Virginia Western Community College
CHM 5
Developmental Chemistry for Health Sciences

Prerequisites

Satisfies MTE 1-3 or MDE 10; and a placement recommendation for ENG 111, co- enrollment in EDE 11/ENG 111, or successful completion of all developmental English requirements.

Course Description

Introduces basic principles of inorganic, organic, and biological chemistry. Emphasizes applications to the health sciences. Can be used as a preparatory course for CHM 111 – CHM 112.

Semester Credits: 4 **Lecture Hours: 3** **Laboratory Hours: 2**

Required Materials

Textbook:

Chemistry: An Introduction to General, Organic, & Biological Chemistry. Timberlake. 14th edition. Pearson Custom Publishing. ISBN: 9780138201869

Lab Manual: Catalyst Custom Version for VWCC. Timberlake. 1st edition. Pearson Custom Publishing. ISBN: 9780137265190

Course Outcomes

At the completion of this course, the student should be able to:

- Understand the basic tenets of the modern atomic-molecular theory.
- Perform basic laboratory techniques safely and accurately.
- Appreciate the relationship between chemistry and aspects of health.
- Perform calculations and metric conversions using correct significant figures and scientific notation.
- Balance chemical reactions and calculate stoichiometric relationships.
- Use the periodic chart to predict binary compound formulas, bonding, names and properties.
- Provide a foundation for Chemistry 111.

Topical Description

Chapter 1: Chemistry in Our Lives

- 1.1 Chemistry and Chemicals
- 1.2 Scientific Method: Thinking Like a Scientist
- 1.3 Studying and Learning Chemistry
- 1.4 Key Math Skills for Chemistry

- 1.5 Writing Numbers in Scientific Notation

Chapter 2: Chemistry and Measurements

- 2.1 Units of Measurement
- 2.2 Measured Numbers and Significant Figures
- 2.3 Significant Figures in Calculations
- 2.4 Prefixes and Equalities
- 2.5 Writing Conversion Factors
- 2.6 Problem Solving Using Unit Conversion
- 2.7 Density

Chapter 3: Matter and Energy

- 3.1 Classification of Matter
- 3.2 States and Properties of Matter
- 3.3 Temperature
- 3.4 Energy
- 3.5 Specific Heat
- 3.6 Energy and Nutrition
- 3.7 Changes of State

Chapter 4: Atoms and Elements

- 4.1 Elements and Symbols
- 4.2 The Periodic Table
- 4.3 The Atom
- 4.4 Atomic Number and Mass Number
- 4.5 Isotopes and Atomic Mass
- 4.6 Electron Energy Levels
- 4.7 Trends in Periodic Properties

Chapter 5: Nuclear Chemistry

- 5.1 Natural Radioactivity
- 5.2 Nuclear Reactions
- 5.3 Radiation Measurement (optional)
- 5.4 Half-life of a Radioisotope
- 5.5 Medical Applications Using Radioactivity (optional)
- 5.6 Nuclear Fission and Fusion

Chapter 6: Ionic and Molecular Compounds

- 6.1 Ions: Transfer of Electrons
- 6.2 Ionic Compounds
- 6.3 Naming and Writing Ionic Formulas
- 6.4 Polyatomic Ions
- 6.5 Molecular Compounds: Sharing Electrons
- 6.6 Lewis Structures for Molecules
- 6.7 Electronegativity and Bond Polarity
- 6.8 Shapes of Molecules
- 6.9 Polarity of Molecules and Intermolecular Forces

Chapter 7: Chemical Quantities and Reactions

- 7.1 The Mole
- 7.2 Molar Mass
- 7.3 Calculations Using Molar Mass
- 7.4 Equations for Chemical Reactions
- 7.5 Types of Chemical Reactions
- 7.6 Oxidation-Reduction Reactions
- 7.7 Mole Relationships in Chemical Equations
- 7.8 Mass Calculations for Chemical Reactions
- 7.9 Energy in Chemical Reactions

Chapter 8: Gases

- 8.1 Properties of Gases
- 8.2 Pressure and Volume (Boyle's Law)
- 8.3 Temperature and Volume (Charles' Law)
- 8.4 Temperature and Pressure (Gay-Lussac's Law)
- 8.5 The Combined Gas Law
- 8.6 Volume and Moles (Avogadro's Law)
- 8.7 Partial Pressures (Dalton's Law)
- Ideal Gas Law (not in book)

Chapter 9: Solutions

- 9.1 Solutions
- 9.2 Electrolytes and Nonelectrolytes
- 9.3 Solubility
- 9.4 Solution Concentrations
- 9.5 Dilution of Solutions
- 9.6 Properties of Solutions

Chapter 10: Acids and Bases and Equilibrium

- 10.1 Acids and Bases
- 10.2 Brønsted-Lowry Acids and Bases
- 10.3 Strengths of Acids and Bases
- 10.4 Acid-Base Equilibrium
- 10.5 Dissociation of Water
- 10.6 The pH Scale
- 10.7 Reactions of Acids and Bases
- 10.8 Buffers

Chapter 11: Introduction to Organic Chemistry: Hydrocarbons

- 11.1 Organic Compounds
- 11.2 Alkanes
- 11.3 Alkanes with Substituents
- 11.4 Property of Alkanes

- 11.5 Alkenes and Alkynes (optional)
- 11.6 Cis-Trans Isomers (optional)
- 11.7 Addition Reactions for Alkenes (optional)
- 11.8 Aromatic Compounds (optional)
- Functional Groups (not in book)

Laboratory Topics

Experiment Number/Week	Experiment Title	Page
1	Check-in and Safety Rules	
2	Chemistry and Measurement	15
3	Conversion Factors and Prob Solving	25
4	Density and Specific Gravity	37
5	Energy and Matter	49
6	Atoms and Elements	63
7	Compounds and Their Bonds	75
8	Chemical Reactions and Equations	89
9	Moles and Chemical Formulas	101
10	Ideal Gas Law	Handout
11	Solutions, Electrolytes and Concentration	113
12	Properties of Solutions	125
13	Acids, Bases, pH, and Buffers	135
14	Acid-Base Titration (optional)	147
15	Properties of Organic Compounds	157

Notes to Instructors

1. Please note that a two-hour time slot is allotted to the laboratory and the student should be aware that this time will be fully utilized. The laboratory time is used not only for experimentation, but may also be used for demonstrations, movies, and problem solving. Whenever time permits, homework problems will be worked out in the beginning of the laboratory and the student is expected to participate.

2. Attendance in the laboratory is mandatory at the scheduled time. In case of an unavoidable situation, the student should contact the instructor beforehand to be excused and to see if any arrangements can be made to make up the laboratory. It may or may not be possible. Approved safety glasses must be worn in the laboratory ***over the eyes*** as required by state law.

3. Laboratory reports are due at the beginning of the next lab period. The report consists of the data report sheets included in the lab manual or handout. To aid not only the instructor but also especially the students, reports will not be accepted two weeks after the lab was assigned (or per instructor's syllabus). Completion of the lab experiment followed by turning in the data and calculations on the due date with appropriate write-up insures a good grade. Grading scales for laboratory reports are at the professor's discretion but will count towards the overall grade for the course.

ADA Statement

https://www.virginiawestern.edu/wp-content/uploads/2024/12/Syllabus-Statement_ADA.pdf

Title IX Statement

https://www.virginiawestern.edu/wp-content/uploads/2024/12/Syllabus-Statement_Title-IX-2025.pdf