



**University of International Business and Economics
International Summer School**

CHE 110 Introduction to Chemistry (with Lab)

Term: May 24– June 24, 2021

Instructor: Guirong Wang

Home Institution: Beijing University of Chemical Technology

Email: wanggr@mail.buct.edu.cn / bettymaggie@126.com

Class Hours: Monday through Thursday, 120 minutes each day (2,400 minutes in total)

Office Hours: TBD

Discussion Session: 2 hours each week

Total Contact Hours: 64 contact hours (45 minutes each)

Credit: 4 units

Course Description:

This course is designed to introduce students to the fundamental principles of chemistry. We will begin with the atomic and molecular nature of matter and its changes, unit conversions, the periodic table and nomenclature. We will discuss the mole concept, stoichiometry, oxidation-reduction and precipitation reactions, and solution chemistry. We will finish the semester discussing quantum chemistry and examine the atomic theory, modes of bonding, periodicity, Lewis structures, VSEPR theory, intermolecular forces and the gas laws.

Course Goals:

- i) To develop an understanding of the atomic and molecular nature of matter and of the chemical reactions that describe their transformations.
- ii) To develop quantitative and critical thinking skills necessary to solve chemical problems using the concepts of balanced chemical reactions, stoichiometry, and solution chemistry.
- iii) To gain an understanding of the periodic table as an organizing concept of chemical properties.
- iv) To use the principles of the VSEPR to gain an understanding for the relationship between molecular structures, geometry and use these to discuss bond polarity, solubility, types of intermolecular forces.

Course Material:

- Chemistry: A Molecular Approach, 4th ed. by Nivaldo J. Tro, ISBN: 97 8-0134112831
- Non-programmable Scientific Calculator



Homework Assignments:

Mandatory graded Assignments will be assigned associated with your textbook at. These assignments will help you to assess your understanding of the material and identify areas of difficulty and allow you to work at your own pace to achieve mastery the material.

Either assignment or quiz, have specified due dates and will be graded. It is your responsibility to complete the assignments by the set deadlines. Assignments count for 20% of each student's final numerical grade.

Laboratory:

Laboratory is an integral part of the course. For more information on the Laboratory, please visit the lab syllabus.

Academic Honesty:

The relationship between students and faculty is based upon trust and the continued maintenance of this trust is necessary for education to be successful. Students need to trust faculty to make appropriate judgments about the content and structure of the course. Faculty members need to trust that the work turned in by students represents their own effort. Violation of this trust undermines the educational process. As a result, there is no tolerance for breach of academic integrity such as cheating, plagiarizing, or inappropriate sharing of laboratories or quizzes.

Anyone caught cheating or plagiarizing will receive an F in the course.

Cheating can include sharing answers, as well as stealing answers. Plagiarism means copying words from someone's work, even if you "change the sentence a bit." If you share your laboratory report you are as guilty as the person copying it. If you do use material from an appropriate source, make sure you reference it properly in your reports. If you have any questions about the proper way to reference sources, please ask.

Grade Calculations:

Regular class attendance and completion of chapter readings are necessary to succeed in this course. Your final course grade will be calculated as follows:

Discussion Attendance and Participation	10%
Assignments	20%
Quizzes (4)	20%
Cumulative Final Exam	30%
Laboratory	20%

Grading Scale:

Assignments and examinations will be graded according to the following grade scale:

A	90-100	C+	72-74
A-	85-89	C	68-71
B+	82-84	C-	64-67
B	78-81	D	60-63
B-	75-77	F	below 60

Tentative Schedule:

Week 1	Topics	Textbook readings
Mon	Overview <ul style="list-style-type: none"> Scientific Method Classification of Matter 	1-5
Tue	Overview <ul style="list-style-type: none"> Physical and Chemical Changes and Properties Units of Measurements 	9-13
Wed	Atoms and Elements <ul style="list-style-type: none"> Basic Principles of Atomic Theory and Structure. Subatomic Particles 	53-55
Thurs	Atoms and Elements <ul style="list-style-type: none"> Atomic Mass The Mole Concept 	65-69
Week 2		
Mon	Molecules, Compounds, and Chemical Equations <ul style="list-style-type: none"> Chemical Bonds Ionic Compounds 	87-90
Tue	Molecules, Compounds, and Chemical Equations <ul style="list-style-type: none"> Molecular Compounds – Nomenclature Formula Mass, Mole Concept of Compounds 	101-107
Wed	Molecules, Compounds, and Chemical Equations Writing and Balancing Equations	107-119
Thurs	Molecules, Compounds, and Chemical Equations Mole Concept and stoichiometry calculations	141
Week 3		

