**AP Chemistry**

**Course Syllabus**

**2020-2021**

**Instructor:** Mr. Benjamin Thompson

 Room G202

 Benjamin.thompson@sfisd.org

 T: (409) 927-3100

**Course Description:**

Welcome to AP Chemistry! Over the course of this year you will have the opportunity to learn a great deal about chemistry, much more than you learned or would have learned in the first year class. We will explore in much greater depth the concepts you have learned as well as new material that will build upon your previous knowledge. Ultimately, this class will serve a number of functions. It will give you a chance to experience what a college class may be like, it will challenge you with new information, it will prepare you to take the AP exam next May, you will use your knowledge in performing labs, thus “seeing and doing” those concepts you learn in class, and you will develop a greater understanding of how chemistry affects the total environment in which we live.

This course is not a revamped, upgraded version of Chemistry I, but rather an in-depth study of more advanced chemical concepts. The course is challenging to both academic content and laboratory procedure. You will be challenged academically, yet the workload is not unbearable. You should review your work every night, and *under no circumstances should you allow yourself* *to fall behind*. If you need help, it is always available. I also suggest that you form peer groups for study sessions or form on-line discussion groups for help with homework and study. You will need to set aside time to study the material, come to class ***prepared***, and ask many questions!

**Textbook and Supplemental Materials:**

Brown, Lemay, Bursten, Murphy, Woodward, Chemistry AP Edition, Twelfth Edition, Pearson Education Inc, 2012.

Abronowitz, Todd and Jones, Kristen. Fast Track to a 5. Preparing for the AP Chemistry Examination. Boston, MA: Cengage Learning, 2017.

Laboratory handouts and materials are for AP Chemistry from Flinn Scientific, Inc.

**Required Materials:**

* Laptop
* Composition notebook

**The Big Ideas and Course Outline:**

This course is structured around four big ideas articulated in the AP Chemistry curriculum framework provided by the College Board. The framework specifies what students must know, be able to do, and understand, with a focus on big ideas that encompass core principles and theories of the discipline. The framework also encourages instruction that prepares students for advanced chemistry coursework.

The big ideas serve as the foundation for the course and allow students to create meaningful connections among concepts. They are often abstract concepts or themes that become threads that can run throughout the course. Revisiting the big ideas and applying them in a variety of contexts allows students to develop deeper conceptual understanding. Below are the big ideas of the course and a brief description of each. (Taken from the AP Chemistry Course and Exam Description Course Framework)

* **Big Idea 1: Scale, Proportion, and Quantity (SPQ)**

Quantities in chemistry are expressed at both the macroscopic and atomic scale. Explanations, predictions, and other forms of argumentation in chemistry require understanding of the meaning of these quantities, and the relationship between quantities at the same scale and across scales.

* **Big Idea 2: Structure and Properties (SAP)**

Properties of substances observable at the macroscopic scale emerge from the structures of atoms and molecules and the interactions between them. Chemical reasoning moves in both directions across these scales. Properties are predicted from known aspects of the structures and interactions at the atomic scale. Observed properties are used to infer aspects of the structures and interactions.

* **Big Idea: Transformation (TRA)**

At its heart, chemistry is about the rearrangements of matter. Understanding the details of these transformations requires reasoning at many levels as one must quantify what is occurring both macroscopically and at the atomic level during the process. This reasoning can be as simple as monitoring amounts of products made or as complex as visualizing the intermolecular forces among the species in a mixture. The rate of a transformation is also of interest, as particles must move and collide to initiate reaction events.

* **Big Idea 4: Energy (ENE)**

Energy has two important roles characterizing and controlling chemical systems. The first is accounting for the distribution of energy among the components of a system and the ways that heat exchanges, chemical reactions, and phase transitions redistribute this energy. The second is in considering the enthalpic and entropic driving forces for a chemical process. These are closely related to the dynamic equilibrium present in many chemical systems and the ways in which changes in experimental conditions alter the positions of these equilibria.

**Laboratory:**

A comprehensive laboratory experience is essential to your success in AP Chemistry. In order to achieve that experience, a minimum of 25% of the total instructional time will be spent doing hands-on laboratory activities. The labs completed require following or developing processes and procedures, taking observations, and data manipulation. Students communicate and collaborate in lab groups; however, each of you will submit your own lab report.

The Laboratory Notebook is an important record of all the work you have done in lab. It is documentation of the quality of work that you have performed. Various types of laboratory reports will be submitted. A specific format will be given to the student for each lab. Students must follow that format. AP Chemistry lab reports are longer and more in depth than the ones completed in the first year chemistry course. Therefore, it is important that students don’t procrastinate when doing pre-lab and post-lab work. **Late labs will not be accepted.**

Most of the experiments will take more than one hour to complete, therefore sometimes I will request that you get here as early as possible (by 8:00 am) to allow as much time in lab as we can get. During the pre-lab session, you need to make sure you understand what is required and clarify anything that is not clear. This will expedite the experiment and make it more enjoyable for all of us.

**Assignments:**

**Daily Assignments**

* Daily assignments will include warm-ups, class work, and quizzes. They will also include released AP exam questions.

