Pima Community College
West Campus

CHM 151IN General Chemistry I
Topic Outline

The current textbook for this course is Required Text: Brown, Theodore L., LeMay, H. Eugene, Jr., Bursten, Bruce E., **Chemistry: The Central Science**, 12th Ed., Pearson Education, 2011

This edition contains additional material by David A. Katz which is also available on this web site.

Also used in this course is the **Mastering Chemistry** program which is bundled with the textbook..

This topic outline is intended for students using the textbook: Kotz, John C., Treichel, Paul M., and Townsend, John R., **Chemistry & Chemical Reactivity**, 7th Ed., Thomson-Brooks/Cole, 2009.

This outline is provided as a courtesy to students who may have the Brown and LeMay textbook and do not want to purchase a new textbook. Please note that all topics and problems will be similar to those in the Kotz and Treichel textbook, but there will be differences in topics and material presented in the course.

Lecture Outline

The following outline presents topics and subtopics as followed in class along with reading assignments and problem assignments for Kotz, John C., Treichel, Paul M., and Townsend, John R., **Chemistry & Chemical Reactivity**, 7th Ed., Thomson-Brooks/Cole, 2009.

Problem assignments list the problem sections at the end of each chapter. Applicable problems should be attempted and solved after methods of problem solving are demonstrated and explained in class. Answers to odd number problems are located in the back of the textbook. An optional student solutions manual is available.

Lecture Topics	Reading Assignment	Problem Assignment
Pre-Class Assignments Math Review (You should be able to solve these problems to succeed in this course.) Significant Figures, Exponents, and Scientific Notation	Math Review (on web site) Significant Figures, Exponents, and Scientific Notation (on web site)	Math Review All problems Significant Figures, Exponents, and Scientific Notation All problems
Note: Knowledge of the following information is assumed as a result of the successful completion of the prerequisites for this course **1. Introduction** a) Chemistry and its methods b) Scientific method c) Matter and its properties d) Density e) Elements, compounds, and mixtures f) Element symbols g) Names and formulas of inorganic compounds h) How big is an atom? : Measurement and the SI system i) How hot is hot?: Temperature j) Precision, accuracy, experimental error, and standard deviation k) Dimensional Analysis problem solving	**Reading to review** Chapter 1 pages 1-43 Metric System (on web site) Temperature (on web site) View: Absolute Zero (link to Nova on web site) Element Symbols (on web site) Formula Writing and Nomenclature (on web site) Problem Solving by Dimensional Analysis (on web site)	**Applicable problems to review** Chapter 1 pages 20-23 1-11, 13-37 (odd nos.) Pages, 43-49 1-59 (odd nos.) Temperature All problems Formula Writing and Nomenclature All problems Problem Solving by Dimensional Analysis All problems
2. Atoms, Molecules and Intro to Nuclear Chemistry a) A brief history of Chemistry to 1800 b) John Dalton: The atomic theory and atomic mass c) Discovery and characterization of the electron d) The proton e) Rutherford and the nuclear atom f) The neutron g) Isotopes h) Atomic weights i) Atomic numbers j) History of the periodic classification k) The periodic law l) The modern periodic table m) Radioactivity n) Radioactive decay o) Nuclear stability p) Half-life: Rates of radioactive decay q) Radioisotope dating r) Nuclear transformations	An Illustrated History of Alchemy and Chemistry (on web site: History of Chem) Chapter 2 Pages 50-82 Milestones in the Development of Chemistry and the Modern View of Atoms and Molecules Pages 338-347 Chapter 23 Pages 1060-1090 Pages 338-347 **View:** Forging the Elements (Link to Nova on web site)	Chapter 2 Pages 100-111 1-51 (odd nos.), 85, 87, 91, 115, 129 Chapter 23 pages 1090-1095 7, 9-19 (odd nos.), 29-43 (odd nos.), 53

