Warren County School District

PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: Academic Chemistry

Course Number: 00331

Course Prerequisites: _____

Course Description: (Include "no final exam" or "final exam required")
The science of chemistry deals with the structure of matter, its properties and the changes it undergoes. Chemistry-CP describes matter using both words and numbers. Students will be required to utilize higher math skills frequently. Current enrollment in or completion of Algebra II is strongly recommended for success in Academic Chemistry. This course will meet 6 periods per week with a double lab period.

Suggested Grade Level: 11

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**)
None

Course Standards

PA Academic Standards: (List by Number and Description)

3.1.12 Unifying Themes
- A. Apply concepts of systems, subsystems, feed back and control to solve complex technological problems.
- B. Apply concepts of models as a method to predict and understand science and technology.
- C. Assess and apply patterns in science and technology.
- D. Analyze scale as a way of relating concepts and ideas to one another by some measure.
- E. Evaluate change in nature, physical systems and man made systems.

3.2.12 Inquiry and Design
- A. Evaluate the nature of scientific and technological knowledge.
- B. Evaluate experimental information for appropriateness and adherence to relevant science processes.
- C. Apply the elements of scientific inquiry to solve multi-step problems.
- D. Analyze and use the technological design process to solve problems.

3.4.12 Physical Science, Chemistry and Physics
- A. Apply concepts about the structure and properties of matter.
- B. Apply and analyze energy sources and conversions and their relationship to heat and temperature.

3.7.12 Technological Devices
- A. Apply advanced tools, materials and techniques to answer complex questions.
- B. Evaluate appropriate instruments and apparatus to accurately measure materials and processes.

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))

This course has been written to address the Grade 12 standards. The Grade 11 Assessment Anchors are included here because of the Grade 11 Science PSSA assessment. Content in the assessment anchors was created from the Grade 10 standards and serves as a basis for this course as well as for the state-wise assessment.

S11.A The Nature of Science

S11.A.1 Reasoning and Analysis

S11.A.1.1 Analyze and explain the nature of science in the search for understanding the natural world and its connection to technological systems.

PA Standards References: 3.1.10.A, 3.2.10.A, 3.1.10.E

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.1.1.1** Compare and contrast scientific theories, scientific laws, and beliefs (i.e., the law of universal gravitation, how light travels, formation of moons, stages of ecological succession).			
B.	**S11.A.1.1.2** Analyze and explain the accuracy of scientific facts, principles, theories, and laws.			
C.	**S11.A.1.1.3** Evaluate the appropriateness of research questions (e.g., testable vs. not-testable).			
D.	**S11.A.1.1.4** Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's universal law of gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, ideal gas laws).			
E.	**S11.A.1.1.5** Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).			

S11.A.1.2 Identify and analyze the scientific or technological challenges of societal issues; propose possible solutions and discuss implications.

PA Standard References: 3.2.10.A, 4.3.10.B

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.1.2.1** Explain and explain scientific concepts to societal issues using case studies (e.g., spread of HIV, deforestation, environmental health, energy).			
B.	**S11.A.1.2.2** Use case studies (e.g., Wright brothers' flying machine, Tacoma Narrows Bridge, Henry Petoskey's Design Paradigms) to propose possible solutions and analyze economic and environmental implications of solutions for real-world problems.			

S11.A.1.3 Describe and interpret patterns of change in natural and human-made systems.

PA Standard References: 3.1.10.C, 3.1.10.E, 4.8.10.A

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.1.3.1** Use appropriate quantitative data to describe or interpret change in systems (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).			
B.	**S11.A.1.3.2** Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis).			
C.	**S11.A.1.3.3** Describe how changes in physical and biological indicators (e.g., soil, plants, or animals) of water systems reflect changes in these systems (e.g. changes in bloodworm populations reflect changes in pollution levels in streams).			
D.	**S11.A.1.3.4** Compare the rate of use of natural resources and their impact on sustainability.			

S11.A.2 Processes, Procedures and Tools of Scientific Investigations

S11.A.2.1 Apply knowledge of scientific investigation or technological design to develop or critique aspects of the experimental or design process.

