CHEMISTRY 111, INTRODUCTORY CHEMISTRY

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COURSE DESCRIPTION:
The properties and theories of the solid, liquid and gaseous states of matter, the stoichiometry and thermochemistry of chemical reactions and theories and applications of molecular structure and bonding. Proficiency in algebra is essential. High school chemistry is strongly recommended. Intended for science majors: biology, chemistry, earth sciences, and physics. 3 hours lecture, 1 hour recitation, 2 hours laboratory. Prerequisites: A C- grade or higher in CHEM 110 or satisfactory score on the Chemistry Placement Test before registration, or permission of the department chair. General Education G2 and L course.
Lecture: MWF at 2:00-2:50 in Roddy 149
Recitation: Tuesday 9:00 Roddy 153, Tuesday 2:10 Roddy 153, or Wednesday 8:00 Roddy 153
Laboratory: Tuesday 10:00 Caputo 328, Tuesday 3:10 Caputo 328 or Wednesday 9:00 Caputo 328

COURSE MATERIALS
1. Text: Chemistry: Structure and Dynamics, 5th Edition; J. N. Spencer, G. M. Bodner and L. H. Rickard; John Wiley & Sons, 2012, ISBN-13 978-0-470-587119
2. Chemistry: A Guided Inquiry Part 1, 8th Edition; The Pogil Project, Kendall Hunt Publishing Company, 2022. ISBN-9781792490699
3. Laboratory Notebook: Duplicate page Laboratory Notebook; quadrille-ruled
4. Safety Glasses

A grade of C- or better (C or better for chemistry majors) in CHEM 111 is prerequisite for CHEM 112.

TENTATIVE EXAM SCHEDULE

Exam 1	Chapters 1 - 2	February 14
Exam 2	Chapters 3 - 4	March 21
Exam 3	Chapters 5 - 6	April 11
Exam 4	Chapters 7 - 8	May 2
Final	Chapters 1 - 9	

LABORATORY SCHEDULE
Week beginning

must be made up within one week of the student's return to class. If an exam or quiz is missed and the absence is excused, the final exam grade will be substituted for the missed work.

11. Understand and use the concept of density.

Chapter 2

1. Determine the number of moles in a given mass.
2. Determine the mass of a given number of moles.
3. Determine the molar mass of a compound.
4. Determine the % composition from a molecular formula or the empirical formula from % composition.
5. Balance chemical equations.
6. Use stoichiometry to predict the moles or mass of a reactant or product.
7. Determine the limiting reagent and use it to predict the amount of product and the % yield.
8. Distinguish between solute, solvent, and solution.
9. Determine the concentration of a solution from mass of solute or volume of known solution.

Chapter 3

1. Know the regions of the electromagnetic spectrum.
2. Calculate wavelength, frequency, and energy associated with electromagnetic radiation.
3. Understand how spectroscopy can be used as an investigative tool to understand the nature of the atom.
4. Understand the concept of energy levels and ionization energy of atoms.
5. Predict electron configuration of atoms. Relate electron configuration to position in the Periodic Table.
6. Know the periodic relationships of size of atoms and ions.
7. Determine the Average Valence Electron Energy (AVEE) for atoms. Relate AVEE to atomic properties.

Chapter 4

1. Determine the number of valence electrons for an atom.
2. Describe the sharing of electrons in a covalent bond.
3. Draw Lewis Structures for covalent molecules and polyatomic ions.
4. Use Lewis structure to describe resonance.
5. Use partial charge to explain the distribution of electrons in a bond.
6. Use formal charge to determine the best of several alternative Lewis structures.
7. Determine the shape of molecules and the electron distribution using Electron Domain Theory.
8. Determine if molecules are polar or nonpolar.

Chapter 5

1. Describe the main group metals, nonmetals and transition metals and their ions.
2. Predict the products of reactions that produce ionic compounds.
3. Describe the three-dimensional structure of ionic compounds.
4. Describe and draw Lewis structures for ionic compounds.
5. Describe the electron distribution in metallic bonds.
6. Use bond type triangles to relate the bonding in metallic, covalent and ionic compounds.
7. Determine the oxidation number of an atom in a compound or ion.
8. Determine if a reaction is an oxidation-reduction reaction.
9. Name basic ionic compounds, binary covalent compounds and acids.

Chapter 6

1. Know the relationships in the simple gas laws.
2. Use the ideal gas law to calculate one of the variables.
3. Determine the density and molar mass of gasses.
4. Use Dalton's Law of Partial Pressures to describe mixtures of gasses.
5. Use the kinetic molecular theory to explain the gas laws on a molecular basis.

Chapter 7

1. Understand the First Law of Thermodynamics.
2. Understand the concept of a state function.
3. Use specific heat to determine the amount of heat gained or lost.
4. Calculate the enthalpy of reaction using enthalpies of atom combination.
5. Relate bond length to the enthalpy of atom combination.
6. Use Hess's Law and enthalpies of for oo

4. Use phase diagrams to describe phase changes.
5. Describe phase equilibria and solubility equilibria.
6. Use intermolecular forces to predict the solubility of covalent molecules in molecular solvents.\
7. Use solubility rules to predict the solubility of ionic compounds in water.
8. Write net ionic equations to describe chemical reactions.

Chapter 9

1. Distinguish between ionic, network covalent, molecular and ionic solids.
2. Describe the forces that hold solids together.
3. Relate the structure of metals to their physical properties.
4. Determine the unit cell of a crystal.

Millersville University Policies

ADA Program (Office of Learning Services) Americans With Disability Act | Millersville University (if you have a disability that requires accommodations under the Americans with Disabilities Act, please present your letter of

Request for Excused Absence To be completed within one week of returning to class.

Student Name:

Dates of Absence:

Reason for Absence (circle one): Illness, Family Emergency, University Activity

I request this absence be excused and that: (check all that apply)

_____ my final exam grade be substituted for the missed lecture quiz.

_____ my final exam grade be substituted for the missed test.

_____ my final exam grade be substituted for the missed pre-lab quiz.

_____ I be allowed to make-up the missed laboratory experiment. The lab must be made-up and the laboratory report submitted for grading within one week of returning to class.

Attach documentation to support the request for an excused absence.

THE LABORATORY NOTEBOOK

The laboratory notebook is a permanent record of your work in the laboratory. You must have your notebook with you in order to work in the lab. All notebooks must be permanently bound and begin with a table of contents. All entries should be in ink. Each page must be consecutively numbered and bear your name and date. The title, purpose, an outline of the procedure, and list of safety precautions must be in the notebook before coming to lab. Each section should have a clear label: (purpose, safety hazards, procedure, data). All data must be recorded in the notebook using correct significant figures and proper units. **Never write data on another sheet of paper with the idea of transferring it to the** notebook. Notebooks should be relatively neat and orderly; however, data should never be recopied into another notebook. If an error is made, do not obliterate the data (also do not use white out, tear out pages or tape in new pages). Draw a single line through any errors and record the correct value to the side.

The notebook is a record of your work as it is done. The notebook should be kept in such a way that the instructor can turn to any experiment and tell exactly what you did during the experiment. All data must include the appropriate units and be labeled to identify the data. All calculations, graphs, tables and assigned questions must be included in the notebo