KAP Chemistry Syllabus
Westerville Central High School
2008-09

Course Setup:

The students attend class during 7-48 minute class periods a week. Two sets of two period sessions (On Tuesdays and Thursdays) are used to conduct laboratory experiments. Each week a lab will be planned and on the other double period class, we will take tests or quizzes. With each unit, all the objectives, dates for quizzes and tests are given at the beginning of the unit. With each lab, a detail lab report is made by each student. Expectations of a detail lab report are given to each student. Other writing assignments dealing classroom/lab activities are described and their expectations laid out. These will occur 2-5 times each nine weeks.

The student is expected to complete at least 90 % of each set of questions for practice and application. Each set is graded for completion with 2-3 questions are checked for the correct answers.

Labs will require a lab notebook (hard bound, preferably). Quizzes will be held every week or every other week, depending on the unit. Homework sets need to be completed before each test. The expectations during each experiment are that the student make and record observations and data. The student is expected to include detail calculations and communicate/compare their results with other students. The student have approximately 7 days to complete the lab report including a summary of their analysis and conclusions, as well as comments on the type and amount of error that occurred in the experiment.

Textbooks:

Author:Zumdahl, Steve
Second Author:Susan, Zumdahl
Title:Chemistry
Publisher:Houghton Mifflin Company
Published Date:2003
Description: 6th edition

Other Course Materials:

Laboratory Experiments for Advanced Placement Chemistry by Sally Ann Vonderbrink, copyright 2001

The Ultimate Chemical Equations Handbook by George Hague, Jr. and Jane D. Smith, copyright 2001

Advanced Chemistry with Vernier: Experiments for AP, IB, and College General Chemistry copyright 2003

Experimental Chemistry by James Hall, 6th edition, copyright 2003

Software:

Vernier Logger Pro 3 Software by Vernier Software and Technology, Beaverton, Oregon; and various probes such as the temperature, gas, pH, and voltage probes in conjuction with LabPro equipment

Websites:

URL:http://lrc-srvr.mps.ohio-state.edu/under/chemed/qb
Description:This is a useful site to practice and conduct self quizzes. There are many topics linked to this site. It is used to give you additional practice on various topics and will be used more as the AP test approaches in the spring.

KAP Chemistry
Westerville Central High School
Topic Outline
2008-09

Grading Period		Topic	Month
1st	Ch 1-2	Compound Language and Fdn	SEPT
	Ch 3-4	Stoichiometry, including Solutions	
	Ch 5		
Gases			Ch 6,10
Heat and Energy		OCT	
	Ch 11	Solution Behavior and Colligative Properties	
2nd	Ch 12	Kinetics	NOV
	Ch 13	Equilibrium (including Gases)	
		←THKSGVNG BREAK	
	Ch 14-15	Acid/Base Equilibrium with buffers	DEC
		← HOLIDAY BREAK	
	Ch 14-15a	Acid/Base Equilibrium with buffers	JAN
3rd	Ch 15b	Solubility/Complex Ion Equilibrium	
	Ch 16	Thermodynamics	FEB
	Ch 17	Electrochemistry	
	Ch 18	Nuclear Chemistry	MAR
4th	Ch 7-9	Atomic Structure, Quantum #, Periodicity	MAR-APR
		← SPRING BREAK	
	Ch 1-18	5 wk Review for the **KAP EXIT EXAM**	APR-MAY
			Extra

Lab experiments and topics will be given is time allows

KAP Chemistry Unit: Chemical Language and Foundation
Zumdahl: Chapter 1-2 Summer Project and Week 1

References: Chapters 1, 2, 22.1-22.4 in *Chemistry*, 6th edition, Stephen Zumdahl ; *The Ultimate Chemical Equations Handbook,* written George R. Hague, Jr. and Jane D. Smith, chapters 1-6

Objectives:

1. Know the following elements and their common ionic charge of the following atomic numbers: 1-38,40,42,47-56,74,76,78-88,90,92,94 (see inside front cover of text)

2. Know the polyatomic ions, their name, and their charges (see p. 67)

3. Be able to write formulas from their correct name (Stock system) and vis versa including Acids, Ionic, Molecular Compounds, and simple Organic compounds such as alkanes, alkenes, alkynes, alcohols, amines, halogenated hydrocarbons and carboxylic acids (include the understanding of the concept of isomers)

