AP SYLLABUS AND SUMMER WORK:

See the chapter 1-3 reading and problems assigned. Supplemental problems are optional. Chapters 1-3 are expected to be done by the first day of school.

AP CHEMISTRY

Course Description: This course is designed to follow completion of Honors Chemistry and will build upon the skills and concepts covered in that first-year high school course. AP Chemistry provides coverage of the topics and labs in a typical first-year college chemistry course. The labs will reinforce the lecture topics (although not always at the same time) and provide experience with which to answer many of the questions on the AP exam. A detailed laboratory notebook will be kept so as to present to any college or university chemistry department requesting to see evidence of the student's work in the lab. The laboratory will be one in which both group work and some individual work will be done. Traditional reports will be written as well as the occasional group or individual oral presentation given on laboratory results. Laboratory grades will be based upon both quantitative results and lab technique in addition to the written lab reports. Problem solving skills are integrated into every aspect of the course and students will be required to show all work, including formulas, significant figures and dimensional (unit) analysis in their solutions. Throughout the course students will be exposed to past AP exams and their format and the current grading of AP exams. Chapter tests will be structured similarly to the format of the AP exam to give students maximum practice and familiarity with the testing format. Students will be required to write about concepts in each chapter to facilitate their skill in explaining their thought processes in terms of problem solving and the interpretations of concepts. The type of student who takes AP Chemistry is expected to be an independent critical thinker and to be skilled in problem solving. Students are expected to come to class having read the text material and/or done the on-line tutorials that accompany the text. Students should be able to read independently and take notes as well as formulate questions while reading. Students are expected to consult their Honors Chemistry notes and coursework to aid in their further application of concepts covered in AP Chemistry. Students are expected to use outside sources of information (internet sourced, study guides, supplemental texts, reference books, etc.) to master topics covered and to answer questions outside of class.

Text: Masterton & Hurley*: Chemistry-Principles and Reactions* (Updated 5th edition) Copyright 2006.
Laboratory/Equation Texts: VonderBrink, Sally: *Laboratory Experiments for Advanced Placement Chemistry* (2nd edition). Copyright 2006
Randall, Jack: *Advanced Chemistry with Vernier.* Copyright 2004
Microscale Experiments: Holt ChemFile Program. Copyright 2006
Hague, G., Smith, J. *The Ultimate Chemical Equations Handbook.* Copyright 2001
Supplemental Study Guides (optional—purchased by individual students):

Cracking the AP Chemistry Exam, 2008 Edition (College Test Prep) (Paperback) by Princeton Review. Publisher: Princeton Review; ISBN: 0375766421

Barron's AP Chemistry 2008 (Barron's how to Prepare for the AP Chemistry Advanced Placement Examination by Neil D. Jespersen Ph.D. Publisher: Barron's Educational Series; ISBN: 0764136852, 4th edition

5 Steps to a 5: AP Chemistry by John Moore and Richard Langley Publisher: McGraw-Hill; ISBN: 0071412751; 1st edition

REA – The Best Test Prep for the Advanced Placement Exam: AP Chemistry, 2006 Edition. Publisher: Research and Education Association, ISBN: 9780738602219; 9th edition.

Other study guides published by: Kaplan, Peterson's, Cliff's, Raymond Chang, National Learning Corporation, etc.

Scheduling: (school year 9/2 – 6/15)

Four day Rotating/Drop Schedule (example)
DAY 1: Double Lab Period ("zero period" (7:00 am – 7:45 am) + 1st session): 100 minutes
DAY 2: NO CLASS
DAY 3: 3rd session: 70 minutes
DAY 4: 2nd session 60 minutes

Total class time:	45 days of 60-minute classes:	2700 minutes
	45 days of 70-minute classes:	3150 minutes
	46 days of 100-minute "double period" lab classes:	4600 minutes
	2 full day in-lab days (one in the fall semester and one in the spring)	720 minutes
TOTAL CLASS TIME for 180 day school year:		11,170 minutes (the equivalent of meeting 4 days a week for a 51 minute class with a double lab period of 102 minutes each week on the 5th day)

AP Test Preparation Activities:

Multiple Choice Practice Quizzes (5 questions, 5 minutes)---once a week
Review/Practice Free Response Questions (within each chapter)
Review/Practice Chemical Equations (once a week)
Past Exam Practice Tests
Optional Lunch-time (30 minutes every four days) discussion sessions on equations, free response questions, multiple choice, study-guide content, etc.

