Chemistry 201 ABC
Lecture Schedule
Spring 2012

Required Textbook: General Chemistry**:** by Petrucci, Herring… 10 Edition, Pearson.

Instructor: Dr. Shams Jaffer
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Meeting Time: Mon: 8:30 am -12:10 pm Room 3831
Wed: 8:30 am -12:10 pm Room 3184

DATE	TOPIC	Chapter
January 18& January 23	**Mathematical Review** Scientific notation, Measurements and Significant Figures, SI Units and Dimensional Analysis. Properties of matter. Density and Percent Composition.	Appendix Chapter 1
January 23	**Placement Test in Basic Chemistry**	
January 25& 30	**Atoms and the Atomic Theory** Atomic Theory and atomic Structure, Chemical Elements Introduction to Periodic Table. Mole Concept in Calculations	Chapter 2
February 1, & 8	**Chemical Compounds** Types of Chemical Compounds and Their Formulas. The Mole Concept. Composition of Chemical compounds. Oxidation states Names and formulas of Inorganic and Organic Compounds	Chapter 3
February 15 & 22	**Chemical Reactions** Chemical Reactions, Chemical Equations and Stoichiometry Chemical Reactions in Solutions. Determining the Limiting reactant	Chapter 4
February 29 March 7	**Reactions in Aqueous Solutions** Precipitation Reactions, Acid - Base Reactions and Oxidation Reduction Reactions. Oxidizing and Reducing Agents Balancing Oxidation—Reduction Equations. Stoichiometry of of Reactions in Aqueous Solutions: Titrations	Chapter 5
March 14&19	**Gaseous State** The Gas Laws: The Ideal Gas Equation and applications. Gases in Chemical Reaction. Mixtures of Gases. Graham'law of Effusion The Kinetic- Molecular Theory of Gases	Chapter 6

March 21&26 **Thermochemistry**

Energy and its Units. Measurements of Heat of Reaction and Calorimetry. The First Law of Thermodynamics. Heats of Reactions: ΔE and ΔH. Hess's Law Standard Enthalpies of Formation — Chapter 7

March 29 & April 9 **Solutions**

Types of solutions, Solution Concentration, Properties of Solutions — Chapter 13

Intermolecular Forces and the solutions Process. Colligative Properties: Vapor Pressure of Solutions, Osmotic Pressure Freezing− Point Depression and Boiling – Elevation of Nonelectrolyte Solutions.

April 2--8 **Spring Break**

April 11 & April 18 **Electrons in Atoms** — Chapter 8

Electromagnetic Radiation. Atomic Spectra. Quantum Theory The Bohr Atom. Quantum Numbers and Electron Orbitals of the Hydrogen Atom. Electron Spin: A Fourth Quantum Number Electron Configuration and Periodicity.

April 18 &23 **The Periodic Table and Some Atomic Properties** — Chapter 9

The Periodic Law and the Periodic Table. Metals and Nonmetals and Their Ions. Sizes of Atoms and Ions. Ionization Energy. Electron Affinity. Magnetic Properties.

April 23&25 **Chemical Bonding** 1: **Basic Concepts** — Chapter 10

Lewis Structures and Resonance. Ionic Bonds, Covalent Bonds Exceptions to the Octet Rule. Formal Charge and Lewis Formulas. Shapes of Molecules. Bond Order, Bond Lengths and Bond Energies.

April25 &30 **Chemical Bonding (11) and Molecular Geometry**

Chapters11 &12

The Valence-Shell Electron-Pair Repulsion (VSEPR) Theory and Molecular Shape. Hybridization of Atomic Orbitals. Bonding in in the Benzene Molecule.

May 2 **FINAL EXAM**

CHEMISTRY 201 ABC
LABORATORY SCHEDULE
Spring 2012

TEXTBOOK: **Chemistry Principles in the Laboratory,** Slowinski, Wolsey and Masterton.
10th Edition.