4. Be able to identify common equipment and know all safety rules in the laboratory

5. Be able to record correct measurements, using correct number of SF and know and write examples using correct scientific notation

6. Be able to convert between any metric units (chart shown on page 9) and with most equalities given, convert Metric to English units

7. Be able to understand, calculate, and demonstrate the concept of density using data and objects

8. Be able to classify matter and know how chromatography can be use to separate mixtures

9. Be able to understand key terms on p. 30-31 and p. 72-73, p. 1089 in the text

10. Be able to give a timeline of the important discoveries in the history of chemistry made by several scientists in sections 2.1 through 2.5 in text

Practice and Application Assignment:

Chapter 1:

1-4, 8, 11, 13, 16, 18-20, 24-5, 28-9, 32, 34-5, 38, 42-3, 46-49, 51,53-4, 56-7, 61-64, 66-9, 73-4, 77, 82

Chapter 2:

2,7, 11,16,18-20, 23-5,27,29,35,38-39, 42, 43,46, 48,50-1,54,56-7,60,62-3, 66,68,70-2,75-79, 85

Chapter 22:

1,2,23,25,29a,b,d;30a,b;31a,b;32b.33a.34a,c;37,a,b;51d,52a,53a,60b,c

Laboratory Exercises:

Determining the % of Cu in post-82 pennies

Assessments: During the first week of the school year, the student will take a series of quizzes mainly to memorize polyatomic ions and elements. A unit test is given at the end of the week.

KAP Chemistry Unit 3 : Stoichiometry
Zumdahl: Chapter 3 Week 2-3

Reference: Chapter 3, *Chemistry,* by Steven Zumdahl, 6th ed.

Objectives: 1. Describe the basics of a mass spectrometer.

2. Explain the importance of the carbon-12 isotope.

3. Calculate the average atomic mass of an element given appropriate data.

4. Understand the concept of the mole, molar mass, and Avogadro's number.

5. Calculate the % composition of a compound.

6. Determine the empirical and molecular formula from % composition of other appropriate data from a reaction.

7. Balance chemical equations.

8. Calculate stoichiometric calculations as they pertain to reactant and products of an equation.

9. Determine the limiting and excess reagent and their stoichiometric relationships in a balanced chemical equation.

10. Calculate the % yield of a product given the appropriate information of the reactants being used.

Practice and Application Assignment:

Chapter 3:

10-13,18-21,23,33c-43c (odd only), 51,53,56,58,59,61,62, 64aefg, 69,71-73,76,77,80,85, 89,91b,93acf,95,100-2,107,11,123

Laboratory Exercises: The students will complete the following labs and write lab reports for each:

1. **Paper Chromatography (or Column Chromatography)**

Purposes:

-Observe and understand the process of Paper Chromatography.

-Calculate using the results of these experiment to calculate Rf of several dyes from permanent pens and a comparison of results of the same colors will occur amongst the students

2. **Limiting Reagent Inquiry Lab Exercise**

Purposes:

-Prepare and set up an lab procedure reacting baking soda and vinegar and isolating the carbon dioxide produced in a balloon in a way to demonstrate the concept of limiting reagents (emphasizing the importance of amounts of the 2 reactants and the relative amount of product formed with each set of amounts prepared)

3. **Determination of the Empirical Formula of a compound containing Copper and Iodine**

Purposes:

-Observe the chemical reaction between Copper and Iodine, including the sublimation of excess iodine and comparing the physical properties of copper compared to the copper-iodine product.

-Follow safe laboratory practices working the reaction in a fume hood

-Working with an analytical balance and recording data using the correct number of significant digits

-Calculating the correct empirical formula of the copper-iodine product

Assessments: The student will complete an assessment quiz covering a portion of the objectives ((that cover sections 3.1-3.5 in the text) and complete an Unit Test at the end of the 2 weeks.

