

**MISSISSIPPI VALLEY STATE UNIVERSITY**  
**Department of Natural Science – Chemistry Program**  
**Course Number: CH 111**  
**Course Name: General Chemistry I**

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**Textbook: Chemistry:** An Atoms First Approach, 2nd Edition by Steven S. Zumdahl and Susan A. Zumdahl, which comes with CengageBrain- online homework and course management.  
**Reference Books:** General Chemistry by Silberberg, 2<sup>th</sup> Edition, Chemistry by Raymond Chang and Kenneth Goldsby 12<sup>th</sup> Edition and additional Reading will be assigned throughout the semester.

**Lectures time / Location:** MWF 10:00-10:50 pm / FLW Building, Room 228

**Lab time / Location:** R 1:00 pm - 3:40 pm / FLW Building, Room 232

**Office Hours:** MWF: 9:00 am - 10:00 am, 11:00 am -12:00 am, R: 9:15 pm - 11:00 pm, MW: 2:50 pm – 4:00 pm and any other time by appointment

**CATALOG COURSE DESCRIPTION:**

Introduce the fundamental concepts and basic principles of chemistry. Atomic structure, chemical bonding periodic table, stoichiometry, chemical formulas and equations, states of matter, nomenclature, valence, oxidation number, thermochemistry, solutions, reaction rates chemical equilibrium, oxygen, hydrogen, halogens, and elements of group I and II are discussed in this introductory course. Role of chemistry in understanding other natural science disciplines and human societal issues is emphasized. (3 credit hours)

**PREREQUISITES:** None

**PURPOSE:**

Employing Mississippi Valley State University's Holistic Transfer Model (HTM), CH 111 contributes to education and training of Holistic Transformers. It is our intention to not only teach fundamental chemistry relationships but also to develop the thinking processes of our students so that they will gain various insights into workings of nature. These skills will transform the student into lifelong learners who can build upon accumulated knowledge and understandings. Additionally these students can become facilitators who stimulate the natural

curiosity of others particular public school students. In doing so, CH 111 develops the skills and scientific background required of teachers of students in public schools by building upon prior knowledge and skills developed in preceding courseware presented by the Department of Sciences and Environmental Health, and by the College of Education.

## GENERAL COURSE GOALS

The following general course goals are established to meet the purposes of CH 111:

1. Develop fundamental understanding of the material classifications and properties.
2. Provide model exercises and demonstrations that enhance the understanding of natural principles and illustrate safe laboratory techniques and practices.
3. Raise awareness of the underlying logic of the presentations and the use of inductive and deductive reasoning.
4. Develop factual report writing skills.
5. Increase scientific vocabulary and facility with common pronunciation related to the use of that vocabulary.
6. Cultivate thoughtful, probing inquiry and discussion.
7. Clarify the significance of replicated, standards or controls, measurements, data reduction and presentation analysis, and accuracy in reporting of the scientific activities.

## COURSE CONTENT AND TENTATIVE TIME LINE:

### **Week 1 and 2**

**Review:** Lab Safety seminar. Measurement and Calculations in Chemistry: The SI system of units and prefixes, causes of uncertainty in measurement, significant figures, precision and accuracy in measurement, converting units between the English and metric systems, conversions among the Fahrenheit, Celsius, and Kelvin temperature scales, density.

**Week 3 and 4 :** Chapter 1 Chemical Foundations: Creative problem solving, identify the principal operations and limitations of the scientific method, brief account of early chemical discoveries, the laws of conservation of mass, definite proportion, and multiple proportions, Dalton's theory of atoms and show the significance of Gay-Lussac's experiments, summarize the experiments that characterized the structure of the atom, features of subatomic particles.

### **Online Quiz 1**

**Week 4 and 5:** Chapter 2 Atomic Structure and Periodicity: Characterizing electromagnetic radiation in terms of wavelength, frequency, and speed, introduce the concept of quantized energy, wave and particulate properties light, diffraction experiments and the dual nature of matter, the line spectrum of hydrogen, development of the Bohr model for the hydrogen atom, Heisenberg uncertainty principle, significance of electron probability distributions, the quantum numbers  $n$ ,  $l$ , and  $m_l$ , shapes of orbitals designated by s, p, d, and f and orbital energies, electron

spin and the electron spin quantum number, Pauli exclusion principle, quantum mechanical model as applied to atoms besides hydrogen, development of the periodic table, Aufbau principle, general trends in ionization energy, electron affinity, and atomic radius in the periodic table, types of information can be obtained from the periodic table.

