

# Advanced Placement® Chemistry

## Welcome!!

This course is designed to be equivalent to a general chemistry course taken during the first year of college. This is an academic, quantitative chemistry course. Chemistry is the study of atoms, molecules, their interactions, and how all of those things follow the laws of the physical world. This course will cover the types of matter, types of reactions, descriptive chemistry, and chemical calculations. There are 6 big ideas, which this course is designed around in order to account for the academic rigor that this course offers. They are:

- Big Idea 1: Structure of matter
- Big Idea 2: Properties, States and Forces
- Big Idea 3: Chemical reactions
- Big Idea 4: Rates of chemical reactions
- Big Idea 5: Thermodynamics
- Big Idea 6: Equilibrium

## Textbook:

Brown, Theodore L. et. al. *Chemistry: The Central Science*. Hoboken, NJ: Pearson Education, 2023. Print. (2023). Chemistry (15<sup>th</sup> ed.).

**Supplemental Text:** It is strongly encouraged that you purchase an AP Chemistry study book. In the past, I have used the book that was put out by the Princeton Review. It was a good overview of the test. Other examples include Barron's

**Materials:** You will need...

- Blue / Black Pens and Pencils
- Scientific Calculator
- Spiral Notebook
- Lab Notebook (may be electronic)
- Lab Donation (optional; Only 1st trimester)

## Absences:

If you are absent you must get the notes from the website or from another student. Tests must be made up of no more than 48 hours upon return. If you miss a lab you must come in before the week is over to make it up. Being absent does not excuse you from the material. Students absent on a quiz or test day will not be allowed to make up the quiz or test and will receive a zero in the gradebook.

**Homework:** Homework will come in 2 different forms. First, there are video lessons that are required to watch for class content. These will be done in Schoology. Finally, each chapter will have an end-of-unit problem set called "Mixed Practice" which will count for homework points and will be done on Schoology. Homework will be accepted up to the unit test, but after the unit test, it will not be accepted for ANY credit.

**Tests and Quizzes:** There will probably be either a formal test or quiz every week. The quizzes will be short and, often, multiple choice. The tests are modeled after the AP Test. There are multiple choice and essay questions. There are 3 testing cycles every trimester and each testing cycle covers 2 units of material. Test cycles are 2 days. Day 1 will be 20 multiple choice questions (10 from each unit). This is a digital test taken on Schoology. Day 2 of the test cycle will be a 20 point written test. These are called Free Response Questions (FRQ). Each trimester will end with a cumulative final that will go into the "test" category of the gradebook. The format of the final will be the same as the testing cycles, only the multiple choice will be 30 questions and the FRQ test is also 30 pts.

Students have an opportunity to drop the lowest score from the "test" category during a trimester ONLY under the following conditions: No missing labs, No missing assignments, no incidents of cheating on any lab, quiz or test. All missing tests and quizzes made up.

## Grading:

Your grade in the class is not influenced by your score on the AP exam. Total points on homework, participation, quizzes, labs, and tests will determine grades. Final grades are not due until the week after the trimester final. Grades can be rounded to the tenth of a percent (for example 89.96% rounds to 90.0%). Please don't contact your teacher about your final grade until after grades are final.

100-93.0 A      92.9-90.0 A-      89.9-87.0 B+      86.9-84.0 B      83.9-80.0 B- and so on...

Tests: 60%      Labs: 25%      Formative Assessments (this category includes quizzes, video lessons, and homework): 15%

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## Material Covered:

U1: Chemistry Basics (Ch. 1 and 2)

*Time: 2 weeks*

*Topics covered*

*Sig figs*

*Units*

*Dimensional Analysis*

*Scientific Method*

*Naming*

*Atomic Models*

**Lab 1: Paper chromatography with different solvents**

**(Science Practices 4 & 5)**

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U2: Atomic Structure and Periodic Trends (Ch. 6 and 7)

*Time: 2 weeks*

*Topics Covered*

*Electrons and Light*

*Quantum Mechanics*

*Periodic Trends*

### **Activity: Periodic Trends (Big Idea 1)**

Students investigate the periodic trends (atomic radius, ionization energy, electron affinity) and help to explain the organization of the periodic table

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U3: Bonding (Ch. 8 and 9)

*Time: 2 Weeks*

*Topics Covered*

*Lewis-Dot Structures*

*VSEPR*

*Hybridization*

**Lab 2: VSEPR Modeling**

**(Science Practices 1, 4, 5-7)**

### **Activity: 3-D Model kits (Big Idea 2)**

Students use 3-D model kits to visualize hybridized orbitals and the different types of bonds (sigma and pi)

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U4: Gasses (Ch. 5 & 10)

