Course Description:

Welcome to AP Chemistry!
This is an advanced placement, college level chemistry course intended to prepare students for subsequent college courses. This is a fast paced course designed to ready students in comprehending and understanding complex chemical processes and enables students to build inquiry investigation science skills. This class will be structured around the six Big Ideas and seven Science Practices as outlined by the College Board. This class is one semester long and meets 90 minutes a day five days a week. The structure of this class will resemble that of a college class. Teaching methods will include lecture, inquiry-based labs and activities, technology based projects, science simulations and web quests, literacy activities including reading, writing, and discussions, online interactives, as well as cooperative review activities. Laboratory investigations will comprise 25% of the instructional time. This course requires a minimum of 16 hands-on labs, at least six of which are inquiry based. Assessment will be both formative and summative. Daily formative assessment techniques will be used to check for understanding. Summative assessments will include quizzes, tests, labs, and projects. I look forward to beginning and facilitating you in this journey in the discovery of the diversity and unity of life in this course.

Course Objectives:

The Six Big Ideas

- Students will connect the enduring understandings within Big Idea 1: The chemical elements are the building blocks of matter, which can be understood in terms of the arrangements of atoms.
- Students will connect the enduring understandings within Big Idea 2: Chemical and physical properties of materials can be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them.
- Students will connect the enduring understandings within Big Idea 3: Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.
- Students will connect the enduring understandings within Big Idea 4: Rates of chemical reactions are determined by details of the molecular collisions.
- Students will connect the enduring understandings within Big Idea 5: The laws of thermodynamics describe the essential role of energy and explain and predict the direction of changes in matter.
- Students will connect the enduring understandings within Big Idea 6: Bonds or attractions that can be formed can be broken. These two processes are in constant competition, sensitive to initial conditions and external forces or changes.

The Seven Science Practices

The Seven Science Practices will not be taught as independent practices, but embedded in the curriculum throughout the course.

Science Practice 1: The student can use representations and models to communicate scientific phenomena and solve scientific problems.

Science Practice 2: The student can use mathematics appropriately.

Science Practice 3: The student can engage in scientific questioning to extend thinking or guide investigations within the context of the AP course.

Science Practice 4: The students can plan and implement data collection strategies appropriate to a particular scientific question.

Science Practice 5: The student can perform data analysis and evaluation of evidence.

Science Practice 6: The students can work with scientific explanations and theories.

Science Practice 7: The student is able to connect and relate knowledge across various scales, concepts and representations in and across domains.

Course Resources:

Textbook

The text for this class will be the 2014 AP Chemistry: A Molecular Approach by Nivaldo J. Tro.

Additional Readings

Readings will be utilized from online sources including journals and current news sites as well library resources such as magazines and information text.

Course Activities:

Readings

Students will read two to three chapters each week which will correlate with class lessons. One to two additional readings will be assigned each week to supplement learning of current trends in science.

Presentations

PowerPoint presentations will also be presented on a week to week basis to enhance the selected weekly readings.

Quizzes

Quizzes will be administered throughout each unit. Question format will vary but will be similar to the format of the AP Exam.

Exams

There will be 2-3 unit tests given each of the 9 weeks. Tests will resemble the AP exam.

Projects

There will be six projects assigned throughout the semester. Projects will be completed in and out of class and will require the use of cooperative learning amongst group members for four of the six projects. Groups will be chosen when the project is assigned.

Assignments

Day to day assignments will include hands-on activities and labs, online science simulations and interactives, web quests, literacy activities including reading, writing, and discussions, as well as cooperative review activities. Participation in all activities will be mandatory.

Lab Reports

A specific format will be given to the student for each lab. Students must follow that format and label all sections clearly as outlined below. All lab reports should be written in pen and should not be discarded. At the end of the year, the notebook should contain all labs performed throughout the year.

