Washtenaw Community College Comprehensive Report

CEM 105 Fundamentals of Chemistry
Effective Term: Winter 2019

Course Cover

Division: Math, Science and Engineering Tech
Department: Physical Sciences
Discipline: Chemistry
Course Number: 105
Org Number: 12320
Full Course Title: Fundamentals of Chemistry
Transcript Title: Fundamentals of Chemistry
Is Consultation with other department(s) required: No
Publish in the Following: College Catalog , Time Schedule , Web Page
Reason for Submission: Three Year Review / Assessment Report
Change Information:
Consultation with all departments affected by this course is required.
Outcomes/Assessment
Rationale: Assessment update
Proposed Start Semester: Winter 2019
Course Description: In this course, students explore a broad survey of the major topics in Chemistry (including states of matter, physical and chemical changes, stoichiometry, atomic and molecular structure, gases and gas laws, electronic structure, periodic properties, chemical bonding, energy and heat, intermolecular forces, acids/bases and redox reactions). This course is designed for students with an interest in nursing, other health related areas, and those needing a general science elective.

Course Credit Hours

Variable hours: No
Credits: 4
Lecture Hours: Instructor: 45 **Student:** 45
Lab: Instructor: 45 **Student:** 45
Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 90 **Student:** 90
Repeatable for Credit: NO
Grading Methods: Letter Grades
Audit
Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Level 3

Requisites

Prerequisite
high school chemistry taken in the 2 years prior to enrolling in this course
or
Prerequisite
CEM 101 minimum grade "C"

General Education

MACRAO

MACRAO Science & Math

MACRAO Lab Science Course

General Education Area 4 - Natural Science

Assoc in Applied Sci - Area 4

Assoc in Science - Area 4

Assoc in Arts - Area 4

Michigan Transfer Agreement - MTA

MTA Lab Science

Request Course Transfer

Proposed For:

Eastern Michigan University

University of Michigan

Wayne State University

Student Learning Outcomes

1. Recognize the concepts and principles of general chemistry relating to matter, energy, fundamental measurements, stoichiometry, electronic structure, periodic properties, chemical bonding, energy and heat, intermolecular forces, acids/bases and redox reactions.

   Assessment 1

   Assessment Tool: Written exam
   Assessment Date: Winter 2019
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All sections
   Number students to be assessed: All students
   How the assessment will be scored: Answer key
   Standard of success to be used for this assessment: 75% of students will score 75% or higher
   Who will score and analyze the data: Departmental faculty

2. Perform laboratory procedures related to stoichiometry, electronic structure, periodic properties, chemical bonding, energy and heat, intermolecular forces and physical properties of substances.

   Assessment 1

   Assessment Tool: Lab reports
   Assessment Date: Fall 2017
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All sections
   Number students to be assessed: Random sample of 25% of students in each section with a minimum of one full section
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: 75% of students will score 7 out of 9 (77%) or higher
   Who will score and analyze the data: Departmental faculty

3. Apply the basic concepts to calculate stoichiometric quantities; determine electron configurations and predict trends in periodic properties; draw Lewis Structures and predict molecular shape and properties; calculate temperature, pressures, volumes or amounts of gases; analyze intermolecular forces of substances and predict properties.

   Assessment 1

   Assessment Tool: Written exam
   Assessment Date: Winter 2019
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All sections
   Number students to be assessed: All students

How the assessment will be scored: Answer key
Standard of success to be used for this assessment: 75% of students will score 75% or higher
Who will score and analyze the data: Departmental faculty

