



PimaCommunityCollege

West Campus

**CHM 130 Fundamental Chemistry
Spring 2008 Syllabus
for Textbook by Kenneth W. Raymond**

Course Information:

Course Prefix/Number: **CHM 130**

Course Title: **Fundamental Chemistry**

Credit Hours: **4.0**

Teaching Format: **Lecture**

Instructor Information:

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Web site: **<http://www.chymist.com>**

Instructional Materials:

Text: Raymond, Kenneth W., **General Organic and Biological Chemistry**, Wiley, 2006

Important: You must have access to a computer with Internet connections. Important materials for both reading and problem assignments for class are available at www.chymist.com under the submenu "General Chemistry Survival Manual". This syllabus is also available under the submenus "Pima Chem Courses" and "Chem 130".

Required: A **scientific calculator**. Cell phones are not permitted in place of calculators in class.

CC Bookstore can be accessed and books ordered via the Internet at www.Pima.bkstr.com.

Lecture Outline for Raymond, Kenneth W., *General Organic and Biological Chemistry*, Wiley, 2006

The following outline presents topics and subtopics in the order they will be discussed in class along with reading assignments and problem assignments. The course content does not necessarily follow the book in a chapter by chapter and page by page order. Read chapters before the material is discussed in lecture. Problem assignments list applicable problems at the end of each chapter. Problems can be worked on in advance or after methods of problem solving are demonstrated and explained in class. Answers to odd number problems are located in the back of the textbook.

| Lecture Topics | Reading Assignment | Problem Assignment |
|--|---|---|
| Pre-class Assignment You should be able to solve these problems to succeed in this course. | Math Review (on web site) | Math Review All problems |
| 1. Introduction and History a) Chemistry and its branches b) Scientific method c) Risk vs. benefit d) Discussion: Scientific research and ethics e) The historical background of chemistry f) Matter: classification and properties g) Density h) Temperature: determining hot and cold i) Measurement: body parts to SI j) Dimensional analysis (Factor-label) k) Significant figures l) Scientific notation | Chapter 1 pages 1-20 Metric System (on web site) Temperature (on web site) Problem Solving by Dimensional Analysis (on web site) Significant Figures, Exponents, and Scientific Notation (on web site) | Chapter 1 pages 20-23 1.1-1.9, 1.12-1.28, 1.33-1.35, 1.39-1.46, 1.47-1.54 Temperature all problems Problem Solving by Dimensional Analysis All problems Significant Figures, Exponents, and Scientific Notation All problems |
| 2. Atoms, Molecules and Intro to Nuclear Chemistry a) Development of the Atomic Theory b) Understanding compounds: Laws of definite composition and multiple proportions c) Elements and allotropes d) The periodic table e) Pieces of atoms: Subatomic particles f) X-rays and radioactivity g) Piecing it together: The nuclear atom h) Isotopes and atomic masses i) Avogadro's hypothesis and the Mole j) Nuclear decay and half-life k) Applications of radioactive isotopes l) Radiation and human health m) Electromagnetic radiation n) Into the light: Atomic spectra o) A new look at light: The quantum theory p) The atom takes shape: The Bohr model q) Electron waves r) The uncertainty principle: Does God play dice...? s) The quantum mechanical atom t) Energy levels, and orbitals u) Electron distributions v) The periodicity of electron configurations w) Discussion: Extending the periodic table | Chapter 2 pages 25-48 Element symbols (on web site) Chapter 3 pages 57-62 | Chapter 2 pages 48-51 2.1-2.46, 2.48-2.50 Chapter 3 page 78 3.11-3.17 |

