Bergen Community College
Division of Mathematics, Science and Technology
Physical Science Department

Course Syllabus
CHM-240 General Chemistry II

Semester and year:
Course Number:
Meeting Times and Locations:

Instructor:
Office Location:
Phone:
Office Hours:
Email Address:

COURSE DESCRIPTION:
CHM-240 General Chemistry II is the second course of a two-semester sequence of general chemistry. Topics covered include intermolecular forces, properties of solutions, chemical kinetics, equilibrium, thermodynamics, acids and bases, and electrochemistry.

CREDITS/HOURS: 3 credits/3 hours

PREREQUISITES: CHM-140 and MAT 160 with a grade of C or better

RECOMMENDED PREREQUISITE: CHM-141

RECOMMENDED COREQUISITE: CHM-241

GENERAL ED COURSE: Yes

STUDENT LEARNING OBJECTIVES (LEARNING OUTCOMES): As a result of meeting the requirements in this course, students will be able to:
1. Explain spectrophotometry, Beer-Lambert Law and solution concentrations
2. Identify the forces of interaction between molecules
3. Interpret a phase diagram
4. Explain the properties of liquids
5. Explain the classification of solids by type and crystalline structure
6. Express solution concentrations in the technical terms used in chemistry
7. Apply the concepts of colligative properties to the solution of chemistry problems
8. Explain the nature of strong and weak acids and bases
9. Interpret kinetic data and apply the principles of kinetics to reaction mechanisms
10. Explain the principles of equilibrium and calculate equilibrium constants
11. Explain the nature of acid-base buffers and calculate pH
12. Interpret the laws of thermodynamics as they apply to chemical reactions
13. Balance oxidation-reduction reactions in acid and base solutions
14. Calculate the electromotive force of voltaic cells (batteries)
15. Define and explain technical terms used in chemistry

ASSESSMENT MEASURES:

The student learning objectives will be assessed by:
1. Assigned homework problems from the text and OWL
2. Quizzes
3. Class participation
4. Unit Examinations (a minimum of 3)
5. Final Examination (**comprehensive**)
6. A writing component in the form of essays or short answer questions on examinations.

At the discretion of the instructor, assessment measures may be somewhat modified.

TEXTBOOK: Chemistry & Chemical Reactivity, 9th Edition: John C. Kotz, Paul M. Treichel and John R. Townsend; Thomson Brooks/Cole; California; 2012.

note: **Text Comes with OWL and Chemistry Now. The Student Solutions Manual and Study Guide are available as separate purchases.**

COURSE CONTENT:

Chapter	4:	Section 4.8: Spectrophotometry; Beer-Lambert Law
Chapter	11:	Intermolecular Forces and Liquids
Chapter	12:	The Solid State
Chapter	13:	Solutions and their Behavior (*Omit* Sect. 13.5)
Chapter	14:	Chemical Kinetics: The Rates of Chemical Reactions
Chapter	15:	Principles of Chemical Reactivity: Equilibria
Chapter	16:	Principles of Chemical Reactivity: The Chemistry of Acids and Bases. (Sect. 16.9 qualitative aspects only)
Chapter	17:	Principles of Chemical Reactivity: Other Aspects of Aqueous Equilibria
Chapter	18:	Principles of Chemical Reactivity: Entropy and Free Energy
Chapter	19:	Principles of Chemical Reactivity: Principles of Reactivity: Electron Transfer Reactions
Chapter	25:	Nuclear Chemistry (optional)

SUPPLEMENTARY READINGS / MATERIALS:

1. Chemistry, The Central Science, 11th Edition, Theodore L. Brown, H. Eugene LeMay Jr., Bruce E. Bursten and Catherine J. Murphy; Pearson/Prentice Hall, New Jersey; 2009.
2. Chemistry: The Molecular Nature of Matter and Change: 6th Edition, Martin S. Silberberg; McGraw-Hill, New York; 2012.
3. Chemistry, 11th Edition, Raymond Chang and Kenneth A. Goldsby; McGraw Hill, New York; 2013.
4. Chemistry, 5th Edition, John McMurry and Robert C. Fay; Prentice Hall, New Jersey; 2008.
5. General Chemistry, 8th Edition: Darrell D. Ebbing and Steven D. Gammon; Houghton Mifflin; Boston; 2013.
6. Chemistry: The Molecular Science, 4th Edition, John W. Moore, Conrad L. Stanitski, and Peter C. Jurs; Brooks/Cole, Thomson Learning, California; 2010.

