

CHEMISTRY 121 – Fall, 2014 Section PQR

Basic Chemistry I: This class introduces basic concepts in chemistry. Other aims are the demonstration of how logical observations about the natural world draw us towards scientific understanding and how logical reasoning can be applied in everyday life. This class is designed mainly for students with little to no background in chemistry or for students that want to improve their understanding before moving on to more advanced coursework.

Course Times: Monday and Wednesday 6:00-8:50 pm, Room 3974

Instructor: Prof. Geovannie Ojeda-Torres Office: PSE Main Office,

Email: gojeda-torres@ccc.edu

Office hours: Wednesday 5:00 to 6:00 pm

Prerequisites: Eligibility for English 101 and eligibility for Math 118 or higher, or completion of Math 99 with a grade of C or better or Consent of Department Chairperson. **If you do not meet this requirement, please see me!**

Required Materials: Textbook: Essentials Introductory Chemistry 5th Ed. By Nivaldo J. Tro

Mastering Chemistry: All students must purchase an access code for mastering chemistry.

- Homework will be assigned here.
- Course ID (TRUOJEDATORRESPQR121)

Scientific Calculator: A scientific calculator with exponential notation and logarithms is **required** for homework, lab reports, quizzes, and examinations.

Laboratory Manual: Professor will supply Handouts prior to the laboratory experience through blackboard.

- Chemical splash goggles: Indirectly vented. Must seal completely around the face. Shield-type or glasses-type are not allowed.

Attendance: Classes begin on time and the students are expected to be on time. Attendance will be pass at the end of each class student not present from beginning to end of the lecture will be count as absent.

The subject matter of each lecture and the corresponding pages in the textbook are listed in the calendar. Students with disabilities who require accommodations for access and participation in this course should visit the **Truman College Disability Access Center (DAC)**. DAC verifies needs pursuant to the American Disabilities Act (ADA), determines student academic accommodations, and issues accommodation letters. The center is located in room 1428 with phone number: (773) 907-4725. Linda Ford is the director. **TRIO Student Support Services** is for low-income students, first generation college students, or students with disabilities who need academic support: room 1435, 773-907-4797. Registration is required at the start of each semester. **Student Success and Leadership Institute** is for students who need various other support services to achieve their educational goals: room 1435, 773-907-4714.

Homework: A homework problem set will be assigned every Wednesday through Mastering Chemistry, and will be due the following Monday at 11:00PM. **There will be NO makeup homework.**

Quizzes: The quizzes will be given at the beginning of class covering the material from the previous class if the student is not present at the end of the class the quiz will not be graded. **There will be NO makeup quizzes.**

Exams: There will be four exams and a final, which will be held during finals week. Exam I will be held on during class time. There will be Final exit exam you need to score 17/30 on the exit exam to receive a C or a better grade in the course. **There will be NO makeup Exams.**

CCC Rules:

1. Food consumption and/ or smoking is prohibited in the classroom.
2. All cellphones or I-anything have to be **TURN OFF** during class.
3. Only pencils and scientific calculators are **ALLOWED** on examinations.
4. **CHEATING** would not be allowed or tolerated in any form, the result will be a **ZERO** in the exam, quiz or laboratory experience and report.

Lab Notebooks:

Bound notebook is required for all labs that will be turned in at the end of the semester. Lab reports will consist of a pre-lab section, in-lab section and a post-lab section. A pre lab is required for all labs and will be checked before you can begin the experiment for that class period. **THIS SHOULD BE WRITTEN ON YOUR LAB NOTEBOOK BEFORE THE LAB.**

Pre Labs:

1. **Title:** The full title of the experiment should be clearly written on the first page of the lab notebook entry.
2. **Introduction:** A brief (five- to ten-sentence) introduction to the experiment should be written at the top of the page. The introduction should state the goals and objectives of the laboratory and describe what data will be collected and how that data will be used to arrive at conclusions at the completion of the laboratory. If hypotheses can be made about the outcome of the experiment beforehand, they should be stated here.
3. **Chemicals Table (or Reaction Table):** Make a table of the chemicals (reagents, starting materials, etc.) that will be used during the experiment. List the chemicals and their formula, structure, molar mass and physical state. If it will be useful to know a reagent's melting point, boiling point, density or other physical property, include that information as well. For experiments involving chemical reactions or where stoichiometry is important, the quantity of each reagent used should be listed and the number of moles (or millimoles) should be calculated for each quantity.
4. **Calculations & Equations:** Write out all relevant equations with variable definitions that are applicable to the experiment. Write out calculations that can

be done ahead of time (e.g., determining the theoretical yield; determining limiting reagent).

