

AMERICAN UNIVERSITY OF BEIRUT
FACULTY OF ARTS AND SCIENCES
DEPARTMENT OF CHEMISTRY

CHEM 102 - General Chemistry II (3 cr.)
Spring 2017-2018

Course Instructor: Houssam El-Rassy, PhD, Associate Professor
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Office Hours: TBA

Lectures: M-W-F 9:00 – 9:50 am (CHEM 101)

Course Description

A course that covers solutions, chemical equilibrium, kinetics, acid-base and solubility equilibria, introductory thermodynamics and electrochemistry; surveys common groups in the periodic table; provides an introduction to organic chemistry and nuclear chemistry. Prerequisite: CHEM 101. Every semester. (Prior to Fall semester 2011-12, Chemistry 102 was a 4-credit course with laboratory component.)

(AUB Undergraduate Catalogue 2017-2018, p. 178)

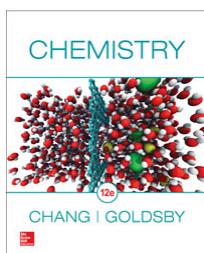
Learning Outcomes

After completing this course, students should be able to:

1. Use the atomic structure arguments to explain the observed periodicity of the elements.
2. Explain the intermolecular attractive forces that determine the properties of the states of matter and phase behavior.
3. Understand colligative properties and their use in determining the characteristic of solutions.
4. Convert between the different concentration units; molarity, molality, mole fraction and percent by mass.
5. Determine the rate of a reaction and its dependence on concentration, time, and temperature.
6. Understand acid base reactions, their products, and how buffer systems work.
7. Solve acid base related problems including pH calculations.
8. Apply the concepts of chemical equilibrium to aqueous systems.
9. Understand and perform calculations with the thermodynamic functions, enthalpy, entropy, free energy.
10. Balance oxidation reduction reactions.
11. Differentiate between a galvanic and an electrolytic cell and determine standard and non-standard cell potentials.
12. Describe some of the properties of metals, nonmetals and their compounds.
13. Explain the basics of nuclear chemistry.
14. Identify the different classes of organic compounds

Resource Available to Students

Textbook: Raymond Chang, Kenneth A. Goldsby, Chemistry, 12th Edition, McGraw-Hill Education, 2016.



PowerPoint Slides Lectures slides will be available to students through Moodle.

Student resources from the Publisher are available on
<https://www.mheducation.com/highered/platforms/connect/access.html>

Course Policy, Exams and Grading

Students must be considerate of their classmates and abstain from disruptive behavior during the lecture period. This includes talking and whispering, while the instructor is addressing the class.

Students are expected to attend all classes and participate in class discussion. Students who do not attend the classes will be dropped out of the course. Students are expected to enter the classroom on time. Attendance will be taken at random intervals.

Students must sit for all exams. Unless a valid excuse is presented (AUBMC family medicine or AUBMC medical report), the student will take a zero on missed exams.

Three quizzes:	20% + 20% + 20%
Final Exam:	40%

If the student is granted permission to miss a quiz, a new grading scheme will be decided upon for the course final grade calculations. If two quizzes are missed, the student will be dropped from the course.

Non-graphing non-programmable calculators are indispensable during the quizzes and final exam. Programmable calculators are not allowed in the exam room. The student must take a quiz without calculator if he/she doesn't bring an appropriate calculator. Students are not allowed to use their mobile phones or any other alternative as calculators during the quizzes and exams. Mobile phones are not allowed in classrooms and exam rooms.

Students must respect the Student Code of Conduct. Any violation of this Student Code of Conduct, either academic or non-academic misconduct, will be reported to the appropriate level where the student risks being subject to disciplinary action in accordance with the Student Code of Conduct. <http://www.aub.edu.lb/pnp/generaluniversitypolicies/Documents/StudentCodeConduct/StudentCodeConduct.pdf>

AUB strives to make learning experiences accessible for all. If you anticipate or experience academic barriers due to a disability (such as ADHD, learning difficulties, mental health conditions, chronic or temporary medical conditions), please do not hesitate to inform the Accessible Education Office. In order to ensure that you receive the support you need and to facilitate a smooth accommodations process, you must register with the Accessible Education Office (AEO) as soon as possible: accessibility@aub.edu.lb; +961-1-350000, x3246; West Hall, 314.

AUB is committed to facilitating a campus free of all forms of discrimination including sex/gender-based harassment prohibited by Title IX. The University's non-discrimination policy applies to, and

protects, all students, faculty, and staff. If you think you have experienced discrimination or harassment, including sexual misconduct, we encourage you to tell someone promptly. If you speak to a faculty or staff member about an issue such as harassment, sexual violence, or discrimination, the information will be kept as private as possible, however, faculty and designated staff are required to bring it to the attention of the University's Title IX Coordinator. Faculty can refer you to fully confidential resources, and you can find information and contacts at www.aub.edu.lb/titleix. To report an incident, contact the University's Title IX Coordinator Trudi Hodges at 01-350000 ext. 2514, or titleix@aub.edu.lb. An anonymous report may be submitted online via EthicsPoint at www.aub.ethicspoint.com

Course Outline

1. Intermolecular Forces and Liquids and Solids (Chapter 11)

Kinetic molecular theory of liquids and solids; Intermolecular forces; Properties of liquids; Crystal structure; X-Ray diffraction by crystals; Amorphous solids; Phase changes; Phase diagrams.

2. Physical Properties of Solutions (Chapter 12)

Types of solutions; Molecular view of the solution process; Concentration units; Effect of temperature on solubility; Effect of pressure on solubility of gases; Colligative properties of nonelectrolyte solutions; Colligative properties of electrolyte solutions; Colloids.

3. Chemical Kinetics (Chapter 13)

Rate of a reaction; Rate law; Relation between reactant concentration and time; Activation energy and temperature dependence of rate constants; Reaction mechanisms; Catalysis.

4. Chemical Equilibrium (Chapter 14)

Concept of equilibrium and the equilibrium constant; Writing equilibrium constant expressions; Relationship between chemical kinetics and chemical equilibrium; What does the equilibrium constant tell us?; Factors that affect chemical equilibrium.

5. Acids and Bases (Chapter 15)

Bronsted acids and bases; Acid-base properties of water; pH, a measure of acidity; Strength of acids and bases; Weak acids and acid ionization constants; Weak bases and base ionization constants; Relationship between the ionization constants of acids and their conjugate bases; Diprotic and polyprotic acids; Molecular structure and the strength of acids; Acid-bases properties of salts; Acid-base properties of oxides and hydroxides; Lewis acids and bases.

6. Acid-Base Equilibria and Solubility Equilibria (Chapter 16)

Homogeneous versus heterogeneous solution equilibria; Common ion effect; Buffer solutions; Acid-base titrations; Acid-base indicators; Solubility equilibria; Separation of ions by fractional precipitation; Common ion effect and solubility; pH and solubility; Complex ion equilibria and solubility; Application of the solubility product principle to qualitative analysis.

7. Entropy, Free Energy, and Equilibrium (Chapter 17)

The three laws of thermodynamics; Spontaneous processes; Entropy; The second law of thermodynamics; Gibbs free energy; Free energy and chemical equilibrium; Thermodynamics in living systems.

8. Electrochemistry (Chapter 18)

Redox reactions; Galvanic cells; Standard reduction potentials; Spontaneity of redox reactions; Effect of concentration of cell Emf; Batteries; Corrosion; Electrolysis.

9. Organic Chemistry (Chapter 24)

Classes of organic compounds; Aliphatic hydrocarbons; Aromatic hydrocarbons; Chemistry of the functional groups.