



Credit- Degree applicable
Effective Quarter: Fall 2017

I. Catalog Information

CHEM 30A Introduction to General, Organic and Biochemistry I 5 Unit(s)

(See general education pages for the requirement this course meets.)

Prerequisite: MATH 114 or equivalent.

Advisory: EWRT 211 and READ 211 (or LART 211), or ESL 272 and 273.

Four hours lecture, three hours laboratory (84 hours total per quarter).

This is a two-part class to be taken in sequence by students entering allied health fields. The focus of the first part of this class is an introduction to general chemistry. This course begins with a discussion of various measurement tools. This will be followed with a discussion of energy and matter which will be followed by a discussion of the discovery of an atom. The next set of topics will cover an introduction to elements, compounds, and types of bonding in compounds followed by various types of chemical reactions and stoichiometric calculations based on chemical equations. Properties of gases and solutions will be discussed. The course concludes with a discussion of acid-base chemistry and nuclear chemistry.

Student Learning Outcome Statements (SLO)

Solve stoichiometric problems by applying appropriate molar relationships.

Identify the differences between elements and compounds and describe the chemical bonding in compounds- ionics vs. covalent.

II. Course Objectives

- A.** Solve chemistry problems using significant figures, dimensional analysis, and scientific notation.
- B.** Examine the relationships between energy and matter
- C.** Compare atoms and elements and summarize major properties of elements based on a discussion of the periodic table of elements
- D.** Categorize compounds based on their chemical bonding and identify the names of chemical compounds from their formulas and vice versa.
- E.** Calculate amounts of reactants and products based on stoichiometric relationships in chemical equations

- F. Examine the properties of gases and laws pertaining to gases
- G. Examine properties of solutions
- H. Compare the properties of acids and bases
- I. Inspect the concepts of nuclear radiation

III. Essential Student Materials

Chemistry department approved safety goggles

IV. Essential College Facilities

Classrooms with charts of "Periodic table of elements".

V. Expanded Description: Content and Form

- A. Solve chemistry problems using significant figures, dimensional analysis, and scientific notation.
 - 1. Units of measurement
 - 2. Measured numbers and significant figures
 - 3. Significant figures in calculations.
 - 4. Scientific notation
 - 5. Prefixes and equalities
 - 6. Writing conversion factors
 - 7. Density calculations
 - 8. Discuss contributions of scientists in the field
 - 9. Provide historical context for scientific theories discussed
- B. Examine the relationships between energy and matter
 - 1. Energy and nutrition
 - 2. Temperature conversions: Celsius to Kelvin
 - 3. Specific heat
 - 4. States of matter
 - 5. Changes of state
- C. Compare atoms and elements and summarize major properties of elements based on a discussion of the periodic table of elements
 - 1. Classification of matter
 - 2. Elements and symbols
 - 3. The periodic table
 - 4. Atomic number and mass number
 - 5. Isotopes and atomic mass

6. Electron energy levels: s, p d, f
 7. Periodic trends
- D.** Categorize compounds based on their chemical bonding and identify the names of chemical compounds from their formulas and vice versa.
1. Octet rule and ions
 2. Ionic compounds
 3. Naming and writing ionic formulas
 4. Polyatomic ions
 5. Covalent compounds
 6. Electronegativity and bond polarity
 7. Shapes and polarity of molecules
 8. Attractive forces in compounds
- E.** Calculate amounts of reactants and products based on stoichiometric relationships in chemical equations
1. Definition of a mole
 2. Molar mass
 3. Chemical and physical changes
 4. Chemical equations
 5. Types of reactions
 6. Oxidation-reduction reactions
 7. Mole relationships in chemical equations
 8. Mass calculations for chemical reactions
 9. Energy in chemical reactions: Joules vs. calories, exothermic vs. endothermic
- F.** Examine the properties of gases and laws pertaining to gases
1. Gas pressure: pascals
 2. Boyle's law
 3. Charles's law
 4. Gay-Lussac's law
 5. Combined gas law
 6. Avogadro's law
 7. Dalton's law
- G.** Examine properties of solutions
1. Electrolytes and non-electrolytes
 2. Solubility

3. Percent concentration
4. Molarity and dilution
5. Solutions in chemical reactions
6. Definitions of colloids and suspensions
7. Definitions of osmosis and osmotic pressure
8. Isotonic, hypertonic, and hypotonic solutions

H. Compare the properties of acids and bases

1. Definitions of acids and bases
2. Strengths of acids and bases
3. Ionization of water- value of K_w , concentrations of hydronium and hydroxide ions.
4. The pH scale
5. Reactions of acids and bases
6. Definition of a buffer

I. Inspect the concepts of nuclear radiation

1. Natural radioactivity
2. Nuclear reactions
3. Radiation measurements
4. Half-life of a radioisotope
5. Medical applications of radioactivity
6. Nuclear fission and fusion

VI. Assignments

A. Reading

1. Required readings from the textbook in preparation for the scheduled lecture. This may include entire chapters or sections from the chapters covering topics included in this outline.
2. Required readings from the laboratory manual as a preparation for the scheduled experiment in order to provide students with familiarity about the specific laboratory protocols and related safety precautions necessary for successful completion of the experiment.