KAP Chemistry Unit 4: Solution Stoichiometry and Writing Chemical Reactions

Zumdahl: Chapter 4 Week 4-6

Reference: Chapter 4 in *Chemistry*, 6th edition, by Stephen Zumdahl and supplemental information given from *The Ultimate Chemical Equations Handbook,* by Hauge and Smith, c. 2001, chapters 7-14, and the Reaction Prediction Section

Objectives:

1. Study and understand the terms listed on page 179-180
2. Know and memorize the solubililty rules on p. 152
3. BAT (be able to) explain water as a common solvent
4. BAT distinguish between strong, weak, and nonelectrolytes
5. BAT calculate molarity from dissolving a solute in a solvent and from diluting a more concentrated solution
6. BAT predict the products of any reaction and complete the total and net ionic equations of these reactions
7. BAT calculate the stoichiometry of acid-base, precipitation, and oxidation-reduction reactions, including and understanding the process of standardization and titration
8. BAT balance oxidation and reduction reactions and identify its oxidizing and reducing agents

Practice and Application Assignment:

Chapter 4:

8-12,15,18,20,21,24,27,28,29ab,30b-d,31ab,32b-d,33a,34cd,36,38,39,43, 45,48,50,51,52,55,56,57,60,62,63,65,66,69,71,74,79,80,81,82,96bd

Laboratory Exercises: The student will complete the following experiments, analyze their results to construct laboratory reports, and learn the follow techniques in the laboratory:

1. to determine (calculate) the amount of a solute to dissolve in water in order to **make a solution of an assigned molarity,** using an analytical

balance, volumetric flask, water bottle (emphasizing the complete transfer method)

2. to **standardize a sodium hydroxide solution via titration** using a buret and stirrer, and conduct a weak acid-strong base titrate to determine the concentration of a store brand vinegar solution to 3 correct significant digits (as described in *Experimental Chemistry*, by James Hall, Experiment 29)

3. to **construct a standard curve (using Beer's Law) by preparing 5 standard copper (II) sulfate solutions and test the absorbance of a copper (II) sulfate of unknown molar concentration** (as described in the Advanced Chemistry with Vernier , by Jack Randall, Experiment 17) using the colorimeter probe

Assessments: Students will memorize the solubility rules and complete a quiz over this objective. Students will complete several quizzes to master writing net ionic equations (following the format of question 4 on the AP exam). Students will complete a unit test at the end of this 3 week unit.

KAP Chemistry Unit 5: Gases
Zumdahl: Chapter 5 **Week 7-8**

Reference: Chapter 5, *Chemistry,* by Steven Zumdahl, 6th ed.

Objectives:

1. Define the various units of pressure, convert between them, and understand how a barometer operates.

2. Describe the various gas law equation involving the relationships between temperature, volume, pressure, and the amount of substance and calculate using these equations.

3. Derive (from combining all the other equations) and use the ideal gas law equation.

4. Define the molar volume of a gas, understand that it has to be at standard temperature and pressure (STP).

5. Calculate the density at various conditions of pressure and temperature, including at STP and compare the properties and uses of gases with changing densities, and calculate the molar mass from the density.

6. Show how to do stoichiometric calculations for gases reactions.

7. State the relationship between partial pressure, total pressure, mole fraction

8. Understand the parts of the kinetic molecular theory and how thermodynamic temperature is defined.

9. Understand and calculate the root mean square velocity, describe effusion and diffusion and the relationship between the two.

10. Describe how real gases deviate from ideal behavior show how the van der Waal's equation allows for real conditions.

Practice and Application Assignment:

Chapter 5:

4,9-12, 16,21-25,29,31-3338,39,46,50,51,62,64-65,67, 70,73,77,79, 80,81,84-88,91,92,94,97,99,106,117,119

Laboratory Exercises: The student will complete the "Molar Mass of a Volatile Liquid" experiment (Experiment 15 in *Experimental Chemistry*, James Hall, 6th ed) by recording various measurements (with the correct number of significant digits) and making the correct calculations to determine the molar mass of the liquid used. They will interpret their results and communicate their results to their classmates as a means to evaluate the amount and cause of their laboratory error.

Assessments: The students will complete a unit test at the end of the 2 weeks.

KAP Chemistry Unit 6 : Introduction to Thermochemistry and the Energy of Bonding

Zumdahl: Chapter 6,8,10,11 Week 9-10

Reference: Chapter 6, *Chemistry,* by Steven Zumdahl, 6th ed; p.241-267;
Chapter 8, *Chemistry,* by Steven Zumdahl, 6th ed., pages p. 348-351;362-366,371-374;
Chapter 10, *Chemistry,* by Steven Zumdahl, 6th ed. p 483-497;
Chapter 11, *Chemistry,* by Steven Zumdahl, 6th ed. .

