Central Michigan University
College of Arts And Sciences

Course Syllabus

CHM 131 Introduction to Chemistry I    4(3-3)
Desig No. Title                       Credit(mode)

I.  Bulletin Description
Fundamental Concepts of Chemistry. CHM 131 and 132 are recommended to constitute the standard one-year course for science majors. Satisfies University Program Group II laboratory requirement. Group (II-B)

II. Prerequisites
High School Algebra (one unit)

III. Rationale for Course Level
Introductory Course

IV. Textbooks and Other Materials To Be Furnished by the Student
3. Approved Safety Goggles
4. Laboratory Notebook
5. Calculator - Scientific - should do the standard arithmetic, exponential, and logarithmic calculations.

V. Special Requirements of the Course
To earn a passing grade in the course requires that passing grades be earned in both laboratory and lecture.

VI. General Methodology Used in Conducting the Course
Lecture and Laboratory

VII. Course Objectives
Upon completion of the course students will be able to:
1. Produce a general description (both microscopic and macroscopic) of matter.
2. Write and balance chemical equations.
3. Carry out calculations necessary to quantitatively interpret chemical equations in terms of moles, mass, volume of solutions and energy.
4. Describe the electronic structure of atoms in terms of elementary Bohr and quantum mechanical models.
5. Use the periodic law to describe the behavior & properties of substances.
6. Carry out calculations necessary to quantitatively describe the bonding in simple substances in terms of elementary covalent and ionic bonding models.
7. Describe the molecular structure of simple covalent species using the VSEPR model.
8. Carry out calculations necessary to quantitatively describe the properties and behavior of substances in the gaseous state.
9. Follow a laboratory procedure, make and record observations, obtain expected results, and carry out calculations necessary for interpretation.

VIII. Course Outline

Lecture Component
1. Introduction & Basic concepts (1 week)
   A. Matter
   B. Units & Measurement
   C. Problem solving
2. Microscopic Structure of Matter (1 week)
   A. Atoms
   B. Periodic Table
   C. Molecules & Ions
   D. Nomenclature
3. Mass relationships – Stoichiometry (2 weeks)
   A. Formulas
   B. Equations
   C. Reaction types
   D. Calculations from Equations
4. Solutions & Reactions in Solution (2 weeks)
   A. Solution composition
   B. Reactions in solution
   C. Solution Stoichiometry
5. Thermochemistry (1 week)
   A. Energy
   B. Energy Changes in Chemical Systems
   C. Energy Change- Enthalpy
   D. Calorimetry
   E. Energy in Foods & Fuels
6. Electronic Structure of Atoms (1 week)
   A. Quantum Theory
   B. The Bohr Model
   C. The Quantum Mechanical Model
7. Periodic Properties & the Periodic Table (1 week)
   A. Development & History
   B. Electronic Structure
   C. Periodic Properties
   D. Element Types
E. Groups/Families

8. Chemical Bonds (2 weeks)
   A. Lewis/Electron Dot Structures
   B. Covalent Bonds
   C. Polar Bonds & Polar Molecules
   D. Ionic Bonds
   E. Oxidation Numbers

9. Molecular Geometry & Bonding Theories (2 weeks)
   A. Prediction of geometries
   B. Polar Molecules
   C. Valence Bond Theory

10. Gases (1 week)
    A. Characteristics & Pressure
    B. The Gas Laws
    C. Molar Mass & Densities
    D. Mixtures & Reactions
    E. Kinetic Molecular Theory
    F. Effusion and Diffusion
    G. Real Gases & the van der Waals Equation

Laboratory Component

1. Density Measurements
2. Experimental Analysis of Hydrates
3. Elemental Analysis of a Metal Oxide
4. Stoichiometry of a Reaction
5. Metathesis Reactions
6. Activity Series of Metals
7. Thermochemistry
8. Preparation and Standardization of a Sodium Hydroxide Solution
9. Volumetric Analysis of an Acid of Unknown Concentration
10. Qualitative Analysis of Anions
11. 9:00 am class: Infrared Spectroscopy
    10:00 am class: Molecular Models Lab
12. 9:00 am class: Molecular Models Lab
    10:00 am class: Infrared Spectroscopy

IX. Evaluation

Four one-hour exams and a final exam (75%) and instructor evaluation of laboratory reports (25%).

Writing in the University Program

CHM 131 satisfies the requirement for “A significant amount of meaningful writing” in the following ways. The laboratory portion of the course requires weekly written laboratory reports which include significant writing and calculations. The laboratory portion of the course constitutes 25% of the course grade.
The lecture portion of the course requires 5 multiple choice examinations. At least half of the questions on each examination require calculations. The lecture portion of the course counts 75% of the course grade.

Therefore, more than half of the course grade in CHM 131 is based on a combination of meaningful writing and calculations.

X. Bibliography

Syllabus Prepared By: ________________________________

Calvin D. Tormanen

Name

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Signature

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May 14, 2002

Date