KAP CHEMISTRY

Instructor: Mrs. Kerr
Classroom: Room 213
Email: Lisa.Kerr@danvilleschools.org
Phone: 740-599-6116

Course Overview

KAP Chemistry meets Monday thru Friday, one block per day 80 minutes. Prerequisites include Physical Science, Biology, Chemistry I, and Algebra II with a B or higher.
KAP Chemistry is a college level course that is designed to not only provide students with a solid general chemistry education but also to develop the student's abilities in the following areas:

(1) read, understand, and interpret information from a wide variety of sources
(2) use appropriate problem solving skills
(3) use mathematical reasoning in solving problems
(4) complete lab experiments, including data acquisition, interpreting the results and acknowledging the uncertainties associated with the experimental outcome. Students should **expect** to spend a minimum of ½ to 1 hour a day studying outside of class in order to master the course material.

An average of two periods per week is spent in the laboratory. Labs vary from prescribed or "cookbook", to limited investigations with some direction, and finally open ended investigations with little or no direction. Students are required to compile a portfolio of graded lab reports to show schools when you register for college courses. Students are **required** to take the ACS College General Chemistry Exam in the spring. This will be substituted for your final.

I am confident that this class will challenge you to expand both your knowledge of chemistry and your ability to think critically. It is going to be a great year!

About KAP

Students participating in the KAP program will receive credit for the four following Kenyon courses, totaling 12 semester hours of college credit:
Chemistry 121 Introductory Chemistry Lecture (0.5 Kenyon units; 4 semester hours)
Chemistry 123 Introductory Chemistry Laboratory (0.25 Kenyon units; 2 semester hours)
Chemistry 124 Biophysical and Medicinal Chemistry (0.5 Kenyon units; 4 semester hours)
Chemistry 125 Biophysical and Medicinal Chemistry (0.25 Kenyon units; 2 semester hours)

Textbook

Textbook:
Chemistry Principles and Reactions ©2004
5th edition by Masterton and Hurley
ISBN 0-534-40878-8
Brooks/Cole-Thompson Learning, Belmont CA 94002

Materials

You will need the following items for this course:

- 3-ring binder with dividers for notes, handouts, and homework
- 3-ring binder (1- 2 inch) for labs, this will be left in the classroom
- pencils and pens (pen required for lab)
- TI-84 or TI-83 calculator, or other graphing calculator

Assessment

Tests will be announced and typically cover two chapters of the textbook.

Quizzes will be given frequently. They may or may not be announced. The lowest quiz score will be dropped each grading period.

Homework will be collected at random and will be graded for both completion and correctness.

Formal lab reports are required and must be compiled into a portfolio of graded lab reports. Each report consists of:

- Title Page/Lab Handout
- Purpose
- Safety hazards
- Materials
- Procedure
- Table(s) of Data
- Computations
- Graph(s) of Results
- Conclusion (including error analysis)

I grade according to the approved Danville High School Student Handbook.

A= 100%-92%
B= 91%-81%
C= 80%-70%

F< 60%

I strongly encourage each of you to check your course grade online on a weekly basis.

Late Work and Absence Policy

Late work will be penalized 10% per day late. All late work should be placed in the Absent/Late bin and **must be received prior to the unit test to receive credit.**
In the case of absence, it is **YOUR** responsibility to determine any assignments missed and turn them in within the required time. A list of daily assignments and all handouts will be available in the classroom. All work must be made up within the number of days absent unless other arrangements are explicitly approved by me. If you are absent for a lab day, you will be expected to complete the lab outside of regular class time. **All missed work must be completed prior to the unit test to receive credit.**

Course Outline

1. Review of Fundamentals (15 days)
    1. Measurement, units, and significant figures
    2. Inorganic nomenclature
    3. Moles, grams, molecules, formula units, atoms
    4. Percent composition
    5. Empirical formulas, molecular formulas
    6. Equation stoichiometry
    7. Molarity
    8. Labs:
        1. Determination of chloride ion concentration in salt water
        2. Determining the empirical formula of a hydrate
        3. Gravimetric analysis of a metal carbonate

2. Graphical Treatment of Experimental Data (5 days)
    1. Direct proportions
    2. Direct square proportions
    3. Inverse proportions
    4. Inverse square proportions
    5. Labs:
        1. Relation between the volume of a gas and its pressure

3. Electronic Structure and the Periodic Table (10 days)
    1. Nature of light
    2. The Bohr Atom
    3. The quantum mechanical atom
    4. The periodic table and trends in properties of the elements
    5. Ions
    6. Labs:
        1. Flame tests

