CHM 102
CONCEPTS IN CHEMISTRY
3 Credit Hours

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CHM102 Concepts in Chemistry

I. CATALOGUE DESCRIPTION

A. Course prerequisites/co-requisites: none

B. 3 semester credit hours

C. Description: This course explores the fundamental concepts of chemistry and chemical bases for everyday events. Included are discussions of the scientific method and measurement, the laws of conservation, chemical bonding, chemical reactions, stoichiometry and how chemistry can be used to understand processes encountered in everyday life and the environment. Prerequisite: Compass score of at least 42 or concurrent enrollment in MTH 002, Basic Algebra. Note, this class does not fulfill the prerequisite requirements for CHM 111 or the nursing and the veterinarian technology program. It is not recommended for those pursuing a career in one of the science or technology fields. Successful completion of this course will fulfill in part the science general education requirement for the Associate of Arts degree at Jefferson College (F, S, Su)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

<table>
<thead>
<tr>
<th>Expected Learning Outcomes</th>
<th>Assessment Measures</th>
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<tbody>
<tr>
<td>Trace the evolution of our modern understanding of atomic structure from Democritus to a rudimentary quantum mechanical description of atomic orbitals</td>
<td>Examinations, homework, quizzes, and class discussions</td>
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<tr>
<td>Given a data set to express and interpret its meaning graphically</td>
<td>Examinations, homework and quizzes</td>
</tr>
<tr>
<td>Given a set of measured data to perform calculations of derived units, including but not limited to volume, density and moles, reporting the answer to the correct number of significant figures</td>
<td>Examinations, homework and quizzes</td>
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<tr>
<td>Given a chemical formula describe the nature of its chemical bonding</td>
<td>Examinations, homework and quizzes</td>
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<tr>
<td>Describe the different intermolecular forces and the roles they play in determining the phase of matter of a substance</td>
<td>Examinations, homework and quizzes</td>
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<td>To discriminate between the different sub disciplines of Chemistry by giving examples</td>
<td>Examinations, homework, quizzes, and class discussions</td>
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<tr>
<td>Recognize the different forms of energy and their inter-conversions</td>
<td>Examinations, homework and quizzes</td>
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<tr>
<td>To delineate and apply the scientific</td>
<td>Examinations, homework and quizzes</td>
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method

Given an example from everyday life, to recognize and discuss the operational significance of chemistry

Examinations, homework, quizzes, and class discussions

III. COURSE OUTLINE WITH UNIT OBJECTIVES

A. Introduction to chemistry
   1. History of chemistry
   2. The scientific method
   3. Classification of matter
   4. Properties of matter
   5. Conservation laws
   6. Dalton’s atomic theory
   7. Rutherford’s theory
   8. Nuclear theory

B. Scientific measurement
   1. Measurement
   2. Scientific notation
   3. SI standard units
   4. SI prefixes
   5. Reading graphs
   6. Algebraic manipulation
   7. Density
   8. Chemical problem solving

C. Atoms
   1. Atomic composition
   2. Atomic symbols
   3. Mass number
   4. Isotopes
   5. Atomic mass
   6. Periodic table and the periodic law
   7. Electron configurations
   8. Valence electrons
   9. 20th century atomic theory
      a. Bohr model
      b. Quantum mechanical model
   10. Family of elements
   11. Element types
   12. The mole
   13. Molar mass
   14. Avogadro’s number

D. Molecules and compounds
1. Chemical formulas
   a. Ionic
   b. Molecular
2. Nomenclature
3. Chemical reactions
4. Balancing chemical equations
5. Stoichiometry

E. Chemical bonding and molecular representations
1. Ionic bonding
2. Covalent bonding
3. Lewis structures
4. Molecular geometry
5. Polarity

F. Organic chemistry
1. Vitalism
2. Hydrocarbons
3. Alkanes
4. Alkenes
5. Alkynes
6. Nomenclature of hydrocarbons
7. Isomers
8. Functional groups
9. Simple nomenclature

G. Light
1. The basis for color
2. Electromagnetic spectrum
3. Wavelength, frequency, and energy relationship
4. Absorption and transmission.
5. Applications of light
   a. Magnetic resonance imaging
   b. Lasers
   c. Medicinal uses

H. Nuclear chemistry
1. History of radioactivity
2. Nuclear equations
3. Types of radiation
   a. Alpha emission
   b. Beta emission
   c. Gamma emission
4. Half-life and a radioactive decay
5. Nuclear fission and fusion
6. Units of radiation
7. Roles of radioactive decay in dating and medicine

I. Energy
1. Types of energy
2. Law of conservation of energy
3. First and second laws of thermodynamics
4. Concepts and differences of heat and temperature
5. Exothermic and endothermic reactions
6. Energy and the environment
7. Renewable energy sources
   a. Solar
   b. Hydroelectric
   c. Wind
   d. Geothermal

J. Gases and the atmosphere
1. Properties of gases
   a. Molecular view
   b. Relationships between P,V,T (pressure, volume, temperature)
2. The atmosphere
   a. Composition
   b. Air pollution
   c. Ozone depletion

K. Liquids and solids
1. Intermolecular forces
   a. Dispersion forces
   b. Dipole-dipole
   c. Hydrogen bonding
2. Melting and boiling points
3. Physical and chemical properties of water
4. Solutions
   a. Solute
   b. Solvent
5. Concentration measurements
   a. Molarity
   b. Percent volume
   c. Parts per million and parts per billion
6. Purification of water

L. Acids and bases
1. Types of acids and bases
   a. Arrhenius
   b. Bronsted-Lowry
2. Balancing acid and base reactions
3. pH scale
4. Examples of acids and bases in nature
5. Acid rain

M. Oxidation and reduction
1. Definitions of oxidation and reduction
2. Reducing and oxidizing agents
3. Electrochemical cells
   a. Cathode
   b. Anode
4. Fuel cells
5. Corrosion
6. Free radicals and your health

N. Chemistry of household products
1. Surfactants
2. Soaps and detergents
3. Drain cleaners
4. Shampoos
5. Sun block
6. Perfumes
7. Types of polymers
   a. Copolymers
   b. Condensation polymers
   c. Rubber

O. Biochemistry and biotechnology
1. Lipids
2. Carbohydrates
   a. Sugars
   b. Starches
3. Amino acids
4. Proteins
   a. Primary, secondary, tertiary, and quaternary structure
5. DNA
6. RNA
6. Nucleotides
7. Recombinant DNA
   a. Medicinal uses

IV. METHOD OF INSTRUCTION

A. Lecture
B. Group discussion
C. Textbook reading
D. Videos

V. REQUIRED TEXTBOOK(S)


VI. REQUIRED MATERIALS

A. Textbook
B. Notebook paper
C. Pens/pencils
D. Scientific calculator

VII. SUPPLEMENTAL REFERENCES

None

VIII. METHOD OF EVALUATION

A. Exams
B. Quizzes
C. Homework
D. Final

E. Grading Scale
   90-100% = A
   80-89% = B
   70-79% = C
   60-69% = D
   Below 60% = F

IX. ADA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Library; phone 636-481-3169)

X. ACADEMIC HONESTY STATEMENT
Students who are caught cheating or plagiarizing material in this course will not receive credit for the assignment in question and may be dropped from the course with a failing grade. A detailed description of the Academic Honesty Policy statement can be found in the Jefferson College Student Handbook or online at: http://www.jeffco.edu/jeffco/index.php?option=com_weblinks&catid=26&Itemid=84

XI. ATTENDANCE STATEMENT

Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.