1. Title	The title should be descriptive and written at the top of the page.
2. Date	Include the date that the lab was performed.
3. Lab Partners	Include the names of partners with whom the lab was performed.
4. Purpose	This is the "goal" of the lab. It should be written by the student or paraphrased from the lab manual.
5. Pre-Lab Questions	Students will need to either re-write the questions or incorporate the question into the answer. The idea is so that when someone looks at the student's lab notebook, he should be able to tell what the question was by merely looking at her lab report.
6. Procedure	This is an outline of the procedure. It may contain numbered steps or bulleted points.
7. Data and Calculations	Include data tables for all data gathered during lab. Data tables should be clearly labeled and include proper significant figures and units of measurement. Calculations should show all calculations carried out, include significant figures, and units of measurement.
8. Results and Discussion	This may include graphs and an explanation of the results of the lab as well as what the results mean. Graphs should have a title and labeled axes.
9. Post-lab Questions	Same as pre-lab questions
10. Conclusion & Error Analysis	This is not a summary of results or procedure. It must state what was learned, such as a scientific principle, based on the purpose of the lab. It also includes a description of how errors would affect the results mathematically.
11. Applications	Describe how this experiment relates to everyday world applications, major societal or technological components (e.g., concerns, technological advances, innovations). For example, for a lab on spectroscopy, this section could explain how spectroscopy can be used to distinguish real art from fake art. [CR4]

COURSE POLICIES:

Instructor Feedback/Communication

I will attempt to grade and return all assignments within one week of submission.

Tutoring
Tutoring will be held on Monday and Friday afternoons by appointment/notification.

Course Fees
Students will be not required to purchase any materials needed for their individual lab. Students may be required to purchase lab materials for further investigations of in-class labs such as fruits and vegetables.

Late Work
No late work will be accepted as this is a college level course.

WILSON COUNTY POLICIES:

Honor Pledge
Students will be held accountable to the Honor Pledge which they will have to agree to: "I pledge, on my honor, to conduct myself with the foremost level of academic integrity."

Integrity and Civility
The following behaviors are in violation of the standards of integrity and civility and are specifically prohibited:

1. Cheating- Cheating includes the actual giving or receiving of any unauthorized aid or assistance or the actual giving or receiving of unfair advantage on any form of academic work;

2. Plagiarism- Plagiarism includes the copying of the language structure, idea and/or thought of another and representing it as one's own work;

3. Falsification- Falsification includes the verbal or written statement of any untruth;

4. Violation of Copyright Laws- Violation of Copyright Laws includes the unauthorized duplication of printed material and computer software;

5. Violation of Computer Access- Violation of Computer Access includes willfully, directly, or indirectly, accessing or causing to be accessed any computer, computer system, computer network, or any component thereof without proper authorization;

6. Cursing or using vulgar, abusive or demeaning language toward another person; and

7. Playing abusive or dangerous tricks otherwise subjecting a student or an employee to personal indignity.

Violations of the standards of integrity and civility may result in disciplinary action including but not limited to warning, chill out, short term suspension, and long term suspension.

Special Needs
Wilson County Schools provides comprehensive programs and services for children with special needs ages 3 through 21. The term "children with special needs" includes, without limitation, all children who, because of permanent or temporary mental, physical, or emotional disabilities:

• need special education, which is specially designed instruction to meet the unique needs of the exceptional child and may include classroom instruction, home instruction, instruction in hospitals and instruction in residential facilities.

• are unable to have all their educational needs met in a regular classroom without special education or related services,

• are unable to be adequately educated in the public schools.

GRADING:

There are two 9 week grades which are worth 40% each for the total class grade. The 9 week grading system is broken down below. The final exam is a teacher made exam that will count as 20% of the total grade. The College Board AP Biology exam is provided for every student. If a students scores a level 3 or higher on the AP exam, college credit is awarded by the college board.

25% **LAB REPORTS and PROJECTS**
(If you are absent for a lab or part of a lab, and it is unexcused- your grade will be reflected).

60% **TESTS**
(2-3 tests/9 weeks)

15% **QUIZZES and CLASSWORK**
(At least 6 quizzes/9 weeks)

Your grade will be calculated using the grade scale set by Wilson County Schools.

