



Pine Grove Area

SCHOOL DISTRICT

SCIENCE

COLLEGE PREPARATORY CHEMISTRY

April 15, 2009

I. PHILOSOPHY

Chemistry investigates the concepts and principles of the subatomic world in order to explain everyday occurrences. Chemistry is a laboratory science its principles have been discovered through experimentation; as such, experiments and demonstrations will be the focus of this course. This course is designed to elicit student participation through interactive lecture, laboratory exercises, and projects. The major objectives of this class are: to teach a broad knowledge of chemistry to use as a basis for further scientific study, to teach organizational skills that the students will need in order to become successful in future endeavors, to teach students how to work successfully with others (another skill employers look for), and to teach students problem solving techniques which they can utilize throughout all aspects of their lives.

II. CORE CONCEPTS

1. Energy and Matter- Utilize knowledge of and distinguish among: energy, temperature scale, classification of matter, chemical properties and physical properties to solve scientific problems.
2. Atomic Structure - Explain how advancements in technology lead to scientific discoveries in atomic structure.
3. Bonding and Molecular Geometry - Predict molecular geometry based on bond type the VSEPR theory.
4. Chemical Reactions, Stoichiometry, and the Mole - Utilize the concepts of chemical reactions, stoichiometry and the mole to solve algebraic , scientific problems.
5. Heat in Chemical Reactions (Hess's Law)- Determine the energy changes that result from a chemical reaction.
6. States of Matter - Describe how intermolecular forces determine the phase of matter for a substance.
7. Chemical Equilibrium- Utilize the concepts surrounding Le Chateliers Principle to predict the dynamics of a solution system.
8. Acids and Bases - Differentiate between acids and bases by developing an analysis scheme.
9. Redox Chemistry- Differentiate between the types of electron transfer reactions.
10. Kinetics and Thermodynamics- Identify and explain the affect of various factors on the rate of reaction.
11. Nuclear Chemistry- List the ways in which nuclear chemistry has effected society.
12. Organic Chemistry - Recognize and name simple organic compounds.

III. COURSE OF STUDY

- A. Course Name: College Preparatory Chemistry
- B. Grade Level: 11th grade
- C. Length of Course: Full Year
 - 1. Frequency: One period a day
 - 2. Duration: 42 minutes total per day
- D. Academic Level: College Preparatory Level Students
- E. Credits: 1.04
- F. Prerequisites: CP Biology, CP Physical Science & Algebra I, and/ or teacher recommendation.
- G. Course Description:

College Preparatory Chemistry is an introduction to the major principles of Chemistry and is recommended for the college bound student. This course is also recommended for students planning on majoring in the nursing, medicine, science, physical therapy and other related fields. Specific topics that will be studied include matter, energy, atomic structure, theories of chemical bonding, mass relationships of elements and compounds, gases, acids, bases, salts, chemical equilibrium and solubility. This course will have a significant portion of hands-on laboratory work with students working in small groups to perform experiments that support the concepts presented in class. Chemistry will combine with many mathematics skills learned in previous classes, so a firm understanding of the concepts presented in Algebra I is recommended.

IV. CONTENT: College Preparatory Chemistry

CORE CONCEPT 1: Energy and Matter:

MAJOR OBJECTIVE: Utilize knowledge of and distinguish among the concepts of: energy, temperature scale, classification of matter, and chemical and physical properties, to solve scientific problems.

CURRICULUM STANDARD:

State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA STANDARD 3.4.10. A Explain concepts about the structure and properties of matter</p> <ul style="list-style-type: none"> • Know that atoms are composed of even smaller sub-atomic structures whose properties are measurable. • Apply knowledge of mixtures to appropriate separation techniques. <p>PA STANDARD 3.1.10. D Apply scale as a way of relating concepts and ideas to one another by some measure</p> <ul style="list-style-type: none"> • Convert one scale to another <p>PA STANDARD 3.4.10.B Analyze energy sources and transfers of heat</p> <ul style="list-style-type: none"> • Use knowledge of conservation of energy and momentum to explain common phenomena. 	<p>Teacher will guide students to:</p> <ul style="list-style-type: none"> • Name three basic forms of energy • State the law of conservation of energy. • Compare the Fahrenheit, Celsius, and Kelvin temperature scales. • Explain what is meant by absolute zero. • Name and describe the four states of matter. • Compare physical and chemical properties of matter. • State the law of conservation of matter. • Explain the difference between an element and a compound. • Compare heterogeneous and homogeneous mixtures. • Describe several techniques to separate mixtures. • Calculate percent error. 	<p>Teacher evaluation of:</p> <ul style="list-style-type: none"> • Student white board work. • Student class discussion. • Student homework assignments. • Student laboratory reports/notebooks. • Student workbooks. • Student tests/quizzes. • Student video presentations. • Student electronic portfolios. 	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 1: Energy and Matter:**

