

Course Syllabus

1	Course title	General chemistry 1
2	Course number	0303101
3	Credit hours	3 Hours
	Contact hours (theory, practical)	(3,0)
4	Prerequisites / corequisites	
5	Program title	Bachelor degree in chemistry
6	Program code	0303
7	Awarding institution	The University of Jordan
8	School	Science
9	Department	Chemistry
10	Course level	1st year
11	Year of study and semester (s)	Fall, Spring and Summer
12	Other department(s) involved in teaching the course	N/A
13	Main teaching language	English
14	Delivery method	<input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online
15	Online platforms(s)	<input type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others.....
16	Issuing/Revision Date	October 8-2023

17 Course Coordinator:

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18 Other instructors:

Prof. Murad Aldamen
Prof. Deeb Taher
Prof. Sharif Arar
Prof. Firas Awwadi
Dr. Haythem Saadeh
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Dr. Ahmad Barham
Dr. Wissam Helal
Dr. Safwan Fraihat
Dr. Abdussalam Qaroush
Dr. Hazem Amarne
Dr. Nader Al Bogouq
Dr. Khaldon Asam
Ms. Malak I. Qadri

19 Course Description:

General chemistry 1 is an introductory course intended for first year university students. It covers basic topics including: The scientific method, measurements and significant figures, units and dimensional analysis, naming simple inorganic compounds, stoichiometry, basic reactions in aqueous solutions and solution stoichiometry, properties of gases and kinetic molecular theory, measurements and calculations of energy associated with physical changes and chemical reactions, basic quantum theory and the electronic structure of the atoms, atomic periodic properties, ionic bonding, covalent bonding, molecular geometry, and hybridization of atomic orbitals.

20 Course aims and outcomes:

A- Aims:

1. To instill in students a sense of enthusiasm for chemistry, an appreciation of its application in different contexts and to involve them in a satisfying experience of learning and studying.
2. To provide students with a broad and balanced foundation of chemical knowledge.
3. To develop in students the ability to apply their chemical knowledge and skills to the solution of theoretical problems in chemistry.
4. To develop in students, through an education in chemistry, a range of transferable skills, in chemical and allied chemical employment related to course content.
5. To provide students with a knowledge and skills base from which they can proceed to further studies in specialized areas of chemistry or multi-disciplinary areas involving chemistry.

B- Course Learning Outcomes (CLOs): Upon successful completion of this course students will be able to:

Part-1: Chemistry and Measurement

- Classify the properties of matter
- Identify physical and chemical properties of matter
- Report measurements properly
- Apply dimensional analysis involving two or more properties

Part-2: Atoms, Molecules, and Ions

- Explain the postulates of Dalton's atomic theory
- Apply the results of early atomic experiments to define the three subatomic particles and isotopes
- Interpret the atomic structure and determine atomic mass and define isotopes
- Express chemical formulas in molecular, empirical, and structural form
- Derive names for common types of compounds using a systematic approach
- Write and balance chemical equations

Part-3: Calculations with Chemical Formulas and Equations

- Relate formula mass, moles, and the numbers of atoms or molecules
- Determine empirical and molecular formulas, determine mass percentage for each element
- Determine amounts of reactants and products in a reaction. Recall the concept of limiting reactant
- Calculate theoretical and percent yield

Part-4: Chemical Reactions

- Classify matter to electrolytes and non-electrolytes. Predict the solubility of ionic compounds in water
- Classify chemical reactions in solutions
- Use molarity to calculate solution concentrations and perform dilution calculations
- Describe titrations and gravimetric data and apply stoichiometry to both
- Determination of oxidation number for atoms in substances in redox reactions

Part-5: The Gaseous State

- Define pressure and pressure units
- Derive the ideal gas law from the three empirical gas laws

- Use the ideal gas law to do stoichiometric calculations
- Validate Daltons law for gas mixtures
- Explain the postulates of the kinetic-molecular theory
- Compute rates of effusion and diffusion

Part-6: Thermochemistry

- Validate the first law of thermodynamics
- Recognize the concepts of internal energy, heat and work
- Apply thermochemistry equations involving heat, specific heat, and temperature change
- Use calorimetry data to solve problems
- Calculate enthalpy of reactions using theoretical methods i.e.: Hess's law and enthalpy of formation.