Mon	Chemical Quantities and Aqueous Reactions Properties of Solutions	
Tue	Chemical Quantities and Aqueous Reactions Solubility of Ionic Compounds and Precipitation Reactions	158-162
Wed	Chemical Quantities and Aqueous Reactions <ul style="list-style-type: none"> • Acid-Base and Gas-Evolution Reactions • Oxidation-Reduction Reactions • Combustion Reactions 	167-175
Thurs	Gases <ul style="list-style-type: none"> • Ideal Gas Law • Kinetic Molecular Theory 	208-224
Week 4		
Mon	Quantum Theory	297-308
Tue	Periodic Properties of the Elements Electron Configuration – Pauli Exclusion Principle, Aufbau Principle, Hund’s Rule	339-347
Wed	Periodic Properties of the Elements Periodic Trends – Size of Atoms, Ionic Radii, Ionization Energy, Electron Affinity	352-356
Thurs	Chemical Bonding I Ionic, Covalent and Metallic Bonds	384-394
Week 5		
Mon	Chemical Bonding I Electronegativity and Bond Polarity	396-399
Tue	Chemical Bonding II <ul style="list-style-type: none"> • VSEPR Theory – Molecular Geometry • Valence Bond Theory – Hybridization 	428-437
Wed	Intermolecular Forces <ul style="list-style-type: none"> • Dispersion, Dipole-Dipole, Ion-Dipole Forces, and Hydrogen Bonding • States of Matter and Physical Properties 	486-489
Thurs	FINAL EXAM	

Online Possibility:

Due to the on-going pandemic, there is a possibility that in-person courses are changed to online ones. UIBE ISS will notify the students once the decision has been made.

If the in-person courses are to be changed to online courses, we will make a few adjustments:

1. **Lecture:** Each lecture will be uploaded on UIBE's online learning platform on a daily basis. Students are required to watch them according to the course schedule.
2. **Discussion:** There will be an open session on ZOOM every Tuesday. The attendance of the discussion is important as it is part of your final score.
3. **Office hours:** I will release the office hours once the course starts. You are very welcome to send me emails to book my time. We will have video or audio calls through ZOOM. Please be noted to book them at least 3 days in advance.

Laboratory Syllabus

Course Goals:

Upon successful completion of this course, students will be able to:

- Demonstrate the ability to work safely and effectively in the laboratory.
- Competently perform a broad variety of analytical and synthetic procedures and critically evaluate the results.
- Perform basic laboratory skills and understand common laboratory practices, procedures, and equipment, including safety issues.
- Explain, analyze and interpret the data obtained from each experiment.
- Demonstrate adequate skills in technical writing.

Tentative Lab Schedule:

Date	Topic
TBD	Laboratory Safety and check-in Experiment #1 Measurements and Density
TBD	Experiment #2 Isolating the Components of a Three-Component Mixture
TBD	Experiment #3 Determining the Water Content of an Ionic Hydrate
TBD	Experiment #4 Studying Chemical Reactions and Writing Chemical Equations
TBD	Experiment #5 Acid-Base Titration
TBD	Experiment #6 Gas Laws
TBD	Experiment #7 Molecular Models (Dry Lab)
TBD	Experiment #8 Spectrophotometric Analysis of Permanganate Solutions

Each module will contain a Lab Activity document where you will find the instructions and procedures for that module's labs. These activity documents are designed to act as a study guide for the module test.

Each Lab Activity Document has the following:

- Purpose
- Learning Objectives
- Assignment Submission Checklist (Experimental Photographs, Formal Lab Reports, Graphs, Lab Assessment, etc.)
- Lab Activity Number
 - Introduction
 - Procedure
 - Analysis and Questions

You will only be submitting what is in the Assignment Submission Checklist Area. You aren't going to submit the handouts or analysis and questions section. Your instructor will have those answers if you are stuck and need clarification.

All reports/handouts will need to be submitted in a word document and uploaded as an attachment. Please make sure you title your file with your last name and the title of the lab. Your name should also be included on the actual document itself.

Online Possibility:

Due to the on-going pandemic of COVID 19. There is a possibility that in-person courses are changed to online ones. The instructor will offer some instruction through distance learning for the Lab experiments. You will have to complete 4 physical experiments of the five at home, and you might need to purchase an electronic balance or some other simple instruments. The lab schedule will be adjusted accordingly as follows. You need to hand in the experimental reports to TA after the experiments.

Tentative Lab Schedule for online course:

Topic
Laboratory Safety and check-in
Experiment #1 Measurements and Density
Experiment #2 Isolating the Components of a Three-Component Mixture
Experiment #3 Oxidation and Reduction Reactions
Experiment #4 Studying Chemical Reactions and Writing Chemical Equations
Experiment #5 Acid-Base Titration with Indicator