TENTATIVE SCHEDULE:

Unit 1: **Matter, Measurements and Problem Solving** **Atoms and Electrons** **Molecules, Compounds, and Chemical Equations** **Chemical Quantities and Aqueous Reactions**	**Categorizing Matter, Properties & Changes (physical versus chemical), Scientific notation, Measurement** **Atomic Theory, Atomic Structure** **Chemical Reactions (molecular, ionic, net ionic), Types of reactions, Stoichiometry**	**Chp. 1-4**	**Lab #9 – Chemical and Physical Changes** **Lab #3 – Gravimetric Analysis of a Carbonate** **Lab #7 – Stoichiometry of Chemical Reactions**	**Big Ideas: 1, 3, 5** **Learning Outcomes: 3.10, 5.10/1.1, 1.7, 1.8, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 3.5, 5.15/1.4, 1.18, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.10** **Science Practices: 1.4, 5.1, 6.1/1.4, 1.5, 2.1, 4.1, 4.2, 5.1, 5.3, 6.1, 6.2, 6.3, 6.4/1.4, 1.5, 2.2, 4.2, 5.1, 6.1, 6.4, 7.1**	**10 Days** **>4 Quizzes** **1 Test** **TBD**

Unit 2: **Gases** **Thermochemistry** **The Quantum-Mechanical Model of Atoms** **Periodic Properties of the Electrons**	**Characteristics of gases, Pressure, Gas Laws, Ideal versus Real Gases, Density of Gases, Volume of Gases, Effusion/diffusion (Graham's Law)** **Energy, Enthalpy, Energy Diagrams, Entropy, Gibbs Free Energy** **Wave Nature of Light, Bohr Models, Photoelectric Effect, Electron Configuration** **Discovery of Table, Introduction to Table, Metals, nonmetals, metalloids, Groups/Periods, Periodic Trends**	**Chp. 5-8**	**Lab #12 – Fundamentals of Calorimetry** **Lab #1 – Molecular Spectroscopy** **Lab #2 – Spectrophotometric Analysis of Food Dyes** **Activity: Students graph values for atomic radius, electronegativity, and ionization energy to predict trends and explain eh organization of the periodic table. LO 1.9, 1.10 [CR3a]**	**Big Ideas: 1, 2, 3, 5, 6** **Learning Outcomes: 2.5, 2.6, 2.12, 3.4/ 3.11, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.12, 5.13, 5.14, 6.21, 6.22, 6.23/1.1, 1.7, 1.8, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 3.5, 5.15/1.7, 1.9, 1.10, 1.11, 2.25** **Science Practices: 1.3, 2.2, 2.3, 5.1, 6.4, 6.5, 7.2/1.4, 2.2, 2.3, 1.5, 4.2, 4.4, 5.1, 6.4, 7.1, 7.2/1.4, 1.5, 2.1, 4.1, 4.2, 5.1, 5.3, 6.1, 6.2, 6.3, 6.4/1.4, 3.1, 5.1, 6.1, 6.2, 6.4, 7.2**	**11 Days** **>4 Quizzes** **1 Test** **TBD**