PA Standard References: 3.2.10.B, 3.2.10.D

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.2.1.1** Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.			
B.	**S11.A.2.1.2** Critique the elements of the design process (e.g., identify the problem, understand criteria, create solutions, select solution, test/evaluate, and communicate results) applicable to a specific technological design.			
C.	**S11.A.2.1.3** Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.			
D.	**S11.A.2.1.4** Critique the results and conclusions of scientific inquiry for consistency and logic.			
E.	**S11.A.2.1.5** Communicate results of investigations using multiple representations.			

S11.A.2.2 Evaluate appropriate technologies for a specific purpose, or describe the information the instrument can provide.

PA Standard References: 3.7.10.B, 3.8.10.B

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.2.2.1** Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality).			
B.	**S11.A.2.2.2** Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meters, probe interface, imaging technology, telescope) is used to extend human abilities and precision.			

S11.A.3 Systems, Models and Patterns

S11.A.3.1 Analyze the parts of a simple system, their roles, and their relationships to the system as a whole.

PA Standard References: 3.1.10.A, 3.1.10.E, 4.3.10.C

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.3.1.1** Apply systems analysis, showing relationships (e.g., flowcharts, concept maps), input and output, and measurements to explain to explain a system and its parts.			
B.	**S11.A.3.1.2** Analyze and predict the effect of making a change in one part of a change in one part of a system on the system as a whole.			
C.	**S11.A.3.1.3** Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).			
D.	**S11.A.3.1.4** Apply the universal systems model of inputs, processes, outputs, and feedback to a working system (e.g. heating, motor, food production) and identify the resources necessary for operation of the system.			

S11.A.3.2 Compare observations of the real world to observations of a constructed model.

PA Standard References: 3.1.10.B, 3.2.10.B, 4.1.10.B, 4.6.10.A

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.3.2.1** Compare the accuracy of predictions represented in a model to actual observations and behavior.			
B.	**S11.1.3.2.2** Describe advantages and disadvantages of using models to simulate processes and outcomes.			
C.	**S11.A.3.2.3** Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of object within the solar system, life spans, size of atomic particles, topographic maps).			

S11.A.3.3 Compare and analyze repeated processes or recurring elements in patterns.

PA Standard References: 3.1.10.C, 3.2.10.B

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.A.3.3.1** Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order.			
B.	**S11.A.3.3.2** Compare stationary physical patterns (e.g., crystals, layers of rocks, skeletal systems, tree rings, atomic structure) to the object's properties.			
C.	**S11.A.3.3.3** Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).			

S11.C. Physical Sciences

S11.C.1 Structure, Properties, and Interaction of Matter and Energy

S11.C.1.1 Explain the relationship between the structure and properties of matter.

PA Standard References: 3.4.10.A

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.C.1.1.1** Explain that matter is made of particles called atoms and that atoms are composed of even smaller particles (e.g., proton, neutrons, electrons).			
B.	**S11.C.1.1.2** Explain the relationship between the physical properties of a substance and its molecular or atomic structure.			

C.	**S11.C.1.1.3** Explain the formation of compounds (ionic and covalent) and their resulting properties using bonding theories .			
D.	**S11.C.1.1.4** Explain how the relationships of chemical properties of elements are represented in the repeating patterns within the periodic table.			
E.	**S11.C.1.1.5** Predict the behavior of gases though the application of laws (e.g., Boyle's law, Charles' law, or ideal gas law).			
F.	**S11.C.1.1.6** Describe factors that influence the frequency of collisions during chemical reactions that might affect the reaction rates (e.g., surface area, concentration, catalyst, temperature).			

S11.C.2 Forms, Sources, Conversion, and Transfer of Energy
S11.C.2.1 Analyze energy sources and transfer of energy, or conversion of energy.

PA Standard References: 3.4.10.B

X – performance assessed during that semester

	Performance Indicators	1	2	Assessment
A.	**S11.C.2.1.1** Compare or analyze waves in the electromagnetic spectrum (e.g., ultraviolet, infrared, visible light, x-rays, microwaves) as well as their properties, energy levels and motion.			
B.	**S11.C.2.1.2** Describe energy changes in chemical reactions.			
C.	**S11.C.2.1.3** Apply the knowledge of conservation of energy to explain common systems (e.g., refrigeration system, rocket propulsion, heat pump).			

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.

