CHEM 1411
General Chemistry I

Western Texas College

I. Basic Course Information
   A. Lecture—Fundamental principles of chemistry for majors in the sciences, health sciences, and engineering; topics include measurements, fundamental properties of matter, states of matter, chemical reactions, chemical stoichiometry, periodicity of elemental properties, atomic structure, chemical bonding, molecular structure, solutions, properties of gases, and an introduction to thermodynamics and descriptive chemistry.
   B. Lab—the required laboratory activities will reinforce the lecture material; introduction of the scientific method, experimental design, data collection and analysis, and preparation of laboratory reports.
   C. Any required prerequisites: C or higher in Math 1314 or equivalent.
   D. Required grade for enrolling in the next course in this sequence: Need a C or higher in CHEM 1411 in order to take CHEM 1412

II. Student Learning Outcomes
   A. Lecture
      1. Define the fundamental properties of matter.
      2. Classify matter, compounds, and chemical reactions.
      3. Determine the basic nuclear and electronic structure of atoms.
      4. Identify trends in chemical and physical properties of the elements using the Periodic Table.
      5. Describe the bonding in and the shape of simple molecules and ions.
      6. Solve stoichiometric problems.
      7. Write chemical formulas.
      8. Write and balance equations.
      9. Use the rules of nomenclature to name chemical compounds.
      10. Define the types and characteristics of chemical reactions.
      11. Use the gas laws and basics of the Kinetic Molecular Theory to solve gas problems.
      12. Determine the role of energy in physical changes and chemical reactions.
      13. Convert units of measure and demonstrate dimensional analysis skills.
   B. Lab
      1. Use basic apparatus and apply experimental methodologies used in the chemistry laboratory.
      2. Demonstrate safe and proper handling of laboratory equipment and chemicals.
      3. Conduct basic laboratory experiments with proper laboratory techniques.
      4. Make careful and accurate experimental observations.

5. Relate physical observations and measurements to theoretical principles.
6. Interpret laboratory results and experimental data, and reach logical conclusions.
7. Record experimental work completely and accurately in laboratory notebooks and communicate experimental results clearly in written reports.
8. Design fundamental experiments involving principles of chemistry.
9. Identify appropriate sources of information for conduction laboratory experiments involving principles of chemistry.

III. Testing Requirements
   A. Campus
      1. The midterm and lecture exam must be proctored by an approved testing organization. (I would use the WTC counseling center)
      2. Students are not allowed to use their book or notes of any kind while taking their proctored tests and exams. A periodic table will be provided.
      3. Students are allowed to use a calculator.
   B. Online
      1. The midterm and final exam must be proctored by an approved testing organization. (Ask your instructor for more details.)
      2. Students are not allowed to use their book or notes of any kind while taking their proctored tests and exams. A periodic table will be provided.
      3. Students are allowed to use a calculator.

IV. Course Requirements
   A. Campus/Online
      1. Lecture: homework assignments; weekly quizzes; midterm and final exam
      2. Lab: lab reports; final exam
      3. Quizzes and exams are timed.

V. Information on Books and Other Course Materials
   A. Required Book: Chemistry: A Molecular Approach, 5th Edition. Tro, Nivaldo J. 2020. Pearson. (ISBN: 9780134874371)
   B. Required Access Code: MasteringChemistry access code is bundled with book.
   C. Required Lab Kit (ONLINE ONLY): General Chemistry 1. Hands- On Learning. (SKU: Kit SP-**3005**-CK-02) (ISBN: 2818560391982) ***Please contact the WTC bookstore to purchase the kit.***
   D. Required Calculators: scientific calculator
   E. Recommended: Quick Study Academic: Chemistry. Jackson, Mark. D. (ISBN: 978-142321859-3)
   F. Recommended: Quick Study Academic: Chemistry Equations & Answers. Jackson, Mark. D. (ISBN: 978-142320189-2)

VI. Grading Breakdown
   A. Campus/Online

Lecture Homework	10%
Lecture Quizzes	5%
Lecture Exams	10%
Lecture Midterm	20%
Lecture Final Exam	25%
Lab Reports	15%
Lab Final Exam	15%

B. A final semester grade will be based as follows:

A = 89.5% and above
B = 79.5 – 89.49
C = 69.5 – 79.49
D = 59.5 – 69.49
F = 59.49% and below
I = Incomplete (failure to complete the requirements of the course)

VII. Other Policies, Procedures and important dates. Please refer to the WTC Catalog for the following:
- B. Campus Calendar
- C. Final exam schedule
- D. How to drop a class
- E. Withdrawal information
- F. Student Conduct/Academic Integrity
- G. Students with disabilities

