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**National Taiwan University of Science and Technology**

**2021 Summer Program**

**CHEM 101 Introduction to Chemistry with Lab**

**Course Outline**

**Term: June 14-July 09, 2021**

**Class Hours: 8:00-9:50 (Monday through Friday)**

**Course Code: CHEM 101**

**Instructor: Prof. Wael Rabeh**

**Home Institution: New York University Abu Dhabi**

**Office Hours: Monday and Wed: hours TBD & by appointment**

**Email: wael.rabeh@nyu.edu**

**Credit: 4**

**Course Description:**

This is a general chemistry course that will cover: basic measurement, stoichiometry, atomic theory, bonding theory, molecular structure, electron configuration, periodicity, thermochemistry, and the study of matter and changes it undergoes. Here, you will learn chemical symbols, write formulas and equations of chemical reaction, and chemical properties and practical applications of problems encountered in our life.

**Course Objectives**

Chemistry is central to all sciences as it connects them to life and applied sciences. Some of the main goals and objectives of this general chemistry course are for each student to:

- be able to classify states of matter and the physical and chemical properties of matter.



- the ability to convert different units of measurements between systems using different conversion techniques.
- understand the Dalton's Atomic Theory and Modern Atomic Theory.
- determine the atomic weights of atoms and molecules to describe their subatomic structures in relation to the Periodic Table.
- learn the trends of physical and chemical properties of elements using the periodic table.
- calculate the % composition and molecular formulas of chemical processes.
- the ability to write balanced chemical reaction equations.
- determine numbers of Moles, grams and particles in a chemical equation to find the limiting reagents.
- explain atomic structure using the quantum mechanical model of the atom.
- draw the structure of ions and molecules using the Lewis Dot Structure.
- acid base chemistry to apply them to chemical and biological systems.
- thermodynamics to convert different forms of energy states.
- identify different types of bonds and how they are formed.
- learn resonance structures, Valence Shell Electron Pair Repulsion Theory (VSEPR) and the 3D shapes of molecules.
- molecular polarity and its effect on behavior and shape of molecules.
- apply the chemical concepts learned in this course to different aspects of our life.

### Course Materials:

The following online textbook will be used as the main source for the course. It can be downloaded at OpenStax Chemistry (open source e-book):

<https://openstax.org/details/books/chemistry>

Additional course materials will include extra readings, lecture PowerPoint slides and in-class practice problems.

### Grading & Evaluation:

Lab (20%) – Quizzes (20%) – Midterm exam (30%) – Final exam (30%)

90-100% (A), 80-89% (B), 70-79% (C), 60-69% (D), ≤ 60% (F)

### Course Schedule:



	Topics	Assignments
Week 1	Fundamental Chemical Information, Atoms, Molecules, and Ions.	
	Atomic Structure: Electronic Configurations and Periodic Table.	
	Molecular Structure and Bonding.	
	Chemical Nomenclature.	Quiz 1
	Lab 1: Atomic Structure and the Periodic Table	
Week 2	Lewis Structure, Molecular Geometry and Bonding Theory.	
	Chemical Reactions and Equations.	Quiz 2
	Chemical Bonds: Ionic, Covalent and Noncovalent Bonds.	
	Chemical Equilibrium.	Quiz 3
	Lab 2: Molecular geometry and Valence-Shell Electron-Pair Repulsion (VSEPR) model	
Week 3	Midterm Exam	
	Stoichiometry & Molarity in Chemical Reactions.	
	Stoichiometry Practice Problems.	
	Thermochemistry: Enthalpy and Chemical Reactions.	Quiz 4
	Lab 3: Solutions and molarity calculation.	
Week 4	Properties of Liquids and Solutions.	
	Solutions: Dilutions, Concentrations and molarity.	Quiz 5
	Acid/base chemistry and pH.	
	Lab 4: Buffers and $pK_a$ values.	
	Final Exam	