MAJOR OBJECTIVE: Utilize knowledge of and distinguish among the concepts of : energy, temperature scale, classification of matter, and chemical and physical properties, to solve scientific problems.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA STANDARD 3.1.10. E Describe patterns of change in nature, physical and man made systems.</p> <ul style="list-style-type: none">Describe how fundamental science and technology concepts are used to solve practical problems.Describe the effects of error in measurements.	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">Explain the difference between an element and a compound.Compare heterogeneous and homogeneous mixtures.Calculate percent error.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">Student white board work.Student class discussion.Student homework assignments.Student laboratory reports/notebooks.Student workbooks.Student tests/quizzes.Student video presentations.Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 2: Atomic Structure****MAJOR OBJECTIVE:** Explain how advancements in technology lead to scientific discoveries in atomic structure.**CURRICULUM STANDARD:**

State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA STANDARD 3.2.10. A. Apply knowledge and understanding about the nature of scientific and technological knowledge.</p> <ul style="list-style-type: none">• Compare and contrast scientific theories and beliefs.• Know that science uses both direct and indirect observation means to study the world and the universe.• Integrate new information into existing theories and explain implied results.	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">• Define the term atom.• List the postulates of Dalton's theory.• Discuss how atoms are related to electricity.• Explain what studies of cathode rays and radioactivity revealed about atoms.• Discuss Rutherford's alpha-scattering experiment and how it showed the existence of the nucleus.• Name and describe the three subatomic particles.• Determine the number of protons, neutrons, and electrons in an atom or ion.• Define isotopes and atomic mass.• Describe the changes that accompany nuclear reactions.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 2: Atomic Structure****MAJOR OBJECTIVE:** Explain how advancements in technology lead to scientific discoveries in atomic structure.**CURRICULUM STANDARD:**

State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA STANDARD 3.4.10. A Explain concepts about the structure and properties of matter</p> <ul style="list-style-type: none">• Know that atoms are composed of even smaller subatomic structures whose properties are measurable.• Explain the repeating pattern of chemical properties by using the repeating patterns of atomic structure within the periodic table <p>PA STANDARD 3.4.10. C Distinguish among the principles of force and motion.</p> <ul style="list-style-type: none">• Identify the relationship of electricity and magnetism as two aspects of a single electromagnetic force.	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">• Define radioactivity.• Describe waves in terms of its frequency, wavelength, speed, and amplitude.• Identify the major regions of the electromagnetic spectrum.• Explain what is meant by a quantum of energy.• Relate the energy of radiation to its frequency.• Distinguish between a continuous spectrum and a line spectrum.• State the main idea in Bohr's model of the atom.• Describe atomic orbitals in terms of their shape, size, and energy.• Determine the electron configurations of several elements using the principles of orbital energy, orbital capacity, and electron spin.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 2: Atomic Structure****MAJOR OBJECTIVE:** Explain how advancements in technology lead to scientific discoveries in atomic structure.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
PA STANDARD 3.4.10. A Explain concepts about the structure and properties of matter <ul style="list-style-type: none">Explain the repeating pattern of chemical properties by using the repeating patterns of atomic structure within the periodic table	Teacher will guide students to: <ul style="list-style-type: none">State the periodic law.Discuss the contributions that Dobereiner, Newlands, Mendeleev, and Moseley made to the periodic table.Explain why elements in a group have similar properties.Identify the four blocks of the periodic table.Define the term periodic trend.Identify four important periodic trends; and explain how each reflects the electron configuration of the elements.	Teacher evaluation of: <ul style="list-style-type: none">Student white board work.Student class discussion.Student homework assignments.Student laboratory reports/notebooks.Student workbooks.Student tests/quizzes.Student video presentations.Student electronic portfolios.	Textbook Resources Computer programs/web sites Journals or notebooks Supplemental materials Scientific Calculators

