



## CHEM 1210 - General Chemistry II

2022 Spring Session	
<b>Total Class Sessions: 25</b> <b>Class Sessions Per Week: 5</b> <b>Total Weeks: 5</b> <b>Class Session Length (Minutes): 145</b> <b>Credit Hours: 4</b>	<b>Instructor: Staff</b> <b>Classroom: TBA</b> <b>Office Hours: TBA</b> <b>Language: English</b>

### Course Description:

General Chemistry II is a continuation of General Chemistry I. The following topics will include in this course: Chemical Equilibrium, Acid–Base Equilibria, Additional Aqueous Equilibria, Electrochemistry, the Solid State, Organic Chemistry, Biochemistry, Nuclear Chemistry, Chemical Kinetics. Basic laboratory experiments supporting theoretical principles will also presented in this course, which include, introduction of the scientific method, experimental design, chemical instrumentation, data collection and analysis, and preparation of laboratory reports.

### Learning Objectives:

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

- ✓ Understand reaction rates and determine how the extent of reaction relates to the time elapsed and how a mechanism is related to the rate law
- ✓ Explain the concept of equilibrium, the equilibrium constant, solve problems using the concept of equilibrium
- ✓ Determine whether a substance is an acid or base, write acid base reactions, understand how a buffer solution works and explain the concept of pH
- ✓ Explain the concepts of enthalpy, entropy, and free energy and use it to solve problems and relate it to everyday occurrences
- ✓ Balance oxidation reduction reactions and relate these processes to electrochemical data
- ✓ Name simple organic compounds identify functional groups and relate organic chemistry to biochemical processes

### Course Materials:

**Chemistry: An Atoms Focused Approach**, 3rd edition, Thomas R Gilbert, Rein V Kirss, Stacey Lowery Bretz, Natalie Foster

ISBN-13: 978-0393697452

### Course Format and Requirements:

Material involves taking time to think things through, develop the knowledge (or process) and



practice this. It is also very helpful to test yourself on your knowledge development. Using the quiz or exam as a means to test if you have learned something could be too late to determine you still have a gap in knowledge. Remember, lecture is very important in seeing process and models and hearing concepts and their derivation and application BUT is not the beginning and end of learning. It would be unusual to learn something simply from sitting in lecture.

### **Course Assignments:**

#### **Attendance:**

Attendance at all class sessions is required. You have to notify the instructor in advance of your absence. If you fail to attend class on a regular basis, your final course grade will be lowered. Likewise, you should arrive to class on time. Tardiness is disruptive and disrespectful to me and to your classmates. Please make every effort to arrive punctually.

#### **Quizzes:**

There will be six quizzes in total. Short, in-class quizzes will test your comprehension of course materials. You are supposed to make adequate preparation before each quiz. You are not allowed to consult your classmates or read your textbook or handout during the quizzes. You should be well-prepared before the class. The lowest score will drop off.

#### **Exams:**

There will be three one-hour midterm exams and one final exam during the course. Exam questions may come from lecture, lab, the text, and/or homework and will be a mix of multiple choice, mathematical problems, and short answers. Please note that you must show your work on arithmetical problems for credit and partial credit. Students are required to take all exams, and there are NO MAKE-UP EXAMS.

### **Course Assessment:**

Attendance	5%
Quizzes (5 out of 6)	15%
Midterm Exam 1	15%
Midterm Exam 2	15%
Midterm Exam 3	15%
Final Exam	35%
<b>Total</b>	<b>100%</b>

### **Grading Scale (percentage):**

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
98-	93-	90-	88-	83-	80-	78-	73-	70-	68-	63-	60-	<60
100	97	92	89	87	82	79	77	72	69	67	62	



### **Academic Integrity:**

Students are encouraged to study together, and to discuss lecture topics with one another, but all other work should be completed independently.

Students are expected to adhere to the standards of academic honesty and integrity that are described in the Chengdu University of Technology's *Academic Conduct Code*. Any work suspected of violating the standards of the *Academic Conduct Code* will be reported to the Dean's Office. Penalties for violating the *Academic Conduct Code* may include dismissal from the program. All students have an individual responsibility to know and understand the provisions of the *Academic Conduct Code*.

### **Special Needs or Assistance:**

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.

