

CHM 151IN General Chemistry I

Course Learning Outcomes (CLOs)

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

- 1. Identify the essential parts of a problem and apply known chemical concepts in solving the problem.**
 - 2. Perform experiments with the given directions, collect valid scientific data, analyze the data, and interpret laboratory results.**
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Performance Objectives:

1. Apply the concepts associated with measurement, units, significant figures, dimensional analysis, etc., to chemistry-related calculations and measurements.
2. Describe the scientific method in principle and apply in an actual laboratory setting.
3. Classify matter and its changes.
4. Demonstrate familiarity with the historical development of the atom, its component parts, atomic mass, and isotopes.
5. Associate the wave-particle duality of the electromagnetic spectrum with the wave-particle view of the electron.
6. Describe the pertinent aspects of the quantum-mechanical view of the atom.
7. Identify the electron configuration of atoms and ions.
8. Demonstrate the ability to use the Periodic Table to extract a range of information including the number of valence electrons, orbital information, metal/nonmetal characteristics, periodic trends, and the reason for the similarity in chemical characteristics.
9. Describe the concepts associated with ionic and covalent bonding. Predict the nature and formula of bonded atoms.
10. Draw Lewis Structures and determine the molecular shape for given compounds.
11. Determine the polarity of a given molecule.
12. Apply Valence Bond Theory to determine the hybridization of bonded atoms.

13. Balance and extract information from chemical equations.
14. Identify simple reaction types.
15. Predict solubility and write supporting equations.
16. Perform concentration calculations.
17. Perform stoichiometry calculations for a range of systems including limiting reagent and aqueous solutions.
18. Describe the thermodynamic variable of enthalpy.
19. Calculate reaction enthalpies from Heats of Formation data.
20. Calculate the energy associated with temperature changes, including the concept of calorimetry.
21. Describe and apply Kinetic-Molecular Theory
22. Describe the various intermolecular forces and identify their existence/function in various systems.
23. Apply the Ideal Gas Law to systems of gases, including the concept of gas mixtures.
24. Distinguish between ideal and non-ideal systems.
25. Describe the various properties associated with liquids, e.g., vapor pressure, surface tension, viscosity, etc.
26. Describe the concept of a solution.
27. Perform concentration calculations.
28. Calculate/describe the solution activity associated with colligative properties. (Optional)
29. Apply the above chemistry concepts and procedures in a “wet” laboratory setting with real laboratory equipment to:
 - a) Develop hands-on experience with a wide range of laboratory apparatus;
 - b) Gain exposure to hands-on use of chemical instrumentation.
 - c) Gain individual expertise in a range of laboratory techniques, e.g. pipetting, massing, use of a burette, titration, etc.
 - d) Begin development of the ability to take hypotheses and design and conduct real experimentation to verify/challenge those hypotheses.