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 __X__ No

District-wide Final Examination Required: _____ Yes __X__ No

Course Challenge Assessment (Describe):

REQUIRED COURSE SEQUENCE AND TIMELINE

(Content must be tied to objectives)

Content Sequence	Dates

I. Measurements in Chemistry **15 days**
- A. Scientific Measurement
  - 1. Qualitative vs. Quantitative measurement
  - 2. Use of and meaning of significant figures
  - 3. Metric system
  - 4. Scientific notation
  - 5. Lab Safety and Equipment
  - 6. Percent Error
- B. Density
- C. Graphing

II. Matter and Changes **8 days**
- A. Types of Matter and Separations
- B. Physical
  - 1. Properties (Intensive and Extensive)
  - 2. Changes
- C. Chemical
  - 1. Properties
  - 2. Changes

III. Formula Writing and Nomenclature **13 days**
- A. Ionic
  - 1. Binary
  - 2. Ternary – Polyatomic ions
  - 3. Roman numerals
- B. Molecular (Covalent)
- C. Acids, Bases and Characteristics
- D. Oxidation Numbers

IV. The Mole **10 days**
- A. Problem solving with factor label/dimensional analysis
- B. Avogadro's Number
- C. Molar Mass
- D. Molar Volume

V. Applications of the Mole **5 days**
- A. Percent Composition
- B. Empirical Formulas
- C. Molecular Formulas
- D. Molarity

VI. Chemical Reactions **13 days**
- A. Balancing
  - 1. Law of Conservation of Mass
  - 2. Skeleton equations
- B. Reaction Types
  - 1. Single Replacement
  - 2. Double Replacement
  - 3. Synthesis (Combination)
  - 4. Decomposition
  - 5. Combustion
- C. Predicting Products of Reactions
- D. Factors That Affect Reaction Rate

VII. Stoichiometry **10 days**
- A. Mass
- B. Volume
- C. Energy
  - 1. Endothermic
  - 2. Exothermic

VIII. Reaction Completion? **9 days**
- A. Limiting Reactants
  - 1. Theoretical yield
  - 2. Percent Yield
- B. Equilibrium
  - 1. Reversible reactions
  - 2. LeChatalier Principle
    - a. Concentration
    - b. Pressure
    - c. Temperature

IX. Atomic Theory **7 days**
- A. Development of Atomic Theory
  - 1. Dalton's Atomic Theory
  - 2. Thomson
  - 3. Rutherford
- B. Atomic Particles
- C. Isotopes
- D. Nuclear Particles and Reactions

X. Quantum Theory **10 days**
- A. Quantization of Energy
- B. Bohr and Heisenberg
- C. Electron Cloud Model
  - 1. Define Quantum Numbers
  - 2. Aufbau, Pauli, and Hund
- D. Electron Configurations
- E. Orbital Notation

XI. The Period Table **8 days**
- A. History and Organization
  - 1. Element Stability and Configurations
  - 2. Groups, Periods, and Configuration
- B. Periodic Trends and Their Influencing Factors
  - 1. Atomic and Ionic Radius
  - 2. Ionization Energy
  - 3. Reactivity

XII. Bonding **8 days**
- A. Electronegativity
- B. Bond Types and Lewis Dot Structures
  - 1. Ionic
  - 2. Polar Covalent
  - 3. Nonpolar Covalent
  - 4. Metallic
- C. Multiple Bonds
- D. Properties

XIII. Molecular Shapes and Polarity **10 days**
- A. VSEPR Theory
- B. Polarity
- C. Intermolecular Forces
  - 1. Dipole
  - 2. Dispersion
  - 3. Hydrogen Bonding

XIV. Gases **10 days**
- A. Kinetic Molecular Theory
  - 1. Gas Pressure
  - 2. Atmospheric Pressure
  - 3. Temperature
- B. Gas Laws
  - 1. Boyle's, Charles', and Combined Gas Laws
  - 2. Dalton's Law of Partial Pressures
  - 3. Ideal Gas Law

XV. Heat and Phase Changes **8 days**
- A. Heat and Specific Heat
- B. Calculating Heat
- C. Calculating Heat in a System
- D. Calculating Heat in a Phase Change

XVI. Laboratory Time **36 days**

Objectives:

1. Recognize that everything is made of matter
2. Assess changes in matter and energy
3. Determine chemical bonding using attractive forces between particles
4. Predict physical and chemical properties based on periodic trends in the properties of atoms
5. Predict chemical reactions

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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 ___X___ Standard weight
   _____ Enhanced weight (Describe)