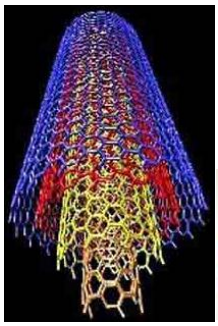

KASKASKIA COLLEGE
CHEMISTRY 111 (Inorganic Chemistry) Course Syllabus

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Text book : Principles of General Chemistry(2nd Edn) by Silberberg
Lboratory: Basic Laboratory Studies in General Chemistry with Semimicro Qualitative Analysis(10th Edn) by Grace R. Hered

(Notes: This is a web-enhanced class. Some activities and assignments must be completed via the Internet as well as traditional classroom instruction)

Course Outline: Chemical problem solving including units and conversion factors with determining the Significant Figures in measurements. Elements, compounds, molecules, atomic structures and chemical bonding with the Lewis-dot structures and shapes of the molecules. Moles and molarity, stoichiometric calculations. Solute-solvent relationships with different types of reactions. Gas laws and Kinetic-Molecular Theory. Thermodynamic laws, thermochemical equations and calculations including Hess's Law. Atomic spectra and quantum theory of light, electronic configurations and the periodic table with the periodic variations, chemical reactivity. Lewis-dot structures, Chemical bonding, hybridizations and shapes of molecules, VSEPR theory, properties of molecules. Molecular Orbital Theory and electron delocalization. Types of intermolecular forces including the phase diagrams. Solid state and crystal structures including the lattice energy calculations. Band theory of metals and Semiconductors and p-n junctions. Electronegativity and polarity relationships including the solution and solubility properties. Isotopes and radioactivity including the nuclear reactions and calculations of binding energy. Introduction of C compounds with their classifications and nomenclatures.

Learning objectives*: Understanding of the electronic configuration of elements based on the atomic structure. To understand and learn how to draw the structure and bonding of chemical compounds based on the electronic configuration. To learn how to do chemical calculations for Analytical chemistry including writing chemical reactions with stoichiometric balancing. To understand*

the solid, liquid, and gaseous state of chemical compounds with thermodynamic and kinetic molecular behavior.

Exams: There will be 4 hour exams and the final Exam (**5** exams total). The Final exam will be **comprehensive**. Need to pass the laboratory part (with 70% score) in order to pass the class.
Lecture Comprehension Quiz: Each lecture should be completed with a quiz. This quiz should be multiple choice.
Weekly Quiz: This quiz will be given on the last class of the week.
Attendance Policy: The students are required to attend every class unless any emergency reason. Proper documents needed to prove the emergency occurrence. 3 regular absences in the whole semester will be accepted. Points will be taken off for each absence (30 points) after 3 regular absences if no proper documentation is submitted for emergency. Students coming to the class 10 minutes (or higher) late or leave the class earlier will be considered as late(**L**) in the grade book and each 3 lates will be equal to 1 full absence(**a**). Also, the student will miss the lecture comprehension quiz for making every absence.
Inside the Class Room policy:

(1) Not talking in the class except class materials
(2) Not sleeping during the class time
(3) Seriously working in the class and in the lab
(4) Regular Note-keeping
(5) No cell phones, CD players, or other listening or recording or cameras are allowed in the class room. The violators might loose points from the total points.
(6) No eating food inside the class
(7) Must bring scientific calculators and books.
(8) The students must be seated separately enough during the quiz or exam period.

Assignments: The assignments will be assigned every week. You cannot copy anybody's homework. You will have to do it by yourself.
COURSE DESCRIPTIONS (INORGANIC(ATOMIC AND MOLECULAR CHEMISTRY)
Chapter 1: Some definitions, states of matter, Importance of energy in Chemistry, The Scientific Approach Density, Physical and Chemical Properties, Units and conversion factors, significant figures, precision, accuracy, and instrument calibration.
Home work: 1.10, 1.14, 1.15, 1.22, 1.25, 1.26, 1.32, 1.44, 1.46(b) and (c), 1.52(a)

Chapter 2: Dalton's Atomic theory. Nuclear atom model. Atomic structure, atomic number, mass number, and atomic symbols. Isotopes and atomic masses. Modern Atomic Theory and the Periodic Table:Ionic and chemical bonding, chemical formula. Cations and anions. Ionic and covalent compounds. Formulas and names of molecules, polyatomic anions and cations
Homework: 2.23, 2.26, 2.32, 2.34, 2.35, 2.64, 2.66, 2.67, 2.72, 2.83

