AP Chemistry Course Syllabus

Unit	MP	Topics	Laboratory	Assessments	Weeks	HW FRQ	*Optional Problem Set*
1-2 Matter, Atoms, Molecules and Ions	1	Classification of matter, Properties of matter, Atomic theory, Atomic structure, Atomic weights, Periodic table, Molecules, Molecular compounds, Ions & Ionic compounds, Naming & FW Ionic compounds & Acids, Simple organic compounds.		Unit exam 2nd day of school			*(pages 32-38): # 20, 22, 24,26,28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 64, 68, 70, 74, 80, 84, 86, 104, and 106.* *(pages 70-75):#18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 42, 44, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 88, 90, 92, 94, 96, 98, 104, and 110.*
Exam within 1st few days of school							
1 Measurement and Equipment	1	**Safety** Identification and proper use of lab equipment; Use of volumetric glassware and analytical balance; Attention to problems of contamination of and cleaning of glassware; Measurement to correct sig figs and unit analysis; Measurement and error-systematic vs random errors.	**Lab #1 Guided Inquiry:** Determination of the empirical formula of a compound **Lab #2** Determination of the Composition of a Mixture	Quizzes Homework	1st lab period		
3 Stoichiometry	1	Chemical Equations; Patterns of chemical reactivity; Formula weights/molar masses; Mole; Percent composition by mass; Empirical Formulas from composition data; Quantitative info. from balanced equations; Limiting Reactants/excess reactants; Theoretical, actual, & percentage yields. **Inquiry Activity**: Combustion Analysis. Students will devise a method that will allow them to use Combustion Analysis data to determine the formula of a hydrocarbon	**Lab #3** Analytical Gravimetric Analysis, What Makes Hard Water Hard? **Lab #4** Determination of mass and mole relationship in a chemical rxn	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	2	1986B, 1 a-d 2008B, 1 a-d	*(pages 119-128): #24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 118, 120, 122, 124, 126, 128, 152, 154, 156, and 158.*
Assessment TBD							

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Unit	MP	Topics	Laboratory	Assessments	Weeks	HW FRQ	*Optional Problem Set*
4 Types of Chemical Reactions and Solution Stoichiometry	1	Properties of aqueous solutions; Weak, strong, and non-electrolytes; Dissociation equations; Molarity; Dilution; Precipitation reactions; Acid-base reactions; Oxidation-Reduction reactions; Solution Stoichiometry & chemical analysis.	**Lab #5** Determination of Concentration by Oxidation-Reduction Titration	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	2	2001D, 1 a-e 2009B, 1 a-c	*(pages 171-179): #13, 21, 23a,b,i, 25, 27a, 29a, 31, 33, 35a, 37, 39, 41, 43, 49, 53, 55, 63, 67, 69, 71, 75, 77, 81, 83, and 87*
Assessment TBD							
7 Atomic Structure and Periodicity	1	Electromagnetic radiation; Frequency, wavelength, energy, and speed of light; Planck's constant; Photoelectric effect; Hydrogen spectrum and the Bohr model; Quantum mechanical model for electron position and spin; Aufbau principle with exceptions for Cr, Cu, Ag; Electron configurations; Photoelectron Spectroscopy; periodic table properties and trends; and Beer's Law. **Inquiry Activity:** Given ionization energies for various unknown elements, students will identify the unknown elements and rationalize their answers.	**Lab #6** Beer's Law. Relationship between the Concentration of a Solution and Amount of Transmitted Light.	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	1.5	1987D, 1 a-c 2007B, 2 a-c	*(pages 330-338): 19, 27, 31, 37, 41, 47, 51, 53, 55, 59, 67, 69, 73, 75, 77, 83, 87, 93, 99, 103, 107, 109, 117, 119, 125*
Assessment TBD							
20 The Representative Elements	1	Periodicity; Bonding; Atomic size and its influence on the differences between members of a group; Covalency of Li, Be, and B; Position of elements on table reflect their properties and behaviors.					*(pages 945-952): #3, 5, 9, 13, 19, 25, 27, 33, 35, 37, 39, 43, 47, 49, 55, 63, 69, 71*
21 Transition Metals and Coordination Chemistry	1	Transition metals; Chemistry of first row transition metals; Electron configuration of transition metal cations; Properties of solutions that contain transition metal ions; Coordination compounds; Isomerism; Models of bonding in complex ions.			1		*(pages 997-1004): #19, 21, 25, 29, 33, 35, 37*
Assessment TBD							