Unit 3: **Chemical Bonding I: Lewis Model** **Chemical Bonding II: Molecular Shapes, Valence bond Theory, and Molecular Orbital Theory** **Liquids, Solids, and Intermolecular Forces** **Solutions**	**Valence Electrons, Ions (cations/anions), Types and properties of bonds, Lattice Energy, Electronegativity and Bond Type, Lewis Dot Structures, Bond Order, energy, and length, VSEPR Theory (geometry), Intermolecular Forces, Valence Bond Theory** **States and Properties (solids, liquids, gases), Kinetic Molecular Theory, Phase changes, Heat of Fusion and heat of vaporization, Vapor Pressure** **Types of Mixtures, Concentration, Dilution, Solution Stoichiometry, Solubility, Saturation, Electrolytes, Colligative properties**	**Chp. 9-12**	**Lab #6 – Types of Chemical Bonds** **Lab #5 – Principles of Chromatography** **Activity: Students construct ball and stick models of the arrangement of pairs of electrons around a central atom (using Styrofoam balls and toothpicks) using VSEPR theory. They also draw 2D pictures of these arrangements and the Lewis diagram, and then apply these to predicting the shapes of the molecules. LO 2.21 [CR3b]** **Activity: Students observe a series of chemical reactions video clips from websites. For each they will (1) classify the type of reaction, (2) write a balanced net ionic chemical equation, (3) write a brief description of observations for each reaction, and (4) determine the driving force towards thermodynamic favorability for the reaction. LO 3.1, 3.2 [CR3c]**	**Big Ideas: 1, 2, 3, 5, 6** **Learning Outcomes:1.5, 1.6, 1.7, 1.12, 1.13, 2.1, 2.2, 2.3, 2.7, 2.11, 2.13, 2.15, 2.16, 2.17, 2.18, 2.19, 2.20, 2.21, 2.22, 2.23, 2.24, 2.26, 2.27, 2.28, 2.29, 2.30, 2.31, 2.32, 5.1, 5.8, 5.9, 5.10, 5.11/2.3, 2.4, 2.16, 5.2, 5.3, 5.6, 5.10, 6.1/ 1.19, 2.7, 2.8, 2.9, 2.10, 2.14, 3.4, 6.21, 6.22, 6.23** **Science Practices:1.1, 1.4, 1.5, 2.3, 4.2, 5.1, 5.3, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2/1.1, 1.4, 2.2, 2.3, 5.1, 6.2, 6.4, 7.1/1.1, 1.2, 1.4, 2.1, 2.2, 2.3, 4.2, 5.1, 6.2, 6.4**	**10 Days** **>4 Quizzes** **1 Test** **TBD**

Unit 4: **Chemical Kinetics** **Chemical Equilibrium** **Acids and Bases** **Aqueous Ionic Equilibrium**	**Factors affecting reactions, Collision Model, Reaction Rate (average and instantaneous), Kinetics Stoichiometry, Reaction Rate and Concentration, Reaction Order, Integrated Rate Laws, Rate Constant and Temperature (Arrhenius equation), Catalysis, Reaction Mechanisms** **Concept of Equilibrium, Solving for equilibrium constant, Equilibrium Calculations (ICE), Reaction Quotient (Q), Le Chatlier's Principle, Solutions, Thermochemistry, Kinetics Equilibrium**	**Chp. 13-16**	**Lab #10 – Chemical Kinetics** **Lab #11 – Factors Affecting Reaction Rates** **Lab #13 – Le Chatelier's Principle and Equilibrium Shifts** **Lab #4 – Complexometric Titration of Calcium in Milk** **Lab #14 – Concentration of Acetic Acid in Household Vinegar** **Lab #15 – Preparation of a Buffered Solution** **Lab #16 – Evaluating Lemonade as a Buffer** **Activity: Students use an online simulation to manipulate the environment and produce stresses that verify the tendency of Le Chatlier's principle. They will predict the shifts in equilibrium and predict stresses that would yield more or less product. LO 6.8, 6.9 [CR3f]**	**Big Ideas: 1, 2, 3, 4, 5, 6** **Learning Outcomes:3.11, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 5.3, 5.17, 5.18/2.2, 5.13, 5.16, 5.17, 5.18, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 6.21, 6.22, 6.23, 6.25/1.20, 2.2, 3.3, 3.7, 6.11, 6.12, 6.13, 6.14, 6.15, 6.16, 6.17, 6.18, 6.19, 6.20, 6.23** **Science Practices:1.3, 1.4, 1.5, 2.1, 2.2, 4.2, 4.4, 5.1, 6.2, 6.4, 6.5, 7.1, 7.2/1.3, 1.4, 2.2, 2.3, 4.2, 5.1, 6.2, 6.4, 7.2/ 1.1, 1.4, 2.2, 2.3, 4.2, 5.1, 6.1, 6.2, 6.4, 7.2**	**15 Days** **>4 Quizzes** **1 Test** **TBD**