Grading System:

Laboratory Notebooks/Reports: 20% of grade
Quizzes: 20% of grade
Tests: 50 % of grade
Mandatory Test Corrections: earn up to ½ of lost points
Homework: 10 % of grade

Teaching Methods:

Lecture (traditional teacher created notes, power-point presentations, etc.)
Problem Solving (Teacher directed)
Problem Solving (Individual student directed)
Problem Solving (Small group learning/presentations)
Pre/Post laboratory discussions/presentations
Demonstrations
Simulations (computer)
Laboratory Experiments

Assessments:

Homework problems from text (supplemental pbs. optional)
AP Test Prep. Workbook assignments
Laboratory Reports
Take-home quizzes
In-class quizzes
Take-home Tests
In-class tests
Demonstration Reports
Simulation summaries

Student Expectations: (see course description also)

It is expected that students will DO CHAPTERS 1-3 (SEE SYLLABUS) AS SUMMER WORK AND COMPLETE BEFORE THE FIRST DAY OF SCHOOL.

It is expected that students will take the AP exam in May.

All work is to be done neatly, in pencil, in a notebook dedicated to AP chemistry.
All problems are solved neatly, with formula shown, dimensional (unit) analysis completed, and answers circled.
Chemical equations are to be shown when appropriate to a problem and balanced. Net ionic equations are to be shown under the complete balanced equation.
Use of textbook companion web-site (http://now.brookscole.com/masterton5e) to do pre-tests and post-tests of each chapter and follow the Study Tools for each chapter (interactive videos, immediate feedback questions, coached problems, tutorials).

Previous knowledge of the following topics from a first year High School chemistry/lab course:

SI measurement system
Dimensional Analysis
Classification of Matter
Chemical nomenclature
Formula writing
Equation balancing and basic reaction prediction (Synthesis and Decomposition of binary compounds, single replacement using the Activity Series, double replacement and basic ionic equation writing)
Stoichiometry and mole relationships in balanced equations
Periodic Table basics and electronic structure
Bonding and intermolecular forces
Gas Laws (Combined and Ideal, Dalton's and Avogadro's)
Solutions
Basics of Acids/Bases including acid/base equilibrium
Basics of Equilibrium (Keq, Ksp)
Basics of Thermodynamics (phase change calculations, Hess' Law, Heats of Solution, entropy, Gibbs Free Energy)
Basics of Kinetics (reaction rates, Energy of Activation, forward and reverse reactions, order of reactions)

Previous laboratory experience:

Laboratory safety rules and practices
Using electronic balances (use of "tare" or "re-zero" function)
Measuring liquids (knowledge of meniscus readings) using graduated cylinders, burettes, pipettes, and volumetric glassware
Bunsen burner operation
Knowledge of names of laboratory equipment and apparatus
Use of CBL's and probes: temperature, conductivity, pH, colorimeters, etc.
Use of Graphical Analysis software
Laboratory report writing (Purpose, Background, Materials, Procedure, Data, Observations, Calculations, Conclusions/Analysis)

Expected Individual Study Activities:

Text Reading
Note taking
On-line self evaluations of learning (Textbook support website using *General Chemistry Now*)
Tutorials (on-line)
Completion of supplemental study book/review sheets
Memorization of required items (ions, equations, etc.)
Equation practice
Attendance at some lunchtime discussion/practice meetings
Attendance at after-school or evening practice exam sessions
Seeking early morning extra help when needed (available 7:15-7:45 on non-lab mornings)
Independent study time per week expected: 5 hours

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned (odds) and Optional Supplemental (evens)
Summer Assignment In class weeks 1/2	**1 Matter and Measurement**	1 class session course outline syllabus expectations exam format, etc. 1 class session review/quiz 1 double lab period	▪ Define chemistry ▪ Use the process and stages of scientific (logical) problem solving ▪ State the three states of matter, their properties and the methods for their conversion ▪ Show understanding of the definitions for physical and chemical change ▪ Know the difference between elements, mixtures and compounds ▪ Define and distinguish between heterogeneous and homogeneous mixtures ▪ Define parts of a solution and distinguish between saturated and unsaturated ▪ Understand and be able to use scientific notation ▪ Memorize and use SI units and prefixes from 10^{12} to 10^{-12} ▪ Be able to convert between SI units ▪ Understand the concept of derived units and use relationships relating to density ▪ State the meaning of uncertainty and understand and be able to use the rules for determining significant figures and rounding off (odd-even rule for final 5's) ▪ Understand the differences between, and be able to apply, the concepts of accuracy and precision ▪ Be able to calculate % error ▪ Use Celsius, Fahrenheit, and Kelvin temperature units and convert between them	**Density of Beverages and % sugar content** (Journal of Chemical Education: Vol. 75 No. 9, Sept. 1998) student conducted lab	**9/12** Chap. 1&2	**1.1:** 1,3,5,13,19,21,23,25,27 **1.2:** 31,37,39 **1.3:** 43,45,47,49,59

