

Warren County School District

PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: Advanced Placement Chemistry

Course Number: 00336

Course Prerequisites: Completion of Advanced Inorganic and Advanced Organic Chemistry with an average of 80% or higher or permission of the principal

Course Description: (Include “no final exam” or “final exam required”)
Advanced Placement Chemistry provides able and motivated students with the opportunity to pursue college-level chemistry studies while still in high school. This course is a college-level laboratory program that enables students to receive college credit by passing the Advanced Placement Examination with appropriate scores in May of the school year. Prerequisites include completion of Advanced Inorganic and Advanced Organic Chemistry with an average of 80% or higher or permission of the principal.

Suggested Grade Level: 12

Length of Course: One Semester X Two Semesters Other
(Describe)

Units of Credit: 1 (Insert *NONE* if appropriate.)

PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certification(s)
(Insert certificate title and CSPG#) Chemistry

Certification verified by WCSD Human Resources Department:
 X Yes No

Board Approved Textbooks, Software, Materials:

Title:

Publisher:

ISBN #:

Copyright Date:

Date of WCSD Board Approval:

BOARD APPROVAL:

Date Written: September 2009

Date Approved: _____

Implementation Year: _____

Suggested Supplemental Materials: (List or insert None)

Course Standards

PA Academic Standards: (List by Number and Description)

3.1 Unifying themes

12.B Apply concepts of models as a method to predict and understand science and technology

12.C Assess and apply patterns in science and technology.

3.2 Inquiry and Design

12.A Evaluate the nature of scientific and technological knowledge.

12.B Evaluate experimental information for appropriateness and adherence to relevant science processes.

12.C Apply the elements of scientific inquiry to solve multi-step problems

3.4 Physical Science, Chemistry and Physics

12.A Apply concepts about the structure and properties of matter.

12. B Apply and analyze energy sources and conversations and their relationship to heat and temperature.

WCSD Academic Standards: (List or None)

None

Industry or Other Standards: (List, Identify Source or None)

None

WCSD EXPECTATIONS

WCSD K-12 Expectations for instruction in writing, reading, mathematics and, technology have been developed and revised annually. The teacher will integrate all WCSD Expectations into this planned instruction.

SPECIAL EDUCATION AND GIFTED REQUIREMENTS

The teacher shall make appropriate modifications to instruction and assessment based on a student's Individual Education Plan (IEP) or Gifted Individual Education Plan (GIEP).

SPECIFIC EDUCATIONAL OBJECTIVES/CORRESPONDING STANDARDS AND ELIGIBLE CONTENT WHERE APPLICABLE

(List Objectives, PA Standards #'s, Other Standards (see samples at end))

ASSESSMENTS

PSSA Assessment Anchors Addressed: The teacher must be knowledgeable of the PDE Assessment Anchors and/or Eligible Content and incorporate them into this planned instruction. Current assessment anchors can be found at pde@state.pa.us.

This course is written to the 12th grade standards. No assessment anchors have been written for this level.

Suggested Formative Assessments: The teacher will develop and use standards-based assessments throughout the course.

- Pre-Assessments of prior knowledge (e.g. entrance cards or KWL chart)
- Labs/lab reports
- Bell ringers/Problems of the Day(PODs)
- Discussions
- Teacher observation/Questioning
- Graphic organizers (e.g. Venn diagrams, word mapping, webbing, KWL chart, etc.)
- Summarizing
- Retelling
- Notetaking
- Problem-based learning modules
- Authentic assessment
- Oral presentations
- Outlining
- Journaling
- Student presentations/projects
- Open-ended response
- Quizzes/tests
- Activities
- Classroom Performance System (CPS)
- White boards

Suggested Summative Assessments:

- Essays
- Open-Ended Responses
- Projects
- Quizzes/tests
- Student presentations
- Portfolios
- Lab Practical
- Lab Report

Portfolio Assessment: ☐ Yes ☒ No

District-wide Final Examination Required: X Yes No

Course Challenge Assessment (Describe):

REQUIRED COURSE SEQUENCE AND TIMELINE

(Content must be tied to objectives)

Teachers have individual course syllabi as required and approved by the College Board.