B. Writing

1. Homework assignments based on classroom discussion/lecture may include answering questions from end-of-chapter exercises or other sources as deemed appropriate by the instructor.
2. Periodic quizzes and mid-term examinations based on material discussed in lectures and/or reading assignments
3. Paper on scientists and/or appropriate chemical literature

C. Laboratory assignments

- C. Pre-lab exercise:** The pre-lab assignment for the scheduled laboratory experiment to be completed when beginning a new experiment. This assignment may be identical to that provided in the laboratory manual or substituted with other appropriate assignments determined by the instructor.
- 2. Report-sheet:** Data obtained in laboratory exercises are to be entered in the assigned laboratory manual or a laboratory notebook. Necessary calculations required to obtain the final results from the experiment must be completed in the manual or the notebook as to be determined by the instructor.

VII. Methods of Instruction

Lecture and visual aids
Discussion of assigned reading
Discussion and problem solving performed in class
Quiz and examination review performed in class
Laboratory experience which involve students in formal exercises of data collection and analysis
Laboratory discussion sessions and quizzes that evaluate the proceedings weekly laboratory exercises

VIII. Methods of Evaluating Objectives

- A.** Homework assignments based on end-of-chapter problems from the primary text will be evaluated for completion to test comprehension of lectures.
- B.** Periodic quizzes will be used to test the comprehension of topics covered during the lecture and will be evaluated for accuracy of responses.
- C.** A minimum of three mid-term examinations will be used to evaluate the ability of students to a) solve problems, b) outline various concepts covered in the lecture, and c) demonstrate an understanding of reading assignments. These will be evaluated for accuracy to assess student progress in achieving various learning outcomes.
- C.** A comprehensive final examination in any chosen format (multiple choice questions or free response) will be based on all the course material covered during the entire quarter and evaluated for accuracy of responses.
- D.** Pre-lab assignments will be evaluated for completeness and level of preparedness required for safe and timely execution of laboratory protocols and experiments.
- E.** Report sheets and/or laboratory reports will be evaluated for successful completion of laboratory experiments as well as accuracy of data analysis and interpretation.
- F.** A comprehensive laboratory examination will be used to evaluate the student understanding of the various concepts discussed in the different experiments performed during the course. Concepts evaluated will include: a) general laboratory protocol b) comprehension of data analysis and interpretation and c) critical thinking as it pertains to the scientific method.
- G.** Scientific paper will be evaluated for critical thinking and depth of research and analysis.

IX. Texts and Supporting References**A. Examples of Primary Texts and References**

- 1.** Timberlake, K.C., "An introduction to general, organic, and biological chemistry" 12th

edition, Prentice Hall, 2014

2. A custom laboratory manual for introduction to general, organic, and biochemistry: Timberlake, Pearson Custom Publishing, ISBN: 1-256-04207-2, 2011

B. Examples of Supporting Texts and References

1. None

X. Lab Topics

A. Laboratory Methodology

1. Maintaining a laboratory notebook
2. Writing laboratory reports

B. Chemical Safety

1. Materials safety data sheets (MSDS)
2. Chemical disposal
 - a. Separation of waste streams
 - b. Proper disposal methods
 - c. Environmental hazards of improper waste disposal

3. Laboratory Environment

- a. Maintaining laboratory cleanliness
- b. Chemical labeling
- c. Segregation of chemicals by hazard
- d. Secondary containment

4. Personal Safety

- a. Safety goggles
- b. Limiting chemical exposure
- c. Safety showers
- d. Eyewash stations
- e. Proper use of the fire extinguishers

5. Emergency Situations

- a. Fires
- b. Earthquakes
- c. Evacuation procedures

C. Physical Measurements

1. Gravimetric Analysis
 - a. Taring

b. Mass by difference**2. Boiling Points****D. Laboratory Techniques****1. Proper ignition of Bunsen burners****2. Use of pipettes****E. Chemical Analysis****1. Measurement and significant figures****2. Conversion factors in calculations****3. Density****4. Energy and states of matter****5. Compounds and their formulas****6. Partial pressures of oxygen, nitrogen, and carbondioxide****7. Solution, electrolytes, and concentration****8. Acids, bases, pH and buffers****9. Acid-base titration**