INSTRUCTOR: Dr S. Jaffer

OFFICE: 3840

Date	**Topic**	**Experiment**
January 23	Check-In, Laboratory Safety and Weighing Techniques	
January 30	Densities of Liquids and Solids. Al-known & unknowns	**1**
February 6or13	Resolution of Matter into Pure Substances. Paper Chromatography	**2**
February 20	**President's Day Holiday**	
February 27	Separation of the Components of a Mixture	**Handout**
March 5or12	Percent of Copper in a Compound	**Handout**
March 19	Molar Mass of a Volatile Liquid	**9**
March 26	The Alkaline Earths and the Halogens	**12**
April 2--8	**Spring Break**	
April 9	Heat Effects and Calorimetry	**14**
April 23& 30	Sdardization of a Basic Solution and the Determination of the Molar Mass of an acid.	**24**
April 30	The Geometrical Structures of Molecules.Using Molecular Models	**13**
May 7	Spot Tests for some Common Anions	**35**
May 7	**CHECK- OUT**	

1. **Students are expected to hand in the lab. Reports at the end of each experiment. A late lab report will carry reduced or no credit.**
2. **Missed laboratory work cannot be made-up.**

CHEMISTRY 201 ABC & FH2
GENERAL INFORMATION

PREREQUISITES: Grade of C or better in Chemistry 121 and Eligibility for Math 140 (C or better in Math 99).

REQUIRED SUPPLEMENTARY MATERIAL:
A scientific calculator (no cell phone or graphic calculator is allowed during tests and exams). You are expected to know how to use your calculator. Bring it with you in class, you will be asked to use it in class. **Calculator may not be shared during examination.**

ATTENDANCE POLICY:

- Students are expected to be in class on time and attend the entire lecture and laboratory sessions.
- Two absences from the first three classes of the semester may result in your being dropped from the class. Poor attendance generally leads to poor grades.
- **There will be no make-up for missed Quizzes or Lab**.
- **Tardiness:** Four (4) late arrivals or early departures are equivalent to one (1) absence.

ACTIVE PURSUIT POLICY:

In order for the students to remain in this course, they must actively pursue the objectives for this course. Students are not actively pursuing the course objectives will be administratively withdrawn (ADW) at midterm if the following apply::
a)A student with six (6) absences (cumulative), b) missing lab Experiments, Exams, Tests and class participation before the Mid-term exam will be eligible for an ADW.

ACADEMIC INTEGRITY: The CCC has no tolerance for violation of academic integrity. The student policy manual, " Plagiarism and cheating of any kind are serious violations of these standards and will result, minimally,, in the grade of 'F' by the instructor". All course work will be checked for Academic Integrity. In this course, the first violation will result in an "F" for the assignment; the second violation will result in course failure. Make-ups and revision are not available after an infraction of academic integrity.

GRADING POLICY:

Written examinations will be given and from these the student's grade will be determined. Written exams will count **75 %** of the grade.

- There will be **10** to **12** short Exams at 100 points each. The best **8 or 10** will constitute **50 %** of the grade
- Final Exam will constitute **25%** of the grade
- Class Participation is important, solving problems and answering questions in class.
- Extra Credit will be given for never missing a class, class participation and Tardiness.

Your letter grade will be determined according to the following grading scale.

A ---------- 90 %
B ----------70 %
C ---------- 60 %
D ---------- 45 %
F ----------Under 45%

LABORATORY: Lab reports will count 20% of the grade. Students will do the experiments alone unless otherwise indicated. Your grade will be determined by the accuracy of your laboratory work. Laboratory work must be done during the assigned lab periods. Record all data in ink while you are working on your experiment. Do not forget to write your name (-2 points) and unknown number (-10 points) on your laboratory report.

TECHNIQUE GRADES 5%: Demerits will be given for poor practices such as spillage, breaking glassware, fires, **not wearing safety glasses**, taking reagent bottles to your laboratory work area etc. Do not wear shorts, sandals or any type of clothing that is not safe in the laboratory or wear lab-coat. Pay attention to these requirements or you will not be allowed to do the lab experiment. It will not be possible for the instructor to tell you what technique grades you are getting until she has observed you for a substantial part of the semester.

OFFICE & ADVISEMENT HOURS:	**8:00 AM to 9:00AM**	**Tue &Th**
	12:20 PM to 2:20 PM	**Monday**
	12:40 PM to 1:40 PM	**Tuesday**
	12:40 PM to 2:40 PM	**Thursday**

No food or drink is allowed in the laboratory.