| Lecture Topics | Reading Assignment | Problem Assignment |
|--|--|---|
| <p>3. Chemical Bonding, Molecular Geometry, Compounds, Formulas, Nomenclature and Intro to Organic Compounds</p> <ul style="list-style-type: none"> a) Some periodic properties of elements b) Removing electrons: ionization energy c) Gaining electrons: Electron affinity d) Atomic and ionic size e) Trading electrons: The ionic bond f) Sharing electrons: The covalent bond g) Extra hold: Multiple bonds h) Molecular elements i) Arranging atoms: Lewis structures j) Keeping things together: Bond energies k) Tug-of-war: Bond polarity and electronegativity l) Spreading out: VSEPR Theory m) Polarity of molecules n) Metallic bonding o) Combining atoms: Oxidation numbers p) Putting atoms together: Formulas of ionic compounds q) Naming of compounds r) Formula and molecular masses s) Formulas of molecular compounds: organic molecules t) Alkanes u) Isomers v) Nomenclature of alkanes w) Sources and properties of alkanes x) Petroleum and petroleum products y) Alkenes and alkynes z) Functional group compounds aa) Analyzing compounds: Percent composition bb) Discussion: Determining the composition of materials | <p>Chapter 3 pages 53-57, 63-77</p> <p>Formula writing and Nomenclature (Answers on web site)</p> <p>Chemical Formulas and Formula Weight Calculations (on web site)</p> <p>Chapter 4 pages 83-117</p> | <p>Chapter 3 pages 77-81 3.1-3.10, 3.18-3.58, 3.60-3.63</p> <p>Formula Writing All problems</p> <p>Formula weight All problems</p> <p>Chapter 4 pages 117-123 4.1-4.65, 4.68-4.73</p> |
| <p>4. Solutions and Colloids</p> <ul style="list-style-type: none"> a) Solutions and terminology b) The solution process c) Solubility and temperature d) Water and its role in solutions e) Solubility of gases f) Organic and biochemical molecules g) Percent h) ppt and ppb i) Molarity j) Dilution k) Vapor pressure of solutions l) Colligative properties m) Freezing point depression and boiling point elevation n) Colloids | <p>Chapter 7 pages 193-222</p> | <p>Chapter 7 pages 222-227 7.1-7.25, 7.27-7.70, 7.72, 7.73</p> |

| Lecture Topics | Reading Assignment | Problem Assignment |
|--|---|---|
| 5. Chemical Reactions a) The meaning of a chemical equation b) Atomic bookkeeping: Balancing equations c) Types of chemical reactions d) Oxidation-reduction d) Reactions in solution e) Net ionic equations f) Conserving matter: Mass relationships g) Yield: Theoretical, actual, and percent h) How far can you go: Limiting reagents i) Heat of reaction j) Collision theory and rates of reactions k) Factors affecting rates l) At the molecular level: Reaction mechanisms m) Activation energy | Chapter 6 pages 161-186 Writing Chemical Equations (on web site) | Chapter 6 pages 187-191 6.1-6.24, 6.33-6.46, 6.51, 6.53 Writing Chemical Equations: Balancing equation problems only |
| 6. Gases, Liquids, and Solids a) States of matter compared b) Kinetic theory and change of state c) Pressure d) Pressure-volume relationships: Boyle's Law e) Temperature-volume relationships: Charles' Law f) The Ideal Gas Law: P-T-V relationships g) Avogadro's law h) Stoichiometry in gas reactions i) Mixtures of gases: Dalton's Law j) Moving gases: Graham's Law k) Liquids l) Pulling it in: Surface tension m) Escaping the masses: Evaporation n) Heat of vaporization o) Vapor pressure p) Boiling and freezing points q) Solids r) Crystal structure s) Phase diagrams t) Discussion: Liquid crystals | Chapter 5 pages 125-155 | Chapter 5 pages 156-159 5.1-5.72, 5.78, 5.79 |
| 7. Acids, Bases, and Equilibrium a) Equilibrium b) The equilibrium constant c) Le Châtelier's principle d) General properties of acids and bases e) The Arrhenius theory f) The Bronsted-Lowry theory g) The Lewis theory h) pH and pOH i) Weak and strong acids and bases j) Polyprotic acids and bases k) K_a and K_b l) Hydrolysis m) Acid-base titrations n) Indicators m) Common ion effect n) Buffers | Chapter 9 pages 259-282 | Chapter 9 pages 283-287 7.11-7.33, 7.35-7.39, 7.41, 7.42, 7.51, 7.59 |