

AP Chemistry Course Syllabus 2007-2008
Teacher: Gary Waterson Benzie Central Schools

Textbook “Chemistry” Zuhmdahl and Zuhmdahl 6th edition 2006

Supplement “Multiple Choice and Free Response Questions” by D and S Marketing Systems. 5th edition 2005

Course Expectations

When the school year begins before Labor Day, you will be expected to meet for a 3 hour lab on a day before the school year starts. When the school year begins after Labor Day, you will be expected to meet for 3 prior to the beginning of the school year.

As a class member, you will be expected to take the AP test given in the spring. There will be no opt outs.

You will be given a 3 ring binder and I will expect you to put all material in an organized fashion into this binder. In the 3 ring binder, you will keep all lab reports in a separate section. The 3 ring binder will be turned in when lab reports are to be graded.

Only quizzes and labs will be graded. I will have the expectation that you will do the assigned reading and the assigned homework. Do not ask for extra credit. None will be given

There will be 3 labs given outside of class time. Each lab lasts approximately 4 hours in length. You will be expected to make time for each of these. Our lab experience will total 42 hours. This exceeds AP requirements.

You will be given a bi-weekly course syllabus. Make sure that you keep up with it.

This is a difficult course. The grading scale will be as follows

| | |
|----------|---|
| 85 – 100 | A |
| 70 – 85 | B |
| 60 – 70 | C |
| 50 – 60 | D |
| <50 | E |

If you are working at a level less than 60%, then you will be asked to consider dropping the course at the semester.

You will not receive a grade for a laboratory report until all corrections are made. These need to be perfect. Laboratory reports will be word processed.

You will need access to a graphing calculator. On 2 labs, you will be processing data on your calculator. You will also need to learn to use CBL's and other complex equipment.

Class will begin @ 7:50 each day. This allows us an extra 15 minutes each class period and an extra 42 hours of class time.

In late April and early May, there will be two 4 hour review sessions and you will be expected to attend both of them.

Course Outline

1. Chemical Foundations

- A. Measurement and uncertainty in measurement (sig figs) 3 classes
- B. Density and Classification of Matter

2. Atoms, Elements, Molecules and Ions

- A. Atomic structure
- B. Molecules and ions
- C. Naming Simple Compounds 5 classes
 - 1. Binary I, Binary II and Binary III compounds
 - 2. Acids – Intro

3. Stoichiometry

- A. Mole
- B. Molar Mass
- C. % composition and Chemical formulae
- D. Chemical equations Balancing 9 classes
- E. Calculations of Reac and Prod
- F. Excess/Limiting reactions

4. Reactions in Solution

- A. Solubility rules
- B. Molality/molality Review
- C. ppt reactions 8 classes
- D. Net ionic equations
- E. Oxidation/Reduction reactions

5. Gas Laws

- A. Gas Law Review
- B. Ideal gas law
- C. Gas stoic
- D. Dalton's Law of pp
- E. Effusion and Diffusion 8 classes
- F. Real vs Ideal gases
- G. Molar mass of gases

6. Thermochemistry

- A. Laws of Thermodynamics
- B. Calorimetry
- C. Enthalpy and Hess' Law 6 classes
- D. Heats of Formation
- E. Exothermic and Endothermic reactions
- F. Enthalpy Diagrams

7. Atomic Structure and Quantum Mechanics

- A. Bohr's model of the atom
- B. Quantum #'s
- C. Wave energy, wave length, wave speed etc 7 classes
- D. orbital shapes
- E. periodic trends in atomic properties
- F. Aufbau principal

8. Bonding

- A. Electronegativity and types of chemical bonds
- B. polarity and dipole moments
- C. Ionic and Covalent character
- D. Bond energies
- E. Lewis structures 8 classes
- F. Lewis exceptions
- G. VSPER model
- H. Hybridization
- I. Bond energy, bond length and bond order

9. Liquids and Solids

- A. Intermolecular Forces
 - 1. Hydrogen bonding as a specialized intermolecular force
- B. Network, ionic, covalent, and molecular solids 5 classes
- C. Vapor pressure and changes of state
- D. Phase diagrams