**Homework**

* I will collect formal homework problems from you during the course of the year. These problems can be from the textbook, practice problems, as well as studying and reading assigned from the textbook and notes. The AP test as well as science in general is problem based and solving problems will give you practice, skill, and confidence in solving the type you will find on the AP exam and class exams. There will also be ample time to ask questions about any assignment problems and get help in class. There are also suggested problems on my AP Chemistry website with solutions to the problems. Solve the suggested problems and then check the solution. Do not rely on just looking at the solution – it is more important for you to understand the concepts and processes to solve the problems. Any of these suggested problems you can expect to find on exams and quizzes, with modifications of course.
* Homework bridges the gap between the classroom and home so that students can reinforce what they have learned and ensure retention of the information.

**Exams**

* There will be two types of exams you will take in this class. The first type will be take home tests. These tests will be rather involved and time consuming. The second type of tests will be designed for you to gain practice for the AP test. They will be of the same format as what you will find on the AP test and will be structured in such a way as to give you in class practice at timed test taking. This is the time for you to begin to develop the speed and skills necessary to do well on the AP exam. You will find questions on your exams that will be similar to types found on the AP Chemistry exam and you must learn how to complete them in a timely manner.
* The take home test portion and in class portion will be combined to give a unit exam grade.

**Grading:**

A student’s grade is a weighted average of the following:

 Tests 60%

 Labs/Quizzes 30%

 Daily work 10%

\*\*This course will have an End of Course Test that will be given at the end of each semester. These exams will count as 20% of the final average.

 **Your final grade will be calculated as follows:**

 The average of your two semester grades: 80%

 Semester Exams: 20%

The goal of the class is that you know and can do a specified set of objectives. To get you there, you will have the opportunity to re-do ANY take home test or quiz. The requirement to retake something is to practice the concepts through a variety of means, bring the practice to me, and trade for a second (or third or fourth) chance to demonstrate you know the material.

**NOTE ON GRADES:** Due to the nature of this AP course – you should not be penalized for taking this class. To that end, you will have the opportunity to improve your grade over the course of the year. If you do all of the assigned work in a timely manner, it is unlikely you will receive a “poor” grade.

**Makeup Work:**

Students shall be permitted to make up work when absent. It is the student’s responsibility to pick up the missed assignments. I will follow the policy in the student handbook for absent assignments.

**Makeup Tests and Quizzes:**

If you are absent for a quiz or test (not the day before a test or quiz) you will have to arrange for a makeup quiz or test. Makeup quizzes or tests are done in the mornings before school or in the afternoons after school. Make these appointments before class begins or after class.

**Late Work:**

With the exception of lab reports, assignments may be turned in late with a penalty of 25%. After 3 school days the missing assignment will be assigned a grade of “zero”.

**Behavior Expectations:**

You are expected to arrive to class on time and bring your materials every day. Each student is expected to act seriously and responsibly during class and activities. Mature behavior will increase the level of learning for all students. Disruptions will be dealt with accordingly. Simply put, I expect my students to respect themselves, each other, me, and the classroom as a learning environment. Specific rules and procedures are listed below:

* Come to class and be on time.
* Keep cell phones and other electronic devices put away during class. If it is seen during class, it will be taken up and turned into the office.
* Bring all of your materials to class every day.
* You are allowed to talk only when the teacher says it is okay.
* Do all of the work asked of you and turn it in on time.
* If you don’t understand something, ask.
* Food and candy should be left outside the classroom.
* The teacher dismisses you from class – not the bell. Every student must be in their seat before dismissal.
* **Leave all the negative attitudes outside of this classroom. AP Chemistry is hard but it will be much easier with a positive attitude. Remember this class was your choice.**
* Do the best you can and enjoy learning!!!!

**Tutoring:**

Tutoring is available on Tuesday and Thursday afternoons from 2:45 to 3:15 or by appointment. Tutoring will be by student request or as mandated by the instructor.

**Website:**

I maintain a website at the following URL:

TBD

**Helpful Websites:**

http://www.webelements.com http://chemwiki.ucdavis.edu

http://antoine.frostburg.edu/chem/senese/101/index.shtml

http://www.chemmybear.com

http://www.chemtopics.com/lectures.htm

**Thoughts from Ben Thompson:**

My job this year will be to prepare you to take the AP exam in May and to give you a good background to be successful in college chemistry. To achieve this, I will incorporate typical exam questions on tests and quizzes and hopefully set aside the two weeks prior to the AP exam for review so you will be as successful as possible.

I will demand more from you than in Chemistry and the pace of the class will be much different from other classes. I realize many of you are taking other AP classes and have much work for those classes as well; Therefore I will not require out of class projects until after the AP exam. Given this, the burden is on you to study and learn much of the material. I will do everything possible to help you be successful but considerable effort must be made on your part. The College Board suggests you spend about an hour a day on AP Chemistry or about 5 hours per week. My take on that is this: you know how well you want to do, you know the grade you want to earn from this class, you have your own expectations and only you can meet them. You must put forth the necessary effort to meet your goals. I would like for all of you to earn an excellent grade in this class and urge you to strive for that.