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Unit	MP	Topics	Laboratory	Assessments	Weeks	HW FRQ	*Optional Problem Set*
8 Bonding: General Concepts	1	Covalent vs. Ionic bonds; Octet rule; Electronegativity vs. electron affinity; Bond order; Bond length and strength; Bond polarity and dipole moments; Electron configurations of ions; Ionic radius; Lattice energy; Bond energies and enthalpies of formation; Lewis structures; Resonance; Exceptions to octet rule; Formal charge; VSEPR model.	Model Building: Lewis Structures and VSEPR **Lab #7** Separation by Chromatography: How do you separate molecules that are attracted to one another? Research one of the dye molecules used in this lab and relate to present day societal issues concerning health and safety.	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	2.5	1997D, 1a-c 2000D, 1a-d 2007B, 6 a-d 2008, 5 a-f	*(pages 392-402): #25, 35, 41, 45, 49, 55, 57, 63, 67, 71, 75, 83, 85, 87, 89, 93, 97 a c f h, 101, 103 (exercise 87 only), 115, 119*
9 Covalent Bonding	1	Localized electron model; Hybrid orbitals; # of electron pairs and orbital geometry; # bonding pairs and lone pairs and molecular geometry; Sigma and pi bonds; Paramagnetism and diamagnetism.					*(pages 430-437): #9, 11, 21, 29, 31*
Assessment TBD							
End of Marking Period 1							
11 Solutions	2	Solubility and Intermolecular forces; Solution concentration in Molarity, % composition, molality, mol fraction; Energetics of soln formation; Saturated soln and solubility; Factors affecting solubility; Colligative properties; Colloids; Coloumb's Law.		Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	1	1998B, 1a-d 2006B, 1a-b	*(pages 530-538): # 19, 21, 29, 33, 37, 39, 43, 45, 49, 51, 53, 55, 59, 61, 65, 69, 71, 75, 77, 79, 81, 83, & 85*
Assessment TBD							
13 Chemical Equilibrium	2	Characteristics of equilibrium systems; Equilibrium law expression and equilibrium constant; Heterogeneous equilibria; Relationship between equilibrium constant and reaction quotient; Calculating equilibrium constant; Calculating equilibrium concentrations from various data; Le Chatelier's Principle. **Inquiry Activity**: Given a set of patient symptoms, students will be asked to identify the biochemical processes that are involved and construct an explanation that connects the symptoms to the reversibility of the underlying biochemical processes.	**Lab #8** Determining the Equilibrium Constant for a Chemical Reaction	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	2	1990,1 a,b,d 2000, 1 a-e 2004, 1 a-g 2004B,1 a-d	*(pages 628-637): #11, 21, 25, 29, 33, 35, 39, 43, 47, 49, 51, 59, 63, 67, 69*
Assessment TBD							