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Summer Assignment In class Weeks 2/3	**2** **Atoms, Molecules, and Ions**	2 class session review and quiz 2 double lab periods	▪ Know a brief history of Atomic Theory ▪ Know and understand the five main aspects of Dalton's Atomic Theory ▪ State the basic evidence that led to the identification of sub-atomic particles ▪ Know the three particles that make up the atom and their relative charges, masses and positions in the atom ▪ Be able to use the Atomic # and Mass # of an isotope to calculate the numbers of protons, neutrons and electrons present ▪ Know what the term isotope means and be able to perform simple calculations finding average atomic mass or % occurrence ▪ Know the relative locations of metals, non-metals and metalloids on the periodic table ▪ Understand the difference between the terms Molecule and Ion ▪ Memorize the lists of common anions and cations (including polyatomic ions) ▪ Know how to combine those anions and cations to form ionic compounds ▪ Understand that oxidation and reduction can be described in terms of loss and gain of electrons respectively ▪ Be able to find the oxidation number of an element within a compound ▪ Be able to distinguish between metal ions using the Stock system and those that don't use Roman numerals ▪ Be able to name binary ionic compounds ▪ Be able to name binary molecular compounds ▪ Be able to name simple binary acids ▪ Be able to name ionic compounds containing polyatomic anions ▪ Be able to name oxyacids	**Determination of the formula of a Compound** (VonderBrink #1) Student Conducted lab **Determination of the % water in a hydrate** (Vonderbrink #4) student conducted lab	**9/12** (Chap. 1&2)	**2.1-2.4:** 7,13,25 **2.5-2.6:** 29,31,35,37,39 supplemental problems: supplemental pbs: 4,8,12,16,18,28,30, 32,34 36,38,46,50,55,57

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Summer Assignment In class Weeks 2/3	**3** **Mass Relations in Chemistry; Stoichiometry**	2 class sessions review 1 class session pb. Solving and quiz 1 double lab period	▪ Be able to write word equations ▪ Be able to write chemical equations using symbols ▪ Understand, and be able to use, state symbols as part of chemical equation writing ▪ Be able to balance chemical equations ▪ Understand the concept of percentage by mass ▪ Be able to calculate an empirical formula from percentage by mass data ▪ Be able to convert an empirical formula to a molecular formula by using Molar Mass data and/or to solve for Molar Mass ▪ Understand and be able to apply the concept of the mole in chemical calculations (including the application of Avogadro's number) ▪ Be able to use combustion data to calculate empirical formula of compounds ▪ Understand the importance of, and be able to apply, the concept of coefficients relating to reacting ratios ▪ Know how to calculate the number of moles of a solid substance present in a reaction from data ▪ Be able to perform stoichiometric calculations using Molarity ▪ Understand and be able to perform calculations relating to the Beer-Lambert law ▪ Be able to calculate the formula of hydrated salts from experimental data ▪ Understand, and be able to apply, the concept of a limiting reactant/excess reactant ▪ Understand, and be able to apply, the concept of percentage yield	**Determination of Mass and Mole Relationships in a Chemical Reaction** (Vonderbrink #5) Student Conducted lab	9/26	**3.1-3.2:** 3,15,21b,23b,25b **3.3:** 29,33,37a,39,43,45,47 51,55,57,59,63,65, 67,81 supplemental problems: 4,12,18,22,32,38, 44,52,60,68,72

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Week 4/5	**4 Reactions in Aqueous Solution**	4 class sessions instruction 1 class session pb. Solving and quiz 2 double lab periods	▪ Calculate Molarity and molality ▪ Calculate % mass, % volume, mole fraction and ppm and ppb ▪ Be able to perform stoichiometric calculations based upon reactions in solution ▪ Know solubility rules and predict ppt reactions ▪ Be able to write and balance net ionic equations for Double Replacement Reactions ▪ Be able to write and balance net ionic equations for Acid-Base Reactions ▪ Know the differences between strong and weak acids and bases ▪ Be able to write and balance net ionic equations for hydrolysis reactions ▪ Be able to write and balance net ionic equations for Simple REDOX Reactions using the oxidation number method ▪ Be able to write and balance net ionic equations for Non-Simple REDOX Reactions using the ion-electron method ▪ Be able to calculate the individual ion concentrations when ionic compounds are dissolved in water	**Standardization of a Solution Using a Primary Standard** **And Determine the concentration of an unknown acid using titration** (Vonderbrink #15) student conducted lab	**10/10**	**4.1:** 1a,3,5a **4.2:** 7,9,11,13,17,76 **4.3:** 21,23,27,31,37 **4.4**: 41,43,45,47,51 55ab,57ab,61 supplemental pbs: 2,6,8,12,14,16, 18, 32,34,36,38 44,50,52,54,56, 58,62,68,72