### **Online Quiz 2**

**Week 5:** Unit exam 1 on Chapters 1 and 2

**Week 6:** Chapters 3 Bonding: Ionic bond, covalent bond, polar covalent bond, nature of a bond in terms of electronegativity, predicting the formulas of ionic compounds, factors governing ion size, lattice energy and show how it can be calculated, relationship between electronegativity and the ionic character of a bond, the covalent bonding model, how bond energies can be used to calculate heats of reaction, localized electron model, writing Lewis structures, the concept of resonance and how to write resonance structures, naming compounds given their formulas and to write formulas given their names.

### **Online Quiz 3**

**Week7:** Midterm Week (Midterm exam on Chapters 1-3)

**Week 8:** Chapter 4 Molecular Structure and Orbitals: Predicting molecular geometry from the number of electron pairs, relationship between bond polarity and molecular polarity, formation of special atomic orbitals in covalent bonding, bond order, bonding in certain molecules of the general formula  $X_2$ , paramagnetism, bond order, bond energy, and bond length.

### **Online Quiz 4**

**Week 9 and 10:** Chapter 5 Stoichiometry: Modern atomic mass scale and how atomic masses are determined experimentally, atomic mass and its experimental determination, conceptual problem solving approach to chemistry, importance of the mole concept, converting among moles, mass, and number of particles for a given sample, calculating values for molar mass. converting among molar mass, moles, and number of particles in a given sample, calculation of the mass percent of a given element in a compound, the calculation of the empirical formula of a compound, obtaining the molecular formula, given the empirical formula and the molar mass. identifying the characteristics of a chemical reaction and the information given by a chemical equation, writing a balanced equation to describe a chemical reaction, calculating the masses of reactants and products using the chemical equation, recognizing the limiting reactant, use of the limiting reactant in stoichiometric calculations.

### **Online Quiz 5**

**Week 11 and 12:** Chapter 6. Types of Chemical Reactions and Solution Stoichiometry: Polar nature of water, strong electrolytes, weak electrolytes, and non-electrolytes, molarity ,

calculations involving the composition of solutions, types of solution reactions, predicting the formation of solid in a solution reaction, reactions in solution by molecular, complete ionic, and net ionic equations, stoichiometric calculations involving precipitation reactions, calculations involved in acid-base volumetric analysis, oxidation-reduction reactions, assigning oxidation states, oxidizing and reducing agents.

### **Online Quiz 6**

**Week 12:** Unit exam 2 on Chapters 4, 5 and 6

**Week 12 and 13:** Chapter 7 Chemical Energy: Energy flow between a system and its surroundings, first law of thermodynamics calculating work that results from changing the volume of a gas at constant pressure, enthalpy and calculations of the change in enthalpy in a chemical reaction, measuring change in enthalpy using calorimetry, characteristics of enthalpy changes, calculating  $\Delta H$  for a chemical reaction, standard states, using standard enthalpies of formation to calculate  $\Delta H^\circ$  for a reaction, fossil fuels and the effects of their use on climate, energy alternatives, comparing the available energy of various fuels.

### **Online Quiz 7**

**Week 14:** Thanksgiving Holiday

**Week 15:** Review for final Exam

**Week 16:** Final Exam (Chapters 1-7)

## LABORATORY

CREDIT HOURS: 1

### **Laboratory Experiments**

(1) Basic Lab Techniques, (2) Measurements and calculations (3) Solubility and Separation of Mixture (4) Physical and Chemical change (5) Precipitation reaction, Determination of Avogadro's Number of water, (6) Determination of the formula of a hydrate, (7) Solubility of a Salt in Water (8) Generation of oxygen. (9) Acid base titration.

### LABORATORY REPORTS:

Reports must be handed in for evaluation and grading one week after each laboratory period. *Deadlines will not be extended.* A complete laboratory report will include:

1. Title
2. Introduction
3. Materials

4. Methods
5. Results
6. Discussion
7. Pre and post lab questions
8. Literature cited if there is any.

#### STUDENT LEARNING OUTCOMES:

Upon successful completion of CH 111 students will be able to know and understand:

1. The key concepts to the Study of Chemistry such as Fundamental Definitions, Chemical Arts and the Origins of Modern Chemistry, Scientific Approach in Developing a Model, Chemical Problem Solving, Measurement in Scientific Study, Uncertainty in Measurement and Significant Figures
2. The Components of Matter which are Elements, Compounds, and Mixtures, the observations that led to an Atomic view of matter, Dalton's atomic theory, the observations that led to the nuclear atom model, the atomic theory of today, formula, names, and masses of compounds, classification and separation of mixtures
3. The Atomic Properties and Chemical Bonds, Ionic Bonding Model, Covalent Bonding Model, Electro-negativity, Bond Energy and Chemical Change.
4. The Development of the Periodic Table, the Characteristics of Many-Electron Atoms, the Quantum-Mechanical Model of atom, Atomic Structure and Chemical Reactivity, the Nature of Light, Atomic Spectra and the Wave-Particle Duality of Matter.
5. The Role of Water as a Solvent, and the different classes of reactions
6. How to determine the Formula of an Unknown Compound, Write and Balance Chemical Equations, Calculate the Amounts of Reactant and Product and understand Fundamentals of Solution Stoichiometry.
7. How to Predict Molecular Shape and Molecular Polarity
8. How to model and demonstrate the scientific method as a process in hypothesis development and testing.
9. The scientific vocabulary and facility with common pronunciation related to the use of that vocabulary.
10. Accepted facts versus observations, hypotheses, theories, and principles relative to the natural universe.
11. How to demonstrate and model the use of standards for controls, measurements, data reduction and presentation, analysis, and accuracy in reporting of the scientific activities.
12. Use of technology to the study of the general chemistry.

## USE OF TECHNOLOGY

Becoming a holistic transformer is facilitated by the use of technology. Scholarship and reflective thinking promoted by easy access to information that may include widely varying theories and knowledge related to an extensive array of scientific and educationally related subjects. The same is, of course, true for developing the habits of life-long learner and classroom facilitator. Therefore, the use of technology in various forms will be encouraged in preparing for classroom discussion, scientific inquiry, practical application exercises, and lesson-plan development. Such technology will include, though not be limited to

1. Computerized library searches for information using scientific and educational databases
2. Use of internet to perform in depth searches for information related to appropriate instructional methodology and materials for teaching students in science; and
3. Computer applications useful in instruction and in scientific applications (e.g., simulations, data and word processing).

## EXAMS, QUIZZES, EVALUATION AND GRADING PROCEDURES:

- Students are responsible for, and may be tested on all the material discussed during lectures and discussion sections as well as assigned reading material whether it was covered in lecture or not.
- Students are expected to take exams during the scheduled times. Dates will be announced in advance. A make-up exam or quiz will be given **ONLY** if a student is **GRAVELY** ill, can provide evidence from a certified M.D., **AND** has notified - **BEFORE THE TEST**. Electronic mail and voice mail messages do **NOT** constitute official means of notification. Other emergencies will be considered on a case by case basis.

The final grade will be determined as follows:

Two Unit Exams:	20%
Midterm:	20%
Final Exam:	30%
Online Quiz	30%

Attendance and class participation: 10 points

A= 90- 100%. B= 89- 80%. C=79-70%. D = 69-60%. F= 59-0%

## INTELLECTUAL HONESTY:

Students are expected to follow principles of intellectual honesty. A student caught cheating on an exam or quiz will receive zero points for that exam or quiz and will be referred to the Dean of Students' office for appropriate action.

## STUDENTS WITH SPECIAL NEEDS

Mississippi Valley State University is committed to providing reasonable accommodations for students with a documented disability. If you feel you are eligible to receive accommodations for a covered disability (medical, physical, psychiatric, learning, vision, hearing, etc.) and would like to request it for this course, you must be registered with the Services for Students with Disabilities (SSD) program administered by University College. It is recommended that you visit the Disabilities Office located inside the EMAP Computer Lab in the Technical Education (IT) Building to register for the program at the beginning of each semester.

For more information or to schedule an appointment, please contact Mr. Billy Benson, Jr. via phone or email at 662-254-3005 or [billy.benson@mvsu.edu](mailto:billy.benson@mvsu.edu).

## SPECIAL POLICIES:

Attendance: 1 letter grade for every three unexcused absences.

Cell Phones: To be turned **off** at all times during class. If phone goes off student may be asked to leave the classroom with no possibility to make up work.

Classroom behavior: Negative classroom behavior will not be tolerated and can result in student being asked to leave the class.

Tardies: 1 letter grade for every four un-excused tardies.

**Note: This document does not constitute a contract but a set of guidelines subject to change.**