CONTENT: College Preparatory Chemistry**CORE CONCEPT: 3 Bonding and Molecular Geometry****MAJOR OBJECTIVE:** Predict molecular geometry based on bond type the VSEPR theory.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA STANDARD 3.4.10.A Explain concepts about the structure and properties of matter</p> <ul style="list-style-type: none">• Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent)• Recognize formulas for simple inorganic compounds. <p>PA STANDARD 3.4.12. A Apply concepts about the structure and properties of matter</p> <ul style="list-style-type: none">• Apply rules of systematic nomenclature and formula writing to chemical substances.	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">• Describe the characteristics of an ionic bond.• State the octet rule.• Describe the characteristics of a covalent bond.• Describe the differences between polar and non-polar covalent bonds.• Write the names for ionic compounds, molecular compounds, and acids.• Describe the VSEPR theory.• Identify the common shapes of small molecules.• Explain what determines the polarity of a molecule.• Explain why water is a polar molecule.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 4: Chemical Reactions, Stoichiometry, and the Mole****MAJOR OBJECTIVE:** Utilize the concepts of chemical reactions, stoichiometry and the mole to solve scientific problems.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
PA Standard 3.4.10.B Analyze energy sources and transfers of heat. <ul style="list-style-type: none">Determine the efficiency of chemical systems by applying mathematical formulas.	Teacher will guide students to: <ul style="list-style-type: none">Describe the characteristics of a chemical reaction.Write balanced chemical equations.Classify chemical reactions.Define a mole and describe its importance.Identify and use Avogadro's number.Define molar mass and explain how it relates the mass of a substance of the number of particles in that substance.Convert among the number of particles, moles, and mass of substance.Describe molar volume and use it to solve problems.Find the percentage composition of a given formula.Use percent composition to determine the formula of an unknown sample.Find the empirical and molecular formulas.	Teacher evaluation of: <ul style="list-style-type: none">Student white board work.Student class discussion.Student homework assignments.Student laboratory reports/notebooks.Student workbooks.Student tests/quizzes.Student video presentations.Student electronic portfolios.	Textbook Resources Computer programs/web sites Journals or notebooks Supplemental materials Scientific Calculators

CONTENT: College Preparatory Chemistry

CORE CONCEPT 4: Chemical Reactions, Stoichiometry, and the Mole

MAJOR OBJECTIVE: Utilize the concepts of chemical reactions, stoichiometry and the mole to solve scientific problems.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA STANDARD 3.4.12. A Apply concepts about the structure and properties of matter.</p> <ul style="list-style-type: none">Classify and describe, in equation form types of chemical and nuclear reactions.	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">Define stoichiometry and describe its importance.Relate stoichiometry to balanced chemical equations.Identify and solve different types of stoichiometry problems.Determine the limiting reactant of a chemical reaction.Calculate the amount of product formed in a chemical reaction when reactants are present in non-stoichiometric proportions.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">Student white board work.Student class discussion.Student homework assignments.Student laboratory reports/notebooks.Student workbooks.Student tests/quizzes.Student video presentations.Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 5: Heat in Chemical Reactions – Hess’s Law****MAJOR OBJECTIVE:** Determine the energy changes that result from a chemical reaction.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA Standard 3.2.10.B Apply process knowledge and organize scientific and technological phenomena in varied ways.</p> <ul style="list-style-type: none">Describe materials precise quantitative and qualitative skills based on observations. <p>PA Standard 3.4.10.B Analyze energy sources and transfers of heat.</p> <ul style="list-style-type: none">Evaluate energy changes in chemical reactions. <p>PA STANDARD 3.4.12.B Apply and analyze energy sources and conversions and their relationship to heat and temperature.</p> <ul style="list-style-type: none">Determine the heat involved in illustrative chemical reactions.	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">Distinguish between exothermic and endothermic reactions.Explain what is meant by enthalpy and enthalpy change.Define standard enthalpy change and explain how it is used.State Hess’s law.Apply Hess’s law to determine ΔH° for a reaction.Describe how a calorimeter determines heats of reactions.Compare heat and temperature.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">Student white board work.Student class discussion.Student homework assignments.Student laboratory reports/notebooks.Student workbooks.Student tests/quizzes.Student video presentations.Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 6: States of Matter****MAJOR OBJECTIVE:** Describe how intermolecular forces determine the phase of matter for a substance.**CURRICULUM STANDARD:**