Lecture Topics	Reading Assignment	Problem Assignment
2. Atoms, Molecules and Intro to Nuclear Chemistry (continued) s) Extending the periodic table t) Biological effects of radiation u) Applications of radioisotopes v) Intro to organic compounds w) Intro to functional group compounds	Prospects for Further Considerable Extension of the Periodic Table (on web site) **View:** Island of Stability (Link to Nova on web site) Web Elements Periodic Table http://www.webelements.com Chapter 10 Pages 442-478 Nomenclature of Organic Compounds (on web site)	Chapter 10 pages 488-495 1-7 (odd nos.), 9 (draw isomers only), 15, 25, 31-35 (odd nos.), 39, 41, 51
3. Chemical Formulas, Moles and Chemical Reactions a) Formula mass/Molar mass b) The Mole and Avogadro's number c) Percent composition d) Empirical and molecular formulas e) Hydrates f) The meaning of a chemical equation g) Balancing equations h) Intro to Chemical Equilibrium i) Types of Reactions j) Acids and bases k) Electrolytes l) Net ionic equations m) Intro to redox reactions n) The activity series	Chapter 2 pages 82-100 Chemical Formulas and Formula Mass Calculations (on web site) Writing Chemical Equations (on web site) Chapter 3 pages 112-152	Chapter 2 pages 100-111 53-83 (odd nos.), 89, 93, 95, 101-113 (odd nos.), 117, 119, 121, 127, 133, 141, 153 Chemical Formulas and Formula Mass Calculations All problems Writing Chemical Equations All problems Chapter 3 pages 152-157 1-69 (odd nos.)
4. Stoichiometry a) Mass relationships in reactions b) Limiting reagents c) Theoretical and percent yields d) Reactions in solution e) Water as a solvent f) Electrolytes g) Solution terminology h) Percent i) Molarity j) Dilution k) pH l) Solution stoichiometry	Chapter 4 Pages 158-195	Chapter 4 Page 195-207 1-73 (odd nos.), 77-113 (odd nos.)

Lecture Topics	Reading Assignment	Problem Assignment
5. Energy and Chemical reactions a) Heat and energy b) Specific heat c) Energy and changes of state d) The first law of thermodynamics e) Energy changes for chemical reactions f) Calorimetry g) Hess's Law h) Standard enthalpy of formation i) Energy change for a reaction	Chapter 5 Pages 208-242 The Chemistry of Fuels and Energy Resources Pages 254-266	Chapter 5 Pages 242-253 3, 6, 7-57 (odd nos.), 67-81 (odd nos.), 85, 89 The Chemistry of Fuels and Energy Resources Pages 266-267 1, 5, 7, 9, 11, 13, 17
6. Electronic Structure of Atoms and the Periodic Table a) Electromagnetic radiation b) Atomic spectra c) The quantum theory d) The photoelectric effect e) The Bohr model f) Electron waves g) The uncertainty principle h) The quantum mechanical atom i) Quantum numbers j) Energy levels and orbitals k) Electron distributions l) Magnetic susceptibility m) Hund's rule n) The periodicity of electron configurations o) Electron configurations and ions p) Atomic Size q) Ionization energy r) Electron affinity s) Ionic radii t) Atomic structure and reactivity	Chapter 6 pages 268-296 Chapter 7 pages 304-331	Chapter 6 pages 297-302 1-17 (odd nos.), 23-35 (odd nos.), 53, 59, 61, 65, 67, 69, 71, 77 Chapter 7 pages 332-337 1-9 (odd nos.), 17-33 (odd nos.), 36-43, 47, 49, 51, 55, 61, 63, 69
7. Chemical Bonding and Molecular Geometry a) Lewis dot symbols of elements b) The ionic bond c) The covalent bond d) Multiple bonds e) The octet rule f) Bond distances and bond strength g) Bond polarity h) Electronegativity i) The metallic bond j) Lewis structures k) Bond energies from Lewis structures l) Molecular shapes m) VSEPR Theory n) Polarity of molecules o) Valence Bond Theory p) Hybrid orbitals q) Intro to Molecular orbital theory	Chapter 8 Pages 348-395 Chapter 9 pages 404-433 The Chemistry of Modern Materials Pages 657-663	Chapter 8 pages 395-403 1-73 (odd nos.), 85 Chapter 9 pages 434-441 1-35 (odd nos.), 39, 41, 45

Lecture Topics	Reading Assignment	Problem Assignment
8. Gases, Liquids, Solids and Intermolecular Forces a) Gases vs. liquids vs. solids b) Pressure c) Boyle's Law d) Charles' Law e) The combined gas law f) The Ideal Gas Law g) Density and Molar mass calculations h) Avogadro's Law: Stoichiometry in gas reactions i) Dalton's Law j) Graham's Law k) The Kinetic-Molecular Theory l) Real gases m) Intermolecular forces n) Surface tension o) Viscosity p) Evaporation q) Heat of vaporization r) Vapor pressure s) Boiling and freezing points t) Crystal structure u) X-ray diffraction v) Types of crystals w) Unit cells x) Phase changes and phase diagrams	Chapter 11 pages 514-545 Chapter 12 Pages 554-581 Chapter 13 Pages 588-610	Chapter 11 pages 546-553 1-51 (odd nos.), 57, 59, 63, 65, 67, 81 Chapter 12 pages 581-587 1-33 (odd nos.), 36, 37-47 (odd nos.) Chapter 13 Pages 610-615 3-11 (odd nos.), 19-25 (odd nos.)