5. **Anticipated Procedure:** Make a numbered list of the tasks that you must complete during the experiment. This list does not have to be exhaustive, but should accurately summarize all aspects of the procedure you are going to complete that day. During the lab, you may deviate from this outline as the requirements change in response to observations that you are making and data that you are collecting.

In-Lab:

Observations: Here, the more details you record, the more complete this section will be.

Use all of your senses—except taste!—when making observations. Make notes about the state of your reagents (e.g., physical state, color, smell) where appropriate, what happens when reagents are mixed (e.g., color changes, gas evolution), and temperature changes. Also, use this section to accurately record data that the manual asks you to collect during the experiment (e.g., masses, volumes, pH). Be as precise in your measurements as possible. If calculations are required in order to continue with the experiment, you may also do that math in this section while listing that procedural step in the Procedure section.

Post-Lab:

1. **Questions:** Most experiments in the lab manual pose questions at the end of the manuscript. These should be answered carefully and completely. Your TA will be checking for correct answers.
2. **Calculations:** If calculations are required using the data that was collected during the experiment, these should be clearly written here. Where applicable, write the full equation being used at the start of each calculation. Show all work for full credit. Write any new chemical equations that are relevant.
3. **Conclusions:** Finally, your post-lab should contain a small paragraph stating the conclusions that you were able to reach during the laboratory experiment. These conclusions should be well supported by the data that you collected and by the calculations that were written in both the Observations column and the Calculations section above. In other words, analyze the data; explain how the results of the experiment(s) led you to the stated conclusions. Also, discuss whether any hypotheses that were postulated in the pre-lab section were supported or unsupported.

Grades: The grade for the course will be calculated as follows:

Final 100 points – The final is weighted the same as an hour exam.

Hour exams 400 points

Homework 200 points

Quizzes (11) 100 points

Attendance 100 points

Laboratory Notebook 100 points

TOTAL: 1000 points

Grade	Points
A	1000-850
B	849-750
C	749-650
D	649-550
F	549 and below

Course Overview:

Date		Reference
8-25	Lecture: Introduction to CHEM 121, The Chemical World	Chapter 1
8-27	Lecture: Measurements and Problem Solving Lab Equipment Inventory, Getting Started in the Laboratory; Drawing Laboratory Apparatus.	Chapter 2
9-1	No Class LABOR DAY HOLIDAY	
9-3	Lecture: Measurements and Problem Solving, Lab Measurement, Temperature	Chapter 2
9-8	Lecture: Matter and Energy Quiz 1	Chapter 3
9-10	Lecture: Matter and Energy Lab: Accuracy and Precision	Chapter 3
9-15	Lecture Atoms and Elements (Documentary about the Periodic Table) Quiz 2	Chapter 4
9-17	Lecture: Atoms and Elements Lab: Identification of an Unknown Metal	Chapters 1-4
9-22	Exam 1	Chapters 1-4
9-24	Lecture: Molecules and Compounds Lab Density	Chapter 5
9-29	Lecture Molecules and Compounds Quiz 3	Chapter 5
10-1	Lecture Chemical Composition Lab Separation of Salt and Sand	Chapter 6
10-8	Lecture Chemical Composition Quiz 4	Chapter 6
10-13	Lecture Chemical Reactions Lab Single Displacement Reactions	Chapter 7
10-15	Lecture Chemical Reaction, Quiz 5	Chapter 7
10-20	Exam 2	Chapter 5-7
10-22	Quantities in Chemical Reactions, Quiz 6	Chapters 8
10-27	Lecture: Quantities in Chemical Reactions Lab Metathesis Reactions	Chapter 8
10-29	Lecture: Electrons and Atoms in the Periodic Table, Quiz 7	Chapter 9
11-3	Lecture: Chemical Bonding	Chapter 10

	Lab Molecular Geometry and Shape	
11-5	Lecture: Chemical Bonding Quiz 8	Chapter 10
11-10	Exam 3	Chapter 8-10
11-12	Lecture: Gases & Liquids, Solids and Intermolecular Forces, Quiz 9	Chapter 11 &12
11-17	Lecture: Liquids, Solids and Intermolecular Forces Lab Preparation and Properties of Carbon Dioxide	Chapter 12
11-19	Lecture: Solutions Quiz 10	Chapter 13
11-24	Lecture Solutions	Chapter 12
11-26	Exam 4	Chapters 11-13
11-28	No Class Thanksgiving Recess	
12-1	Lecture: Acid and Bases Quiz 11	Chapter 14
12-3	Lecture: Acid and Bases, Review Final Exam	Chapter 14
12-8	Final Exam	
12-10	Last Day of Class, Discussion of Final Grade	

* These dates can be subject to change.