State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA Standard 3.2.10.B Apply process knowledge and organize scientific technological phenomena varied ways.</p> <ul style="list-style-type: none">• Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.• Use process skills to make inferences and predictions using collected information and to communicate, using space/ time relationships, defining operationally.	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">• Describe the Kinetic Molecular Theory and explain how it accounts for observed gas behavior.• State gas laws and explain what gas pressure means and describe how it is measured.• Convert from one pressure unit to another.• Discuss the significance of the ideal gas equation.• Compare ideal and real gases.• Relate gas density to temperature and molar mass.• Explain how the Kinetic Molecular Theory accounts for the physical properties of liquids and solids.• Describe the different types of intermolecular forces.• Describe vaporization, condensation, and boiling.• Describe freezing and melting.• Identify the features of a phase diagram.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 6: States of Matter****MAJOR OBJECTIVE:** Describe how intermolecular forces determine the phase of matter for a substance.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA Standard 3.4.10.A Explain concepts about the structure and properties of matter.</p> <ul style="list-style-type: none">• Predict the behavior of gases through the use of Boyle's, Charles', or the ideal gas law, in everyday situations.• Describe phases of matter according to the Kinetic Molecular Theory <p>PA STANDARD 3.4.12. A Apply concepts about the structure and properties of matter.</p> <ul style="list-style-type: none">• Explain how the forces that bind solids, liquids, and gases affect their properties. <p>PA STANDARD 3.1.10. D Apply scale as a way of relating concepts and ideas to one another by some measure</p> <ul style="list-style-type: none">• Convert one scale to another.• Apply dimensional analysis and scale as a ratio.	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">• Describe the Kinetic Molecular Theory and explain how it accounts for observed gas behavior.• State gas laws and explain what gas pressure means and describe how it is measured.• Convert from one pressure unit to another.• Discuss the significance of the ideal gas equation.• Compare ideal and real gases.• Relate gas density to temperature and molar mass.• Explain how the Kinetic Molecular Theory accounts for the physical properties of liquids and solids.• Describe the different types of intermolecular forces.• Describe vaporization, condensation, and boiling.• Describe freezing and melting.• Identify the features of a phase diagram.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 7: Chemical Equilibrium****MAJOR OBJECTIVE:** Utilize the concepts surrounding Le Chateliers Principle to predict the dynamics of a solution system.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA Standard 3.4.12.A Explain concepts about the structure and properties of matter.</p> <ul style="list-style-type: none">Quantify the properties of matter (e.g., density, solubility coefficients) by applying mathematical formulas. <p>PA Standard 3.1.10.E Describe patterns of change in nature, physical and manmade systems.</p> <ul style="list-style-type: none">Recognize that stable systems often involve underlying dynamic changes(e.g., a chemical reaction at equilibrium has molecules reforming continuously).	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">Describe the properties of solutions.Identify the different types of solutions.Measure the concentration of solutions in terms of molarity , molality, and mole fraction.Differentiate among saturated, unsaturated, and supersaturated solutions.Explain how solutions form.Define solubility and describe the factors that affect solubility.Describe the factors that affect the rate at which a solute dissolves in solvent.Define a colligative property of a solution.Describe four colligative properties of solutions.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">Student white board work.Student class discussion.Student homework assignments.Student laboratory reports/notebooks.Student workbooks.Student tests/quizzes.Student video presentations.Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 7: Chemical Equilibrium****MAJOR OBJECTIVE:** Utilize the concepts surrounding Le Chateliers Principle to predict the dynamics of a solution system.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA Standard 3.4.12.A Explain concepts about the structure and properties of matter.</p> <ul style="list-style-type: none">Quantify the properties of matter (e.g., density, solubility coefficients) by applying mathematical formulas. <p>PA Standard 3.1.10.E Describe patterns of change in nature, physical and manmade systems.</p> <ul style="list-style-type: none">Recognize that stable systems often involve underlying dynamic changes(e.g., a chemical reaction at equilibrium has molecules reforming continuously).	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">Describe a reversible reaction.Define chemical equilibrium and explain how it is achieved.Determine the equilibrium constant for a given reaction.Analyze the extent of a reaction from its equilibrium constant.Use the reaction quotient of a reaction to determine if the reaction is at equilibrium.Explain Le Chatelier's Principle.Describe how changes in concentration, pressure, and temperature affect a reaction at equilibrium.Explain the Haber Process in terms of equilibrium.Compare dissolution and precipitation.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">Student white board work.Student class discussion.Student homework assignments.Student laboratory reports/notebooks.Student workbooks.Student tests/quizzes.Student video presentations.Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