VIII. Course Content

Chapter 1: Matter, Measurement, and Problem Solving	Atoms and Molecules The Scientific Approach to Knowledge The Classification of Matter Physical and Chemical Changes and Physical and Chemical Prosperities Energy: A Fundamental Part of Physical and Chemical Change The Units of Measurement The Reliability of a Measurement Solving Chemical Problems Analyzing and interpreting Data
Chapter 2: Atoms and Elements	Brownian Motion: Atoms Confirmed Early Ideas About the Building Blocks of Matter Modern Atomic Theory and the Laws that Led to It Discovery of an Electron The Structure of an Atom Subatomic Particles: Protons, Neutrons, and Electrons in the Atoms

	Finding Patterns: The Periodic Law and the Periodic Table Atomic Mass: The Average Mass of an Element's Atoms Molar Mass: Counting Atoms by Weighing Them
Chapter 3: Molecules, and Compounds	Hydrogen, Oxygen, and water Chemical Bonds Representing Compounds: Chemical Formulas and Molecular Models The Atomic-Level View of Elements and Compounds Ionic Compounds: Formulas and Names Molecular Compounds: Formulas and Names Summary of Inorganic Nomenclature Formula Mass and Mole Concept for Compounds Composition of Compounds Determining a Chemical Formula from Experimental Data Organic Compounds
Chapter 4: Chemical Quantities and Chemical Reactions	Climate Change and the Combustion of Fossil Fuels Writing and Balancing Chemical equations Reaction Stoichiometry: How Much Carbon Dioxide Stoichiometric relationships: Limiting Reactant, theoretical Yield, and Percent Yield Three examples of chemical reactions: Combustion, Alkali metals and Halogens
Chapter 5: Introduction to Solutions and Aqueous reactions	Molecular Gastronomy and the Spherified cherry Solution Concentrations Solution Stoichiometry Types of Aqueous Solutions and solubility Precipitation Reactions Representing Aqueous Reactions: Molecular, ionic and net ionic equations Gas-evolution reactions Oxidation-reduction reactions
Chapter 6: Gases	Supersonic Skydiving and the Risk of Decompression Pressure: The Result of Molecular Collisions The Simple Gas Laws: Boyle's Law, Charles's Law, and Avogadro's Law The Ideal Gas Law Applications of the Ideal-Gas Equation: Molar Volume, Density, and Molar Mass of a Gas Mixtures of Gases and Partial Pressures Gases in Chemical Reactions: Stoichiometry Revisited Kinetic Molecular Theory: A Model for Gases Mean Free path, Diffusion, and Effusion of Gasses

	Real Gases: The Effects of Size and Intermolecular Forces
Chapter 8: The Quantum-Mechanical Model of an Atom	Schrodinger's Cat The Nature of Light Atomic Spectroscopy and the Bohr Model The Wave Nature of Matter: The de Broglie Wavelength, the Uncertainty Principle, and Indeterminacy Quantum Mechanics and Atoms The Shapes of Atomic Orbitals
Chapter 9: Periodic Properties of the Elements	Nerve Single Transmission Development of the Periodic Table Electron Configurations: How electrons Occupy Orbitals Electron Configurations, Valance Electrons, and the Periodic Table The Explanatory Power of the Quantum-Mechanical Model Periodic Trends in the Size of Atoms and Effective Nuclear Charge Ions: Electron Configurations, Magnetic Properties, Ionic Radii, and Ionization Energy Electron Affinities and Metallic Character Periodic trend summary
Chapter 10: Chemical Bonding I: The Lewis Model	Bonding Models and AIDS Drugs Types of Chemical Bonds Representing Valence Electrons with Dots Ionic Bonding: Lewis Symbols and Lattice Energies Covalent Bonding: Lewis Structures Electronegativity and Bond Polarity Lewis Structures of Molecular Compounds and Polyatomic Ions Resonance and Formal Charge Exceptions to the Octet Rule: Odd- Electron Species, Incomplete Octets, and Expanded Octets Bond Energies and Bond Lengths Bonding in Metals: The Electron Sea Model
Chapter 11: Chemical Bonding II: Molecular Shapes, Valance Bond Theory, and Molecular Orbital Theory	Morphine: A molecular imposter VESPR Theory: The Five Basic Shapes VESPR Theory: The Effect of Lone Pairs VESPR Theory: Predicting Molecular Geometries Molecular Shape and Polarity Valance Bond Theory: Orbital Overlap as a Chemical Bond Valance Bond Theory: Hybridization of Atomic Orbitals Molecular Orbital Theory: Electron Delocalization

Last Modified: November 15, 2019