

AP Chemistry Syllabus

****WARNING**:** This is a **COLLEGE**-level course. We will operate at that level both in rigor, expectations, and pace. Be prepared to spend time working to master these concepts at that level or be prepared for resulting consequences. Pull out your planners now and add the date of the exam to your calendars. The AP test is May 3rd. Did you write it down?! If not....DO IT! More information about how an AP class functions will follow in this syllabus and during class discussion.

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Curriculum Details:

The AP program for chemistry arranges chemistry concepts under four “Big Ideas” that are broken down into Enduring Understandings (EU), Essential Knowledge (EK) and Learning Objectives (LO). The Big Ideas encompass the core scientific principles, theories, and processes governing chemical systems while the Enduring Understandings incorporate core concepts that students should retain from the learning experience.

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 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 3: Transformations (TRA) - At its heart, chemistry is about the rearrangement 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 in 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.

In addition, students must demonstrate skill in each of the six Scientific Practices (SP) that are equally important in the AP Chemistry course. Each LO can be tied to one or more of these SP as well as an EK component.

Science Practice 1: Models and Representations Describe models and representations, including across scales.

Science Practice 2: Question and Method – Determine scientific questions and methods.

Science Practice 3: Representing Data and Phenomena – Create representations or models of chemical phenomena.

Science Practice 4: Model Analysis – Analyze and interpret models and representations on a single scale or across multiple scales.

Science Practice 5: Mathematical Routines – Solve problems using mathematical relationships.

Science Practice 6: Argumentation – Develop an explanation or scientific argument.

Google Classroom

Google Classroom is Highland High’s digital content, learning, and support system. Students are expected to check their Classroom course pages on a regular basis. Parents are able to receive email reports from Google Classroom as well.

TOPICS TO BE COVERED: These cover Units 1-9 in the 2020 AP Chemistry Course Description and include material related to each of the 6 big ideas

Unit 1: Atomic Structure and Properties

Chapter 1	Keys to the Study of Chemistry - Big Ideas 1 and 2	pp 1-39
Chapter 2	The Composition of Matter - Big Ideas 1 and 2	pp 40-89
Chapter 7	Quantum Theory and Atomic Structure - Big Idea 1	pp 286-321
Chapter 8	Electron Configuration and Chemical Periodicity - Big Idea 1	pp 322-357

Unit 2: Molecular and Ionic Compound Structure and Properties

Chapter 9, 11	Models of Chemical Bonding and Theories of Covalent Bonding - Big Idea 2	pp 358-393 pp 428-453
Chapter 10	The Shapes of Molecules - Big Idea 2	pp 394-427

Unit 3: Intermolecular Forces and Properties

Chapter 2	The Components of Matter - Big Ideas 1 and 2	pp 40-89
Chapter 12	Intermolecular Forces: Liquids, Solids, and Phase Changes - Big Idea 2	pp 454-515
Chapter 5	Gases and the Kinetic-Molecular Theory - Big Idea 2	pp 198-249

Unit 4: Chemical Reactions

Chapter 4	Three Major Classes of Chemical Reactions - Big Ideas 2 and 3	pp 138 -197
Chapter 3	Stoichiometry of Formulas and Equations - Big Ideas 1 and 3	pp 90 -137

Unit 5: Kinetics

Chapter 16	Kinetics: Rates and Mechanisms of Chemical Reactions - Big Idea 3 and 4	pp 674-729
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Unit 7 and 8:

Chapter 17	Equilibrium: The Extent of Chemical Reactions - Big Idea 4	pp 720-775
Chapter 18	Acid-Base Equilibria - Big Idea 3	pp 776-825
Chapter 19	Ionic Equilibria in Aqueous Systems - Big Ideas 3 and 4	pp 826-875

Unit 6 and 9:

Chapter 6	Thermochemistry: Energy Flow and Chemical Change - Big Idea 4	pp 250-285
Chapter 20	Thermodynamics: Entropy, Free Energy, and the Direction of Chemical Reactions - Big Idea 4	pp 876-917

Unit 9:

Chapter 21	Electrochemistry: Chemical Change and Electrical Work - Big Ideas 3 and 4	pp 918-975
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LABS:

**Guided inquiry labs are indicated by a double star, and are taken from the Fall 2019 College Board lab manual, The following labs (included in both semesters) will require 25% of the instructional time.