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CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA Standard 3.4.12.A Explain concepts about the structure and properties of matter.</p> <ul style="list-style-type: none">Quantify the properties of matter (e.g., density, solubility coefficients) by applying mathematical formulas. <p>PA Standard 3.1.10.E Describe patterns of change in nature, physical and manmade systems.</p> <ul style="list-style-type: none">Recognize that stable systems often involve underlying dynamic changes(e.g., a chemical reaction at equilibrium has molecules reforming continuously).	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">Describe equilibria for aqueous solutions of ionic solids.Predict whether a precipitate will form using the solubility product.Write net ionic equations to describe the formation of an aqueous solution.Describe the common ion effect	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">Student white board work.Student class discussion.Student homework assignments.Student laboratory reports/notebooks.Student workbooks.Student tests/quizzes.Student video presentations.Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 8 : Acid and Base Chemistry****MAJOR OBJECTIVE:** Differentiate between acids and bases by developing an analysis scheme.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA Standard 3.2.10.C Apply the elements of scientific inquiry to solve problems.</p> <ul style="list-style-type: none">• Generate questions about objects, organisms and or events that can be answered through scientific investigations.• Evaluate the appropriateness of questions.• Design an investigation with adequate control and limited variables to investigate a question.• Conduct a multiple step experiment.• Organize experimental information using a variety of analytic methods.• Judge the significance of experimental information in answering the question.• Suggest additional steps that might be done experimentally.	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">• State the Bronsted-Lowry definition of acids and bases.• Identify the common physical and chemical properties of acids and bases.• Explain what dissociation constants indicate about an acid or a base.• Use experimental data to calculate a dissociation constant.• Explain what most acidic hydrogen atoms have in common.• Explain what most bases have in common.• Describe how acids are named.• Identify the ion concentrations in pure water.• Describe the pH scale.• Identify a buffer.• Explain how buffers work.• Describe an acid-base titration.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 8 : Acid and Base Chemistry****MAJOR OBJECTIVE:** Differentiate between acids and bases by developing an analysis scheme.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA Standard 3.2.10.D Identify and apply the technological design process to solve problems.</p> <ul style="list-style-type: none">• Examine the problem, rank all necessary information and all questions that must be answered.• Propose and analyze a solution.• Implement the solution.• Evaluate the solution, test, redesign, and improve as necessary.• Communicate the process and evaluate and present the impacts of the solution. <p>PA Standard 3.4.12.A Apply concepts about the structure and properties of matter.</p> <ul style="list-style-type: none">• Characterize and identify important classes of compounds (e.g., acids, bases, salts).	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">• Explain how indicators are used in titrations and how they are chosen.• Identify 11 unknown substances by developing and analysis scheme.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 9: Redox Chemistry****MAJOR OBJECTIVE:** Differentiate between the types of electron transfer reactions.**CURRICULUM STANDARD:**

State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
PA Standard 3.4.10.B Analyze energy sources and transfers of heat. <ul style="list-style-type: none">• Use knowledge of chemical reactions to generate an electrical current.• Explain resistance, current and electro-motive force (Ohm's Law).	Teacher will guide students to: <ul style="list-style-type: none">• Define oxidation and reduction.• Explain what oxidation numbers are and how they are assigned.• Explain what is meant by the activity series of metals.• Describe some applications of redox reactions.• List the steps in balancing a redox equation.• Describe electrochemical cells.• Explain the operation of voltaic cells.• Relate standard electrode potentials to standard cell potentials.	Teacher evaluation of: <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	Textbook Resources Computer programs/web sites Journals or notebooks Supplemental materials Scientific Calculators

CONTENT: College Preparatory Chemistry

CORE CONCEPT 9: Redox Chemistry

MAJOR OBJECTIVE: Differentiate between the types of electron transfer reactions.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA Standard 3.4.10.B Analyze energy sources and transfers of heat.</p> <ul style="list-style-type: none">• Use knowledge of chemical reactions to generate an electrical current.• Explain resistance, current and electro-motive force (Ohm's Law).	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">• Describe the operation of rechargeable and non-rechargeable batteries.• Compare fuel cells and batteries.• Describe some applications of electrolytic cells.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 10: Kinetics and Thermodynamics****MAJOR OBJECTIVE:** Identify and explain the affect of various factors on the rate of reaction.**CURRICULUM STANDARD:**

