

AP[®] Chemistry

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AP[®] Chemistry is a one-credit course that parallels the material covered during the two semesters of entry level college chemistry courses. Successful completion of this course and the AP Chemistry Exam given in May qualifies your child for a possibility of earning six college hour credits for General Chemistry I and II lecture courses offered in most universities. It is also possible to earn an additional 1 – 2 college hour credits for laboratory work (see Laboratory Program below). It is best to check with prospective universities as to their policy regarding AP courses and earning college credits. .

Just as college level courses have a strong quantitative component AP Chemistry also will emphasize numeric chemical calculations. Students will be assigned a problem set every week. On Fridays students will be required to present a solution to one of the assigned problems which I will pick randomly and for which they will receive a grade per a rubric. The student must explain the steps he or she used to derive the answer.

Goals of the course

- Students are prepared to be critical and independent thinkers who are able to function effectively in a scientific and technological society.
- Students should attain a depth of understanding of chemistry fundamentals and a reasonable competence in dealing with chemical calculations.
- Contribute to the development of the students' abilities to think clearly, solve problems and to express their ideas, orally and in writing, with clarity and logic.
- Students will be able to make an acceptable score on the AP Chemistry Examination in May.
- In each laboratory experiment, students will physically manipulate equipment and materials in order to make relevant observations and collect data; use the collected data to form conclusions and verify hypotheses; and communicate and compare results and procedures (informally to other experimenters, and also in a formal, written report to the teacher).

Prerequisites

Successful completion of Chemistry I and Algebra II

Textbooks

Title: Chemistry: AP Edition, 7th Edition

Author: Zumdahl, Steven S., Second Author: Zumdahl, Susan A.

Publisher: Houghton Mifflin Company

Published Date: 2007

Replacement cost: \$123

Laboratory Manual

Unless otherwise noted lab experiments are from the following manual:

Title: Experimental Chemistry, 7th Edition

Author: James F Hall

Publisher: Houghton Mifflin Company

Published Date: 2007

Replacement cost: \$123

AP Test Prep Manual

Fast Tract to a 5, Preparing for the AP Chemistry Examination

Publisher: Houghton Mifflin Company

Published Date: 2006

Replacement cost: \$26

Special supplies you will need for this class:

Required Materials:

1. Dedicated spiral notebook or a dedicated section (divided by separators) of a spiral notebook for chemistry notes. (loose leaf paper in a binder will not suffice)
2. **Bound composition notebook** to be used as a journal and laboratory notebook
3. Scientific calculator
4. A folder or dedicated pocket in a notebook for chemistry papers only
5. A minimum of two pens and a pencil

Lab Fee

We are requiring that each chemistry student pay a \$25 lab fee.

Grades:

Your course work (tests, quizzes, homework, and labs) is 75% of your semester grade. Your semester exam is a 90 minute cumulative exam (covers the entire semester) and counts for 25% of your grade. You will receive a progress report card at the end of the first and third quarter. You earn a half unit for each semester that you pass this course.

Categories and percentage (of the total grade) are as follows:

Test and quizzes	25%
Labs	25%
Homework	25%
Semester exam	25%

Grading scale

90% - 100%	A
80% - 89%	B
75% - 79%	C
70% - 74%	D
Below 70%	F

Tutoring hours

Unless I am otherwise committed to a school function I am available to help your child every afternoon from 4:00 - 5:00. If given a little advance notice and I can also schedule a time before school for you and I to meet.

Expectation of study habits

AP Chemistry is a college course and therefore is taught at a college level. You will have homework every night. You will receive a reading assignment and/ or problem sets every day, a weekly laboratory report to complete, a quiz every Friday and a unit approximately test every two - three weeks. I would expect my students to study, review, and work on completing assignments no less than an hour per night, five nights per week. In addition, the student should spend an hour working on lab assignments for every hour the student spends in lab. Many lab activities have pre-lab questions that must be completed before the beginning the lab activity commences. A student that desires to earn an above average grade will usually need to study more than an hour per night.

