

I. COURSE DESCRIPTION:

In this course, students will continue to apply the skills learned in CHM102 to quantitatively analyze various chemical systems and reactions.

This course includes topics in organic chemistry, energy changes in chemical reactions, chemical equilibrium, acids and bases, and electrochemistry.

Students will also complete a series of laboratory experiments involving common lab procedures and calculations. The purpose of the lab work is to develop practical and safety skills while gaining a better understanding of the theoretical concepts covered in this course and CHM102.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. Represent organic and biochemical compounds by name and formula and describe their physical and chemical characteristics.

Potential Elements of the Performance:

- Use the IUPAC system of nomenclature to name organic and biochemical compounds.
- State the common names of some organic compounds.
- Draw structural formulae for simple organic and biochemical compounds.
- Construct models of organic compounds using a molecular modeling kit.
- Identify functional groups found in organic and biochemical compounds.
- Determine physical properties of organic compounds.
- State and describe different types of organic and biochemical reactions.
- Predict the products of reactions involving organic and biochemical reactants.

2. Identify and analyze oxidation-reduction reactions.

Potential Elements of the Performance:

- Describe and differentiate between oxidation and reduction.
- Identify oxidizing and reducing agents in a reaction.
- Write and balance redox reactions.

- Describe the transfer of electrons in redox reactions.
 - Explain the roles of oxygen and hydrogen in biochemical redox reactions.
3. Describe, analyze, and calculate energy changes in physical and chemical processes.

Potential Elements of the Performance:

- Define and describe specific heat capacity, enthalpy, and enthalpy change.
 - Determine if a physical change or chemical reaction is endothermic or exothermic.
 - Sketch and interpret potential energy diagrams.
 - Express and interpret thermochemical equations with energy terms.
 - Solve problems involving specific heat capacity, mass, temperature change, and enthalpy change of a substance.
4. Explain and analyze reaction rates.

Potential Elements of the Performance:

- State five factors that affect reaction rate.
 - Explain each factor by applying the collision theory.
 - Use a potential energy diagram to explain the effect that a catalyst (such as an enzyme) would have on reaction rate.
5. Analyze chemical equilibria.

Potential Elements of the Performance:

- Explain the concept of dynamic equilibrium.
 - Describe different types of chemical equilibria.(ex. involving gases, solubility, acid/base)
 - Predict, using Le Chatelier's principle, the effect of a variety of stresses (adding/removing a substance, changing pressure, changing temperature) on a system at equilibrium.
 - Write expressions for common equilibrium constants (K_{eq} , K_{sp} , K_a , K_b , K_w).
 - Solve problems involving concentration and equilibrium constants.
6. Recognize and analyze precipitation reactions and perform quantitative calculations involving solubility equilibria.

Potential Elements of the Performance:

- Describe precipitate formation.
 - Use solubility rules to predict whether or not two soluble ionic compounds will react to form a precipitate.
 - Perform a precipitation reaction and determine (by gravimetric analysis) the amount of precipitate formed.
 - Write net ionic equations.
 - Solve problems involving concentration and K_{sp} .
7. Describe and analyze acid-base reactions and perform quantitative calculations involving acid-base equilibria.

Potential Elements of the Performance:

- Define and identify strong acids, strong bases, weak acids, weak bases, and conjugate acid-base pairs.
 -
 - Describe the amphoteric nature of water.
 - Solve problems involving pH, pOH, K_a , K_b , K_w , and concentration.
 - Perform an acid-base titration.
 - Compare the strengths of various acids and bases based on their equilibrium constants.
 - Decide whether an aqueous solution of a given salt will be acidic, basic, or neutral.
 - Describe how buffers stabilize the pH of a solution and calculate the pH of buffer systems.
8. Conduct laboratory investigations using appropriate scientific techniques.

Potential Elements of the Performance:

- Use proper measurement techniques for the precise and accurate collection of quantitative data.
- Portray scientific data using charts, tables, and appropriate scientific language.
- Use scientific reasoning to draw conclusions that explain investigation results.

III. TOPICS:

1. Organic Chemistry
2. Redox Reactions
3. Energy Changes
4. Kinetics and Reaction Rate
5. Chemical Equilibrium
6. Acids, Bases, and Salts

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

1. Textbook: Corwin, Charles H. (2014). *Introductory Chemistry: Concepts and Critical Thinking*, 7th Edition. Pearson Education, Inc.
2. Lab Materials: Lab Coat, Safety Glasses
3. Sault College Learning Management System (D2L)

V. EVALUATION PROCESS/GRADING SYSTEM:

Written tests	60%
Quizzes/Assignments	10%
Lab Work	30%

Notes:

1. Written tests are cumulative in nature and may not be equally weighted. Students must complete all written tests and achieve an overall test grade of at least 50%, independent of other components, to pass this course.
2. Students must achieve an average of 50% on lab work, independent of other components, to pass this course.
3. Missed tests, labs, or quizzes/assignments will be assigned a grade of 0 unless notification of a LEGITIMATE reason is given PRIOR to the test/lab time or due date. Regardless of the circumstances, students should discuss the situation and available options with the professor upon return to class.
4. All policies and procedures outlined in the Student Code of Conduct will be followed.

The following semester grades will be assigned to students:

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
A+	90 – 100%	4.00
A	80 – 89%	3.00
B	70 - 79%	2.00
C	60 - 69%	1.00
D	50 – 59%	0.00
F (Fail)	49% and below	
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field /clinical placement or non-graded subject area.	
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.	
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.	
NR	Grade not reported to Registrar's office.	
W	Student has withdrawn from the course without academic penalty.	

If a faculty member determines that a student is at risk of not being academically successful, the faculty member may confidentially provide that student's name to Student Services in an effort to help with the student's success. Students wishing to restrict the sharing of such information should make their wishes known to the coordinator or faculty member.

VI. SPECIAL NOTES:

Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located in D2L and on the portal form part of this course outline.