Learning Outcomes and Course Objectives

Learning Outcomes for Chemistry 121

At the completion of this course, the successful student will be able to:

- Compare and contrast the chemical behavior and physical properties of common substances.
- Predict and explain the electronic and molecular structures of common substances using models.
- Determine the qualitative and quantitative relationships between matter and energy involved in chemical or physical processes.
- Classify matter by its state and bonding behavior using the Periodic Table as a reference.
- Solve quantitative problems (stoichiometric) involving chemical formulas and equations.
- Formulate and test hypotheses.
- Perform laboratory experiments demonstrating safe and proper use of standard chemistry glassware and equipment.
- Record, graph, chart and interpret data obtained from experimentation.

Course Objectives for Chemistry 121

Each course objective is cross referenced to a specific [General Education Goal \(GEG\)](#)

At the completion of this course, the successful student will be able to:

- Describe processes and procedures used in the scientific method; G EG 3-5
- Differentiate terms such as observation, hypothesis, data, conclusion, theory; G EG 3-5
- Explain how the use of the scientific method furthers scientific knowledge; G EG 3-5
- Convert numbers in decimal notation to scientific notation and vice versa; G EG 2-5
- Convert temperature data to values in three scales: Celsius, Fahrenheit and Kelvin; G EG 2-5
- Explain why the Kelvin scale does not use negative numbers; G EG 3,4
- Convert quantities using common metric units: liters/milliliters, kilograms/grams/milligrams and meters/centimeters/millimeters; GEG3-5
- Demonstrate the use of significant figures in basic calculations: addition/subtraction, multiplication/division; G EG 2-5
- Differentiate between precision and accuracy; G EG 3-5
- Calculate one of the three quantities: mass, volume, density given the values for the other two; G EG 4,5
- Determine volume by difference; G EG 5
- Measure the density of a sample of a solid or a liquid using available laboratory equipment; G EG 2,4,5
- List the names and chemical symbols of at least 44 elements including Uranium (92) from the inner transition elements; GEG3,4
- List the names and formulas of common polyatomic ions; G EG 3,4
- Given a positive and a negative ion - construct the formula of the ionic compound formed; G EG 3,4
- Compare and contrast the difference between covalent and ionic compounds; G EG 3,4

- Classify bonds in common compounds along the continuum of purely covalent to purely ionic; G EG 3,4
- Differentiate between pure substances (elements and compounds) and mixtures (homogeneous and heterogeneous); GEG3,4
- Define colloid and give examples of colloids: foams, gels, smoke; G EG 4
- Classify common elements as metals, non-metals and semi-metals and describe the properties of each class; G EG 3,4
- Explain how the arrangement of electrons in an atom affects its bonding and chemical properties; G EG 3,4
- Explain how the periodic table is arranged and what is indicated by rows, columns and various sections of the table; GEG3,4
- List electronic configurations for the first thirty-six elements; G EG 3,4
- List the number of valence electrons for the first thirty-six elements (main group elements only); G EG 4
- Construct simple Lewis Dot structures: water, methane, ammonia, boron trichloride, carbon dioxide, the diatomic molecules; GEG4
- Identify the alkali metals, alkaline earth metals, transition elements, halogens and noble gases on the periodic table; GEG3,4
- Convert between mass and moles; G EG 3,4
- Convert between number of moles and number of formula units, molecules or atoms; GEG 3,4
- Solve empirical formula problems; G EG 4
- Classify chemical reactions into types: combination (synthesis), decomposition, single displacement (replacement) and double displacement (replacement) and combustion; GEG4
- Determine if a metal/metal ion in a reaction is being oxidized or reduced; G EG 4
- Balance simple chemical reactions; G EG 4
- Paraphrase the chemical properties of common ionic compounds and common covalent molecules; G EG 3,4
- Recognize the formation of a precipitate or the evolution of a gas or heat during a chemical reaction performed in the laboratory; GEG5
- Construct chemical formulas for common compounds given the compound's name; G EG 3
- Identify the name of compounds from its formula; G EG 3
- Perform basic stoichiometric calculations to determine the quantity of products given various quantities of reactants; GEG4
- Solve limiting reactant problems; G EG 4
- Solve percent yield problems; G EG 4
- Compare and contrast the properties of the three basic states of matter: gas, liquid and solid; G EG 3,4
- Explain the Kinetic Molecular Theory of Gases and list the assumptions of this theory; G EG 3,4
- Calculate volume, temperature or pressure of a gas sample that undergoes changes in its initial conditions using the combined gas law; GEG4,5