Course Objectives

1. Recognize that the principle scientific approach to problem solving is found in the Scientific Method and identify the steps involved in moving from Hypothesis to Theory.
2. Classify matter according to state, chemical and or physical properties/changes, or composition.
3. Describe and calculate the energy changes that occur during chemical and physical processes.
4. Use and interpret symbolic notation representing atoms and compounds.
5. Describe the history of the atom, beginning with Democritus through Dalton's Atomic Theory concluding with the current nuclear model of the atom.
6. Apply the concept of dimensional analysis to problems involving English, Metric and SI units.
7. Apply rules for Significant figures to all calculations throughout the course and in the lab.
8. Apply the concept of the mole in chemical calculations to determine quantities such as empirical formulas, stoichiometric amounts and solution concentrations.
9. Represent electron configurations of atoms.
10. Predict properties of elements based on electron configuration and position in the Periodic Table.
11. Account for trends in periodic properties based on size of subshell, effective nuclear charge and strength of electrostatic attraction between nucleus and valence electrons.
12. Distinguish among ionic, metallic and covalent bonds, identify which type occurs in various substances and compare their properties.
13. Write Lewis electron dot structures for atoms, ions, and molecules and interpret Lewis structures to determine shape and polarity of molecules.
14. Name ionic, molecular and acid compounds given a chemical formula and write the formula for these compounds given their name.
15. Write and balance chemical equations.
16. Classify chemical reactions given reactants and products.
17. Given the reactants in a metathesis reaction and a solubility table, write balanced molecular and ionic equations, identify spectator ions, and write net ionic equations.
18. Apply the concept of stoichiometry to calculations involving chemical reactions, including calculations of theoretical yield, percent yield and molar volume problems for gases.
19. Use the Kinetic Molecular Theory to account for observed macroscopic properties of a gas and to explain the experimentally determined gas laws.
20. Describe the effects of temperature, pressure, volume and quantity on the behavior of a gas based on the Gas Laws - Boyle's, Charles, Gay-Lussac's, and Dalton's.
21. Use the Ideal Gas Law to predict values of temperature, pressure, volume or quantity of a gas or to determine molar mass of a gas.
22. Describe properties of solids and liquids.
23. Sketch and interpret heating/cooling curves and phase diagrams.
24. Describe the specific properties of water that make it a most unusual liquid.
25. Identify specific solution terminology and explain the concept of solubility using the solubility rule "like dissolves like".
26. Outline the steps in the solution process, including energy changes that occur.
27. Recognize and calculate various types of solution concentration.
28. Explain how reaction rates are related to Collision Theory indicating the specific factors that can affect reaction rates.
29. Identify the energy changes that occur when chemical bonds are made or broken.
30. Use Le Chatelier's Principle to make predictions about how reactions in equilibrium will be affected by changes in temperature, pressure, concentration and presence of a catalyst.
31. Describe the concept of dynamic equilibrium. Write and interpret equilibrium constant expressions.
32. Define acids and bases according to the Bronsted Lowry model.
33. Describe a Titration using correct terminology and solve problems related to titrations.
34. Define a buffer solution and describe how this solution is able to resist changes in pH in the presence of additional acid or base.
35. Assign oxidation numbers to the atoms in a given chemical formula.
36. For a given oxidation-reduction reaction, identify the oxidizing agent, the reducing agent, the species

that are oxidized, and the species that are reduced.
37. Balance oxidation/reduction equations using half-reactions.
38. Describe chemical cells (electrolytic and voltaic) explaining how these reactions produce and/or use electricity.
39. Observe laboratory safety procedures.
40. Keep a laboratory journal.
41. Manipulate laboratory equipment.
42. Interpret and follow written procedures.
43. Make observations and collect data.
44. Interpret and summarize data and calculate results.
45. Apply significant figures to measurements, calculations and data analysis.
46. Draw conclusions based on experiment results.
47. Classify given acids or bases as weak or strong.
48. Interpret pH values or litmus paper test results to determine if a solution is acidic, basic, or neutral.

New Resources for Course

Course Textbooks/Resources

Textbooks

Zuhmdahl. *Introductory Chemistry - A Foundation*, Customized ed. Cengage Learning, 2014, ISBN: 978-1-305-039.

Manuals

Giswold - WCC Chem Department. Fundamentals of Chemistry - A Laboratory Manual CEM 105, Huron Valley Publishing Solutions, 09-01-2014

Periodicals

Software

Equipment/Facilities

Level III classroom

Reviewer	Action	Date
Faculty Preparer:		
Kathleen Butcher	*Faculty Preparer*	*Jul 12, 2018*
Department Chair/Area Director:		
Kathleen Butcher	*Recommend Approval*	*Jul 12, 2018*
Dean:		
Kristin Good	*Recommend Approval*	*Jul 13, 2018*
Curriculum Committee Chair:		
Lisa Veasey	*Recommend Approval*	*Oct 29, 2018*
Assessment Committee Chair:		
Shawn Deron	*Recommend Approval*	*Oct 30, 2018*
Vice President for Instruction:		
Kimberly Hurns	*Approve*	*Nov 02, 2018*