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 6/7	**5 Gases**	4 class sessions instruction 1 class session pb. Solving and quiz 1 double lab period	▪ Explain the kinetic Theory and use the formula for kinetic energy ▪ Describe the difference between a Real gas and an Ideal gas ▪ Be able to convert between different units of pressure ▪ Be able to interpret manometer diagrams ▪ Understand the concept and operation of a barometer ▪ Be able to convert between different units of temperature ▪ State and be able to use Boyle's law in calculations ▪ State and be able to use Charles' law in calculations ▪ State and be able to use Gay-Lussac's law in calculations ▪ State and be able to use Avogadro's law in calculations ▪ State and be able to use the Combined gas law in calculations ▪ State and be able to use the Ideal gas law in calculations and know the units used for R ▪ Show understanding of and be able to use the van der Waals equation (modified ideal gas law) in calculations ▪ Know and be able to use Dalton's law of partial pressures in calculations ▪ Know the values for STP ▪ Be able to use molar gas volume in calculations ▪ Understand the Kinetic theory as applied to gases ▪ Understand the concept of, and be able to perform calculations involving, the root-mean-square-speed of gases ▪ Understand the terms effusion and diffusion and be able to perform calculations relating to those concepts using Graham's Law ▪ Perform gas law Stoichiometry calculations	**Determination of the Molar Volume of a Gas** (Vonderbrink #8) Student Conducted lab	**10/24**	**5.1-5.2:** 5,15,17,69 **5.3:** 13,23,25,29 **5.4:** 31,33 **5.5:** 37,40,43 **5.6-5.7:** 45,47,53 supplemental pbs. 4,6,10,14 20,22,24,28 34,36,40,44 50,56,62,64

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 7/8	**6 Electronic Structure and the Periodic Table**	3 class sessions instruction 1 class session pb. Solving and quiz 1 double lab period	▪ Understand the Bohr model of the atom ▪ Understand how line emission spectra are formed ▪ Recall and state the differences between spectral lines in the Balmer, Paschen and Lyman Series ▪ Appreciate that the electron can be considered to have wave like properties as well as particle type properties ▪ Understand and use equations that relate the Energy, frequency, speed and wavelength of waves including the Rydberg equation ▪ Understand the concept of electrons in shells and the use of quantum numbers ▪ Understand the use of the terms s, p, d and f and their use in orbital notation ▪ Recall and understand the rules for filling orbitals and determining electronic configuration, including the Pauli exclusion principle, Hund's rule and notable exceptions ▪ Be able to construct the electronic configuration of the elements using the s, p and d and f notation ▪ Be able to construct the electronic configuration of the elements using the noble gas core and s, p, d and f notation ▪ Be able to construct the electronic configuration of simple ions (including d block ions) ▪ Recall the shapes of the s, p and d orbitals ▪ Recall that orbitals are electron probability maps ▪ Be able to assign quantum numbers to electrons ▪ Be able to describe electronic configurations using the electrons in boxes (orbital) notation ▪ Recall the meanings of the terms paramagnetic, diamagnetic and isoelectronic	**An Activity Series** (Vonderbrink #7) Student Conducted lab	**10/31**	**6.1-6.2:** 3,5,8,9,15 **6.3-6.4:** 17,21,23,25,27 **6.5-6.7:** 29de,31,33,37, 41,43,45,49,51 **6.8:** 53,55,57,59 supplemental pbs: 2,6,10,14,18,20,24, 26,30,32,38,42,44

	6 (continued) Electronic Structure and the Periodic Table		▪ Understand that regular, repeatable patterns occur across periods and within groups on the periodic table ▪ Appreciate that these patterns sometimes have notable exceptions ▪ Recall and understand that the noble gases have full outer shells that represent stable electronic configurations ▪ Recall how, and understand why, group I (1), II (2), VI (16) and VII (17) elements achieve noble gas electronic configurations ▪ Know the definition of ionization energy ▪ Know the definition of electron affinity ▪ Know and understand the variation in ionization energy and electron affinity when moving about the periodic table ▪ Be able to predict the group an element is in from ionization energy data and know the patterns in successive ionization energies and how that relates to achieving a noble gas electronic configuration ▪ Explain how and why atomic and ionic size vary when moving about the periodic table ▪ Understand how many physical properties change when moving about the periodic table			

