equilibrium: Combination indicators Micro-titration pH measurement Vernier technology
Student Activity – Students determine the concentration of species at equilibrium given the equilibrium constant and the concentration of other species in the reaction at equilibrium. Students will apply Le Chatelier's Principle quantitatively to equilibrium systems that are altered. **LO 6.8 (CR3f)**	

CURRICULUM CONTENT MAP – EARLY MARCH-LATE MARCH

Big Idea 6: Any bond or intermolecular attraction that can be formed can be broken. These two processes are in a dynamic competition, sensitive to initial conditions and external perturbations. **(CR2)**
Learning Objectives: 1.20, 3.7, 6.11, 6.12, 6.13, 6.14, 6.15, 6.16, 6.17, 6.18, 6.19, 6.20
Textbook Chapter(s): 16

Unit and Topics	Lab Activity Title and Science Practice Skills Acquired **(CR5b) & (CR6)**
Acids, Bases and Salts Dissociation versus Ionization Preparation of Acids, Bases and Salts Classification of Acids and Bases Bronsted-Lowry Theory of Acids and Bases Degree of Ionization Equilibrium Constant for Acids and Bases Weak Acids and Bases Binary acids versus Oxyacids Determination of Acid and Base properties based on structure Ionization of Water pH and pOH Acid-Base Stoichiometry Problems-Review Ionization Calculations of Weak Acids and Bases Henderson-Hasselbalch Equation Titration Calculations Indicators Types of Salts Dissociation of Salts and Buffers	Preparation of Sodium Hydroxide Solution and Standardization using a Primary Standard **SP 4.2, 5.1** - Micro-titration using syringes Determination of Molecular Weight and K of an Unknown Organic Acid **SP 2.2, 5.1, 6.4** pH probes Titration curves using data acquisition (Logger Pro) Determination of Equivalence point using 2nd derivatives Determination of midpoint to determine pK Vernier technology Neutralization Reactions **SP 2.2, 2.3, 6.2** - Students will use a prescribed procedure to perform a series of neutralization reactions and use indicators and macroscopic observations to confirm predictions about such reactions. Students will use a prescribed procedure to perform a chemical reaction and use a series of calculations to determine the ionization constant of an indicator **SP 2.3, 5.1, 2.3, 4.2, 6.4** - Calculations using the Hasselbalch equation - Beer's Law - Vernier technology

Student Activity: Students determine pH of various buffer solutions and describe the mechanism that would occur within the buffer system upon the addition of an acid or a base. **LO 6.20 (CR3f)**

CURRICULUM CONTENT MAP – END MARCH

Big Idea 3: Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons. **(CR2)**	
Learning Objectives: 3.12, 3.13, 5.14, 5.15, 6.25	
Textbook Chapter(s): 19, 20	
Unit and Topics	Lab Activity Title and Science Practice Skills Acquired **(CR5b) & (CR6)**
Electrochemistry and Thermodynamics Oxidation and Reduction Substances gaining potential Types of electrochemical cells Voltaic cells Cell Potentials Concentration dependence of E Nernst Equation Cell potentials and Equilibrium Metal Electrodes Reference Electrodes Indicator Electrodes Applications of Voltaic Cells Eletrolysis Faraday's Law Electrolytic Cells Order of Reduction Applications of Electrolytic cells Gibbs Free Energy Equation (Free Work) Relationship of Equilibrium and Q Relationship to E	Voltaic Cell and Nernst Equation Lab **SP 2.2, 2.3, 5.1, 6.4** - Prepare a list containing all seven metal/metal ion half-reactions as reduction reactions, using a definition of the Ag/AgCl half-reaction as 0.00 volts - List the half-reactions from the most positive reduction potential to the most negative reduction potential - Compare with the order given on chart in your reference tables for chemistry - Sketch an electrochemical cell for all the cells created. Include each half-cell, the salt bridge, the electrodes and solutions, the voltmeter leads, the voltmeter and a switch in your drawing. Electrolysis of Aqueous Solutions Lab **SP 2.2, 2.3, 5.1, 6.4** - Students will use a prescribed procedure to perform a series of redox chemical reactions for galvanic cells - Students will use macroscopic observations and calculations to generate a list of all the particles (ions

	and molecules) present in the U-tube before electrolysis. Write a balanced oxidation half-reaction Write a balanced reduction half-Reaction Determine the balanced net ionic equation for the chemical reaction Determine the ions present in the solution are oxidized and which are reduced Determine which electrode is the anode and which electrode in the cathode Determine E^o Determine deltaG Copper Plating Lab **SP 6.2** - Determine the number of faradays, coulombs and current used to coat a leaf with copper. **Guided-Inquiry**: Electrolysis of Sodium Sulfate Using Micro Hoffman Apparatus **SP 2.2, 2.3, 5.1, 6.4** - Given experimental research using syringes to collect gases over water, atmospheric pressure and room temperature: - Students collect an unknown volume of gas generated - Determine the system's net ionic equation, moles of gas, moles of electrons used to generate gas - Determine amperes used in the experiment

FINAL EXIT ASSESSMENT – WHOLE MONTH OF APRIL

AP EXAM PRACTICE TEST	**REVIEW AND ASSESSMENT**