Lab Number	Lab Name
1	Separation of a Solid Mixture
2	Paper chromatography of Acid/Base Indicators
3	Qualitative Analysis Group I Cations
4	MW of a Volatile Liquid
5	Charles' Law

6	Reactions of Cu
7	Formula of a Hydrate
8	Predicting Solubility Rules / Reactions
9	**What Is the Relationship Between the Concentration of a Solution and the Amount of Transmitted Light Through the Solution?
1	Rate Law
2	**Can We Make the Colors of the Rainbow? An Application of Le Châtelier's Principle
3	Standardization of NaOH and % KHP
4	Making a Copolymer
5	**The Hand Warmer Design Challenge: Where Does Heat Come From?
7	**Relating Equilibrium, pH, and Solubility Product Constant - Louis J. Gotlib, "Relating Equilibrium, pH, and Solubility Product Constant: An Introductory Chemistry Laboratory Experiment" Journal of Chemical Education, volume 67, p. 937, 1990.
8	Conjugate Acid / Base and pH of salts
9	**How Can We Determine the Actual Percentage of H₂O₂ in a Commercial (Drugstore) Bottle of Hydrogen Peroxide?
10	Electrochemistry / reactivity series
11	**The Preparation and Testing of an Effective Buffer: How Do Components Influence a Buffer's pH and Capacity?

Materials:

Required

- 3-ring binder with lined paper **OR** notebook and folder with additional loose-leaf lined paper
- Writing utensil (if you choose to write in pen, dark blue or black ink only - I **highly** recommend pencil, though!!!)
- Calculator: **phone calculators are NOT acceptable**. Any calculator with an EE or EXP button will suffice. Graphing functions are not needed. Typically, these can be found at stores for around \$10-\$15. A limited number of classroom calculators are available to borrow.
- Chromebook, always charged.
- Expo type markers (dark colors are best - we use these daily)
- One roll of paper towels

Strongly Recommended

- Flash cards/index cards for vocabulary terms (you are learning a new language - the language of chemistry)
- Colored pencils
- Plastic sheet protectors (extremely useful during labs and for modeling activities)

Primary Text: Silberberg, Martin S. and Amateis, Patricia G., Chemistry: The Molecular Nature of Matter and Change, AP Edition, 7th Ed. 2015

Electronic Secondary Text: Zumdahl, Steven S. and Zumdahl, Susan A., Chemistry, AP Edition, 9th Ed, 2016

Personal Electronics Policy

Cell phones should be on silent and left in your backpack. If you have real life happening and need to have your phone, have a conversation with me prior to coming into the room. Research has shown that proximity to cell phones is extraordinarily distracting to students and inhibit their ability to succeed. If you'd like more information on this research, please ask.

Attendance: Being in class is imperative to your success; you **NEED** to be here **every** day. Coming to class is not enough; you need to come to class prepared and **ready to engage in learning** (including **actively** participating in discussions, small group work, lab work, and questioning).

The Importance of Attendance

Student attendance closely matches and nearly always mirrors academic achievement. Students who are absent from school miss the introduction of new material as well as the benefits of interacting with their peers in discussion, activities and presentations. Our attendance policy is designed to involve you as the parent through communication from the office and individual teachers, as well as to teach students to be responsible and academically accountable.

Students who are chronically or habitually absent may be asked by their grade level administrator to provide documentation for excessive absences from medical personnel. Ideally, all attempts should be made by parents to schedule orthodontist, dentist and doctor appointments before or after school. Family vacations should be scheduled during school breaks (we do **NOT** suspend school the day before or the day after breaks).

If you are taking your student out of class for any reason – you must **physically** sign your student out of school at the attendance office! I am not allowed to release them without the attendance office's notification to me.

Extra- Curricular Activities

Students who are excessively absent, failing courses or have grades below a D, may be denied the ability to participate in field trips or other extra-curricular activities. This includes all athletic events as well as performing arts and other club events.

Make Up Work

Students with unexcused absences may not be given the opportunity to make up missed work, based on individual teacher classroom policies and may even be denied credit for the course once they have missed more than 10 days in a semester. School excused activities (field trips, athletic, performing arts events, etc.) do not count toward a student's absences, but they do affect student learning! You must decide what is most important. School coaches are always consistent in how they treat academics and are always willing to let students attend to academic matters first, **before** practices. If you find that a school coach is in conflict with this, **please let me know!** Your **student** is responsible for obtaining any make-up work, including performing missed labs, which may require before or after school work on their **OWN** time. Our goal is to help your student be successful by encouraging them to attend school whenever possible. Please work with your child's counselor and grade level administrator should circumstances arise which impact their ability to attend school.

Tardies

Students who arrive to class late are a distraction to the students in class as well as to their teacher. After looking closely at which hour tardies were the highest it was determined that Highland would implement a sweep program. This has had a tremendously positive impact on getting students to their first hour on time. Students who are tardy to their first hour will be swept (sent to the cafeteria) and will not be allowed to attend class unless they have a test that day. They must see their teacher during lunch or after school to collect any work they may have missed the same day as the sweep occurred. After 5 sweeps the administration will assign additional consequences ranging from detention to Saturday School.

Classroom detention may be assigned to students who are tardy during hours 2-7 upon the 4th or 5th tardy. Once a classroom detention has been served, students with additional tardies may be issued a referral to an administrator who may assign additional detention, campus work detail or Saturday School.

Please encourage your child to leave the house early enough to account for traffic and get to school on time.

- If you know you are going to be absent, please see me **before** you leave to gain access to the items you need to stay up to date with the class.
- If you have an excused absence, you have the number of days you were out to make up the work you missed.
- If you are absent the day of a test, you are expected to make up the test on the day you return during **non**-class time (this could be after school or during lunch).
- If you are absent from my class because you made the decision to cut my class, you will receive a zero for whatever work was assessed.
- If you miss a lab, please see me to make arrangements to make the lab up after school. Labs will be available for **one week** after the original day. If you wait longer than this, you may forfeit your ability to make the lab up resulting in a zero.

It is **YOUR** responsibility to acquire any notes, handouts, assignments, or updates that were given during the absence.

Grading: The grade for this course will be calculated as follows:

- **Tests:** You can expect 2-4 tests per semester. All tests are cumulative with 10-20% of the test being previously covered material. Tests will be composed of both open-ended and multiple-choice type questions. Each semester you will take a cumulative final exam. This will count for 20% of your final grade each semester.
- **Quizzes:** Be prepared for quizzes daily beginning the second week of school. They will account for the first 10 minutes of each class and they are timed. These are designed to prepare you for the AP exam, which is also timed. There is **not** an opportunity to make up these assessments, similar to daily grades. If you are late or absent, you will earn a score of 0.
- **Labs:** Success in many labs will largely depend on students taking the course demands seriously. Labs may be scripted or inquiry based. Lab reports will always be completed; the style of the lab report will follow the format listed on the next page. Lab notebooks are graded, so keep them professional-looking.
- **Homework:** Homework will be assigned often. This course is challenging, and without dedicated practice it becomes overwhelming. Assignments will come from the text or in the form of a hand out. Homework will be graded on completion and student performance of in-class checks, which may include reviewing a problem with the class.

LABORATORY REPORT GUIDELINES:

Lab reports will be written up in bound laboratory notebooks that produce a carbonless copy of each page. A copy will be torn out and turned in for grading, leaving you with a copy of each lab in your book. Some colleges and universities want to see your lab notebook before granting credit for chemistry lab classes. Therefore, it is imperative that you keep a neat, accurate representation of your laboratory work.

LAB FORMAT:

All lab reports must be handwritten in blue or black ink. All errors should be drawn through with a single line. **NO** whiteout, no erasable pen, either! This is standard practice in labs to prevent fraudulent work.

Each lab should include the following parts:

- I. Title, your name, date
- II. Objective (purpose of the lab)
- III. Procedure (Do not copy the lab handout. Simplify! On inquiry labs, list your planned procedure and leave extra spaces for necessary changes and/or additions.)
- IV. Pre-lab Questions (These are usually found at the end of the lab. Write the question and the answer.)
- V. Data Tables, if applicable (Any tables needed should be drawn BEFORE entering the lab area.)
- VI. Observations (Record all observations directly into your lab book at the time of observation)
- VII. Calculations and Graphs, if applicable
- VIII. Conclusion (This is the most important section! It includes your interpretation of what took place in the lab. Discuss your results. Include errors and how they affected your results.)
- IX. Questions (Write question and answer to any end of experiment questions.)

*****Parts I -V (including empty data tables) must be written up before you can enter the lab! If this is not done in time, the student will receive a 50% deduction on the lab grade. All data and observations must be recorded directly into the lab notebook at the time of the lab! No additional papers may be taken into the laboratory area.**

Late assignments will **NOT** be accepted in this class. If you know you will have difficulty completing an assignment, please have a conversation with me and we will come up with a plan! Any assignment turned in without your name and hour will **NOT** be graded.

Grade Break Down

Tests and Quizzes: 45% Homework/Daily Grades: 18% Final Exam: 20%
Labs Reports/Lab Notebook: 17%

Email Correspondence:

Please use this tool. Please use it responsibly, respectfully and often. A few notes on emailing me....

- Procrastination on your part does **NOT** necessitate an emergency on mine. If you email me after 8pm, you likely will not receive a response until the following day.
- Please make sure you identify yourself in your email. I don't know who "Rockin.Chem@blah.com" is and it may automatically be classified as spam.
- If you have a question or a concern, please don't hesitate to contact me!

Extra Help:

I am available:

- before school
- Tuesdays* and Thursdays* after school
- during 5th hour lunch in room 1210

If you find that none of those times work for you, please let me know and we can work to schedule an appointment to get you the help you need. *Please try to let me know in advance that you're coming for help so I'm best prepared!*

Behavior:

Teacher and Student Expectations:

Hawks SOAR (we act with a focus on service, opportunity, accountability and respect). In addition, I ask that we maximize our success by:

- removing "can't" from our vocabulary
- approach one another (including yourself) with **kindness** and **patience**

This is a rigorous course. It will challenge you intellectually, which **WILL** be frustrating. That is **NOT** an excuse for inappropriate behaviors. We will discuss unique expectations for behavior in this class in the coming days and will draft an additional contract with one another. An overarching rule: Any rude, demeaning, offensive, dangerous or crass behavior will not be tolerated. Discrimination will not be tolerated in this classroom, nor will bullying nor preventing others from learning in a safe setting, both emotionally and physically.

Science Practice 1

Models and Representations - Describe models and representations, including across scales.

Students take the data from a spreadsheet "Titrations" (see following page for data) on pH against added acid or base, and interpret the data in terms of the types of acid or base present, endpoints, the presence or absence of a buffer system, and appropriate indicators with justification based on the data and be able to draw pictures at the nanoscopic scale of what is present.

Science Practice 2

Question and Method - Determine scientific questions and methods.

Students will follow a historical development of atomic structure, examining models from Dalton through Thomson, Bohr to quantum mechanics to develop questions about each model, how the model demonstrates experimental evidence, and how the experimental evidence shows the inability of the model to make correct predictions.

Science Practice 3

Representing Data and Phenomena - Create representations or models of chemical phenomena.

Students will prepare models of the various electron pair arrangements, and complete a table which shows the Lewis structure, electron pair geometry, molecular structure, and use that information to predict the presence or absence of a dipole moment.

Science Practice 4

Model Analysis - Analyze and interpret models and representations on a single scale or across multiple scales.

Students will graph and interpret several data sets on atomic properties (atomic radius, first ionization energy and electronegativity) in order to arrive at the periodic table and trends from the jumps in the graphs.

Science Practice 5

Mathematical Routines - Solve problems using mathematical relationships.

Students will demonstrate their knowledge of the determination of kinetics by displaying the solution to the following problem to the class:

The thermal decomposition of an organic nitrile produced the following data:

t / (103 s)	0	2.00	4.00	6.00	8.00	10.00	12.00	∞
[nitrile] / (mol L ⁻¹)	1.10	0.86	0.67	0.52	0.41	0.32	0.25	0.00

Determine the order of the reaction and the rate constant.

Science Practice 6

Argumentation - Develop an explanation or scientific argument.

Students will develop an argument for which IMF's are present for various molecules and pairs of molecules to explain boiling point, freezing point, and the solubility of various compounds and elements.

Activity for a Societal or Technological Issue

Students solve a stoichiometry problem on the amount of carbon dioxide produced in the burning of a tankful of gasoline (assumed to be octane) with information of the size of the gas tank of the vehicle, the density of octane (0.7028 g mL^{-1}), and a variety of other conversion factors. Following the solution of this problem, a discussion of what happens to this carbon dioxide will ensue, encompassing the greenhouse effect, whether the burning of fossil fuels contributes to global climate change, and if something should be done about the burning of fossil fuels (especially given current estimates for the amount of fossil fuel remaining in the earth and the students estimated lifetime).

Science Practice 1 Inquiry Activity Data for Acid Base Titration of Strong Acid And Strong Base and Weak Acid and Strong Base (put both sets on same graph)

mL of NaOH added	pH of 25 mL SA 0.100 M	pH of 25 mL of WA 0.100 M
0	1	2.9
2.5	1.1	3.6
5	1.2	4.1
7.5	1.4	4.5
10	1.6	5
12.5	1.8	5.1
15	1.9	5.2
17.5	2	5.3
20	2.1	5.5
21	2.4	5.6
22	3.1	5.7
23	3.7	5.8
25	7	8.8
26.5	10.8	10.8
27	11.7	11.7
28	11.8	11.8
29	11.9	11.9
30	12.1	12.1
32	12.1	12.1
33	12.1	12.1
34	12.1	12.1
35	12.1	12.1

make a sketch of 30mL of 0.1M NH_3 with 30 mL of 0.1M HCl

Course Expectations Agreement

2020-2021

AP Chemistry

Ms. Edwards

Desert Ridge High School

Student Name: (print) _____

Parent/Guardian Name:(print) _____

I have read the course expectations for AP Chemistry and I agree to adhere to the expectations, rules, and policies set forward here. I also understand and accept consequences for failure to adhere to these expectations.

Student Signature:

_____ Date: _____

I have read the course expectations for AP Chemistry and I agree to support my student in adhering to the expectations, rules, and policies set forward here. I also understand and accept consequences for failure to adhere to these expectations by my student.

Parent/Guardian Signature:

_____ Date: _____

Please list any questions, comments or concerns you have on the reverse of this page.

Course Expectations Agreement

2020-2021

AP Chemistry

Ms. Edwards

Desert Ridge High School

Student Name: (print) _____

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