Unit 5: **Free Energy and Thermodynamics** **Electrochemistry** **Radioactivity and Nuclear Chemistry**	**Energy, Enthalpy, Energy Diagrams, Entropy, Gibbs Free Energy** **Oxidation states, Oxidation versus reduction, Redox reactions, Voltaic (Galvanic) Cells, Equilibrium and cell potential, Gibbs Free Energy and cell potential, Electrolytic cells (electroplating and stoichiometry)** **Nuclear Chemistry, Radioactive decay, Nuclear Stability, Radiometric Dating (half-life), Nuclear fusion and fission, Nuclear energy**	**Chp. 17-19**	**Lab #8 – Vitamin C in Fruit Juices by Redox Titration** **Activity: Given a set of conditions, students determine if the situation is thermodynamically favored by looking at entropy, enthalpy, and Gibbs Free Energy. LO 5.13 [CR3e]** **Activity: Students complete the "M&M radioactive decay" activity in which M&Ms radioactively decay into Skittles, then Sweetarts, then Smarties (based on nuclear decay first-order kinetics). They will construct four graphs to show the relationship of the four candies over time and then determine the half-life of each candy. LO 4.3 [CR3d]**	**Big Ideas: 3, 4, 5, 6** **Learning Outcomes: 3.11, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.12, 5.13, 5.14, 6.21, 6.22, 6.23/3.8, 3.9, 3.12, 3.13, 5.15, 6.1/4.3** **Science Practices:1. 4, 2.2, 2.3, 1.5, 4.2, 4.4, 5.1, 6.4, 7.1, 7.2/2.2, 2.3, 4.2, 5.1, 6.1, 6.2, 6.4/2.1, 2.2**	**11 Days** **>4 Quizzes** **1 Test** **TBD**

2-3 Day Review Before AP Exam
AP Chemistry Exam: May 4, 2015

Unit 6: **Organic Chemistry** **Biochemistry** **Chemistry of Nonmetals** **Metals and Metallurgy** **Transition Metals and Coordination Compounds**	**Organic Compounds, Structural formulas, Functional Groups, Isomers, Organic Reactions, Biological Molecules, Nonmetals, Metals, Transition Metals**	**Chp. 20-24**	**End of Year Project**	**This material will covering remaining topics in book (not required for AP Test)**	**20 Days** **>4 Quizzes** **1 Test** **TBD**

Laboratory Experiments and Descriptions [CR5b] & [CR6]
Asterisk (*) indicates guided-inquiry laboratory experiment

1. Molecular Spectroscopy (BI 1, LO 1.15, SP 4.1, 6.4) Students interpret molecular spectroscopy data and determine the types of chemical bonds in substances and investigate their electronic structure. Includes infrared, ultraviolet, visible, and photoelectron spectroscopy. Students analyze data, justify the selection of data, use theoretical models to explain observed data, evaluate sources of data to answer a scientific question, and justify claims with evidence.

2. Spectrophotometric Analysis of Food Dyes (BI 1, LO 1.16, SP 4.2, 5.1)Determine the concentration of food dyes in powdered drink mixes using Beer-Lambert's law. Prepare standard solutions of 2 food dyes, plot calibration curves of absorbance as a function of concentration for each dye, and determine the concentration of each dye in its unknown solution. Procedure does not use toxic thiocyanate salts.

3. Gravimetric Analysis of a Carbonate (BI 1, LO 1.19, SP 4.2, 5.1, 6.4) Students determine the identity of 2 unknown Group I metal carbonates using gravimetric analysis. The first step is to precipitate the carbonates with excess calcium ions. After drying, the mass and moles of the resulting calcium carbonate are determined. From that data, students calculate the formula mass of the unknown Group I metal carbonate and identify the Group I metal.

4. Complexometric Titration of Calcium in Milk (BI 1, LO 1.20, SP 4.2, 5.1, 6.4) Students determine the concentration of calcium in milk by complexometric titration, either by preparing and standardizing a solution of EDTA and using it to determine the 13 concentration of calcium in milk, or by designing a procedure to collect and analyze data, perform error analysis, write and balance chemical equations, use volumetric glassware, standardize a titrant, and perform multiple trials.