Objectives:

1. Be able to (BAT) describe the energy flow between a system and its surroundings.
2. BAT discuss the first law of thermodynamics
3. BAT show how to calculate the work that results from changing the volume of a gas at constant pressure.
4. BAT define enthalpy (delta H) and demonstrate calculations of the change in enthalpy and how is measured with a calorimeter
5. BAT discuss the characteristics of enthalpy changes and how to calculate the delta H of a reaction (endothermic vs endothermic reactions)
6. BAT define standard states and be able to use standard heat of formations to calculate standard delta H for a reaction (also how to calculate the heat of a set of reactions using Hess's Law)
7. BAT discuss lattice energy and show how it can be calculated.
8. BAT show how bond energies can be used to calculate heats of reaction and compare this method with the previous objectives
9. BAT discuss or draw a heating curve given a set of data and discuss the features of phase diagrams
10. BAT define the heat of solution and discuss its various energy components.

Practice and Application Assignment:

Chapter 6:
33,36,39,46-49,53-55,57,60,61,81
Chapter 8:
43,45-47,49-51,53,54,57,59
Chapter 10:
75,77,79-83,85,87,90
Chapter 11:
33,35,37,39

Laboratory Exercises: The student will complete Lab #6 in the *Laboratory Experiments for AP Chemistry*, by Dr. Sally Ann Vonderbrink, "Thermochemistry and Hess's Law"

Assessments: The student will take a unit test at the end of the two weeks.

KAP Chemistry Unit 11 : Solutions and Colligative Properties
Zumdahl: Chapter 11 Week 11-12

Reference: Chapter 11 in *Chemistry*, 6th edition, by Stephen Zumdahl

Objectives:

1. Be able to (BAT) define various ways to describe concentrations (main objective for the quiz)

2. BAT understand how molecular structure, pressure (Henry's Law) and temperature affect solubility (based on the familiar concept "like dissolves like")

3. BAT relate vapor pressure and concentration (using mole fraction) for ideal and nonideal solutions.

4. BAT understand how the boiling point and freezing point of a pure solvent is changed with increasing amounts of solute is added.

5. BAT calculate the gram formula mass of an unknown solute given information of the freezing point, boiling point, and osmotic pressure.

6. BAT understand how colligative properties are affected by the solute being an electrolyte vs. when it is a nonelectrolyte.

Practice and Application Assignment:

Chapter 11:

1 ,2,3,6,8,13,14,15,16,21, 24,25,26,27,28,30,31,32,37,38,39, 43,45,53,54,57,58,59,62,63, 65,66,67,70,71,72, 79,74,76,79,82,83,88a,91,92

Laboratory Exercises:

The students will make ice cream and determining the Kb value for water. The method is set up as an inquiry, in order for the student to design a correct method to calculate molality of the salt solution since all the salt does not dissolve in the ice water mixture. They realize the difficulty designing a method that allows the student to obtain accurate data.

Assessments: The students will take a short quiz to check for understanding on the various ways to record concentration besides molarity. Then a unit test is given at the end of the unit.

KAP Chemistry Unit 12 : Kinetics and Nuclear Chemistry
Zumdahl: Chapter 12 and 18 Week 13-15

Reference: Chapter 12 and 18.1 -18.4 in *Chemistry*, 6th edition, by Stephen Zumdahl

Objectives:

1. Define reaction rate and be able to determine the relative rates of reactants and products.

2. Describe the two types of rates laws.

3. Learn methods for determining the rate law of a reaction.

4. Summarize the two types of rate laws: integrated and differential, and the methods to which they can be determined.

5. Know how to determine the order of a reaction by examining graphical analysis of concentration vs time, natural log of the concentration vs time , and the inverse of concentration vs time, including how to calculate the half time of a reaction.