Schedule and/or experiments are subject to change.

Chemistry 201 Syllabus

Truman Mission Statement: Our mission dedicates us to deliver high-quality, innovative, affordable, and accessible educational opportunities and services that prepare students for rapidly changing and diverse global economy.

Course objectives:
At the completion of the course the successful student will be adequately prepared to take subsequent courses: General College Chemistry II (203), Organic (205). For the students who may not continue to study chemistry it will increase appreciation of Science and methods. The following topics will be covered in this course:

Contents and Concepts

1. An introduction to Chemistry
2. We start by defining the science called chemistry and introducing some fundamental concepts.
3. Modern Chemistry: A Brief Glimpse
4. Scientific Methods: Law, Hypothesis, Theory
5. Use of Significant Figures as indicators of precision of measurements and calculated values.
6. Use of Exponential notation
7. Convert from English system to the metric system (& vice versa) common units of length, mass and temperature.
8. Differentiate between heat and temperature
9. Do simple calculation of heat changes using specific heat
10. Be able to use Hess' law to calculate the enthalpy change for a chemical reaction given a table of enthalpy of formation values.
11. Solve problems using density as the relationship between mass and volume.
12. Use and define (describe or explain) basic chemical concepts with respect to the properties of matter: physical states of matter, physical and chemical properties of matter, physical and chemical changes, the law of conservation of mass, the law of conservation of energy, the law of definite composition, classification of elements.
13. Distinguish between pure substances (elements and compounds) and mixtures (homogeneous and heterogeneous).
14. Know the names of chemical symbols of 48 elements
15. Distinguish between ionic and molecular compounds.
16. Understand chemical formulas of common substances in terms of the number and kind of atoms which have been bonded.
17. List the formulas of 9 of the most common molecular elements

18. Use basic chemical nomenclature for inorganic chemistry
19. Write the formulas of binary ionic compounds, common binary molecular compounds 12 common acids, 4 common bases, inorganic ternary compounds using 15 common polyatomic ions.
20. Use oxidation numbers to distinguish oxidation states of metals in compounds
21. Balance chemical equations given the formulas of the reactants and products.
22. Calculate the oxidation number of each element, given the formula of a compound.
23. Balance oxidation-reduction equations using oxidation numbers

24. List the basic principles of Dalton's atomic theory and indicate how the theory has been further developed in this century
26. State the basic properties of the subatomic particles: protons, neutrons, electrons
27. Describe the Rutherford atom
28. Define atomic number, mass number and isotopes
29. Define the atomic mass unit and Avogadro's number
30. Use the conversion factor from grams to amu in simple calculations
31. Be able to calculate the average atomic weight from isotopic masses and percentages abundances.
32. Be able to apply the terms: metals, non metals, alkali metals, alkaline earth metals, Metalloids, transition metals, noble gases, halogens, and inner transition metals to the arrangement of elements in the periodic table.
33. Describe the arrangement of the elements in the periodic table.
34. Use the periodic table to predict formulas of compounds
35. Define the term anion, cation and polyatomic ion.
36. Describe how ionic and covalent bonds are formed.
37. Calculate the oxidation number of each element, given the formula of a compound
38. Calculate the percent composition compounds, given the formula.
39. Calculate the empirical formula, given the percent composition,
40. Distinguish between empirical and molecular formulas.
41. Understand the concept of the chemical quantity0 the mole, and the relate it to the counting of atoms and molecules.
41. Convert mass in grams to moles, molecules (and/or atoms) using atomic weights, Formula weights, molecular weights.
43. Know the basic rules which predict whether a salt is soluble in water.
44. Be able to write and balance equations describing several examples of combustion, acid-base, precipitation, and exchange reactions. Write the equation in total molecular, total ionic and net ionic format.
45. Explain the information given by chemical equations.
46. Perform stoichiometric calculations from a given chemical equation
47. Use calculations to show which is the limiting reagent, how much excess reagent is left, and what is the theoretical and percent yield of each product.
48. List the properties of solutions and distinguish true solutions from heterogeneous and colloidal mixtures
49. Define solubility, percent concentration, molarity, mole fraction and molality
50. Explain the factors affecting solubility and the rate of dissolving
51. Write molecular, total ionic and net ionic equations which show that the solution is the reaction medium.
52. Use percent concentration, molarity and molality in stoichiometirc calculations.
53. List the basic principles of the Kinetic Molecular theory of gases.
54. Describe the measurement of pressure using a barometer
55. Use 4 kinds of pressure units in calculations and convert from one to another.
56. Calculate Kelvin temperatures from Centigrade and vice versa.
57. Calculate pressures, volumes and temperatures of gases using Boyle's law, Charles Law, the combines gas law and Dalton's law of partial pressures.