*Time: 2 Weeks*

*Topic Covered*

*Combined Gas Law*

*Idea Gas Law*

*Deviation From Ideal Gas*

**Lab 3: Molar Volume of a Gas**

**(Science Practices 2, 3, 6)**

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U5: Stoichiometry (Ch. 3)

*Time: 8 Days*

*Topics Covered*

*Mole Relationships*

*Limiting Reactants*

*% Yield*

**Lab 4: Dehydration of a Hydrate**

*(Science Practice 2 & 5)*

**Lab 5: Determine the Empirical Formula**

*(Science Practices 2 & 5)*

**Lab 6: Applying Green Chemistry to Purification \*GUIDED INQUIRY**

*(Science Practice 2, 4-6)*

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U6: Types of Reactions (Ch. 4)

*Time: 2 weeks*

*Topics Covered*

*Types of Reactions*

*Predicting Products*

*Redox*

**Lab 7: Ten Test-tube Mystery \*GUIDED INQUIRY**

*(Science Practices 4 & 5)*

**Lab 8: Redox reaction involving  $H_2O_2$  in Commercial Hydrogen Peroxide \*GUIDED INQUIRY**

*(Science Practice 2, 4 - 6)*

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U7: Thermochemistry and Energy (Ch. 6 and 17)

*Time: 2 Weeks*

*Topics Covered*

*Energy*

*Work*

*Heat*

*Enthalpy*

*Hess's Law*

**Activity: Journal Article (Relating Concepts to Society and Technology)**

we will explore a scientific idea through a scientific journal that has a strong effect on our everyday life. We will read and discuss the article and debate the pros and cons of the technological advances and innovations that are affecting our lives and the lives of future generations.

**Lab 9: Heat of Reaction**

*(Science Practice 2, 3, 4, 5, 6)*

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U8: Liquids and IMF (Ch. 11)

*Time: 1 week*

*Topics Covered*

*Phase Change*

*IMF*

*Phase Diagram*

**Activity: Heating and Cooling Curves (Big Idea 5)**

Students will analyze heating curves in order to determine how much energy is gained or lost when a substance is heated or cooled. Students should be able to identify an unknown substance based on how much heat was lost or gained by identifying the specific heat capacity of an unknown substance.

**Lab 10: What's in the bottle \*Guided Inquiry\***

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U9: Solutions (Ch.13)

*Time: 2 weeks*

*Topics Covered:*

*Energy of Solution*

*Solubility*

*Solution Composition*

*Colligative Properties*

**Lab 11: Determining the concentration of an unknown solution using Beer's Law and spectrophotometers. (Science Practice 2-7)**

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U10: Kinetics (Ch. 14)

*Time: 2 weeks*

*Topic Covered:*

*Reaction Rates*

*Rate Laws*

*Collision Model*

*Catalysts*

**Lab 12: Determining the rate of a reaction of a gas decomposition (Science Practices 2-6)**

**Activity: Rate Determining Step (Big Idea 4)**

Students will be given several examples of multi-step chemical reactions and try to determine which step is the slow step (rate-determining) using clues and other information provided.

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U11: Equilibrium (Ch. 15)

*Time: 2 Weeks*

*Topics Covered:*

*Equilibrium Conditions*

*Equilibrium Calculations*

*Le Chatelier's Principle*

**Lab 13: Determine  $K_{eq}$  using Beer's Law (Science Practice 2 & 5)**

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U12: Acids, Bases, and Buffers (Ch. 16 & 17)

*Time: 3 Weeks*

*Topics Covered:*

*Acid Characteristics*

*Common Ions*

*Buffers*

*Titrations*

**Lab 14: Types of Titrations \*GUIDED INQUIRY (Science Practice 2, 5, & 6)**

**Lab 15: Preparation of a Buffer \*GUIDED INQUIRY (Science Practice 2, 3, 4, & 5)**

**Activity: Common Ion Effect (Big Idea 6)**

Students will investigate the effect that common ions have on acid/base equilibrium. Students will then calculate the concentration of a conjugate acid/base pair in order to obtain a buffer of a predetermined concentration.

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U13: Thermodynamics (Ch. 19)

*Time: 2 Weeks*

*Topics Covered:*

*Entropy*

*Free Energy*

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U14: Electrochemistry (Ch. 20)

*Time: 2 Weeks*

*Topic Covered:*

*Redox*

*Voltaic Cells*

*Cell Potential*

*Batteries*

*Corrosion, Electrolysis, Electroplating*

## **Lab 16: Voltaic Cell Lab** (Science Practice 2 & 5)

### **Activity: Balancing Redox Reactions (Big Idea 3)**

Students will learn how to balance redox reactions that occur in both an acid and a base. Students practice balancing reaction that range from the more simple redox reactions to the most complex.