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Week 9/10	**7 Covalent Bonding**	4 class sessions instruction 1 class session pb. Solving and quiz 2 double lab periods	▪ Understand that when forming chemical bonds atoms are attempting to form more stable electronic configurations ▪ Distinguish between molecules achieving stability with the octet rule and using exceptions to the octet rule ▪ Understand the essential difference between intra- and inter- molecular bonding ▪ Understand the concept of covalent bonding and how it differs from ionic bonding ▪ Be able to draw Lewis structures for ions, atoms and compounds ▪ Understand the concept of resonance ▪ Understand the concept of formal charge ▪ Be able to predict the shape of, and bond angles in, simple molecules and ions using VSEPR theory ▪ Be able to explain the role of unshared electron pairs in molecular geometry and bond angles ▪ Understand the concept of the co-ordinate covalent bond related to Lewis structures ▪ Understand that ionic bonding and covalent bonding are at two ends of a sliding scale of bond type ▪ Understand the role of charge density in determining some physical properties of ionic compounds ▪ Understand the concept of electronegativity ▪ Understand that polarization caused by cations leads to ionic compounds exhibiting some covalent character ▪ Understand that differences in electronegativity in covalent molecules causes dipoles and some ionic character in covalent compounds ▪ Understand when molecules exhibit polarity ▪ Be able to predict the shapes of simple molecules and ions using Lewis structures ▪ Understand the occurrence, relative strength and nature of dipole-dipole interactions, London dispersion forces and hydrogen bonds ▪ Understand the nature of sigma and pi bonds ▪ Understand and be able to identify different types of orbital hybridization	**Separation by Chromatography** (Vonderbrink #13) student conducted lab **Molecular Model Building** (Teacher assigned molecules) student conducted hands-on activity with presentations made to the class	**11/7**	**7.1:** 1,3,5,9,13,17,21,24 **7.2-7.3:** 31,33,35,37,43,45,47 **7.4:** 49,51,55,57,63 supplemental pbs: 2,10,14,22,28 32,38,40,44,48 50,56,60,66,70,76

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 11/12	**8 Thermochemistry**	5 class sessions instruction 1 class sessions pb. Solving and quiz 1 double lab period	▪ State and apply the principles of heat flow ▪ Be able to apply direction and sign to heat flow (q) ▪ Perform basic calorimetry calculations ▪ Learn definitions that describe the systems studied in thermochemistry ▪ State and use the rules of thermochemistry ▪ Understand, be able to quote a definition and write suitable equations for standard enthalpy of formation ▪ Understand, be able to quote a definition and write suitable equations for standard enthalpy of combustion ▪ Understand and be able to use a Hess's law cycle or algebraic methods to calculate a given enthalpy change ▪ Understand and be able to use in calculations, average bond energy terms ▪ Understand the meaning of the terms exothermic and endothermic ▪ Understand and be able to interpret heating and cooling curves ▪ Understand and be able to apply the concept of entropy both in descriptive and calculation contexts ▪ Understand and be able to apply the concept of Gibbs Free Energy both in descriptive and calculation contexts ▪ Understand and be able to apply the energetics of the ionic bond as described by the Born-Haber cycle and associated calculations ▪ Understand the role of charge density in determining some physical properties of ionic compounds	**Determination of Enthalpy Change Association with a Reaction** (Vonderbrink #6) student conducted lab	**11/21**	**8.1-8.2:** 1,3,5,11 **8.3-8.4:** 15,17,23,24,25,26, 27,29 **8.5:** 31,33,35,37,39,41 **8.6:** 69 supplemental pbs: 2,4,10,14,16,18, 20,28,30,32,34, 36,38,44,46, 48,50,52,54, 70

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 13/14	**9 Liquids and Solids**	2 class sessions instruction 1 class sessions pb. Solving and quiz 1 double lab period	▪ Understand how solid structure influences properties ▪ Understand the nature of liquids ▪ Understand the concept of vapor pressure and variables which affect it ▪ Perform calculations using the Clausius-Clapeyron equation to relate temperature to vapor pressure ▪ Be familiar with an interpret phase diagrams for substances with three or more phases ▪ Locate critical and triple points on phase diagrams ▪ Understand and be able to interpret heating and cooling curves ▪ Apply intermolecular forces to the understanding of properties of certain solids and liquids ▪ Differentiate between network covalent, ionic and metallic solids ▪ Know the basics of crystal structures ▪ Relate unit cell dimensions to atomic or ionic radii	**Determination of Molar Mass from Vapor Density** (Vonderbrink #9) Student Conducted lab	**12/5**	**9.1:** 1,3,5,7,9 **9.2:** 13,15,17 **9.3-9.4:** 21,23,25,27,29,31,35, 41abc,61 supplemental pbs: 2,6,10 14,18 24,26,28,32 36,40,42 48,52,54 56,62,64

