University of International Business and Economics

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International Summer School

CHE 110 Introduction to Chemistry (with Lab)

Term: May 25– June 25, 2020
Instructor: Guirong Wang
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Class Hours: Monday through Thursday, 120 minutes each day
Office Hours: TBD
Discussion Session: 2 hours each week

Total Contact Hours: 64 contact hours (45 minutes each)
Credit: 4 units

If you wish to speak to me outside the allotted office hours, please come by or make an appointment.

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

Electronic Devices:

All electronic communication devices must be turned off during class time. You will not be allowed to use electronic devices during exams or quizzes (no cell phones calculators).

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 10% of each student's final numerical grade.

Laboratory:

Laboratory is an integral part of the course. Attendance is mandatory. You must have a passing grade in lab to pass course. For more information on the Laboratory, please visit the lab syllabus.

Attendance Policy for Classes, Quizzes & Exams:

It is highly recommended that you make every effort to attend all classes, as the quizzes and the three one-hour exams are based solely on the lecture. No additional "credit" is given in this course.
Make-up quizzes or exams will only be permitted due ***to illness or family emergency***. If you are unable to attend class on a quiz or exam day because of illness or emergency, you are expected to contact me ***before class*** by phone, WeChat or e-mail. Failure to notify me in one of these ways will result in you not receiving consideration for a make-up quiz or examination. A Doctor's note is required in case of an illness.

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.

Final Exam:

The final exam will be comprehensive and accounts for 20% of your final grade.

Final Exam: Friday, June 25th

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:

Lecture Attendance and Participation	10%
Assignments	15%
Quizzes (5)	15%
Midterm exam	20%
Cumulative Final Exam	20%
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** • Scientific Method • Classification of Matter	1-5
Tue	**Overview** • Physical and Chemical Changes and Properties • Units of Measurements	9-13
Wed	**Atoms and Elements**	53-55

	• Basic Principles of Atomic Theory and Structure. • Subatomic Particles	
Thurs	**Atoms and Elements** • Atomic Mass • The Mole Concept	65-69
Week 2		
Mon	**Molecules, Compounds, and Chemical Equations** • Chemical Bonds • Ionic Compounds	87-90
Tue	**Molecules, Compounds, and Chemical Equations** • 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** • Acid-Base and Gas-Evolution Reactions • Oxidation-Reduction Reactions • Combustion Reactions	167-175
Thurs	**Gases** • 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** • VSEPR Theory – Molecular Geometry • Valence Bond Theory – Hybridization	428-437
Wed	**Intermolecular Forces** • Dispersion, Dipole-Dipole, Ion-Dipole Forces, and Hydrogen Bonding • States of Matter and Physical Properties	486-489
Thurs	FINAL EXAM	

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.

Course Material:

- Approved Eye Protection. Safety regulations require that splash-proof, chemical goggles be worn by everyone present at any time that any experimentation is being conducted or at any time that chemicals or equipment are being moved by anyone else in the laboratory. Failure to wear goggles will result in expulsion from the laboratory for the experiment involved. Don't forget them! Goggles must be splash-proof (indirect vents). Appropriate goggles are available at the bookstore.

- Scientific Calculator. Please bring your calculator to each lab. You may not use your cell phone as a calculator.

Policy on Safety and Breakage:

Before working in the laboratory, every student must read and sign a Safety Agreement and take the safety quiz found in the beginning of your lab manual. Some highlights and supplements:

1) Food and drink (including bottled water) are not permitted in the lab
2) You must wear eye protection and your long white lab coat at all times
3) You must wear sturdy clothing that completely covers your feet, ankles and legs below your lab coat. Sturdy long pants that cover your ankle and sturdy shoes or boots that encase your foot are strongly advised. Open-toe, open-top, and open-heel shoes, sandals, slippers, pajamas, shorts, and short skirts are not permitted
4) Your clothing and hair must not dangle into your experiments: tuck it in, tie it back, or remove it
5) The use of cell phones is not permitted in the lab, even as a calculator
6) You may not run an unauthorized experiment or remove chemicals or equipment from the lab

It is imperative for your safety that you and everyone around you strictly adhere to the Safety Rules. Failure to wear safe attire, or comply with safety regulations, will result in dismissal from the lab for that day and a zero-lab grade for that experiment. You will utilize equipment furnished by the College. It is your responsibility to properly maintain the equipment while it is in your care. If equipment that has been entrusted to you is not returned in satisfactory condition, you will be held responsible for it.

Attendance Policy:

Students are expected to attend and perform ALL scheduled labs. With proper documentation and permission of instructor, students, including student athletes, will be allowed to make-up a missed experiment. All students must contact their laboratory instructor prior to their scheduled lab to arrange permission to make-up the experiment.

Preparation and Pre-lab Questions:

You are expected to read the laboratory procedure before your laboratory session. This preparation will be necessary for you to complete your experiments within the allotted time. You are expected to complete the Pre-lab Questions (found at the beginning of each report form) before your lab period – these will be collected at the beginning of lab. Failure to answer the Pre-Lab Questions in advance will result in zero credit for those questions on your report.

Reports:

Unless otherwise noted, lab reports are due at the end of the lab period on the day that the experiment has been conducted. Your instructor must personally accept your report and give you permission to leave before you exit the lab. Late reports will not be accepted.

The Report sheets (including the Pre-Lab Questions) are worth 90% of your grade for each lab period. The Report Sheet must reflect information obtained by you while in the laboratory and recorded in your lab manual. Although you may be asked to work in groups at times, each member of the group must turn in their own complete report sheet. If you wish, you may discuss the lab with others as you complete the report; however, your answers to the report questions must be written in your own words. Identical lab reports, even from lab partners, are considered a violation of the Academic Honesty Policy, and each party will receive a zero for that report. Neatness and completeness may be considered when grades are assigned.

Grade Calculations:

The lab portion of the course is worth 20% towards your final course grade. Each experiment will be graded out of 100 points according to the following grading scheme:

Prelab Questions	15%
Lab Report Sheet	75%
Lab Safety, Technique and Cleanup	10%

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