

# CHEM 101

## General Chemistry I

### Syllabus: Spring 2018

**Instructor:** Prof. Mazen Al-Ghoul, PhD  
**Office:** Chemistry Bldg., Room 510  
**Office Hours:** Thursday 2:00 pm – 3:30 pm, and by appointment  
**E-mail:** mazen.ghoul.students@gmail.com

#### Course Description

An introductory course that covers atomic structure, chemical reactions, stoichiometry, gas laws, thermochemistry, periodic relationships among the elements, chemical bonding, and other basic concepts. Each semester. (Prior to Fall semester 2011-12, Chemistry 101 was a 4-credit course with laboratory component.) (AUB Undergraduate Catalogue 2016-2017, p. 171)

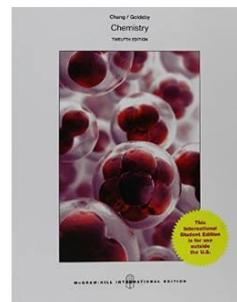
#### Learning Outcomes

After completing this course, students should be able to:

- Incorporate the use of scientific notation and significant figures in problem solving.
- Use chemical names, symbols and formulas of substances.
- Identify different types of chemical reactions.
- Use chemical equations in an accurate balanced form to represent reactions.
- Use the gas laws to solve related problems.
- Describe the arrangement of electrons in atomic orbitals.
- Know the trends in the Periodic Table and deduce relevant information.
- Distinguish between the different types of chemical bonding.
- Predict the shape of molecules.
- Apply chemical theories and principles to the solution of new and hypothetical chemical problems.
- Apply problem solving skills and critical thinking in a chemical context.
- Apply chemical principles to situations encountered in everyday life.

#### Resource Available to Students

Textbook: Raymond Chang, Chemistry, 12<sup>th</sup> Edition, McGraw-Hill, 2015.



**Lecture Material:** Lectures slides and other relevant material will be available to students through Moodle.

Student resources are available on

<http://www.mhhe.com/physsci/chemistry/chang/index.mhtml>

It contains the following sections: solutions manual, study guide, ARIS (assessment, review and instruction system), animations etc.



## 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 (AUB Infirmary or AUH medical report), the student will take a zero on missed exams.

Two quizzes: 20% + 30% (higher grade)  
Final Exam: 50%

If the student is granted permission to miss an exam, a new grading scheme will be decided upon for the course final grade calculations.

If two quizzes are missed, the student will be asked to withdraw from the course.

Non-graphing non-programmable calculators are indispensable during the exams. 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 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.

# CHEM 101: Course Outline

- 1. The Study of Change (Chapter 1)**

The study of Chemistry; The scientific method; Classifications of Matter; The states of Matter; Physical and chemical properties of Matter; Measurement; Handling numbers; Dimensional analysis in solving problems.
- 2. Atoms, Molecules, and Ions (Chapter 2)**

The atomic theory; Structure of the atom; Atomic number, mass number, and isotopes; Molecules and ions; Chemical formulas; Naming compounds; Introduction to organic chemistry.
- 3. Mass Relationships in Chemical Reactions (Chapter 3)**

Atomic mass; Avogadro's number and the molar mass of an element; Molecular mass; Mass spectrometer; Percent composition of compounds; empirical formulas; Chemicals reactions and equations; Amounts of reactants and products; Limiting reagents; Reaction yield.
- 4. Reactions in Aqueous Solutions (Chapter 4)**

Properties of aqueous solutions; Precipitation reactions; Acid-base reactions; Oxidation-reduction reactions; Concentration of solutions; Gravimetric analysis; Acid-base titrations; Redox titrations.
- 5. Gases (Chapter 5)**

Substances that exist as gases; Pressure of a gas; the gas laws; The ideal gas equation; Gas stoichiometry; Dalton's law of partial pressures; The kinetic molecular theory of gases; Deviation from ideal behavior.
- 6. Thermochemistry (Chapter 6)**

Nature and types of energy; Energy changes in chemical reactions; Introduction to thermodynamics; Enthalpy of chemical reactions; Calorimetry; Standard enthalpy of formation and reactions; Heat of solution and dilution.
- 7. Quantum Theory and the Electronic Structure of Atoms (Chapter 7)**

Photoelectric effect; Bohr's theory of the hydrogen atom; The dual nature of the electron; Quantum mechanics; Quantum numbers; Atomic orbitals; Electron configuration; The building-up principle.
- 8. Periodic Relationships Among the Elements (Chapter 8)**

Development of the periodic table; Periodic classification of the elements; Periodic variation in physical properties; Ionization energy; Electron affinity; Variation in chemical properties of the representative elements.
- 9. Chemical Bonding I: Basic Concepts (Chapter 9)**

Lewis dot symbols; Ionic bond; Lattice energy of ionic compounds; Covalent bond; Electronegativity; Writing Lewis structures; Formal charge and Lewis structure; Concept of resonance; Exceptions to the Octet rule; Bond enthalpy.
- 10. Chemical Bonding II: Molecular Geometry and Hybridization of Atomic Orbitals (Chapter 10)**

Molecular geometry; Dipole moment; Valence bond theory; Hybridization of atomic orbitals; Hybridization in molecules containing double and triple bonds; Molecular orbital theory; Molecular orbital configurations; Delocalized molecular orbitals.

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*If you are pregnant or planning to be pregnant, you should consult with your healthcare provider so you become fully informed of the potential risks and understand the precautions that you should take.*