58. Define standard condition of temperature and pressure.
59. Use the ideal gas law to calculate density and molecular weight of a gas.
60. Use the gas law in chemical stoichiometric calculations.
61. Define and distinguish between diffusion and effusion.
62. Define and explain the terms electromagnetic radiation, wavelength, frequency, wave amplitude, spectrum, standing waves, nodes.
63. Describe the Bohr hydrogen atom; describe the hydrogen atom in terms of simple quantum mechanics.
64. Explain the source of atomic line spectra
65. Be able to define and/or explain the terms quantum mechanics, wave mechanics, wave- particle duality, the Heisenberg uncertainty principle.
66. Be able to define and use to predict electronic configurations, the terms wave function orbital's quantum numbers, electron shell, subshell.
67. Write the electronic configuration of the first 50 element's; show the diagrams of their electronic structure, indicting the spin of each electron.
68. Sketch the shapes of s and p orbitals.
69. From electronic configuration predict which atoms are paramagnetic or diamagnetic
70. State the Pauli exclusion principle, Hund's rule and the Aufbau principle
71. Define ionization energy and electron affinity.
72. Use ionization energy trends to predict the stability of electronic configurations and the tendency for outer shell electrons to undergo changes in order to form compound
73. Define electronegativity to estimate the polarity of bonds
74. Show the trends of atomic and ionic sizes on the periodic table.
75. State the octet rule, including exceptions.
76. Write Lewis electron dot structures for simple covalent compounds and polyatomic ions.
77. Use double and triple bonds to show structures of molecules and ions; use resonance to describe equivalent bonds.
78. Use the Valence Shell Electron Pair Repulsion theory to describe structural electron pairs, structural pair geometry, molecular geometry and bond angles.
79. Predict the polarity of bonds and molecules.
80. Define bond order and bond dissociation energy; use bond energies to estimate reaction enthalpies.
81. Calculate the formal charge of an atom in a molecule or ion, and use it to predict which are the most reasonable resonance structures.
82. Explain simple valence bond and molecular orbital theory.
83. Use the concepts of orbital overlap, sigma and pi bonds, hybrid orbital's to explain the strength and or orientation of covalent bonds.
84. Use simple molecular orbital theory to explain the paramagnetism of the oxygen molecule.
85. Use molarity in calculations concerning the dilution of solutions.
86. Explain at least two examples of colligative properties.
87. Calculate the depression of the freezing point and the elevation of the boiling point due to the addition of a nonvolatile molecular solute to a pure solvent.
88. List at least five properties each for acids and bases.
89. Explain the behavior of acids and bases in terms of the Arrhenius and Lowry/ Bronsted theories.

90. Write equations for acids and bases showing conjugate acid/base pairs.
91. List six common strong acids and six common strong bases.
92. Given the conjugate acid, write the formula of the conjugate base and vice versa
93. Write complete equations for at least two examples of each of the following reaction: acids +metal, acid +base, acid +metal oxide, acid + carbonate.
94. Given the formula of a salt, write the formulas of the acid and base which would react to form the salt.
95. Distinguish between electrolytes and non-electrolytes, strong and weak electrolytes. List at least three examples of each
96. Define pH. Given a pH value, state whether the solution is acidic, basic or neutral.
97. Given a pH calculate the H+ concentration and vice versa.
98. Perform simple tasks in the laboratory. Perform 12 experiments as described in the laboratory manual and hand-outs. Calculate the results and answer the questions for each experiment.

Academic Integrity

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