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**Lab:** The course is designed to spend 25% of your time in the lab. The weighting of the grades reflects this time commitment. You must have your lab notebook filled out and ready to go when you get to class. You may need to purchase a new lab notebook if you do not have your notebook from last year or filled your current one. As mentioned above, labs must be made up before the end of the week. There are 16 labs scheduled at this time.

## **AP Chemistry Lab Topics and Labs (\*Guided Inquiry Lab):**

### **Lab 1: Paper Chromatography with different solvents**

Description: Students separate inks in different markers with different solvents and determine the  $R_f$  of each.

### **Lab 2: VSEPR Modeling**

Description: Students will draw lewis dot structure, predict the geometry, and predict relative bond angles of different molecules.

### **Lab 3: Molar Volume of a Gas**

Description: Students will use their knowledge of partial pressures and the ideal gas law to prove the molar volume of a gas at STP is 22.4 L

### **Lab 4: Dehydration of a Hydrate**

Students investigate how much water is in a hydrate to determine the unknown ratio of water: anhydrous salt.

### **Lab 5: Empirical Formula Lab**

Description: Students determine the empirical formula of an unknown substance based on mass measurements.

### **Lab 6: Applying Green Chemistry to Purification \*GUIDED INQUIRY**

Description: Students discover the % by mass of a mixture of  $\text{Na}_2\text{CO}_3$  and  $\text{NaHCO}_3$

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## **Lab 7: Ten Test-tube Mystery \*GUIDED INQUIRY**

Description: Students use principles of chemical reactions to determine the identity of 10 different liquids.

## **Lab 8: Determine Actual Percentage of H<sub>2</sub>O<sub>2</sub> in a Drugstore Bottle of Hydrogen Peroxide \*GUIDED INQUIRY**

Description: Students determine how close commercial H<sub>2</sub>O<sub>2</sub> labels are their actual concentration

## **Lab 9: Heat of a Reaction Lab**

Description: Students perform a series of reactions using bleach in a redox reaction to determine the amount of energy gained or released during the redox reaction.

## **Lab 10: What's In That Bottle \*GUIDED INQUIRY**

Description: Students will determine the type of bonding in unlabeled chemicals using physical and chemical properties of substances containing ionic, molecular, and metallic bonds

## **Lab 11: Determining the concentration of an unknown solution using Beer's Law and spectrophotometers.**

Description: Using colorimetry and Beer's law, students determine the concentration of an unknown solution.

## **Lab 12: Determining the rate of reaction data collected from the production of a gas**

Description: Students use a gas pressure sensor in order to determine the initial rate of the catalyzed decomposition reaction of hydrogen peroxide.

## **Lab 13: Determine K<sub>eq</sub> using Beer's Law**

Description: Students investigate the equilibrium constant using absorption data they collected from a colorimeter

## **Lab 14: Titration of Acids/Bases \*GUIDED INQUIRY**

Description: Students investigate titration curves by doing titrations of different combinations of weak and strong acids and bases

## **Lab 15: Buffers \*GUIDED INQUIRY**

Description: Students experimentally determine the capacity of a buffer and support their findings with data

## **Lab 16: Voltaic Cell Lab**

Description: Students find the reduction potentials of a series of reactions using voltaic cells/multimeters and build their own reduction potential table.

## Lab Reports

Students will need to supply evidence of understanding upon the completion of each lab. Students will document all of their work on the 16 labs in a lab notebook. The notebook may be hard copy or electronic. The notebook will be evidence of their laboratory knowledge and may need to be submitted to a future college or university in order to receive credit.

Students are expected to complete EVERY lab and meet deadlines ON TIME in order to receive full credit for this course. The lab reports are to be TYPED and include the following information:

- Names and Date Lab Performed

- Pre-lab Answers

- Data

- Calculations

- Results/Conclusion

Failure to not include any of these sections will NOT result in full credit for the lab report.

## Trimester Incomplete

Students may receive an incomplete grade for the trimester if they are missing any tests or labs done in that trimester. Any quizzes or homework assignments not completed by the last Friday of the trimester will result in ZERO CREDIT. Students have 20 school days to make up the tests or labs. At the end of 20 days, the grades for those tests and labs will automatically result in ZERO CREDIT and the final grade for that trimester will be calculated at that time.

## Other Info

Check the website for updates on a daily basis!!

Most of the problems with the bodies and minds of the folks occupying the current culture involve an unwillingness to do anything hard or anything that they'd rather not do. I applaud your resolve, and I welcome you to the community of people who have decided that EASY will no longer suffice.

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