4. Bonding (12 days)
    1. Ionic bonding
    2. Covalent bonding
    3. Polar covalent bonds
    4. Electronegativities
    5. Lewis structures
    6. VSEPR theory
    7. Resonance
    8. Formal charge
    9. Hybridization
    10. Sigma and pi bonding
    11. Labs:
        1. Molecular model building

5. Spectrophotometry (12 days)
    1. Nature of light
    2. Beer's Law
    3. Organic nomenclature
    4. NMR
    5. IR
    6. Labs:
        1. Absorption spectra
        2. Beer's law
        3. Synthesis and analysis of a coordination compound
        4. Analysis of an unknown using NMR and IR spectroscopy

6. Gases (12 days)
    1. Gas laws
    2. Ideal gas equation
    3. Avogadro's Law
    4. Dalton's Law of Partial Pressures
    5. Graham's Law of Effusion
    6. Kinetic Molecular Theory
    7. Real vs. ideal gases
    8. Labs:
        1. Molar volume and mass of CO_2
        2. Molar volume of H_2
        3. Determination of molar mass of a volatile liquid
        4. Graham's law of effusion

7. Kinetics (12 days)
    1. Meaning of reaction rate
    2. Rate law from initial rate data
    3. Integrated rate laws

4. Collision theory of reaction rates
5. Factors affecting the rates of reaction
6. Catalysts
7. Mechanisms
8. Potential energy diagrams
9. Labs:
    1. Factors affecting the rate of a reaction
    2. Determination of the rate law of the Iodine Clock reaction
    3. Rate Law determination of the Crystal Violet reaction

8. Equilibrium (15 days)
    1. The nature of equilibrium
    2. The equilibrium constants K_C and K_P
    3. LeChatelier's principle
    4. Labs:
        1. Pop-bead equilibrium
        2. Determining the K_C of the $FeSCN^{2+}$ equilibrium
        3. LeChatelier's Principle

9. Solubility Equilibria (5 days)
    1. The solubility product, Ksp
    2. The common ion effect
    3. Solubility rules
    4. Labs:
        1. Micro-progressive precipitation
        2. Ksp of calcium hydroxide
        3. Qualitative analysis of cations and anions

10. Acid-base Equilibria (15 days)
    1. Acid-base models: Arrhenius, Bronsted/Lowry, Lewis
    2. Strong acids and bases
    3. Kw
    4. pH, pOH
    5. weak acids and bases, Ka and Kb
    6. Hydrolysis
    7. Buffers
    8. Henderson-Hasselbalch equation
    9. Indicators
    10. Titrations
    11. Labs:
        1. Hydrolysis of salts
        2. Buffers
        3. Titration of a strong acid and strong base
        4. Titration of a weak acid with a strong base to find the % acid in vinegar

11. Thermodynamics (15 days)
    1. Nature of heat and heat flow
    2. First Law of Thermodynamics
    3. Calorimetry
    4. Enthalpy
    5. Hess's Law
    6. Heats of formation and heats of reaction
    7. Entropy
    8. Second Law of Thermodynamics
    9. Free Energy
    10. The equilibrium constant
    11. Labs:
        1. Hess's Law
        2. Urea solubility thermodynamics

12. Electrochemistry (15 days)
    1. Oxidation-reduction reactions
    2. Redox-titrations
    3. Electrolysis
    4. Electrochemical cells
    5. Cell potentials
    6. Nernst equation
    7. Labs:
        1. Mass % of commercial hydrogen peroxide solution
        2. Voltaic cells
        3. Electrolysis of $CuCl_2$

13. Liquids and Solids (5 days)
    1. Bonding
    2. Intermolecular forces
    3. Changes in state
    4. Heating and cooling curves
    5. Vapor pressure curves
    6. Phase diagrams
    7. Labs
        1. Separation and identification of amino acids
        2. Heat and changes of state

14. Colligative Properties of Solutions (5 days)
    1. Concentration units: molarity, molality
    2. Solubility curves
    3. Colligative properties of solutions
    4. Labs:
        1. Boiling point elevation and freezing point depression

15. Organic Chemistry (5 days)
    1. Nomenclature
    2. Functional groups
    3. Labs
        1. Synthesis and analysis of aspirin

16. The Nucleus (5 days)
    1. Radioactive decay
    2. Transformation rules
    3. Artificial transformations
    4. Decay rate and half life
    5. Labs:
        1. Nuclear decay rate simulation (virtual lab)

All provisions of the syllabus are subject to change at the instructor's discretion – students will be notified of any changes.