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Unit	MP	Topics	Laboratory	Assessments	Weeks	HW FRQ	*Optional Problem Set*
14 Acids and Bases	2	Arrhenius and Bronsted-Lowry acid-base models; Strong vs. weak acids and bases; pH scale; Autoionization of water; Calculating pH of strong and weak acids; Dissociation/ionization of weak acids and bases; Polyprotic acids; Hydrolysis of salts; The effect of molecular structure on relative acidity; Basic and acidic anhydrides; Lewis acids and bases.	**Lab #9a** Standardization of a Solution Using a Primary Standard **Lab #9b** Determination of Concentration by Acid-Base Titration, including a Weak Acid or a Weak Base	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	2	1993, 1 a-d 2002B, 1 a-d	*(pages 688-696): #19, 21, 23, 25, 31, 33, 35, 37, 39, 41, 45, 49a b, 57, 59, 61, 67, 69, 73, 75, 81b, 85, 87c, 89, 91, 95, 101, 105, 107, 109, 113, 115, 119, 123, 125 a c e, 127 c d, 129 c d, 131, 133, 137*
Assessment TBD							
15 Acid-Base Equilibria / 5.2.12.A.6	2	Common ion effect; Buffer solutions; Buffering capacity; Henderson-Hasselbalch equation; Titrations and pH curves; Acid-base indicators.	**Lab #10** Preparation and Properties of Buffer Solutions	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	2	2000, 8 a-d 2005, 1 a-e	*(pages 736-739): #15, 17, 21, 23, 25, 33, 37, 41, 43, 45, 49, 55, 59 a b, 61, 63, 69 (exercise 55 only), 73*
Assessment TBD							
16 Solubility & Complex Ion Eq. /5.2.12.A.5	2	Solubility equilibria; Determining Ksp; Common ion effect; Selective precipitation and qualitative analysis; Factors that affect solubility; Complex ion equilibria; Formation & stability constants. Inquiry Activity Unknown Solutions–students design a procedure to identify solutions from a list of possibilities	**Lab #11** Separation and Qualitative Analysis of Cations and Anions	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	1	2006, 1 a&b	*(pages 766-769): #21, 25, 31, 33, 39, 49, 51, 55, 59, 61, 63, 67, 69, 73*
Assessment TBD							
10 Liquids and Solids / 5.2.12.A.2	2	Molecular comparison of liquids and solids; Intermolecular forces; Effect of intermolecular forces on viscosity, surface tension, and vapor pressure of liquids; Structures of solids; Bonding in solids; Phase change equilibria; Heating/cooling curves and phase diagrams.	**Lab #12** Determination of Molar Mass by Vapor Density	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	1.5	2006D, 1 a-c 2008A, 6 a-d 2009B, 6 a-d	*(pages 487-496): #13, 17, 21, 23, 25, 31, 33, 35, 37, 39, 41, (skip structures and properties of solids) , 87, 89, 91, 93, 95, 97, 99, 101, 103, 105*
Assessment TBD							
End of Marking Period 2							
5 Gases / 5.2.12.C.1	2	Characteristics of gases; Pressure; Gas laws; Ideal-gas law and its connection to the other gas laws; Ideal gas equation; Gas mixtures and partial pressures; Molecular effusion and diffusion; Kinetic-molecular theory; Mole fractions; Real gases and their deviation from ideal gases; Temperature and rms velocity; van der Waals equation of state. **Inquiry Activity:** Graham's Law Investigation .	Determination of the Molar Volume of a Gas (Completed in Honors Chemistry)	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	2	1990B, 1 a-d 1994B, 1 a-d 2009B, 3 a-f	*(pages 224-234): #21, 23, 25, 27, 29, 31, 35, 37, 43, 45c, 49, 53, 59, 63, 65, 69, 73, 75, 77, 81, 83, 85, 89, 95, 97, 99, 101, 103, 105, 107, 111*
Assessment TBD							