Exam I : Sept 14, Fri

Chapter 3: . Molecular masses and moles, Mole, % calculation, Empirical and Molecular formula**.** Balancing chemical equations, stoichiometric calculations, limiting reagent and percent yield calculations.
Homework: 3.8, 3.10, 3.12, 3.14, 3.16, 3.28, 3.34, 3.38, 3.50, 3.54, 3.58, 3.68, 3.73, 3.78
Chapter 4: Electrolytes, the role of water as a solvent, solubility of ionic compounds and writing ionic reactions, Solution stoichiometry, Types of reactions, precipitation reaction, acids and bases, acid-base reactions and oxidation-reduction reactions, Measurement of acidity and pH. Acid-Base titrations.
Homework: 4.8, 4.12, 4.14, 4.17, 4.25, 4.27, 4.31, 4.52, 4.55, 4.58, 4.62

Exam II: Oct 12, Fri

Chapter 5::Units pressure, temperature, pressure, and volume, Gas laws, Avogadro's laws, ideal gas laws, partial pressures, gas law and reaction stoichiometry, real gas and Vanderwaals equation
Homework: 5.8, 5.16, 5.24, 5.31, 5.36, 5.44, 5.46
Chapter 6: Systems and surroundings, conservation of energy and heat transfer, heat and work, units of energy, internal energy, PV work, enthalpy, heat of reactions, Hess's law.
Homework: 6.3, 6.21, 6.22, 6.23, 6.33, 6.35, 6.44, 6.45, 6.56

Exam III: NOV 2, Fri

Chapters 7: The wave nature and electromagnetic spectrum of light, relationship between wavelength and energy, diffraction of light and particle nature of light, atomic spectra, Bohr model of the hydrogen atom, the energy state of hydrogen atom, wave-particle dualism, Heisenberg's uncertainty principle, quantum-mechanical model, orbital, and shapes of orbitals, quantum numbers. The quantum numbers and electronic configurations. Periodic trends of ionization energy.
Homework: 7.2, 7.6, 7.12, 7.17, 7.24, 7.28, 7.40, 7.44, 7.48
Chapter 8 and 9 and 10 and 11: Chemical bonding, types of bonding, periodic trends of atomic radii and trends in ionization energy, and electron affinity, trends in metallic behavior rule, Lewis-Dot symbols and structures of elements, valence, ionic bonding model, lattice energy and ionic bonding, coordination

bonding and coordination compounds, the covalent bonding model, bond energy and bond length, electronegativity and bond polarity, polar and non-polar molecules, partial ionic character. Octet Rule and Lewis-Dot structures, Delocalization and Resonance structures, Formal charge calculation and the best resonance structure, Valence-Shell electron-pair repulsion (VSEPR) theory, molecular shape and polarity. Valence Bond theory and hybridization of orbitals and shapes of molecules, type of orbital overlap, overlap and molecular rotation, Molecular Orbital (MO) Theory and magnetic behavior (diamagnetism and paramagnetism) and bond order calculations.
Homework: 8.22, 8.26, 8.40, 8.46, 9.28, 9.48, 10.8, 10.11, 10.24, 10.38, 10.40, 10.48, 10.60, 11.8, 11.16, 11.42

EXAM IV: Nov 30, Fri

Chapter 12: Types of intermolecular forces, Ion-dipole forces, Dipole-dipole forces, the hydrogen bonding, polarizability and London forces, Crystalline solids, types of crystals, X-ray crystal structure, Band theory and semiconductors, phase diagrams, triple points. solubility and equilibrium process.
Homework: 12.15, 12.31, 12.36, 12.74, 12.73, 12.75
Chapter 23: Terms and notations, types of emissions, nuclear reactions, half life calculations, applications of nuclear chemistry.
Homework: 23.6, 23.10, 23.22, 23.26
Chapter 22: Bonding, Structures, Names and Classifications of C compounds.