6. Explore the relationship between the reaction pathway and the rate law.

7. Discuss the temperature dependence of reaction rates

8. Describe the collision model.

9. Define and show how to calculate activation energy.

10. Explain how a catalyst speeds up a reaction.

11. Discuss heterogeneous and homogeneous catalysts.

12. Relate the stability of a nucleus to the number of protons and neutrons.

13. Classify the types of radioactive decay.

14. Define and show how to calculate the half-life of a radioactive nuclide.

15. Show how one element may be changed into another either my alpha and beta radiation and by particle bombardment.

Practice and Application Assignment:

Chapter 12:

3,4,9-11,13-15,17-22,24,25,27,28,30,32,34-38,40,41, 43-47,49,50,51,53,55, 57,58,61,62,65,68,69,71,73,74

Chapter 18

6,9,10,12,13,14,18,19,21,22,25,29

Laboratory Exercises: The student will complete the following lab exercises:

a. The "kinetic flow of water", designed by a fellow AP Chemistry teacher, Pasty Muller, of Highland Park, Illinois

b. Lab #12 in the *Laboratory Experiments for AP Chemistry*, by Dr. Sally Ann Vonderbrink, "Study of the Kinetics of a Reaction"

Assessments: The students will complete a unit test at the end of the third week.

KAP Chemistry Unit 13 : Equilibrium
Zumdahl: Chapter 13 Week 15-18

Reference: Chapter 13 in *Chemistry*, 6th edition, Stephen Zumdahl

Objectives:

1. to discuss how equilibria is established compared to the reactions that go essentially to the right (i.e., using stoichiometric calculations).

2. To introduce the law of mass action and to show how to calculate values for the equilibrium constant

3. To show how Kc and Kp are related.

4. To show how the equilibrium constant is used to predict the direction in which a system (via calculating reaction quotient, Q) will move to reach equilibrium.

5. To demonstrate the calculation of equilibrium concentrations given initial concentrations (i.e., using the ICE method)

6. To generalize the procedure for doing equilibrium calculations.

7. To show how to predict the changes that occur when a system at equilibrium is disturbed.

Laboratory Exercises: The students will complete the following labs and write lab reports for each:

a. They conduct an initial **experiment of the equilibrium dinitrogen tetroxide to nitrogen dioxide.** The students collect NO_2 while reacting copper pennies on nitric acid. They design a technique to collect the gas in a pipet bulb and then determine how to close off the opening. When this is completed, the student places the closed pipets in the freezer and in a hot water bath and make comparisons to their results.

b. In a second experiment, the student will complete an another experiment on **LeChatelier's Principle.** They react concentrated HCl with a 0.1M $CoCl_2$ solution using a setup at the microscale level. They use a procedure in an older Merrill Chemistry Lab Manual. They observed the reaction with increasing number of drops added to $CoCl_2$ and then run 3 more sets of reactions. To the first, they add a higher amount of water, to the second set, add an additional amount of concentrated HCL, and then the last, they add drops of 1.0 M $AgNO_3$. They also run the standard set (the first

set) in ice and in a hot water bath to determine if the reaction is endothermic or exothermic. This lab emphasizes the importance of safety while working with concentrated HCl. They use the results to visually understand this important principle. And, it introduces the concept of complex ions.

Practice and Application Assignment:

Chapter 13:

9-15,17-18,20bd,21,22,24,28-33,35,37abd,38a-c,39,41,45,47,52,54,57,59, 65,72,73,76a,80

Assessments: The student completes a unit test at the end of the third week.

KAP Chemistry Unit 14-15a: Acid –Base Equilibria and Buffers Zumdahl: Chapter 14-15.5 Week 19-22

Reference: Chapter 14 and Chapter 15.1 -15.5 in *Chemistry*, 6th edition, Stephen Zumdahl

Objectives::

1. Understand the 3 models of acids and bases: Arrhenius, Bronsted-Lowry, and Lewis acids and bases (including the naming and writing the formula of various amines and their conjugate acids).

2. Relate acid strength to the position of the dissociation equilibrium, including the relationship of conjugate acid/base pairs.

3. Understand the autoionization of water and Kw.

4. Define pH, pOH, and pKa and pKb and solve acid –base problems.

5. Determine the pH of a strong acid or base.

6. Determine the pH of a weak acid or base.

7. Calculate the percent dissociation of weak acids.

8. Understand and calculate acid problems using a diprotic acid .

9. Explain salts and how they can be acidic, neutral, or basic and be able to calculate the pH of a acidic or basic salt.

10. Relate bond strength and polarity to acid-base properties.

11. Predict what kind of oxides form acids or bases.

12. Study the effect of the common ion on the acid dissociation equilibria.

13. Explain the characteristics of buffers and describe how they can be made.

14. Describe the concept of buffer capacity.

15. Calculate the pH of any point of an acid-base titration.

16. Be able to draw titration curves of various kinds of acid and bases and explain the buffer region, the equivalence point, and the species that are present at any point in these titrations, even with diprotic acids.
17. Explain how indicators work.