Part-7: Quantum Theory of the Atom

- Apply quantum mechanics to the electrons in an atom
- Deduce Quantum Numbers and relate them to the atomic orbitals in an atom

Part-8: Electron Configurations and Periodicity

- Write electron configurations of atoms by considering building up principle, Pauli exclusion principle and Hund's rule
- Express the electron structures of cations, anions, and ionic compounds
- Describe and explain the observed trends in atomic size, ionization energy, and electron affinity of the elements

Part 9: Ionic and Covalent Bonding

- Describe ionic bonds, write electron configurations of Ions and compare ionic radii. Understand bond strength and lattice energies
- Define covalent bond, electronegativity of atoms and polar bonds
- Create Lewis symbols and structures
- Quantify formal charges and resonance using the Lewis structure
- Determine bond length and bond order
- Calculate enthalpy of reactions using theoretical methods i.e.: Bond Enthalpy

Part 10: Molecular Geometry and Chemical Bonding Theory

- Interpret VSEPR theory and polarity
- Summarize valence bond theory
- Describe atomic orbital hybridization
- Describe multiple covalent bonding and resonance

CLO \ SO	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)	SO (6)	SO (7)
1	X						
2	X	X			X		
3	X	X			X		
4	X	X	X		X		
5	X	X	X		X		
6	X	X	X		X		
7	X	X	X		X		
8	X	X	X		X		
9	X		X		X		
10	X		X		X		

21. Topic Outline and Schedule:

Week	Lecture	Topic(s)	Teaching Methods/platform	Evaluation Methods	References
1	1.1	1.1 Modern Chemistry 1.2 Experiment and Explanation	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	1.2	1.3 Law of Conversation of Mass 1.4 Matter: Physical State and Chemical Composition 1.5 Measurement and Significant Figures	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	1.3	1.6 SI Units 1.7 Derived Units 1.8 Units and Dimensional Analysis	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
2	2.1	2.3 Nuclear Structure and Isotopes 2.4 Atomic Weights	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	2.2	2.8 Naming Simple Compounds	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	2.3	2.9 Writing Chemical Equations	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
3	3.1	2.10 Balancing Chemical Equations.	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	3.2	3.1 Molecular Weight and Formula Weight 3.2 The Mole Concept	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	3.3	3.3 Mass Percentages from the Formula 3.4 Elemental Analysis: Percentages of Carbon, Hydrogen, and Oxygen	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
4	4.1	3.5 Determining Formulas 3.6 Molar Interpretation of a Chemical Equation	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	4.2	3.7 Amounts of Substances in a Chemical Reaction	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	4.3	3.8 Limiting Reactant, Theoretical and Percentage Yields	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
5	5.1	4.1 Ionic Theory of Solutions and Solubility Rules	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	5.2	4.2 Molecular and Ionic Equations 4.3 Precipitation Reactions	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	5.3	4.4 Acid-Base Reactions 4.5 Oxidation-Reduction Reactions	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
6	6.1	4.6 Balancing Simple Oxidation–Reduction Equations 4.7 Molar Concentration	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	6.2	4.8 Diluting Solutions 4.9 Gravimetric Analysis 4.10 Volumetric Analysis	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	6.3	5.1 Gas Pressure and Its Measurement 5.2 Empirical Gas Laws	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
7	7.1	5.3 The Ideal Gas Law 5.4 Stoichiometry Problems Involving Gas Volumes	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	7.2	5.5 Gas Mixtures: Law of Partial Pressures	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	7.3	5.6 Kinetic theory of an ideal gas	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
8	8.1	5.7 Molecular Speeds: Diffusion and Effusion	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	8.2	6.1 Energy and Its Units 6.2 First Law of Thermodynamics, Work and Heat	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	8.3	6.3 Heat of Reaction, Enthalpy of Reaction 6.4 Thermochemical Equations	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
9	9.1	6.5 Applying Stoichiometry to Heats of Reaction	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	9.2	6.6 Measuring Heats of Reaction 6.7 Hess's Law	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	9.3	6.8 Standard Enthalpies of Formation	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
10	10.1	7.4 Quantum Mechanics	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	10.2	7.5 Quantum Numbers and Atomic Orbitals	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	10.3	8.1 Electron Spin and Pauli Exclusion Principle 8.2 Building-Up Principle and the Periodic Table	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
11	11.1	8.3 Writing Electron Configurations Using the Periodic Table	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1