CHM-240 General Chemistry II Course Outline and Sample Calendar*

Week Objectives	Topic/Activity/Assignments*	Student Learning (Learning Outcomes)
1	Introduction to course	
	Chapter 4: Section 4.8 Spectrophotometry Beer-Lambert Law, Solution Concentrations	1, 15
	Chapter 11: States of matter and intermolecular forces Interactions between molecules Properties of Liquids Assigned homework problems	2, 3, 15
2	Chapter 11: Properties of Liquids – Vapor Pressure Enthalpy of Vaporization, Boiling Point Assigned homework problems	2, 4, 15
	Chapter 12: Crystalline Solids and Unit Cells Ionic Compounds and Lattice Energy Assigned homework problems	2, 5, 15
3	Chapter 12: Solid Materials Phase Changes and Phase Diagrams Assigned homework problems	2, 3, 15
	Chapter 13: Units of Concentration: Molarity, Molality Mole Fraction, Mass Percentage of Solute Assigned homework problems	2, 4, 6, 15
4	Chapter 13: Solubility and the Solution Process Effects of Temperature and Pressure Henry's Law Assigned homework problems	2, 4, 6, 15
	Chapter 13: Colligative Properties: Assigned homework problems	2, 6, 7, 15
5	Chapter 14: Rates of Reactions and Orders Rate Law and Rate constant Assigned homework problems	6, 9, 15
6	Chapter 14: Integrated Rate Laws Graphing Kinetic Data Half –Life Assigned homework problems	6, 9, 15
	Chapter 14: Activation Energy Arrhenius Equation	6, 9, 15

Week	Assigned homework problems **Topic/Activity/Assignments***	**Student Learning Objectives** **(Learning Outcomes)**
7	Chapter 14: Reaction Mechanisms Catalysis Assigned homework problems	9, 15
	Chapter 15: Equilibrium, Equilibrium Constant Calculations Interpreting Equilibrium Constants Calculating Equilibrium Concentrations Assigned homework problems	6, 10, 15
8	Chapter 15: LeChatelier's Principle Disturbing a Chemical Equilibrium Changing Reaction Conditions - Effect on Equilibrium Constant Predicting Equilibrium Shifts Assigned homework problems	10, 15
	Chapter 16: Arrhenius Acids and Bases Bronsted Acids and Bases – Conjugate Pairs Polyprotic Acids Water Autoionization; pH Scale Assigned homework problems	4, 6, 8, 10, 11, 15
9	Chapter 16: Relative Strengths of Acids and Bases Equilibrium (Ionization) Constants Strong Acids and Strong Bases pH of a Solution Acid–Base Properties of Salt Solutions Assigned homework problems	6, 8, 10, 11, 15
	Chapter 16: Predicting the Direction of Acid Base Reactions Equilibrium Constant Calculations: Weak Acid Ionization: Equilibrium & pH Weak Base Ionization: Equilibrium & pH Assigned homework problems	6, 10, 11, 15
10	Chapter 16: Molecular Structure and Acid Strength Lewis Acids and Lewis Bases	6, 10, 11, 15
	Chapter 17: Common-Ion Effect Buffers – Controlling pH Assigned homework problems	6, 10, 11, 15

Week	Topic/Activity/Assignments*	Student Learning Objectives (Learning Outcomes)
11	Chapter 17: Solubility of Salts: Equilibrium Solubility Product Constant, Ksp Precipitation Calculations; Complex-Ion formation Assigned homework problems	6, 10, 11, 15
	Chapter 18: Second Law of Thermodynamics - Entropy Entropy Measurement and Values Third Law of Thermodynamics Assigned homework problems	12, 15
12	Chapter 18: Entropy Changes and Spontaneity Gibbs Free Energy - Concept Free Energy, Spontaneity and Chemical Equilibrium Assigned homework problems	2, 4, 5, 6, 12, 15
	Chapter 18: Free Energy and Temperature Assigned homework problems	12, 15
13	Chapter 19: Balancing Oxidation-Reduction Equations Redox in Acid and Basic Solutions Assigned homework problems	4, 6, 12, 13, 15
14	Chapter 19: Construction of Voltaic Cells Commercial Voltaic Cells Standard Reduction Potentials Electromotive Force (EMF) E^o of Cells Oxidizing and Reducing Agents Assigned homework problems	4, 5, 6, 12, 13, 14, 15
	Chapter 19: Nernst Equation Electrochemistry and Thermodynamics Electrolysis Assigned homework problems	3, 5, 6, 12, 13, 14, 15
15	Review Final Exam	

*The above calendar, including exams dates, may be modified by the instructor.