State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA STANDARD 3.4.10. A Explain concepts about the structure and properties of matter.</p> <ul style="list-style-type: none">Describe various types of chemical reactions by applying the laws of the conservation of mass and energy <p>PA Standard 3.4.12.B Apply and analyze energy sources and conversions and their relationship to heat and temperature.</p> <ul style="list-style-type: none">Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat <p>PA Standard 3.1.10.E Describe patterns of change in nature, physical am man made systems.</p> <ul style="list-style-type: none">Describe changes to matter caused by heat, cold, light, or chemicals using a rate function.	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">Define the rate of a chemical reaction.Identify the intermediate products of a reaction mechanism.Describe a rate law for a chemical reaction.Understand chemical reactions in terms of collision theory.Explain how energy is involved in chemical reactions.Define activation energy.List the factors that affect reaction rates.Explain what is meant by a spontaneous process.Relate enthalpy changes to spontaneity.Define entropy and state criterion for a spontaneous reaction in terms of free energy change	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">Student white board work.Student class discussion.Student homework assignments.Student laboratory reports/notebooks.Student workbooks.Student tests/quizzes.Student video presentations.Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

CONTENT: College Preparatory Chemistry**CORE CONCEPT 11: Nuclear Chemistry****MAJOR OBJECTIVE:** List the ways in which nuclear chemistry has affected society.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
PA Standard 3.4.12.A Apply concepts about the structure and properties of matter. <ul style="list-style-type: none">• Explain how radioactive isotopes that are subject to decay can be used to estimate the age of materials.• Apply the predictability of nuclear decay to estimate the age of materials that contain radioactive isotopes.	Teacher will guide students to: <ul style="list-style-type: none">• Explain what is meant by the half-life of a radioactive element.• Describe what happens in a nuclear bombardment reaction.• Describe how radiation affects living things.• Discuss several beneficial applications of radio isotopes.• Compare nuclear fission and nuclear fusion.• Explain how nuclear reactors are used to produce energy.	Teacher evaluation of: <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	Textbook Resources Computer programs/web sites Journals or notebooks Supplemental materials Scientific Calculators

CONTENT: College Preparatory Chemistry**CORE CONCEPT 12: Organic Chemistry****MAJOR OBJECTIVE:** Recognize and name simple organic compounds.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
PA Standard 3.4.10.A Explain concepts about the structure and properties of matter. <ul style="list-style-type: none">Understand that carbon can form several types of compounds.	Teacher will guide students to: <ul style="list-style-type: none">Explain carbon's unique bonding properties.Define organic molecules and organic chemistry.Explain how carbon and hydrogen atoms can form thousands of different hydrocarbons.Define alkanes.Identify conformations and structural isomers.Identify the different classes of unsaturated hydrocarbons.Define polymer.Explain why recycling plastics is important.Explain how several classes of organic compounds can be derived from hydrocarbons.Identify differences among halocarbons, alcohols, ethers, esters, amides, amines and carboxylic acids.	Teacher evaluation of: <ul style="list-style-type: none">Student white board work.Student class discussion.Student homework assignments.Student laboratory reports/notebooks.Student workbooks.Student tests/quizzes.Student video presentations.Student electronic portfolios.	Textbook Resources Computer programs/web sites Journals or notebooks Supplemental materials Scientific Calculators

CONTENT: College Preparatory Chemistry**CORE CONCEPT 12: Organic Chemistry****MAJOR OBJECTIVE:** Recognize and name simple organic compounds.

CURRICULUM STANDARD:			
State Standard/Student Expectation	Specific Content	Assessments	Resources/Materials
<p>PA Standard 3.4.10.A Explain concepts about the structure and properties of matter.</p> <p>Understand that carbon can form several types of compounds.</p>	<p>Teacher will guide students to:</p> <ul style="list-style-type: none">• Write formulas for halocarbons, alcohols, ethers, esters, amides, amines and carboxylic acids.	<p>Teacher evaluation of:</p> <ul style="list-style-type: none">• Student white board work.• Student class discussion.• Student homework assignments.• Student laboratory reports/notebooks.• Student workbooks.• Student tests/quizzes.• Student video presentations.• Student electronic portfolios.	<p>Textbook Resources</p> <p>Computer programs/web sites</p> <p>Journals or notebooks</p> <p>Supplemental materials</p> <p>Scientific Calculators</p>

V. EXPECTED LEVELS OF ACHIEVEMENT

A. Students are expected to reach the proficient level (B or above) of achievement, including all of the skills noted in the specific content area of this curriculum.

B. Grading system C.P. Chemistry is as follows:

Grading Scale	
A	90-100
B	80-89
C	70-79
D	60-69
F	0-59

C. Each student's grade will be determined at the conclusion of each marking period. The final grade is a weighted average of all points earned during the marking period. Progress notes will be issued half-way throughout each marking period for students who are performing below 70%.