

Syllabus 1445 (2023-2024)
GENERAL CHEMISTRY 1
(CHEM 101)

Textbook: *Raymond Chang, Chemistry, 14th edition, 2022*

Topics	Page Number	Lecture hours
Ch1: Measurement and the Properties of Matter		
1.1 Chemistry: A Science for the Twenty-First Century	2	3
1.2 The Scientific Method	4	
1.3 Measurements	6	
1.4 Handling Numbers	13	
1.5 Dimensional Analysis in Solving Problems	20	
1.7 Classification of matter	25	
<i>Review and Exercises</i>		
Ch2: Atoms, Ions, and Molecules		
2.1 The Atomic Theory	41	5
2.2 The Structure of the Atom	43	
2.3 Atomic Number, Mass Number, and Isotopes	49	
2.4 The Periodic Table	51	
2.5 Molecules and Ions	54	
2.6 Chemical Formulas	55	
2.7 Naming Compounds	60	
<i>Review and Exercises</i>		
Ch3: Mass Relationships in Chemical Reactions		
3.1 Atomic Mass	80	6
3.2 Avogadro's Number and Molar Mass of an Element	82	
3.3 Molecular Mass	85	
3.4 The Mass Spectrometer	88	
3.5 Percent Composition of Compounds	90	
3.6 Experimental Determination of Empirical Formulas	93	
3.7 Chemical Reactions and Chemical Equations	95	
3.8 Amounts of Reactants and Products	100	
3.9 Limiting Reagents	104	
3.10 Reaction Yield and Atom Economy	108	
<i>Review and Exercises</i>		
Ch4: Reactions in Aqueous Solutions		
4.1 General Properties of Aqueous Solutions	125	5
4.2 Precipitation Reactions	127	
4.3 Acid-Base Reactions	132	
4.4 Oxidation-Reduction Reactions	138	
4.5 Concentration of Solutions	150	
4.6 Gravimetric Analysis	155	
4.7 Titrations	157	
<i>Review and Exercises</i>		

Ch5: Gases		
5.1 That Exist as Gases	176	6
5.2 Pressure of a Gas	178	
5.3 The Gas Laws	181	
5.4 The Ideal Gas Equation	188	
5.5 Gas Stoichiometry	196	
5.6 Dalton's law of Partial Pressures	199	
5.7 The Kinetic Molecular Theory	205	
5.8 Deviation from Ideal Behavior	214	
<i>Review and Exercises</i>		
Ch6: Thermochemistry		
6.1 The Nature of Energy and Types of Energy	231	6
6.2 Energy Changes in Chemical Reactions	232	
6.3 Introduction to Thermodynamics	234	
6.4 Enthalpy of Chemical Reactions	241	
6.5 Calorimetry	247	
6.6 Standard Enthalpy of Formation and Reaction	253	
6.7 Heat of Solution and Dilution	259	
<i>Review and Exercises</i>		
Ch7: Quantum Theory and the Electronic Structure of Atoms		
7.1 From Classical Physics to Quantum Theory	274	5
7.2 The Photoelectric Effect	281	
7.3 Bohr's Theory of the Hydrogen Atom	283	
7.4 The Dual Nature of the Electron	290	
7.5 Quantum Mechanics	294	
7.6 Quantum Numbers	297	
7.7 Atomic Orbitals	300	
7.8 Electron Configuration	305	
7.9 The Building-Up Principle	312	
<i>Review and Exercises</i>		
Ch12: Physical Properties of Solutions		
12.1 Types of Solutions	528	6
12.2 A Molecular View of the Solution Process	529	
12.3 Concentration Units	532	
12.4 The Effect of Temperature on Solubility	536	
12.5 The Effect of Pressure on the Solubility of Gases	538	
12.6 Colligative Properties of Nonelectrolyte Solutions	541	
12.7 Colligative Properties of Electrolyte Solutions	552	
<i>Review and Exercises</i>		
TOTAL HOURS		42

- **Grading:**

1- Mid Exam 1	15 points
2- Mid Exam 2	15 points
3- Laboratory Experiments	30 points
4- Final Exam	40 points

TOTAL	100 points
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- **Mid Exam 1**

- 1- Ch1: Measurement and the Properties of Matter
- 2- Ch2: Atoms, Ions, and Molecules
- 3- Ch3: Mass Relationships in Chemical Reactions

- **Mid Exam 2**

- 1- Ch4: Reactions in Aqueous Solutions
- 2- Ch5: Gases
- 3- Ch6: Thermochemistry

- **Final Exam**

All chapters