<u>Bergen Community College Core Competencies</u>

<u>Competency</u>	<u>Student Learning Objectives (Learning Outcomes)</u>
1. Communication	1–5, 7–12, 15
2. Quantitative Reasoning	5, 6, 8 - 14
3. Critical Thinking	1-15
4. Technological and Information Fluency	4, 5, 13, 14, 15
5. Applied Knowledge	1 - 15

<u>OTHER REQUIREMENTS</u>:
1. A scientific calculator is required. Graphing and cell phone calculators are not permitted.
2. Students are required to use the factor-label method (dimensional analysis) for problem solving.

<u>GRADING POLICY</u>
<u>Instructor's Grading Policy</u>:
The grading policy for each section will be provided separately by the individual instructor at the first class meeting.

<u>General Grading Policy Guidelines</u>:

Assigned homework problems from the text and OWL	not more than 10%
Quizzes	not more than 20%
Class participation	not more than 5%
Unit Examinations (a minimum of 3)	50 to 75%
Final Examination (**comprehensive**)	15 to 25%

1. Any examination not taken will receive a grade of zero. Make - up examinations will be administered in accordance with the instructor's policy.
2. Any student caught cheating (including using unauthorized formula sheets of any kind) will receive a grade of zero on that particular examination or paper. That zero cannot be replaced by any other examination grade or extra work.
   Please read The Bergen Community College Statement on academic integrity as found in the college catalog.
3. Late work is not accepted unless specifically authorized by the instructor.

Conduct demonstrating a lack of integrity will not be tolerated. This includes, but is not limited to, cheating (copying or using unauthorized formula sheets), plagiarism, and falsification of data (using fictional data or data from another student, past or present).
Please consult The Bergen Community College Statement on academic integrity, as found in the college catalog or Student Handbook, for details and consequences of such behavior.

ATTENDANCE/LATENESS POLICY:
All students are expected to attend punctually every scheduled meeting of each course in which they are registered. Attendance and lateness policies and sanctions are to be determined by the instructor for each section of each course. These will be established in writing on the individual course outline. Attendance records will be kept for administrative and counseling purposes.

OTHER POLICIES:
Electronic Devices:
The use of portable electronic devices such as pagers and cell phones is not permitted while class is in session. Please silence these devices before entering class.

Code of Student Conduct:
Students are encouraged to read, understand and follow the rules and standards of conduct as explained in the Student Handbook. The Student Handbook is available in the Office of Student Life and on the BCC website.

STUDENT SUPPORT SERVICES:

The STEM Walk-In Learning Center in Room L-131 and the CLAC Tutoring Center In L-125 provide student support in chemistry, math and other sciences.

Faculty office hours may be a productive vehicle for assistance in understanding course material.

The BCC Library provides extensive support services for student research.

SERVICES FOR STUDENTS WITH DISABILITIES
Bergen Community College aims to create inclusive learning environments where all students have maximum opportunities for success. Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Specialized Services at 201-612-5269 or via email at ossinfo@bergen.edu for assistance.

FACULTY ABSENCE PROCEDURE:
A daily listing of cancelled classes will appear in a glass case near the registration area on the first floor. Another such listing will appear in a glass case in Ender Hall. Students can consult these cases before going to class. Cancelled classes are also listed under class cancellations at bottom of the BCC website page. Under no circumstances are notices regarding class cancellations taped to classroom doors binding.

If students find a class cancelled which has not been listed, they should report this to the Divisional Dean's Office, A-304 or the Evening Office C-107.

All BCC students enrolled in credit courses are entitled to a WebAdvisor account. With WebAdvisor, you may register online, pay your bill, check your schedule, room assignments, GPA, and find out what courses you need to take. To find out more about WebAdvisor or to sign up online, visit <http://go.bergen.edu>! While there, please make sure you give us your preferred email address. You'll find directions how to do this at <http://go.bergen.edu/email>.
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