- Apply the ideal gas law in solving chemical problems; G EG 4
- Compare the solubility of various common compounds; G EG 3,4
- Define the terms: solution, solute, solvent and solubility; G EG 3
- Calculate the molarity of solutions; G EG 4
- Identify and classify strong acids, hydroxide bases and neutral salts given the formula e.g. HCl is an acid, KOH is a base, NaCl is a neutral salt; GEG4,5
- Perform laboratory experiments that illustrate basic chemical principles; G EG 1,2,4,5
- Demonstrate the careful recording of observations and data in the laboratory; G EG 1-5
- Demonstrate a knowledge of laboratory safety; G EG 1,2
- Demonstrate effective laboratory procedures such as transfer of solids, weighing of solids, pouring of liquids, measurement of liquid volume; GEG1,2
- Collect, organize and graph experimental data; G EG 2-5
- Interpret experimental data and draw inferences from the data; G EG 4,5
- Summarize the results of experimental observations and data; G EG 4,5
- Give the names of common laboratory glassware: beakers, erlenmeyer flasks, graduated cylinders, test tubes.

Teaching and Learning Goals Established by Truman College
Taking a course in Chemistry helps a student achieve all of the following general education goals. How this occurs is explained below.

- Communicate effectively in both written and oral forms

Students will keep a laboratory notebook and learn to record careful observations, draw appropriate conclusions and reflect on what they have learned.

- Gather, interpret and analyze data

Students will learn to collect data in the laboratory, create graphs, compare quantitative data and draw conclusions about the data obtained.

- Demonstrate the ability to think critically, abstractly and logically

The Scientific Method is predicated upon deductive and inductive logical reasoning. Students will study applications of the scientific method to information gathered by the scientific community. Students will read articles about chemical discoveries. Abstract thinking is developed in many ways in chemistry from the use of symbols and models to the use of mathematics to solve a variety of problems.

- Work with a variety of technologies

Students use computers, data acquisition equipment, microscopes, digital imaging devices, media, the Internet, podcasts, digital balances, all in the pursuit of scientific knowledge.

- Exhibit social and ethical responsibility

This very serious goal is addressed on many levels in the chemistry course, from the discussion of the importance of careful and precise measurements that could affect the life of a patient to the discussion of what happened when the space ship Challenger exploded or a grain elevator explodes -we examine the role of responsible use of chemical knowledge.

- Perform productively in the workforce

Because Chemistry education is comprehensive in utilizing the body (kinesiology), the mind (both spatial and analytical reasoning) and the heart (looking at the connection of chemistry to the world) it is an excellent course to prepare individuals for the workforce.

- Demonstrate the ability to learn independently

Students are given independent projects to complete in the course. They are also given

questions to research independently. Reporting these results to the class develops their ability to speak confidently to their peers.

- Gain awareness of their role in the global community

By discussing the way that chemistry is connected to other occupations and careers we develop student awareness about their career choice and its dependencies on a basic understanding of chemistry.

General Education Goals Established by Truman College

- GEG1: The student exhibits social and ethical responsibility and is aware of her or his place in the global community.
- GEG2: The student performs effectively in the workplace and has the ability to work and make effective use of a wide variety of current technologies.
- GEG3: The student communicates effectively in both written and oral formats.
- GEG4: The student demonstrates the ability to think critically, abstractly, and logically.
- GEG5: The student gathers, interprets and analyzes data.

Physical Science and Engineering Departmental Learning Outcomes

Upon graduation with an Associate degree from Truman College a student should be able to:

- Organize, analyze and interpret information and use the scientific method to make inferences.
- Exhibit knowledge of scientific concepts through written and oral communication.
- Demonstrate excellent laboratory skills and techniques including the proper use of relevant instruments and related technologies.
- Use the lexicon of science to explain abstract scientific concepts.
- Relate concepts learned in Physical Science and Engineering Department classes to real world situations.