### **Course Schedule:**

Week	Topics	Assignments
Week One (Class 1~5)	<ul style="list-style-type: none"><li>• <b>Introduction to The Course</b></li><li>• <b>Briefly Review the Content in General Chemistry I</b></li><li>• <b>Chemical Equilibrium: Equal but Opposite reaction rates</b><ul style="list-style-type: none"><li>➤ The Dynamics of Chemical Equilibrium</li><li>➤ Writing Equilibrium Constant Expressions</li><li>➤ Relationships between <math>K_c</math> and <math>K_p</math> Values</li><li>➤ Manipulating Equilibrium Constant Expressions</li><li>➤ Equilibrium Constants and Reaction Quotients</li><li>➤ Heterogeneous Equilibria</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Quiz 1</li></ul>
Week Two (Class 6~10)	<ul style="list-style-type: none"><li>• <b>Acid–Base Equilibria: proton transfer in Biological Systems</b><ul style="list-style-type: none"><li>➤ Acids and Bases: A Balancing Act</li><li>➤ Acid Strength and Molecular Structure Strong and Weak Bases</li><li>➤ pH and the Autoionization of Water</li><li>➤ <math>K_a</math>, <math>K_b</math>, and the Ionization of Weak Acids and Bases</li><li>➤ Calculating the pH of Acidic and Basic Solutions</li><li>➤ Polyprotic Acids</li><li>➤ Acidic and Basic Salts</li></ul></li><li>• <b>Additional Aqueous Equilibria: Chemistry and the Oceans</b><ul style="list-style-type: none"><li>➤ Ocean Acidification: Equilibrium under Stress</li><li>➤ The Common-Ion Effect</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Quiz 2</li><li>• Midterm exam 1</li></ul>



	<ul style="list-style-type: none"><li>➤ pH Buffers</li><li>➤ Indicators and Acid–Base Titrations</li><li>➤ Lewis Acids and Bases</li><li>➤ Formation of Complex Ions</li><li>➤ Hydrated Metal Ions as Acids</li><li>➤ Solubility Equilibria</li></ul>	
Week Three (Class 11~15)	<ul style="list-style-type: none"><li>• <b>Electrochemistry: The Quest for Clean Energy</b><ul style="list-style-type: none"><li>➤ Running on Electricity</li><li>➤ Electrochemical Cells</li><li>➤ Standard Potentials</li><li>➤ Chemical Energy and Electrical Work</li><li>➤ A Reference Point: The Standard Hydrogen Electrode</li><li>➤ The Effect of Concentration on E-cell</li><li>➤ Relating Battery Capacity to Quantities of Reactants</li><li>➤ Corrosion: Unwanted Electrochemical Reactions</li><li>➤ Electrolytic Cells and Rechargeable Batteries</li><li>➤ Fuel Cells</li></ul></li><li>• <b>the Solid State: A particulate View</b><ul style="list-style-type: none"><li>➤ Structures of Metals</li><li>➤ Alloys</li><li>➤ Metallic Bonds and Conduction Bands</li><li>➤ Semiconductors Structures of Some Crystalline Nonmetals</li><li>➤ Salt Crystals: Ionic Solids</li><li>➤ Ceramics: Useful, Ancient Materials</li><li>➤ X-ray Diffraction: How We Know Crystal Structures</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Quiz 3</li><li>• Midterm exam 2</li></ul>
Week Four (Class 16~20)	<ul style="list-style-type: none"><li>• <b>Organic Chemistry: Fuels, pharmaceuticals, and modern materials</b><ul style="list-style-type: none"><li>➤ Carbon: The Stuff of daily life</li><li>➤ Alkanes</li><li>➤ Alkenes and Alkynes</li><li>➤ Aromatic Compounds</li><li>➤ Amines</li><li>➤ Alcohols, Ethers, and Reformulated Gasoline</li><li>➤ Aldehydes, Ketones, Carboxylic Acids, Esters, and Amides</li><li>➤ A Brief Survey of Isomers</li></ul></li><li>• <b>Biochemistry: The Compounds of Life</b><ul style="list-style-type: none"><li>➤ Composition, Structure, and Function: Amino Acids</li><li>➤ Protein Structure and Function</li><li>➤ Carbohydrates</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Quiz 4</li><li>• Quiz 5</li><li>• Midterm exam 3</li></ul>



	<ul style="list-style-type: none"><li>➤ Lipids</li><li>➤ Nucleotides and Nucleic Acids</li><li>➤ From Biomolecules to Living Cells</li></ul>	
Week Five (class 21~25)	<ul style="list-style-type: none"><li>• <b>Nuclear Chemistry: the risks and Benefits</b><ul style="list-style-type: none"><li>➤ The age of radioactivity</li><li>➤ Decay Modes for Radionuclides</li><li>➤ Rates of Radioactive Decay</li><li>➤ Energy Changes in Radioactive Decay</li><li>➤ Making New Elements</li><li>➤ Fusion and the Origin of the Elements</li><li>➤ Nuclear Fission</li><li>➤ Measuring Radioactivity</li><li>➤ Medical Applications of Radionuclides</li></ul></li><li>• <b>Chemical Kinetics: Clearing the Air</b><ul style="list-style-type: none"><li>➤ Cars, Trucks, and Air Quality</li><li>➤ Reaction Rates</li><li>➤ Effect of Concentration on Reaction Rate</li><li>➤ Reaction Rates, Temperature, and the Arrhenius Equation</li><li>➤ Reaction Mechanisms</li><li>➤ Catalysts</li></ul></li></ul>	<ul style="list-style-type: none"><li>• Quiz 6</li><li>• Final exam</li></ul>