



## ADVANCED PLACEMENT CHEMISTRY

*Counselors are available to assist parents and students with course selections and career planning. Parents may arrange to meet with the counselor by calling the school's guidance department.*

### COURSE DESCRIPTION

Advanced Placement Chemistry is a college-level course that deals with advanced concepts in chemistry. The course is designed in accord with the requirements of the College Board. Students are expected to take the Advanced Placement Chemistry Examination at the end of the course.

### COURSE GOALS

- Develop an in-depth understanding of the fundamentals of general chemistry
- Develop reasonable competence in dealing with chemical problems
- Develop the ability to think clearly and to express ideas orally and in writing with clarity and logic

### PREREQUISITE

Chemistry

### OPTIONS FOR NEXT COURSE

Advanced Placement Environmental Science (Biology and Chemistry prerequisite)

Advanced Placement Biology (Biology and Chemistry prerequisite)

Advanced Placement Physics (Algebra II/Trigonometry prerequisite)

Earth Science

Biology

Oceanography (Earth Science prerequisite)

Astronomy (Earth Science prerequisite)

Physics (Algebra II prerequisite or co-requisite)

### REQUIRED STUDENT TEXTBOOK AND LABORATORY MANUAL

*General Chemistry*, Hill, Petrucci, McCreary, Perry (Pearson Prentice Hall, 2005)

*Laboratory Manual for Principles of General Chemistry*, Beran (Prentice Hall, 2009)

### MINIMUM REQUIREMENTS

- Demonstrate knowledge and understanding of all core objectives through laboratory investigations, projects, oral and/or written tests, quizzes, and reports
- Attend the extended class or laboratory sessions scheduled each week
- Participate in the laboratory activities, prepare written laboratory reports, and adhere to all safety procedures
- Read science journals, magazines, and books to expand the ideas and topics presented in class

## The Knowledge, Skills, and Attitudes That Comprise the Advanced Placement Chemistry Course are as Follows:

### Structure of Matter

- Atomic theory and atomic structure
- Chemical bonding
- Nuclear chemistry

### States of Matter

- Gases
- Liquids and solids
- Solutions

### Reaction

- Reaction types
- Stoichiometry
- Equilibrium
- Kinetics
- Thermodynamics

### Descriptive Chemistry

- Chemical reactivity and products of chemical reactions
- Relationships in the periodic table: horizontal, vertical, and diagonal
- Chemistry of the main groups and transition elements, with emphasis on alkali metals, alkaline earth metals, halogens, and the first series of transition elements
- Organic chemistry: physical and chemical properties of simple organic compounds, notably hydrocarbons, alcohols, and organic acids

(Organic compounds will be included as exemplary material for the study of other areas such as bonding, equilibria involving weak acids, kinetics, colligative properties, and stoichiometric determinations of empirical and molecular formulas. Reactions specific to organic chemistry are NOT tested.)

### Core Areas for Laboratory Skills and Experiences

Advanced Placement Chemistry students are expected to spend at least 200 minutes each week in the classroom plus a minimum of 90 minutes in the laboratory. Investigations emphasize experimental procedures and the collection and analysis of quantitative data. The following areas are studied in laboratory experiments:

- Determination of the formula of a compound
- Determination of the percentage of water in a hydrate
- Determination of molecular mass by vapor density
- Determination of molecular mass by freezing-point depression
- Determination of the molar volume of a gas
- Determination of concentration by acid-base titration, including a weak acid or weak base
- Determination of concentration by oxidation-reduction titration
- Standardization of a solution using a primary standard
- Determination of mass and mole relationship in a chemical reaction
- Determination of the equilibrium constant for a chemical reaction
- Determination of appropriate indicators for acid-base titrations; pH determination
- Determination of the rate of a reaction and its order
- Determination of enthalpy change associated with a reaction
- Separation and qualitative analysis of cations and anions
- Synthesis of a coordination compound and its chemical analysis
- Analytical gravimetric determination
- Colorimetric or spectrophotometric analysis
- Separation by chromatography
- Preparation and properties of buffer solutions
- Determination of electrochemical series
- Measurements using electrochemical cells and electroplating

**NOTE:** *Students should keep records of their laboratory work in such a fashion that the reports can be readily reviewed. Some institutions want to see a record of the laboratory work done by an advanced placement student before making a decision about granting credit and/or placement in the chemistry program.*

### Chemical Calculations

The following list summarizes types of problems either explicitly or implicitly included in the preceding material. Attention should be given to significant figures, precision of measured values, and the use of logarithmic and exponential equations.

- Percentage composition
- Empirical and molecular formulas from experimental data
- Molecular masses from gas density, freezing-point, and boiling-point measurements
- Gas laws, including the ideal gas law, Dalton's law, and Graham's law
- Stoichiometric relations using the concept of the mole; titration calculations
- Mole fractions; molar and molal solutions
- Faraday's law of electrolysis
- Equilibrium constants and their applications, including their use for simultaneous equilibria
- Standard electrode potentials and their use; Nernst equation
- Thermodynamic and thermochemical calculations
- Kinetics calculations



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A H E A D O F T H E C U R V E

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*The Virginia Beach City Public Schools, in partnership with the entire community, will empower every student to become a life-long learner who is a responsible, productive and engaged citizen within the global community.*

Dr. James G. Merrill, Superintendent

### DEPARTMENT OF CURRICULUM AND INSTRUCTION

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