In order for you to be successful in this course keep the following in mind as we continue throughout the year:

1. You must **PRACTICE**!!!!! This means that you have time in class to practice solving problems in small groups. Sharing information and problem solving strategies and working on them with your fellow students will be of great help to you. You must practice at home as well and homework will be devoted to your practice or essential concepts. The more you practice deciphering and solving problems the more success you will have on quizzes, tests, and the AP exam.
2. You must **WRITE**!!!!! This means you must learn to write answers and explanations for problems and practice this. Part of the AP exam involves you writing answers that must communicate your thoughts concisely and clearly. You may also be assigned a formal lab report each semester that will require you to write in a different manner than you will find in your Language classes. We will practice writing answers to questions, conclusions to laboratory experiments, and essential elements of formal reports.

**AP Chemistry Unit Overview**

**Unit 1: Atomic Structure and Properties**

**Topics Covered:**

1. Moles and Molar Mass
2. Mass Spectroscopy of Elements
3. Elemental Composition of Pure Substances
4. Composition of Mixtures
5. Atomic Structure and Electron Configuration
6. Photoelectron Spectroscopy
7. Periodic Trends
8. Valence Electrons and Ionic Compounds

**Unit 2: Molecular and Ionic Compound Structure and Properties**

**Topics Covered:**

1. Types of Chemical Bonds
2. Intramolecular Force and Potential Energy
3. Structure of Ionic Solids
4. Structure of Metals and Alloys 5. Lewis Diagrams
5. Resonance and Formal Charge
6. VSEPR and Bond Hybridization

**Unit 3: Intermolecular Forces and Properties**

**Topics Covered:**

1. Intermolecular Forces
2. Properties of Solids
3. Solids, Liquids, and Gases
4. Ideal Gas Law
5. Kinetic Molecular Theory
6. Deviation from Ideal Gas Law
7. Solutions and Mixtures
8. Representations of Solutions
9. Separation of Solutions and Mixtures/Chromatography
10. Solubility
11. Spectroscopy and the Electromagnetic Spectrum
12. Photoelectric Effect
13. Beer-Lambert Law

**Unit 4: Chemical Reactions**

**Topics Covered:**

1. Introduction for Reactions
2. Net Ionic Equations
3. Representations of Reactions
4. Physical and Chemical Changes
5. Stoichiometry
6. Introduction to Titration
7. Types of Chemical Reactions
8. Introduction to Acid-Base Reactions
9. Oxidation-Reduction (Redox) Reactions

**Unit 5: Kinetics**

**Topics Covered:**

1. Reaction Rates
2. Introduction to Rate Law
3. Concentration Changes Over Time
4. Elementary Reactions
5. Collision Model
6. Reaction Energy Profile
7. Introduction to Reaction Mechanisms
8. Reaction Mechanism and Rate Law
9. Steady-State Approximation
10. Multistep Reaction Energy Profile
11. Catalysis

**Unit 6: Thermodynamics**

**Topics Covered:**

1. Endothermic and Exothermic Processes 2. Energy Diagrams

1. Heat Transfer and Thermal Equilibrium
2. Heat Capacity and Calorimetry
3. Energy of Phase Diagrams
4. Introduction to Enthalpy of Reaction
5. Bond Enthalpies
6. Enthalpy of Formation
7. Hess’s Law

**Unit 7: Equilibrium**

**Topics Covered:**

1. Introduction to Equilibrium
2. Direction of Reversible Reactions
3. Reaction Quotient and Equilibrium Constant
4. Calculating the Equilibrium Constant
5. Magnitude of the Equilibrium Constant
6. Properties of the Equilibrium Constant
7. Calculating Equilibrium Concentrations
8. Representations of Equilibrium
9. Introduction to Le Chatelier’s Principle
10. Reaction Quotient and Le Chatelier’s Principle
11. Introduction to Solubility Equilibria
12. Common-Ion Effect
13. pH and Solubility
14. Free Energy of Dissolution

**Unit 8: Acids and Bases**

**Topics Covered:**

1. Introduction to Acids and Bases
2. pH and pOH of Strong Acids and Bases
3. Weak Acid and Base Equilibria
4. Acid-Base Reactions and Buffers
5. Acid-Base Titrations
6. Molecular Structure of Acids and Bases
7. pH and pKa
8. Properties of Buffers
9. Henderson-Hasselbalch Equation
10. Buffer Capacity

**Unit 9: Applications of Thermodynamics**

**Topics Covered:**

1. Introduction to Entropy
2. Absolute Entropy and Entropy Change
3. Gibbs Free Energy and Thermodynamic Favorability
4. Thermodynamic and Kinetic Control
5. Free Energy and Equilibrium
6. Coupled Reactions
7. Galvanic (Voltaic) and Electrolytic Cells
8. Cell Potential and Free Energy
9. Cell Potential Under Nonstandard Conditions
10. Electrolysis and Faraday’s Law

**AP Chemistry Syllabus**

I have read and understand the contents of the AP Chemistry syllabus.

|  |  |
| --- | --- |
| Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_    |   |
| Student Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_    | Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  |
| Parent Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_    |   |
| Parent Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  | Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  |