Practice and Application Assignment:

Chapter 14:

16-18, 22,25,28;29,30,32-38,39ac,40ab,
41,44-46,47,50,51,54,55,57,59-61,63-65,67;71a,73-74,76,78ab,
79,82,83,89,91;93,94,96,97;99,102,103,106,107,112,113-115,117,118;119,120,123,124,127,129,133b,134,137,138

Chapter 15: 13-16,22,25,27,29,31,34,36,37a-c,38,40,43,44abc,45,46,47,50
53,56-7,62,65,69,72, 109, 112, 113, 115, 117, 127,128

Laboratory Exercises: The students will complete the following labs and write lab reports for each:

The student will complete the following labs using the pH meter from Vernier lab probes:

a. Lab 7 Acid-Base Titration
b. Lab 24 Determination of the Ka of an acid using a half-titration process
c. Lab 25 (using the *Chemistry Lab book with Computers*, by Vernier

These labs incorporate technology into the data collection and graphing. The student identifies all the regions of titration curves of various combinations of acids and bases

d. Hydrolysis of Salts, recording the pH using indicator strips. Completing this task aids in writing any possible ions that can hydrolyze water even hydrated metal ions

Assessments: They will complete a quiz focusing on the first three objectives listed above. The student will complete a unit test at the end of the 4 weeks of this unit.

KAP Chemistry Unit 15b: Solubility and Complex Ion Equilibria Zumdahl: Chapter 15.6-15.8 Week 23

Reference: Chapter 15.6-15.8 in *Chemistry*, 6th edition, Stephen Zumdahl

Objectives:

1. Write the equilibrium reactions involving insoluble salts and complex ions.
2. Distinguish between the size of the Ksp and the Kf constants and how that represents the extent to which the reactions proceed to the right of the reaction double arrow.
3. Calculate the solubility product given its solubility and vice versa.
4. Predict relative solubilities given the appropriate Ksp values.
5. Explain the effect of pH and a common ion on the solubility of a salt.
6. Predict if precipitation would occur after mixing, given the concentrations of the reactions.
7. Describe selective precipitation to separate mixtures.
8. Explain how complex ions can increase the solubility of a salt.
9. Explain how pH can affect the solubility of a salt.

Practice and Application Assignment:

Chapter 15:
73,76-77, 80-81,84-85,87-88,91-93, 103-104, 118

Laboratory Exercises: The students will complete the following labs and write a lab report: Merrill Chemistry Lab book called **"**Studying the Ksp of a Double Replacement Reaction"

Assessments: The student will complete a unit test at the end of the week.

KAP Chemistry Unit 16 : Spontaneity, Entropy , and Free Energy

Zumdahl: Chapter 16 **Week 24-26**

Reference: Chapter 16 in *Chemistry*, 6th edition, Stephen Zumdahl

Objectives::

1. Define entropy and the spontaneous process.

2. State the 2nd Law of thermodynamics in terms of entropy.

3. Discuss the importance characteristics of entropy changes in their surroundings. explain the relationship between delta S*surr* , enthalpy, and temperature (in K).

4. Define free energy and how it applies to spontaneity.

5. Relate molecular complexity to entropy.

6. Be able to calculate the standard free energy change in a chemical reaction.

7. Define the standard free energy of formation and show how it can be use to predict spontaneity.

8. Relate equilibrium to standard free energy.

9. Be able to relate work done to the change in free energy.

Practice and Application Assignment:

Chapter 16:
7,8,12,23-25,27-28,30,32,35,38-9,41-42,45-46,48-51,53-53,56-58,61,68,71,74

Assessments: The student will complete a unit test at the end of the 2nd week .

KAP Chemistry Unit 17: Electrochemistry
Zumdahl: Chapter 17 **Week 27-29**

Reference: Chapter 17 in *Chemistry*, 6th edition, Stephen Zumdahl

Objectives: 1. Review oxidation and reduction reactions.