FINAL EXAM: Comprehensive

Laboratory:
Experiment 1: Measurement
Experiment 2: Identifying a substance
Experiment 3: Chemical and Physical Changes
Experiment 4: Separating components of Mixture
Experiment 5: Determining Chemical Formula
Experiment 6: Water of hydration
Experiment 8: Molecular Mass Determination by Vapor Density Method
Experiment 10: Atomic Spectroscopy
Experiment 11: Relative Chemical Activity of some Metals
Experiment 12: Chemical Bonding
Experiment 13: Dimensions of Molecules
Experiment 17: Solutions and Solubility
Experiment 18: The Solutions of Electrolytes
Experiment 20: Chemical Equilibrium
Experiment 24: Acid Base Titrations
Experiment 25: Electrometric Study of Acid-Base Equilibria
Experiment 26: Ionic Equilibria of Weak electrolytes
Experiment 27: Oxidation-Reduction
Experiment 28: Determination of Fe by Permanganate Titration
Experiment 28: Determination of Hardness of water
Experiment 32: Spectrophotometric Analysis

The Learning outcomes of Chem 111:

(1) The students should be able to memorize the scientific method and know how to use them. Memorize and understand the conversion factors of units of measurements including the related experiments.
(2) should be able to understand applications and importance of significant numbers in their experimental calculations
(3) should be able to define matter, element, atom, molecule, and a compound and distinguish between them giving examples.
(4)should be able to distinguish between chemical and physical changes giving

examples.
(5) should be able to describe atomic structures giving examples. Define atomic number and mass number, atomic weight, molecular weight and isotopic abundance for atomic weight calculations.
(6)The students should be able to understand the differences between Bohr's Atomic Theory and Modern Quantum theory bothy qualitatively and quantitatively. They should be able to understand how to use four quantum numbers are related to the energy levels and sublevels or orbitals.
(7)should be able to understand the differences between Aufbau principle, Hund's rule of multiplicity, and Pauli- Exclusion principle and their applications in electronic configurations.
(8)should be able to identify the covalent and ionic compounds with examples and identify and memorize the polyatomic anions and cations.
(9) should be able to understand the periodic properties of elements and discuss the position of elements in the periodic table including the periodicity or periodic variations
(10) should be able to understand the valence shell and how to draw the Lewis-dot structures of atoms, ions, ionic compounds, and covalent compounds.
(11) should be able to understand hybridizations and discuss the variations in the bond angles, geometry, and polarities of the compounds based on the electronegativity differences and symmetry of molecules
(12) The students should be able to understand the concept of mole, and molarity and be able to calculate the number of moles from the number of grams. Calculate the number of molecules from the number of moles and grams(using Avogadro's number), balance the chemical reactions and should be able to perform their stoichiometric calculations.
(13) should be able to how to calculate the % of any element or compound, calculate the number of molecules or ions in a mole of the compound
(14) should be able to differentiate between acids and bases and (both Bronsted-Lowry and Lewis concept) with examples
(15) should be able to differentiate between strong acids and bases and weak acids and bases with examples and their dissociation in aqueous systems
(16))should be able to understand the definition of pH and pH and their relationships and how to calculate the pH and pOH of different solutions containing acids and bases, and equilibrium calculations of weak acids and buffer systems.
(17) should be able to write the balanced chemical reactions involving acids, bases, and salts.
(18) should be to understand the titrations of acids with bases and their calculations in Analytical chemistry.
(19) should be able to understand the mechanism of hydration of polar compounds and non-polar compounds and their differences. Understand the surface tension and viscosity and other properties of liquids.
(20) The students should be able to able to draw the Molecular Orbital Diagram of various covalent compounds and should know how to calculate the Bond Orders of different compounds. They should be able to establish the differences between Oxidizing and Reducing Agents and how to calculate the Oxidation States or Oxidation numbers.
(21) should be able to understand the nuclear reactions, nuclear isotopes, their applications and half-life calculations

(22) should be able to understand and memorize the uints of temperature, pressure, and volume.
(23) should be able to understand the ideal gas laws including the Boyle's law, Charles's law, and the combined gas law. How to calculate the pressure, volume, temperature from the gas laws.
(24) The students should be able to understand and identify the different types of crystal structures and different types of packing and how to determine the number of atoms per unit cells.
(25) Should be able to understand the phase diagram for water and be able to identify the physical state of a substance at various temp and pressures.

Grading policy:

Homework	**100**
Quizzes	**100**
Laboratory	**100**
Exams	**700**
TOTAL	1000

Scores	Letter grade
900-1000	A
800-899	B
700-799	C
600-699	D
<600	F

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HAPPY STUDYING: Never get Tired of learning

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