

**OHLONE COLLEGE**  
**Ohlone Community College District**  
**OFFICIAL COURSE OUTLINE**

**I. Description of Course:**

1. **Department/Course:** CHEM - 101A

2. **Title:** General Chemistry

3. **Cross Reference:**

4. **Units:** 5

**Lec Hrs:** 3

**Lab Hrs:** 6

5. **Repeatability:** No

6. **Grade Options:** Grade Only (GR)

7. **Degree/Applicability:**

Credit, Degree Applicable, Transferable -  
CSU & UC (T)

8. **General Education:**

9. **Field Trips:** Not Required

10. **Requisites:**

**Prerequisite**

and

and Student may demonstrate satisfactory  
performance on the Chemistry Placement  
Test at Ohlone College to meet this  
prerequisite

12. **Catalog Description:**

Chemistry 101A is a general college-level inorganic chemistry course designed for students majoring in biology, chemistry, engineering, pre-med, and other fields demanding rigorous scientific preparation. Topics covered include atomic theory, stoichiometry, chemical reactions, introductory thermochemistry, theories of bonding, and the properties of solids, liquids, gases, and solutions.

13. **Class Schedule Description:**

Firsthalf of general college chemistry series for science and pre-engineering majors.

14. **Counselor Information:**

Math skills and good study habits are essential. This is a BIG course. Motivated students with good math skills can skip the "HS chemistry or equivalent" prerequisite, but the first six weeks will be demanding for them.

**II. Student Learning Outcomes**

The student will:

1. Perform unit conversions involving metric and/or English systems using the Factor Label method of unit cancellation; apply the correct rules of significant figures to express quantitative results.
2. Describe the major contribution of famous scientists whose work influenced chemistry, including Dalton, Thomson, Millikan, Rutherford, Lavoisier, Boyle, Einstein, and Meitner.
3. Explain the organization of the Periodic Table; locate all major groups and features; use the table to determine general properties of atoms; predict charges on ions; write electron configurations of atoms and ions; rank atoms according to relative radius, electronegativity, electron affinity, ionic radius, and the acidity of its oxide; defend these rankings based on a thorough discussion of principles.

4. Demonstrate proper techniques of using a balance, graduated cylinder, thermometer, Bunsen burner, meterstick, volumetric flask, buret, crucible, evaporating dish, and other standard equipment common to a chemistry laboratory.
5. Perform calculations involving empirical and molecular formulas of a compound, mass %, molar mass, and density; calculate weighted averages of isotopes; determine empirical formulas from combustion analysis; calculate theoretical yield, percent yield, or actual yield; perform limiting reagent problems; perform calculations involving concentration; calculate heats and specific heats; perform other standard calculations encountered in chemistry.
6. Write correctly balanced chemical equations; apply equations in solving a variety of chemical applications; apply Hess's Law; include the enthalpy term appropriately.
7. Predict the type of bonding in a given compound; distinguish between intramolecular and intermolecular forces; predict the presence of dipoles; apply these concepts to explain properties of matter; describe three cubic unit cells and discuss packing characteristics.
8. Draw correct Lewis structures; predict formal charges; compare and contrast resonance structures; predict shapes of molecules; use molecular shapes and electronegativity considerations to predict the direction of a molecular dipole; compare and contrast bonding theories; predict hybridization of orbitals; draw Molecular Orbital diagrams and use them to analyze properties of diatomic molecules; apply band theory to explain the properties of semiconductors.
9. Given a chemical equation, determine which species was oxidized, which was reduced, which was the oxidizing agent and which was the reducing agent; determine oxidation numbers of each atom or ion in an equation; apply the equation to solving practical problems.
10. Use calculations to solve problems involving specific heat capacity, mass, change in temperature, and heat of reaction; describe the transfer of thermal energy between a system and its surroundings.
11. Describe the wave characteristics of light; discuss the dual nature of light; describe the electromagnetic spectrum; perform calculations of energy, wavelength, and frequency; explain the photoelectric effect and other phenomenon related to electromagnetic radiation.
12. Describe each of the four colligative properties: vapor pressure lowering, boiling point elevation, freezing point depression, and osmotic pressure; use these properties to make predictions; perform calculations to determine quantitative changes.

### III. **Course Outline:**

#### I. Introduction, the Scientific Method

A. Matter and Energy

B. Properties

1. Physical

2. Chemical

C. Processes

1. Physical

2. Chemical

D. Using a Scientific Calculator

E. Significant Figures

F. Unit conversions

#### II. The Components of Nature

- A. Atomic Theory
- B. The Periodic Table
- C. Electronic Structure
- D. Isotopes
- E. Atomic mass
- III. Compounds
  - A. Ionic bonds
  - B. Covalent bonds
  - C. Metallic bonds
  - D. Nomenclature
- IV. Stoichiometry
  - A. Classes of Chemical Reactions
  - B. Oxidation/Reduction
  - C. Combustion Analysis
  - D. Acid-Base Reactions
- V. Gases
  - A. Gas laws
  - B. Density
  - C. The Ideal Gas Law
  - D. Dalton's Law of Partial Pressure
- VI. Thermochemistry
  - A. Calorimetry
  - B. Enthalpy
  - C. Entropy
  - D. Hess's Law
  - E. Energetics of Phase Changes
- VII. Electron Configuration and Chemical Periodicity
  - A. Chemical Bonding Theories
    - 1. Lewis Structures
    - 2. VSEPR Theory
    - 3. Valence Bond Theory
    - 4. Molecular Orbital Theory
    - 5. 3-D Network Solids
  - B. Intermolecular Forces
    - 1. Hydrogen Bonding
    - 2. Dipole-Dipole Forces
    - 3. London Dispersion Forces
    - 4. Ion-Ion Forces
      - a. Lattice Energy
      - b. Born-Haber Cycles
    - 5. Ion-Dipole Forces
- VIII. Properties of Solutions
  - A. Units of Concentration
  - B. Mixing solutions using volumetric flasks; dilutions
  - C. Diffusion
  - D. Osmosis

## E. Colligative Properties

## IX. Lab Skills

### A. Safety in the lab

### A. Proper use of equipment

1. Balance
2. Graduated cylinders, volumetric flasks, burets, and other vessels used to measure volume
3. Bunsen burners
4. Beakers, test tubes, crucibles, evaporating dishes, other vessels
5. Spectrophotometer

### B. Skills

1. Making an aqueous solution from the dry reagent
2. Performing a dilution
3. