Honors Chemistry II and AP Chemistry
Syllabus (2021-2022)

Lenoir City High School
4th Block

Teacher: Keith Garrett
Room: 115

Description of course:

At LCHS, the AP Chemistry course consists of two semesters (36 weeks total). The first semester is labeled Honors Chemistry II (33224) in the LCHS Program of Studies, and the second semester is labeled AP Chemistry (33225). The two semesters together cover the AP Chemistry curriculum as outlined by the College Board (see www.collegeboard.com for details). Students may choose to take only Honors Chemistry II in order to fill a STEM requirement or as a prerequisite for another course.

AP Exam:

In May of 2022, students may take the AP Chemistry Exam in order to receive college credit at some universities and colleges. Taking the exam is not a requirement, but all students who take both semesters are encouraged to do so. Details about cost, fee waivers, deadlines, etc. may be found at www.collegeboard.com.

Text:

Zumdahl/Zumdahl/DeCoste, *Chemistry 10e AP Edition (also available as an ebook through Webassign, the homework platform used for this class)*

Lab Manuals*:

Nelson, John H., and Kemp, Kenneth C. *Laboratory Experiments*.

Vonderbrink, Sally Ann. *Laboratory Experiments for Advanced Placement Chemistry*. (ISBN # 0-618-26505-8)

Williamson, Kenneth L., and Little, John G. *Microscale Experiments for General Chemistry*. (ISBN # 1-877991-34-1)

*other lab supplements and teacher created labs are also used

Required Materials/Fees:
-class notebook: a three ring binder with sections for notes, labs, homework, and quizzes.
-scientific calculator (I have a class set, but you need access to one for homework.)
-class fee: **$20** (payable by check or cash to LCHS)

Laboratory:

We will be involved in laboratory activities for approximately 90 minutes per week.
You will usually work in pairs or groups of three to complete lab activities. You will need to keep all lab reports (or copies of group reports) in a notebook. The notebook will be your record of your laboratory work in the course, and it may be requested by some colleges and universities before they will waive their lab requirements if you pass the AP exam.

Grades:

In both semesters a category-weighted grading system is used. All assignments are graded on a scale from 0-100.

Tests: 50%
Labs: 20%
Quizzes: 25%
Homework: 5%

Additional points are added to the final grade at the end of each semester; 3 points are added for Honors Chemistry II and 5 points are added for AP Chemistry.

Homework:

Most homework assignments will be completed online using Webassign, and a separate set of instructions will be given to you for accessing this website. ***According to the AP Chemistry Course Description, you should expect to spend an hour, on average, each night completing AP Chemistry homework.*** Be sure to keep up with due dates and use this rule of thumb in order to complete homework assignments accurately and on time. In order to receive credit for Webassign assignments, you must still submit your written work for any problems. Make sure your name, the due date and the assignment title are displayed on the work you submit.

Quizzes:

Some quizzes will be announced, some will not. You should come prepared each day to take a quiz. All quizzes will be timed.

Tests:

Test dates are usually scheduled several days in advance, but you should always use the syllabus to help you plan study time before a test. We will have a test at the end of each unit. We will usually spend some time in class reviewing for an upcoming test.

Study Sessions:

Monday through Friday: 7:30 am – 8:15 am
(I am also available most afternoons.)

(I have early duty during the weeks of August 16-20 and April 4-8, so there will be no morning tutoring on those days.)

Extra Credit:

For each 30 minutes of study sessions attended you will receive 2 quiz points. You must sign in each morning (name, date, time, total minutes), and you may stay part of the time or for the entire session. You must work only on chemistry during this time. At the end of each grading period I will total your extra credit points and add them to your quizzes. For example, attending 12 study sessions (45 minutes each) would earn you 36 extra credit points on any quiz, or those points may be distributed among several quizzes. *Your total quiz grade for a grading period, however, may not exceed 100 points, and extra credit points from one grading period may not be transferred to another grading period.*

Guidelines for Retakes

Anyone can request a retake on any assignment (test, quiz, lab, homework), regardless of the assignment or grade.

There is a limit of 3 retakes per semester.

There is a requirement of time* devoted to remediation before the retake:

F = 2 hours
D = 1.5 hours
C = 1 hour
B = 30 min

*Time must be logged on the retake form. This may be done outside of school (*honor system*), or in RM 115. *At least 30 minutes of the total time must be spent with me going over the material*. Time spent with me can also be used for study session extra credit (2 quiz points/30 minutes).

The original grade will be replaced with a new grade, up to the highest possible score on the original assignment (i.e. 100 %).

A retake form must be completed and submitted before the retake. The alternate assignment/retake is tailored to each student.

Retakes must be completed within ***two weeks*** of the original assignment. If the original assignment was completed at or near the end of the grading period, the retake must be completed within 5 school days.

Contact Information for Mr. Garrett:

If you have any questions or comments relating to this class, or if you need help with an assignment, please don't hesitate to contact me. I check my texts and emails frequently.

Email: kgarrett@lenoircityschools.net
Mobile: 423-836-1180

Units *(time requirements are only approximations and are subject to change)***:**

Review *(≈1 to 1.5 Weeks)*

Calculations (dimensional analysis, significant figures, metric system)
Nomenclature (writing formulas and names, polyatomic ions)

Activities/Labs:

Ion Bingo
Cation/Anion Concentration (Internet memory game)

Stoichiometry *(≈1.5 to 2 Weeks)*

Average atomic mass
The mole concept and molar mass
Percent composition
Empirical and molecular formulas
Chemical equations, predicting reaction products
Actual yield, theoretical yield, and percent yield

Activities/Labs:

Lab: Isolation of the Silver in a Dime
Lab: Cu Cycle

Solution Stoichiometry (*2 Weeks*)

Molarity
Precipitation reactions (net ionic equations and stoichiometry)
Introduction to acids and bases
Titrations
Redox reactions (oxidation states and balancing equations by the half reaction method)

Activities/Labs:

Lab: Analysis of Commercial Vinegar (a titration)
Lab: Beer's Law (with Spec 20D)

Gas Laws (*2.5 Weeks*)

Pressure
The laws of Boyle, Charles, Avogadro, Dalton
The ideal gas law
Gas stoichiometry
Kinetic molecular theory
Effusion and diffusion
Real gases and the van der Waals equation

Activities/Labs:

Lab: Molar Mass of a Volatile Liquid
Lab: Boyle's Law (w/ CBL pressure probes)
Lab: Charles' Law and the Determination of Absolute Zero

Thermodynamics I (*2.5 Weeks*)

Energy and work
The 1st Law of Thermodynamics
Enthalpy
Calorimetry
Hess's Law
Standard Enthalpies of Formation

Activities/Labs:

Lab: Calorimetry
Lab: Hess's Law

Atomic Structure and Periodicity (*2 Weeks*)

Electromagnetic radiation
Spectroscopy
The Bohr model of the atom
Quantum mechanical model of the atom
Quantum numbers
The Aufbau principle and electron configurations of polyelectronic atoms
Periodic trends in ionization energy, electron affinity, and atomic radius

Activities/Labs:

Lab: Flame Tests
Lab: Spectroscopy

Chemical Bonding (*2.5 Weeks*)

The nature of the chemical bond
Electronegativity
Bond polarity (ionic vs. covalent character)
The formation of ionic bonds (lattice energy)
The formation of covalent bonds
Calculating enthalpies of reaction using bond energies
Lewis structures (octet rule, resonance, odd-electron molecules)
Valence Shell Electron Pair Repulsion and molecular shape
Simple organic functional groups and introduction to organic nomenclature
Orbital hybridization

Activities/Labs:

Lab: Molecular Models I (using spice drops and toothpicks)
Lab: Organic Synthesis of Esters
Lab: Molecular Models II (using model kits)

Intermolecular Forces (*2.5 Weeks*)

Dipole-dipole forces, London dispersion forces, hydrogen bonding
Unit cells and calculations involving unit cells
Solids (atomic, network covalent, molecular, ionic)
Vapor Pressure
Using the Clausius-Clapeyron equation
Heating curves
Phase diagrams

Activities/Labs:
Lab: Vapor Pressure and the Enthalpy of Vaporization of Water

**********End of Chemistry II semester**********

Colligative Properties (*2.5 Weeks*)

Expressing solution concentration (calculating molarity, molality, percent, mole fraction)
Solution formation and enthalpy
Solubility (structural effects, temperature, pressure)
Vapor pressure of Solutions and Raoult's Law
The van't Hoff factor
Colligative properties (vapor pressure lowering, boiling point elevation, freezing point depression, osmotic pressure)

Activities/Labs:

Lab: Colligative Properties of Solutions (determination of K_f for a solvent and subsequent determination of the molar mass of an unknown solute)

Equilibrium I (*2.5 Weeks*)

The nature of chemical equilibrium
The law of mass action and the equilibrium expression
Calculating and using the equilibrium constant, K
K_p
Calculating the reaction quotient, Q, and predicting shifts in equilibrium
Le Chatelier's Principle
Equilibrium calculations (ICE tables, simplifying approximations)

Activities/Labs:

Lab: Le Chatelier's Principle

Acids and Bases (*2.5 Weeks*)

Definitions (Arrhenius, Bronsted-Lowry, Lewis)
Factors affecting acid/base strength
pH calculations (strong/weak acids/bases)
Percent dissociation
Polyprotic acids
Acid-base properties of salts

Activities/Labs:

Lab: Acid-Base Properties of Salts
Lab: Determination of the Dissociation Constants of Weak Acids

Aqueous Equilibria (*2.5 Weeks*)

The common ion effect
Buffers
Buffer calculations
Titrations and pH curves
Acid-base indicators
Solubility product, K_{sp}
Solubility and pH
Equilibria involving complex ions

Activities/Labs:

Lab: Analysis of Stomach Antacid Tablets
Lab: Determination of the Solubility Product of an Ionic Compound

Thermodynamics II (*2.5 Weeks*)

Spontaneous processes and entropy, S
The 2nd Law of Thermodynamics
Free energy, G
Predicting the sign of ΔS for a reaction
Calculating ΔH, ΔS, and ΔG and predicting spontaneity
Free energy and equilibrium

Electrochemistry (*2.5 Weeks*)

Galvanic cells
Cell potential and the standard hydrogen electrode
Cell diagrams and cell line notation
Cell potential and free energy
Cell potential and concentration (using the Nernst equation)
Batteries
Electrolysis

Activities/Labs:

Lab: Constructing a lemon battery
Internet activity: Diagram of a galvanic cell using a flash animation of a galvanic cell
Lab: Cell Potentials
Lab: Electrolysis (plating metals on coins)

Kinetics (*2 Weeks*)

Definition of reaction rate
Factors that affect rate (catalysts, concentration, temperature, surface area of reactants)
Rate laws (differential vs. integrated)
Using the method of initial rates to determine the form of the rate law
Using graphs to determine the order of a reaction
Calculations using the integrated rate laws
Half-life calculations (including radioactive decay problems)
Reaction mechanisms
Calculations and graphs involving the Arrhenius equation
Activation energy and the role of the catalyst

Activities/Labs:

Lab: Rates of Chemical Reactions

AP Exam Review (*2 Weeks*)

Practice Test (1999 Released Exam Multiple Choice)
Test-taking strategies
Examples of Free-Response Questions
Take-home review packets
Individual remediation

Activities/Labs:

Lab: Silver Mirroring (stoichiometry review)
Lab: Cu Cycle Revisited (electrochemistry and predicting products)