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 15/16	**10 Solutions**	4 class sessions instruction 1 class session pb. Solving and quiz 1 double lab period	▪ Review concentration units (covered during chapters 3 and 4) ▪ Discuss and apply principles of solubility ▪ Compare and contrast solubility of substances based on temperature, heats of solution, nature of particles, and pressure (Henry's Law) ▪ Understand the concept of how vapor pressure is changed by presence of a solute ▪ Be able to relate changes (both quantitative and qualitative) in vapor pressure to addition of non-volatile solutes to solvents (Raoult's Law) ▪ Understand and recall Raoult's Law in terms of ideal solutions of two volatile components AND deviations from ideal behavior ▪ Be able to recall and use equations relating to quantitative treatments of Boiling Point Elevation, Freezing Point Depression, Osmotic Pressure and the van't Hoff factor ▪ Understand that a reaction in aqueous solution is one that is carried out in water ▪ Understand the terms electrolyte, weak electrolyte and non-electrolyte and be able to predict which compounds fall into which category ▪ Be able to calculate the individual ion concentrations when ionic compounds are dissolved in water ▪ Understand the difference between, and be able to write, full, ionic and net ionic equations ▪ Learn some reactions that produce gases from aqueous solutions as products and the chemical tests for those gases	**Determination of Molar Mass by Freezing Point Depression** (Vonderbrink #11) Student Conducted lab	**12/19**	**10.1-10.2:** 11,13,15,19,25 **10.3-10.4:** 27,29,33,39,41 45,49 supplemental pbs: 2,6,8,10,12,18 20,24,26 30,34,38,42,50 56,66,68,70

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 17/18	**11 Rate of Reaction**	4 class sessions instruction 1 class sessions pb. Solving and quiz 1 double lab period	▪ Be able to recall AND understand Collision Theory ▪ Be able to recall AND understand how temperature, concentration, surface area and catalysts affect a rate of reaction ▪ Understand AND be able to interpret a Maxwell-Boltzman distribution plot ▪ Understand AND be able to interpret an energy profile plot ▪ Be able to deduce orders, rate equations and rate constants (including units) from initial rate data ▪ Understand the link between the rate determining (slow step) in a reaction mechanism and the rate equation ▪ Understand AND be able to interpret graphical data relating to rates ▪ Use the Arrhenius equation to relate rate constant to temperature	**Determination of the Rate of a Reaction and its Order** (Vonderbrink #12) Student Conducted lab	**1/9**	**11.1-11.2:** 3,5,9,11,15,17,21,25 **11.3:** 33,37,41,45 **11.4-11.5:** 55,75,77 **11.6-11.8:** 61,62,63,67 supplemental pbs: 2,6,10,16,18, 22,26,2,32,36, 40,42,44,46 50,52,56,58 60,64, 68,76

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 19/20	**12 Gaseous Chemical Equilibrium**	4 class sessions instruction 1 class session pb. Solving and quiz 1 double lab period	▪ Understand the concept of dynamic equilibrium ▪ Be able to write an expression in terms of concentrations for the equilibrium constant Kc given a chemical equation ▪ Understand that equilibria take a finite time to be achieved ▪ Be able to calculate values for Kc and associated data from initial concentrations ▪ Be able to write an expression in terms of partial pressures for the equilibrium constant Kp given a chemical equation ▪ Be able to calculate values for Kp and associated data from pressure data ▪ Recall and understand Le Chatelier's Principle ▪ Understand the application of Le Chatelier's Principle and be able to predict the shift in position of equilibria and optimum conditions in reactions ▪ Understand and be able to apply the relationship of Kc to Kp, the different formats of Kc (reciprocals and roots) and the relationships in simultaneous equilibria ▪ Understand and be able to apply to calculations, the concept of solubility product ▪ Understand and be able to apply to calculations, the concept of common ion effect ▪ Use K to determine the direction of a reaction	**Microscale Equilibrium Concepts Lab (Le Chatelier's Principle and the Common Ion Effect)** Holt ChemFile Lab Program #16 Teacher Demonstration Lab done on Overhead projector	**1/23**	**12.1-12.2:** 1,3,5bd,7a,9a, 11ad,13,15,17 19,21 (calculate K_c for 19 and 21) **12.3:** 29,31,33,35,39,41 **12.4:** 25,27,37 **12.5:** 43,45,49 (tell if K will increase of decrease only) supplemental pbs: 4,6,12 14,16,20,24 26,28,30,34,36,40 44,46,50,52,60,68