Content Sequence	Dates
I. Structure of Matter	Time: 9 weeks
A. Atomic theory and atomic structure	
1. Evidence for the atomic theory	
2. Atomic masses; determination by chemical and physical means	
3. Atomic number and mass number; isotopes	
4. Electron energy levels; atomic spectra, quantum numbers, atomic orbitals	
5. Periodic relationship including, for example, atomic radii, ionization energies, electron affinities, oxidation states	
B. Chemical bonding	
1. Bonding forces	
a. Types: ionic, covalent, metallic, hydrogen bonding, van der Waals (including London dispersion forces)	
b. Relationships to states, structure and properties of matter	
c. Polarity of bonds, electronegatives	
2. Molecular models	
a. Lewis structures	
b. Valence bond: hybridization of orbitals, resonance, sigma and pi bonds	
c. VSEPR	
3. Geometry of molecules and ions, structural isomerism of simple organic molecules and coordination of complexes; dipole moments of molecules; relation of properties to structure	
C. Nuclear chemistry; nuclear equations, half-lives, and radioactivity; chemical applications	
II. States of Matter	Time: 9 weeks
A. Gases	
1. Laws of ideal gases	
a. Equations of state for an ideal gas	
b. Partial pressures	
2. Kinetic molecular theory	
a. Interpretation of ideal gas laws on the basis of this theory	
b. Avogadro's hypothesis and the mole concept	
c. Dependence of kinetic energy of molecules on temperature	
d. Deviations from ideal gas laws	
B. Liquids and solids	
1. Liquids and solids from the kinetic-molecular viewpoint	
2. Phase diagrams of one-component systems	
3. Changes of state, including critical points and triple points	
4. Structure of solids; lattice energies	

C. Solutions

1. Types of solutions and factors affecting solubility
2. Methods of expressing concentration (The use of normalities is not tested.)
3. Raoult's law and colligative properties (nonvolatile solutes); osmosis
4. Non-ideal behavior (qualitative aspects)

III. Reactions

Time: 12 weeks

A. Reaction types

1. Acid-base reactions; concepts of Arrhenius, Bronsted-Lowery, and Lewis; coordination complexes; amphoterism
2. Precipitation reactions
3. Oxidation-reduction reactions
 - a. Oxidation number
 - b. The role of the electron in oxidation-reduction
 - c. Electrochemistry; electrolytic and galvanic cells; Faraday's laws; standard half-cell potentials; Nernst's equation's prediction of the direction of redox reactions

B. Stoichiometry

1. Ionic and molecular species present in chemical systems: net ionic equations
2. Balancing of equations including those for redox reactions
3. Mass and volume relations with emphasis on the mole concept, including empirical formulas and limiting reactants

C. Equilibrium

1. Concept of dynamic equilibrium, physical and chemical; Le Chatelier's principle; equilibrium constants
2. Quantitative treatment
 - a. Equilibrium constants of gaseous reactions: K_p , K_c
 - b. Equilibrium constants for reactions in solution
 - (1) Constants for acids and bases; pK ; pH
 - (2) Solubility product constants and their application to precipitation and the dissolution of slightly soluble compounds
 - (3) Common ion effect; buffers; hydrolysis

D. Kinetics

1. Concept of rate of reaction
2. Use of experimental data and graphical analysis to determine reactant order, rate constants and reaction rate laws
3. Effect of temperature change on rates
4. Energy of activation the role of catalysts
5. The relationship between the rate-determining step and a mechanism

E. Thermodynamics

1. State functions
2. First law: change in enthalpy heat of formation; heat of reaction; Hess's law; heats of vaporization and fusion; calorimetry
3. Second law: entropy; free energy of formation; free energy of reaction; dependence of change in free energy on enthalpy and entropy changes
4. Relationship of change in free energy to equilibrium constants and electrode potentials

IV. Descriptive Chemistry

Time: 6 weeks

Knowledge of specific facts of chemistry is essential for an understanding of principles and concepts. These descriptive facts, including the chemistry involved in environmental and societal issues should not be isolated from the principles being studied, but should be taught throughout the course to illustrate and illuminate the principles. The following areas should be covered.

1. Chemical reactivity and products of chemical reactions
2. Relationships in the periodic table: horizontal, vertical and diagonal with examples from the alkali metals, halogens, and the first series of transition elements.
3. Introduction to organic chemistry; hydrocarbons and functional groups (structure, nomenclature, chemical properties).

V. Laboratory

Time: Throughout course

The differences between college chemistry and the usual secondary school chemistry course are especially evident in the laboratory work. The AP Chemistry Examination includes some questions based on experience and skills students acquire in the laboratory:

- Making observations of chemical reactions and substances
- Recording data
- Calculating and interpreting results based on the quantitative data obtained
- Communicating effectively the results of experimental work.

Objectives:

1. Evaluate scientific processes by collecting data and applying knowledge to physical models to interpret data.
2. Assess and apply patterns in equilibrium systems, nuclear reactions, and the structure of matter.
3. Evaluate the atomic theory.
4. Evaluate data correctly for conclusions.
5. Characterize matter in terms of its structure and properties.

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WCSD STUDENT DATA SYSTEM INFORMATION

1. Is there a required final examination? X Yes No
2. Does this course issue a mark/grade for the report card?
 X Yes No
3. Does this course issue a Pass/Fail mark? Yes X No
4. Is the course mark/grade part of the GPA calculation?
 X Yes No
5. Is the course eligible for Honor Roll calculation? X Yes No
6. What is the academic weight of the course?
 No weight/Non credit Standard weight
 X Enhanced weight (Describe) As per current school board policy.