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Text book :Foundations of General, Organic, and Biochemistry(1<sup>st</sup> Edn) By  
Denniston and Topping

**CHEM 103 COURSE SYLLABUS**

**KASKASKIA COLLEGE**

NAME \_\_\_\_\_

TERM \_\_\_\_\_

YEAR \_\_\_\_\_



*HAPPY STUDYING: Never get  
Tired of learning*



**Learning Objectives:** Getting familiar with the elements and the periodic table. Understanding the electronic configurations of elements based on the atomic structure. To understand the organization of elements in the periodic table. To understand chemical bonding and structure with various molecular properties, writing chemical compounds and chemical equations and chemical equilibria. Learning how to balance chemical reactions with stoichiometric calculations. Also, to understand about the units and scientific measurements. To learn intermolecular interactions and solid, liquid, and gaseous state behavior of chemical compounds. To understand the ionization of chemical compounds, nature of acids and bases with pH calculations. Getting into the laboratory techniques in chemistry with understanding hypothesis and experimental design. Understanding nuclear reactions with the nature and application of radioactivity. Getting familiar with the chemistry at Carbon (organic chemistry). Be able to know some practical applications of chemistry in various ways.

**Exams:** There will be 4 hour exams and the final Exam( 5 exams total). The Final exam will be **comprehensive. Everybody needs to pass the lab part separately by earning 70% in the lab points..**

**Weekly Quiz:** Look at the schedule of the quizzes on your blackboard (Assessment section). Submit the work in the class in due date. Lecture comprehension quiz should also be given after any lecture is completed.

**Attendance Policy:** The students are required to attend every class unless any emergency reason. Proper documents needed to prove the emergency occurrence. Only one regular absence(**a**) with no emergency in the whole semester will be accepted. Points will be taken off for each absence (30 points) after one regular absence 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 2 lates will be equal to 1 full absence(**a**).

**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.

## **COURSE DESCRIPTION**

**Chapter 1: Chemistry: Methods and Measurement:** Discovery process, Chemical physical properties, hypothesis, major areas of units of measurements, significant numbers, volumes, density and specific gravity.

Homework: 1:45, 1.46, 1.47, 1.48, 1.49. 1.50, 1.54, 1.56, 1.60, 1.70(a,b,c), 1.72(a,b, and c), 1.74(a and b), 1.76(a,b and c) and 1.86

**Chapter 2: The Structure of Atom and the Periodic Table.** Subatomic particles, Dalton's theory, The relationships between light and atomic structure, the Bohr atomic

model, Modern atomic theory, orbital and electron density, atomic number, mass number, isotopes, atomic mass unit. Getting familiar with the periodic table and periodic trend or variation of periodic properties (atomic radii or size and ionization energy), classification of elements. quantum numbers, electronic configuration, Pauli exclusion principles, Aufbau principles, Hund's rule of multiplicity, the octet rule.

Homework: 2.34, 2.35, 2.36, 2.56, 2.68, 2.69, 2.74, 2.78, 2.80

**Chapter 3 : Structure and Properties of the Ionic and Covalent Compounds:** Valence electrons, electron dot structures, resonance structures, ionic and covalent compounds, cations and anions, naming and writing formulas, polyatomic anions and cations, hybridization, geometry, bond polarity and electronegativity, and bond angles and their variations (Valence Shell Electron Repulsion Theory(VSEPR), blood pressure and  $\text{Na}^+/\text{K}^+$ .

Homework: 3.28, 3.32, 3.38, 3.42, 3.46, 3.52, 3.64, 3.66, 3.73

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## **EXAM 1: Sept 13(Thurs)**

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**Chapter 4:Calculations and the Chemical Equation:** Mole, molarity, chemical calculations, stoichiometric calculations(calculations using chemical equations), theoretical and percent yield, writing balanced equations.

Homework:4.36, 4.40, 4.46, 4.54, 4.68, 4.72, 4.76, 4.78, 4.82, 4.84

**Chapter 5:Energy, Rate, and Equilibrium:** Thermochemical reactions, enthalpy, entropy and free energy, chemical equilibrium, potential energy diagrams, factors affecting chemical equilibrium.

Homework:5.40, 5.66, 5.69, 5.70, 5.72

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## **EXAM 2: Oct 11 (Thurs)**

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**Chapter 6:States of Matter: Molecules in motion:**Gas laws, Vapor pressure of a liquid, Molecular interactions in liquids and solids, boiling point, vaporization.

Homework: 6.44, 6.48, 6.52, 6.54, 6.60, 6.64, 6.68

**Chapter 7: Reactions and Solutions:** Writing Chemical Reactions, Types of chemical reactions, different types of solutions, Hydrogen bonding and water, boiling point, vaporization, evaporation, solvation, % calculation, molarity and calculations, electrolytes in body fluids.

Homework: 7.30, 7.32, 7.36, 7.40, 7.44, 7.48, 7.50

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## **EXAM III: Nov 1(Thurs)**

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**Chapter 8: Acids, Bases, Salts, and Buffers:** Acids and bases, ionization, and neutralization, strong and weak acids and bases, pH calculations and equilibrium constant. Buffers, normality calculations, oxidation-reduction reactions and electrochemical cells.