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 20/21	**13** **Acid and Bases**	4 class sessions instruction 1 class session pb. Solving and quiz 1 double lab period	▪ Be able to recall the Bronsted-Lowry, Arrhenius and Lewis definitions of an acids and bases ▪ Be able to identify acid base conjugate pairs ▪ Recall the difference between strong and weak acids in terms of ionization ▪ Be able to calculate pH of strong acids and strong bases ▪ Be able to calculate pH of weak acids and weak bases using Ka and Kb ▪ Recall a definition of Kw, the ionic product of water ▪ Be able to write and balance net ionic equations for Hydrolysis Reactions ▪ Understand the techniques and procedures associated with titrations ▪ Be able to sketch titration curves and be able to suggest a suitable indicator for a particular titration ▪ Understand the hydrolysis of salts and the effect this has on pH ▪ Understand the meaning of the term 'equivalence point' ▪ Understand how indicators work ▪ Understand the terms electrolyte, weak electrolyte and non-electrolyte and be able to predict which acids and bases fall into which category ▪ Recall that an acid is a hydrogen ion donor ▪ Recall that a base is a hydrogen ion acceptor ▪ Understand how the degree of ionization/dissociation determines the strength of an acid and a base ▪ Understand that in a neutralization reaction an acid and base react to form a salt and water	**Preparation of Solutions of Acids and Bases** (Teacher designed) student conducted lab	**1/30**	**13.1-13.3:** 1,3,5abcd,7ac,9abc, 11,13,17 **13.4:** 25bcd,27,29,31,35 39,45 13.5: 49,51,53a,55 **13.6:** 59,61,63,65 supplemental pbs: 2,6,10,16,22 26,30,34,38,42 48,50,52,54,56, 60,62,68,72,74,76

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 22/23	**14 Equilibria in Acid-Base Solutions**	4 class sessions instruction 1 class session pb. Solving and quiz 1 double lab period	▪ Define a buffer and state how it works ▪ Calculate the pH of a buffer ▪ Choose a buffer to get a specified pH ▪ Calculate pH of a buffer after addition of hydrogen or hydroxide ions ▪ Determine the color of an indicator at a given pH ▪ Choose an appropriate indicator ▪ Calculate pH during a titration ▪ Calculate K for an acid-base reaction ▪ Be able to sketch and interpret a titration curve ▪ Be able to carry out stoichiometric calculations with acids and bases of various strengths ▪ Understand hydrolysis of salts and write equations for this process	**Determination of Ka of a weak acid** (Vonderbrink #14) Student Conducted lab	**2/13**	**14.1:** 1,9ac,13,15, 17,25,29,31, 33,37 **14.2:** 41,43,44 **14.3:** 45,51,55,60 supplemental pbs: 2,6,10,12, 16,20,32,36 40,46,56

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 24/25	**16 Precipitation Equilibria**	5 class sessions instruction 1 class session pb. Solving and quiz 2 double lab periods	▪ Recall that a reaction in aqueous solution is one that is carried out in water ▪ Recall some and learn new reactions that produce gases as products ▪ Recall solubility rules ▪ Write the Ksp expression for any ionic solid ▪ Use Ksp to calculate: concentration of one ion ▪ Use Ksp to determine ppt formation ▪ Use Ksp to determine the relative solubility of ions ▪ Use Ksp to interpret solubility in common ion situations ▪ Calculate K for a metal hydroxide in a strong acid ▪ Calculate K for the dissolving of a ppt ▪ Write balanced net ionic equations when a ppt dissolves in a strong acid or in NH_3 or OH^- ▪ Be familiar with a limited number of colors associated with precipitates	**Determination of a Ksp for an ionic compound** (Vonderbrink #18) Student Conducted lab **Colored Precipitates** (Holt Microscale Experiments #12) Student Conducted lab	**2/27**	**16.1:** 1ab, 3ad, 5ab, 7a, 11,13,17 **16.2:** 21,23,25,27,31,33,37 supplemental pbs: 2,6,12,16,24,26 28,32,36,38,42 44,48,52

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 25/26	**17 Spontaneity of Reaction**	4 class sessions instruction 1 class session pb. Solving and quiz 1 double lab period	▪ Learn definitions that describe the systems studied in thermochemistry ▪ Understand, be able to quote a definition and write suitable equations for standard enthalpy of formation ▪ Understand, be able to quote a definition and write suitable equations for standard enthalpy of combustion ▪ Understand and be able to use a Hess's law cycle or algebraic methods to calculate a given enthalpy change ▪ Understand and be able to use in calculations, average bond energy terms ▪ Understand the meaning of the terms exothermic and endothermic ▪ Understand and be able to apply the concept of entropy both in descriptive and calculation contexts and deduce the signs for deltaS and Calculate deltaS^{o} ▪ Understand and be able to apply the concept of Gibbs Free Energy both in descriptive and calculation contexts ▪ Relate deltaG^{o} to K ▪ Know the Gibbs Hellmholtz equation and use it in calculations ▪ Understand and be able to apply the energetics of the ionic bond as described by the Born-Haber cycle and associated calculations	**Preparation and Analysis of Tetraaminecopper (II) Sulfate Monohydrate** (Vonderbrink #24) student conducted lab	**3/13**	**17.1-17.2:** 5,7,9,11b,13b,15b **17.3-17.4:** 17,23c,27,31 **17.5:** 33,35,43,47,49,51,53 **17.6-17.7:** 55,57,59,61,63,65,67 supplemental pbs: 4,8,14,18,24,30 34,36,42 50,58,64,72,80