Course Outline

Course Overview:

AP[®] Chemistry is a one-credit course that parallels the material covered during the two semesters of entry level college chemistry courses. Successful completion of this course and the AP Chemistry Exam given in May qualifies your child for a possibility of earning six college hour credits for General Chemistry I and II lecture courses offered in most universities. It is also possible to earn an additional 1 – 2 college hour credits for laboratory work (see below). It is best to check with prospective universities as to their policy regarding AP courses and earning college credits.

Laboratory Program

In order to earn 1 – 2 hours of credits for a college chemistry laboratory course, many universities require that students must demonstrate that they have participated and succeeded in a college level laboratory program. A college lab course typically meets for a minimum of one three hour block per week. Most AP labs require 2 – 3 hour blocks to complete. AP Chemistry labs are college level lab experiments and the labs are conducted after school and/or during a three hour session on the weekend. Students are required to keep proper records of all experimental work done in the course. They will end the year with a document that is a source of pride and that demonstrates the growth of their skills. This record is an important document that may be requested by the Chemistry Department at a college or university when a decision is needed regarding credit for a college lab course and/or placement in more advanced chemistry courses. This record will consist of a laboratory notebook and all written lab reports.

Unit 1: Calculations and Uncertainty 0.5 week

Dimensional analysis, uncertainty, significant figures

Text: Chapter 1

Experiments

- Precision of a Measuring Instruments, adapted from Holt ChemFiles, Holt, Rinehart and Winston, 2002

Unit 2: Atoms, Molecules, and Ions 1.0 weeks

Text: Chapter 2

Review of formula writing, oxidation states, nomenclature, distinguish between metals and nonmetal etc.

Experiments

- Experiment 9: Resolution of a Mixture: Chromatography

Unit 3: Stoichiometry

1.0 week

Text: Chapter 3

Mole, atomic weight, molecular formula, balancing equations, mass and volume relations with emphasis on the mole concept, including empirical formulas, limiting reactants & percent yield

Experiments

- Experiment 12: Hydrates

Unit 4: Reactions

1.5 week

Text: Chapter 4

Strong and weak electrolytes, precipitation reactions, describing reactions in solution, ionic and molecular species present in chemical systems: net ionic equations, applying the periodic law to chemical reactivity in predicting reaction products, using the activity series of elements to predict single replacement reactions, stoichiometry of precipitation reactions, acid-base reactions, oxidation number, oxidation-reduction reactions

Experiments

- Experiment 11: Stoichiometric Determination and Limiting Reactant
- Experiment 34: Gravimetric Analysis
- Reacting Ionic Species in Aqueous Solution, adapted from Holt ChemFiles, Holt, Rinehart and Winston, 2002

Unit 5: States of Matter

2.0 weeks

Text: Chapters 5 & 10 sections 2, 3 (pages 435-436 only), 6, 7, 9

Ideal gas law, deviations from ideal gas laws (van der Waal's equation), Avogadro's Law, STP, Dalton's Law, Graham's Law, kinetic theory of gases, liquid state, types of solids (molecular, ionic, metallic), metallic bonding, network solids, vapor pressure, changes of state including critical points and triple points, phase diagrams, specific heat, structure of solids; lattice energies

Experiments

- Experiment 14: The Gas Laws
- Experiment 15: Molar Mass of a Volatile Liquid
- Experiment 16: Vapor Pressure

Unit 6: Thermochemistry

2.0 weeks

Text: Chapter 6, Chapter 10 section 8

State functions, thermochemical equations, heats of formation, bond energies, heats of reactions, first law of thermodynamics, change in enthalpy, heat of formation, heat of reaction, Hess's law, heats of vaporization and fusion, calorimetry, exothermic and endothermic reactions,

Experiments

- Experiment 17: Heat of Acid/ Base Reactions

Unit 7: Atomic Structure and Periodicity

2.5 weeks

Text: Chapters 7, 18 sec-1 & sec-3

Atomic spectra, Bohr atom, quantum numbers, atomic orbitals, electron configurations, periodic table, trends in the periodic table in terms of physical and chemical properties (for example, atomic radii, ionization energies, electron affinities, oxidation states), valance, nuclear equations, nuclear particle emissions, fission and fusion