2. Define the components of an electrochemical cell.

2. Distinguish between a galvanic cell vs electrochemical cell.

3. Define cell potentials.

4. Calculate the volts of an electrochemical experiment by using the Standard Reductive Potential.

5. Compare this Potential list to the single displacement list that is used in the reactions unit.

6. Calculate the maximum cell potential from the change in the free energy between the products and reactants.

8. Use the Nersnt equation to show the relationship between concentration of the metals and how to calculate the equilibrium constant from these concentrations.

9. Calculate the electrolysis and the stoichiometry from this process

.

Practice and Application Assignment:

Chapter 17:

1,2,3,5,8,11,13-19, 21,23,24-28,29a,30ab,31a,32ab,33-36,39,40,42,43,44,46,48, 51,54,57,60,63,67,68,70,72,73ac,76,78,80, 83, 85,87,91,92,98,103,108

Laboratory Exercises: The students will complete the following labs and write lab reports for each:

(a) Electrochemical and the Galvanic Cell

(b) Electroplating copper onto a key
by following both in the *Advanced Chemistry Lab Book for Computers* by Vernier.

Assessments: The student will complete a test on this unit at the end of the three weeks.

AP Chemistry Unit 7-10: Atomic Models and Structure, Quantum numbers, Lewis Dot structures, Polarity versus Nonpolarity, Intermolecular Forces Week 30-31

Reference: Chapter 7-10 in *Chemistry*, 6th edition, Stephen Zumdahl

Objectives:

1. Be able to read atomic spectra and calculate the frequency and energy of these spectral lines, and determine the energy levels the electron has jumped in a hydrogen atom.

2. Be able to list the four quantum numbers and describe what they mean and represent

3. Be able to see a set of four quantum numbers, know what electron each set of four will represent

4. Be able to write an electron configuration of any element, their orbital diagram, and Lewis structure

5. Be able to describe all the periodic trends within a group or period and explain the reasons for these trends, including all the tips and peaks that occur

6. Be able to draw a Lewis structure, know the shape and angles, bond order and bond length, using the VSEPR theory

7. Be able to determine the type of hybrid orbitals these bonds have and describe if they have sigma or pi bonds, especially working with many different organic and biochemical structures

8. Be able to determine whether a compound or alloy has ionic, covalent, or metallic bonding and be able to explain the electron movement and energy exchange as these bonds are formed.

9. Be able to determine the type of intermolecular forces covalent compounds have and how this determine the boiling point and vapor pressure of these liquids or solids.

Practice and Application Assignment:

Chapter 7:

3-4, 14,18,19,20,23,25,27,28,31,40,41,43,46,51,63,64,69,71,77,79,82,85,89, 90,95,114,119,123

Chapter 8:

61,63,65,70,71,72,77,81-83,85-87

Chapter 9:

15,17,21,22ghik,27,28,49

Chapter 10:

14,21,27-29,35,38,39,67,87,104,105

-

Laboratory Exercises: The students will complete the following labs and write lab reports for each:

1. Working with a larger spectroscope and identifying the wavelength of each spectral line and calculating its frequency, energy, and using the Bohr's equation, the energy levels that the electron jumped.
2. Completing drawings of several Lewis structures and have them determine the shape, angle, sigma or pi bonds, hybrid orbitals, polarity, intermolecular forces and predict the relative boiling points of a set of similar covalent compounds.
3. Make models of their Lewis structures.
4. Compete in the "Great Race," putting several substance on cotton balls and predicting which substance will evaporate on a chalkboard faster than the others.
5. Read Phase diagrams and understand the intermolecular forces of that compound from the shape or angles on the graph. This includes working with clamping dry ice and having them observe the triple point of carbon dioxide.

Assessments: The student will complete a unit test at the end of the two week unit.

KAP Review unit (depending on the time available)
Weeks 32-38

Objectives of the Review for the Exit Exam : (which is proposed to be the American Chemical Society General Chemistry Exam and/or a lab practical exam)

1. The student will study various topics already covered. They will work on timing themselves to complete equilibrium problems, and various other key general chemistry problems.

2. The student will take tests that mimic the multiply choice portion to time themselves to pace themselves and be able to determine if they should not answer some of the questions given. (if they are penalized for guessing on the ACS exam)

3. The student will prepare for the possible lab questions and essay questions. (that I may add as a lab practical exam)

4. If time is warranted, the students will conduct labs and projects to help culminate all the topics covered in this college course.