Homework: 8.30, 8.32, 8.36, 8.42, 8.46, 8.50, 8.54, 8.56, 8.59

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**Chapter 9: The Nucleus, Radioactivity, and Nuclear Medicine:** Natural radioactivity, writing nuclear reactions, properties and uses of radioisotopes  
Homework: 9.28, 9.32, 9.36, 9.48, 9.49, 9.67, 9.70

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## EXAM IV: Nov 29 (Thurs)

**Chapter 10: An Introduction of Organic Chemistry**  
**The Chemistry of Carbon:** Differences between organic and inorganic compounds, families of organic compounds, alkanes, alkenes, and alkynes, nomenclature of organic compounds, functional groups and their properties, aromatic compounds, introduction to biological molecules and their role. Homework: will be assigned later.

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## FINAL EXAM(Comprehensive)

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### Laboratory Experiments in CHEM 103 (Laboratory:Location:ST-120)

- Experiment 0: Safety procedures and rules in the laboratory
- Experiment 1: Measurement and density
- Experiment 2: Preparing graphs
- Experiment 3: Identification of an unknown liquid
- Experiment 4: Elements, compounds and mixtures
- Experiment 5: Separation using chromatographic techniques
- Experiment 6: Simple chemical reactions
- Review A: Chemical Arithmetic(Formulas)
- Experiment 7: Hydrates and determination of formula
- Experiment 8: Copper oxide and the determination of its formula
- Review B: Chemical Arithmetic(Equations)
- Experiment 9: Analysis of  $\text{KClO}_3$ .KCl mixture
- Experiment 11: Lewis-dot structures and Molecular models
- Experiment 13: The Preparation and properties of oxygen and oxides
- Experiment 14: The Boyle's law and the Charles's law
- Experiment 15: The Gravimetric Analysis of a soluble sulfate
- Review C: Chemical Arithmetic-Molarity
- Experiment 16: Acid-Base Titrations

### THE LEARNING OUTCOMES OF CHEM 103

The students should be able to

- (1) understand the scientific methods and show how experiments are related to these methods. They should be to memorize and understand the conversion factors of units of measurements including their uses in the related experiments
- (2) should be able to understand the applications and importance of significant numbers.
- (3) should be able to define matter, element, atom, molecule, and a compound and distinguish between them giving examples.
- (4) to distinguish between chemical and physical changes giving examples.
- (5) to describe atomic structures giving examples. They should be able to define atomic number and mass number and how are they indicated in the symbols.
- (6) should be able to understand and memorize four quantum numbers and how they are related to the energy levels and sublevels or orbitals.

- (7) should be able to understand and memorize Aufbau principle, Hund's rule of multiplicity, and Pauli- Exclusion principle and their use in the Electronic configurations.
- (8) should be able to distinguish between orbitals and orbitals. Discuss the electronic configuration of the first 30 elements in the periodic table.
- (9) should be able to identify the covalent and ionic bonds with examples. Identify and memorize the polyatomic anions and cations.
- (10) 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.
- (11) should be able to draw the Lewis-dot structures of atoms, ions and ionic and covalent compounds.
- (12) able to understand hybridizations of orbitals and identify the variations in the bond angles, geometry, and polarities of the compounds.
- (13) should be able to understand the concept of mole, and molarity. 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)
- (14) should be able to balance the chemical reactions and show their stoichiometric calculations.
- (15) should learn how to calculate the % of any element or compound
- (16) should learn to calculate the number of molecules or ions in a mole of the compound
- (17) should be able to differentiate between acids and bases and (both Bronsted-Lowry and Lewis concept) with examples.
- (18) should be able to differentiate between strong acids and bases and weak acids and bases with examples and their dissociation in aqueous systems.
- (19) should be able to understand the definition of pH and pOH and their relationships and how to calculate the pH and pOH of different solutions containing acids and bases.
- (20) should learn how to write the balanced chemical reactions involving acids and bases.
- (21) should be able to understand the titrations of acids with bases and their importance in Analytical Chemistry.
- (22) should be able to understand the mechanism of hydration of polar and non-polar compounds and their differences. Should be able to understand the surface tension and viscosity and other properties of liquids.
- (23) should understand the nuclear reactions, nuclear isotopes, their applications and half-life calculations
- (24) should be able to identify the bonding and structure of organic compounds, their nomenclature and some important reactions
- (25) should understand and memorize the units of temperature, pressure, and volume.
- (26) should understand the ideal gas laws including the Boyle's law, Charles's law, the combined gas law, and the ideal gas laws and should be able to calculate the pressure, volume, temperature from the gas laws.
- (27) should be able to understand the differences between physical and chemical changes in the laboratory.

(28) should be able to identify qualitatively the presence of cations and anions by some reactions with positive observations.

(29) should understand the distillation process and should be able to perform experiments showing the distillation of some liquids.

(30) should understand the hypothesis, experimental design, results and conclusion in chemical studies.

### Grading policy:

Laboratory	150
Quizzes & homework	150
Exams	700
<b>(EXAM 1 150 points</b>	
<b>EXAM 2 100</b>	
<b>EXAM 3 100</b>	
<b>EXAM 4 150</b>	
<b>FINAL 200)</b>	

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TOTAL

1000

### Scores

900-1000

800-899

700-799

600-699

<600

### Letter grade

A

B

C

D

F