	11.2	8.4 Orbital Diagrams of Atoms, Hund's Rule	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	11.3	8.6 Some Periodic Properties	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
12	12.1	9.1 Describing Ionic Bonds 9.2 Electron Configurations of Ions	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	12.2	9.3 Ionic Radii 9.4 Describing Covalent Bonds 9.5 Polar Covalent Bonds and Electronegativity	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	12.3	9.6 Writing Lewis Electron-Dot Formulas 9.7 Delocalized Bonding: Resonance	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
13	13.1	9.8 Exceptions to the Octet Rule 9.9 Formal Charge and Lewis Formulas	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	13.2	9.10 Bond Length and Bond Order 9.11 Bond Enthalpy	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	13.3	10.1 The Valence-Shell Electron-Pair Repulsion (VSEPR) Model	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
14	14.1	10.2 Dipole Moment and Molecular Geometry	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	14.2	10.3 Valence Bond Theory	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
	14.3	10.4 Description of Multiple Bonding	In the class	Written exam	Darrel Ebbing and Steven gammon, General Chemistry, 11th ed. Ch 1
15	15.1				
	15.2				
	15.3				

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	CLO	Period (Week)	Platform
Midterm exam	30	Topics covered in chapters 1+2+3+4	1+2+3+4	Week # 7	On campus computerized exam
Semester work exam	20	Topics covered in chapters 5+6+7	5+6+7	Weak # 11	On campus computerized exam
Final exam	50	All Chapters	1+2+3+4 +5+6+7+ 8+9+10	Final exams week	On campus computerized exam

23 Course Requirements

N/A

24 Course Policies:

A- Attendance policies:

Students should attend at least 85% of the total number of the lectures.

B- Absences from exams and submitting assignments on time:

Students who miss an exam must submit and acceptable excuse and then a makeup exam will be appointed.

C- Health and safety procedures:

Followed according to university regulations.

D- Honesty policy regarding cheating, plagiarism, misbehavior:
Followed according to university regulations.

E- Grading policy:
1. Mid exam 30%
2. Semester work 20%
3. Final exam: 50%
The letter grade scale is adopted.

F- Available university services that support achievement in the course:
Central library, personal computer labs at different locations in the university, e-learning site, faculty member's website.

25 References:

- A- Required book (s), assigned reading and audio-visuals: General Chemistry, 11th ed., D. Ebbing & S. Gammon, Brooks Cole, 2017.
- B- Recommended books, materials, and media:
1) Chemistry, 9th ed., S. Zumdahl & S. Zumdahl, Brooks Cole, 2013.
2) 2. General Chemistry, The essential concept, 7th ed., R. Chang, McGraw-Hill, 2016.

26 Additional information:

This course is required by almost all students in scientific faculties at the University of Jordan. The number of students registered in general chemistry 1 (0303101) course in Fall 2021/2022 is was ~5000 student distributed on 61 sections.

Name of Course Coordinator: -----	Signature: -----	Date: -----
Head of Curriculum Committee/Department: -----	Signature: -----	
Head of Department: -----	Signature: -----	
Head of Curriculum Committee/Faculty: -----	Signature: -----	
Dean: -----	Signature: -----	