Experiment

- Experiment 18, Atomic Spectroscopy
- Experiment 20, Properties of Some Representative elements

Unit 8: Chemical Bonding

3.0 weeks

Text: Chapters: 8, 9, 10 sec-1, chapter 21 sec 3 & sec 4, chapter 22 sec 1 & sec 2

Lewis structures, polarity of bonds, electronegativities, ionic bonding, character of bonds, covalent model, octet rule and exceptions, resonance, VSEPR model, hybridization, dipole–dipole interactions, hydrogen bonding, van der Waals (including London dispersion forces), hydrocarbons: structure, nomenclature, chemical properties, coordination compounds, structural isomerism of simple organic molecules and coordination complexes

Experiment

- Experiment 19, Molecular Shapes and Structures
- Experiment 35, Preparation of Coordinated Complex of Copper

Unit 9: Properties of Solutions

2.0 weeks

Text: Chapter 11

Electrolytes and nonelectrolytes, molarity, molality, dilutions, mole fraction, colligative properties, Raoult's Law, Henry's law, freezing point depression, boiling point elevation, and osmotic pressure

Experiment

- Experiment 23, Freezing Point Depression and Molar Mass Determination

Unit 10: Chemical Equilibria

1.5 weeks

Text: Chapter 13

Laws of mass action, equilibrium expressions, calculations of K , K_p , K_c and equilibrium concentrations, Le Chatelier's principle, and how equilibrium is shifted by temperature, concentration, & pressure

Experiment

- Experiment 26, Determination of an Equilibrium Constant

Unit 11: Acids and Bases

1.5 weeks

Text: Chapters 14

pH, pOH, constants for weak acids and weak bases (pK_a , pK_b), titration, degree of ionization, K_w expressions, indicators, equivalence points, Arrhenius, Brønsted-Lowry and Lewis acid theories, and salt

hydrolysis

Experiments

- Experiment 28, Acids, Bases and Buffer Systems: Determining pH Using Indicators
- Acid Base Titration: Standardization of NaOH and Analysis of an Unknown Acid Sample

Unit 12: Aqueous Equilibria

3.0 weeks

Text: Chapters 15

Factors affecting solubility, solubility product constants (K_{sp}) and their application to precipitation and the dissolution of slightly soluble compounds, common ion effect, K_a and K_b expressions, buffers; hydrolysis, equilibrium calculations of weak acids and weak bases, given the concentration and amount of weak acids or bases and an appropriate titrant, calculate data to produce a titration curve

Experiments

- Qualitative Analysis of Selected Cations and Anions, adapted from Experiments 43 – 48.
 - Part 1: Experimental Technique
 - Part 2: Analysis of an Unknown

Unit 13: Chemical Kinetics

1.5 weeks

Text: Chapters 12 and 18 sec-2

Reaction kinetics, rate law expressions, order of reactions, rate constant, half-life, activation energy, catalysts, and reaction mechanism

Experiments

- Experiment 25, Rates of Chemical Reactions

Unit 14: Chemical Thermodynamics

1.5 weeks

Chapters 16 and 18 sec-5

Gibbs free energy equation; 2nd law of thermodynamics, entropy, energy and work, free energy of formation; free energy of reaction, dependence of change in free energy on enthalpy and entropy changes, thermodynamic stability of the nucleus

Unit 15: Electrochemistry

2 weeks

Text: Chapter 17

Oxidation and reduction half-cells equations, electrochemical (voltaic & electrolytic) cells, standard half cell potentials from a table, calculations using the Nernst equation, Faraday's laws, writing redox equations, prediction of the direction of redox reactions, balancing equations in acid/base solutions, relationship of change in free energy to equilibrium constants and electrode potentials

Experiments

- Experiment 32, Chemical Cells: Part A: The Electromotive series, Part B: Voltaic Cells, Part C: The Effect of Concentration on Cell Potential (The Nernst Equation)
- Experiment 33: Electrolysis of Water

AP Exam Review

3 – 4 weeks

I emphasize chemical calculations, descriptive chemistry, reactions and reviewing AP Released Exams. A serious of practice exams will be given using AP Released Exams.