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Unit	MP	Topics	Laboratory	Assessments	Weeks	HW FRQ	*Optional Problem Set*
6 Thermo-chemistry	3	First law of thermodynamics; Kinetic and potential energy; Internal energy, heat, and work; Calorimetry; Enthalpy; Enthalpies of combustion; Hess's Law; Enthalpies of formation. **Inquiry Activity:** Given an acid/base reaction, students will identify the measurements that must be made in order to obtain various thermodynamic quantities and predict how a change in data will affect the thermodynamic quantities	**Lab #13** Determination of Enthalpy Change Associated with a Reaction	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	2	1998, 2 a-c 1995, 2 a-d 1996, 3a,b,d 1997, 7 a&b	*(pages 275-283): #11, 15, 25, 33, 37, 41, 45, 55, 61, 67, 69, 73, 75, 77, 83, 85*
Assessment TBD							
17 Spontaneity, Entropy, and Free Energy	3	Entropy, spontaneity, and the 2nd law of thermodynamics; Temperature and entropy; Free energy and spontaneity; Entropy changes in reactions; Free energy and reactions; Free energy and its relationship to equilibrium and work.		Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	2		*(pages 807-815): #11, 17, 23, 29, 31, 33, 35, 37, 39, 41, 45, 47, 49ad, 51, 53, 55, 57, 59, 61, 63, 67, 69, 71*
Assessment TBD							
12 Chemical Kinetics	3	Reaction rates; Factors that affect reaction rate; Rate laws and rate constants; Reaction order; Reaction mechanisms; Collision theory; Arrhenius equation; Catalysis. **Inquiry Activity:** After viewing a video on the molecular representation of catalyst activity, students will formulate how the concentration of a catalyst affects reaction rate.	**Lab #14** Determination of the Rate of a Reaction and its Order	Unit Exam Multiple choice, problems in this capter?, constructed response Quizzes Problem sets Lab Notebook	2.5	1991, 3 a-d 1994, 2 a-d 1997, 4 a-e 1999, 3 a-d	*(pages 580-592): #17, 21, 25, 27, 29, 31, 33, 35, 39, 41, 43, 47, 49, 51, 53, 55, 57, 59, 61, 65, 67, 69, 73,*
19 The Nucleus: A Chemist's View	3	Nuclear stability; Radioactive decay; Nuclear transformation equations; Detection and uses of radioactivity; First order kinetics for nuclear decay; Half-life of radioactive isotopes; Fission and fusion; Effects of radiation; Binding energy.		Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook		1989D, 1 a-d 1991D, 1 a-d 1997D, 2 a-d	*(pages 901-903): #11, 13, 15,17, 21, 23, 25, 29, 31, 33, 35, 37, 41, 43*
Assessment TBD							
18 Electro-chemistry	3	Oxidation-reduction reactions; Balancing redox reactions; Standard reduction potentials; Galvanic cells; Cell potential and free energy; Batteries; Corrosion; Nernst equation; Electrolytic cells.	**Lab #15** Measurement Using Electrochemical Cells and Electroplating **Lab #16** Predicting the Products of Chemical Reactions and Writing Chemical Equations	Unit Exam Multiple choice, problems, constructed response Quizzes Problem sets Lab Notebook	3	1992, 2 a-d 1993, 7 a-c 2001, 7 a-d 2004, 6 a-f 2006B, 2 ab	*(pages 861-871): #17, 21, 29, 31, 39, 41 (refer to question 39 only), 43, 47, 53, 57, 59, 61, 63, 69, 71 (refer to question 39 only), 73, 75, 79, 81ab, 83, 85, 93, 95, 99, 103, 105*

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Unit	MP	Topics	Laboratory	Assessments	Weeks	HW FRQ	*Optional Problem Set*
22 Organic and Biological Molecules	4	Aliphatic hydrocarbons; Alkanes, alkenes, and alkynes; Aromatic hydrocarbons; Functional Groups; Combustion, addition, and substitution reactions.	**Lab #17** Synthesis, Purification, and Analysis of an Organic Compound		0.5		*(pages 1052-1056): #1, 21, 23, 25, 27, 29, 31, 35, 43, 47, 51, 55, 57, 59*
Assessment TBD							
End of Marking Period 3							
Review for AP Exam	4	Practice AP exams, Practice multiple choice, free response questions	**Lab #18** Practical Applications of a Redox Reaction (time permitting)	Sample AP Exams	2		*Review book, Old exams, Worksheets*
Final Exam (Practice AP Exam)							
				TOTAL	**32.5**		

AP Chemistry Exam is normally the 1st AP scheduled exam in May

Special Note: This syllabus is not set in stone. Some extra time has been built in for review and alteration of the schedule due to specific needs of the class. For this reason, the syllabus is only scheduled for 32 weeks.