5. Principles of Chromatography (BI 2, LO 2.10, SP 4.2, 5.1, 6.4)* In the inquiry activity, students design an experiment to separate food dyes in drink mixes and must select the proper mobile and stationary phases to effect an efficient separation.

6. Types of Chemical Bonds (BI 2, LO 2.22, SP 4.2, 6.4)* Inquiry activity: students test the properties of 4 solids, develop their own set of characteristics to distinguish between each bonding type, then apply their rules to classify 8 more solids.

7. Stoichiometry of Chemical Reactions (BI 3, LO 3.3, SP 2.2, 5.1) Determine the molar ratio of reactants in 2 acid-base reactions using the method of continuous variation. React acid and base in different ratios and graph the temperature changes. The volume ratio that produces the largest temperature change is the correct reaction stoichiometry. Students design a procedure to collect data, plot data, calculate molar ratios, and write chemical equations.

8. Vitamin C in Fruit Juices by Redox Titration (BI 3, LO 3.9, SP 4.2, 5.1) Determine the concentration of ascorbic acid in a commercial fruit juice by redox titration. Titrate solutions of known ascorbic acid concentration to create a standard curve, then titrate a sample of fruit juice and determine the concentration of ascorbic acid from the curve. Fruit juice connects redox and titration to the real world and captures students' interest.

9. Chemical and Physical Changes (BI 3, LO 3.10, SP 1.4, 6.1)* In this comprehensive laboratory exercise, students determine whether a process is a chemical or a physical change based on the production of heat, evolution of a gas, formation of a precipitate, or a color change.

10. Chemical Kinetics (BI 4, LO 4.2, SP 5.1, 6.4) Determine orders of reaction, calculate reaction rate constants, and write rate laws for the oxidation of 4 food dyes. Students mix a food dye with bleach and monitor the

solution's absorbance over time. From their Beer-Lambert graph of absorbance versus time, students write an integrated rate law for the reaction and calculate the reaction's rate constant.

11. Factors Affecting Reaction Rates (BI 4, LO 4.1, SP 4.2, 5.1) Investigate factors that affect reaction rate using the iodine clock reaction. Change temperature, concentration, and surface area of solid reactants and add a catalyst to observe changes in reaction rates. The iodine clock reaction provides an easy visual cue to measure reaction times. Reaction rates are explained using physical phenomena, such as molecular collisions.

12. Fundamentals of Calorimetry (BI 5, LO 5.7, SP 4.2, 5.1, 6.4)* Students determine specific heat capacity of a calorimeter and molar enthalpy of solution of 2 chloride salts. Inquiry activity: students design hot pack or cold pack using chloride salts. Uses NO nitrate salts.

13. Le Chatelier's Principle and Equilibrium Shifts (BI 6, LO 6.9, SP 4.2) Investigate how temperature, concentration, and pressure affect chemical equilibrium in 3 different reactions. This experiment addresses equilibrium changes both in solution and in the gas phase, shows the reversible nature of reactions, and provides visual interest by using changes in color to monitor chemical reactions. It also includes a discussion of the Haber process.

14. Concentration of Acetic Acid in Household Vinegar (BI 6, LO 6.13, SP 5.1, 6.4) This laboratory exercise combines the traditional skills of titration to determine acid concentration with insightful use of the Henderson-Hasselbalch equation to determine pKa. Students titrate the acetic acid in vinegar and use their titration data to determine the acid's concentration and pKa.

15. Preparation of a Buffered Solution (BI 6, LO 6.18, SP 2.3, 4.2, 6.4)* Prepare buffer solutions of assigned pH values and determine the buffer capacity of these solutions. Students determine how to prepare the stock solutions, how to mix the stock solutions to create a buffer solution of desired pH, and test the buffering capacity of their buffers. Provides a thorough experience in buffers.

16. Evaluating Lemonade as a Buffer (BI 6, LO 6.20, SP 6.4)* Students evaluate a buffer solution's buffering capacity and compare the titration curves of a buffer solution and a weak acid

The provided schedule is a plan. As many of us know the plan can sometimes change. All dates are tentative. As date changes arise they will be announced.