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Weeks 27/28	**18 Electrochemistry**	6 class sessions instruction 1 class session pb. Solving and quiz 3 double lab periods	▪ Recall the definition of oxidation and reduction in terms of electrons ▪ Understand and recall the definition of standard electrode potential ▪ Become familiar with some common oxidizing and reducing agents and the half-equations that represent their action ▪ Use Standard reduction potentials to compare strengths of oxidizing and reducing agents ▪ Use Standard reduction potentials to Calculate E^o and reaction spontaneity ▪ Understand and recall how to construct a cell diagram (line notation) and draw a diagram (picture) of the apparatus needed with appropriate labels for direction of e^- flow ▪ Recall the conditions under which standard electrode potentials are measured ▪ Understand the nature and purpose of a salt bridge ▪ Be able to predict the likelihood or otherwise of chemical reactions using standard electrode potentials ▪ Understand and use the Nernst equation to relate voltage to concentration ▪ Understand the relationship between Gibbs free energy, equilibrium constants and Ecell, and be able to perform related calculations ▪ Understand electrolysis and be able to perform quantitative calculations relating to it Understand and be able to write electronic configurations of transition metals and their ions ▪ Be able to carry out quantitative calculations relating to REDOX reactions ▪ Be able to relate mass of product to amount of electricity and/or amount of Energy in Joules	**Determination of Concentration by Redox Titration** (Vonderbrink #20) Student Conducted lab **Determination of an Electrochemical Series** (Vernier: Electrochemistry: Voltaic Cells) Teacher Demonstration Using overhead Projections of Readings on Graphing Calculator **OR** **Measurements Using Electrochemical** Cells (Vonderbrink #21)	**3/27**	**18.1-18.2:** 1,3,5,7,9,11, 13,15a 19,23,25c,27, 29,31 **18.3-18.4:** 37,39a (find K also),43,45,47b, 49,74 **18.5:** 58,61 supplemental pbs: 2,4,8,10,12,14,16 20,24,26,28,30 34,36,38,44,48, 52,56,64,79

Dates	Chapter	# Class sessions or Double Lab Periods	Content of Class Sessions	Lab	Test Date	Textbook Problems Assigned
Week 29	**19 Nuclear Reactions**	2 class sessions 1 pb. Solving and quiz 2 double lab periods	▪ Understand the phenomenon of radioactivity and the properties of radioactive particles ▪ Be able to write nuclear equations ▪ Understand the concept of half-life and be able to perform calculations related to it ▪ Recall some uses of radioactivity ▪ Understand the term mass deficit ▪ Be able to use neutron: proton ratio to make predictions about stability ▪ Understand the terms nuclear fission and fusion ▪ Understand, that in very general terms, radioactivity involves the rearrangement of the nucleus and chemical reactions involve the rearrangement of electrons	**Separation of and Qualitative Determination of Cations and Anions** (Vonderbrink #19) Student Conducted lab	**4/3**	**19.1-19.2:** 1,3,5,11,25
Week 30	**22 Organic Chemistry**	3 class sessions instruction 1 class session pb. solving and quiz 2 double lab periods	▪ Be able to name some simple aliphatic organic compounds and draw isomers ▪ Understand and be able to write equations for some organic reactions (Combustion, Substitution, Acid Base, Addition & Esterification, condensation) ▪ Be able to write and balance net ionic equations for Organic Reactions ▪ Know the difference between saturated and unsaturated compounds ▪ Distinguish between alcohols, ethers, aldehydes, ketones, carboxylic acids, esters and amines ▪ Distinguish between alkanes, alkenes, alkynes, cyloalkanes, aromatics and name them	**Synthesis, Purification and Analysis of an Organic Compound** (Vonderbrink #25) Student Conducted lab	**4/10**	**22.1-22.3:** 1,3,5,7,11,17 **22.4:** 15,16,17,19ab

4/13-5/8 weeks 32-35	**Exam Review and Practice Test Sessions**	12 class sessions	A substantial buffer is built in as this is the first time the course is to be taught and time estimates will, undoubtedly, need to be adjusted over the course of the year.		**4/17** Friday after school or evening **4/24** Friday after school or evening **5/1** Friday after school or evening	
		Total class sessions scheduled 86/90	Total tests scheduled 18 to occur during extra "double period" time---20 extra sessions scheduled and/or class session time as determined by the nature of each chapter's work schedule…time within each 4-day rotation schedule to be allotted for instruction or problem solving or quiz taking or laboratory experiments or tests as dictated by each topic.	Total labs for periods scheduled 26/46 with remainder (20) being used for 18 tests		