10. Properties of Solutions

- A. Solubility Factors
- B. Vapor pressures of solutions compared to liquids 6 classes
- C. BP elevation FP depression
- D. Osmotic Pressure

11. Kinetics

- A. Reaction Rates and rate laws
- B. Determining orders of reactants
- C. Integrated Rate Law 9 classes

- D. Reaction Mechanisms Rate determining step
- E. Catalyst and its affect on Activation energy

12. Chemical Equilibrium

- A. Equilibrium equations
- B. K_{eq} to K_c and K_p
- C. Equilibrium expressions 9 classes
- D. Equilibrium applications
- E. LeChatelier's Principle
- F. Disrupting Equilibrium

13. Acids and Bases I

- A. Nature of acids and bases
 - 1. Arrhenius
 - 2. Bronsted Lowry
 - 3. Lewis
- B. Strong and weak acids Strong and weak bases
- C. Conjugates 12 classes
- D. pH
- E. Using K_a to calculate pH of weak acids
- F. Using K_b to calculate pH of weak bases
- G. $(K_a)(K_b) = K_w$
- H. Polyprotic acids
- I. Using Lewis structures to determine the strength of acids

14. Acids and Bases II

- A. Using conjugates to figure pH
- B. Buffered solutions and buffer capacity 7 classes
- C. Acid/Base titrations
- D. Titration curves
- E. Indicators

15. K_{sp}

- A. Solubility of solids and ions
- B. Solubility Equilibria and solubility products 4 classes
- C. Quantitative analysis

16. S and G. Determining spontaneous reactions

- A. 2nd Law of Thermodynamics
- B. Entropy
- C. Temperature and entropy
- D. Gibb's Law Free Energy 6 classes
- E. Free energy and equilibrium
- F. Work

17. Electrochemistry

- A. Galvanic Cells
- B. Reductions Potentials
- C. Oxidation and Reduction
- D. Electrochemical cells 8 classes
- E. Nernst half cell concentrations
- F. Batteries
- G. Electrolysis

18. Nuclear Chemistry

- A. Radioactive decay
- B. Nuclear transformations
- C. Energy calculations 4 classes
- D. Nuclear fission and nuclear fusion
- E. Radiation

19. Organic Chemistry

- A. Nomenclature alkanes, alkenes and alkynes
- B. Simple organic reactions
- C. Aromatics 4 classes
- D. Isomers
- E. Types of organic molecules

- 20. Review 15 classes

AP Chemistry Labs 24 labs for a total of 42 contact hours. This lab work is more than the required double class/week for lab experience.

1. Molar mass of a monoprotic acid KHP *
2. Is it Cu(I) or Cu(II)? $\text{Cu} + \text{I}_2$
3. Isolation of a ppt Excess/Limiting
4. Redox #1 Tin(II) + $\text{MnO}_4^- + \text{H}^+$
5. Redox #2 Hydrogen Peroxide + $\text{CrO}_4^{2-} + \text{H}^+$
6. Isolation of a ppt Is it Co^{2+} or Co^{3+} ?
7. Solubility Rules ppt lab
8. Hf of Butane
9. Enthalpy of bleach and sodium sulfite
10. Finding the molar mass of butane $PV = nRT$ gas law
11. Molecular Geometry Lab *
12. Finding the vapor pressure of ethanol
13. Finding the molar mass of an organic molecule with FP depression
14. Kinetic #1 Bleaching of crystal violet *
15. Kinetic #2 Decomposition of hydrogen peroxide
16. Conjugate Lab
17. Titration and pH curves *
 - A. Strong acid/Strong Base
 - B. Strong acid/Weak base
 - C. Strong base/Weak acid
18. Buffer Lab HAc/Ac^- Buffer capacity
19. K_{sp}
20. Galvanic cells
21. Cell potential and Nernst
22. Review Lab #1 Unknown acid Is it mono, di or a tri protic acid
23. Review Lab #2 Identification of ions in solution
24. Review Lab #3 Using a spec-20 Finding concentrations

* Denotes a lab expected to be done outside of regular class time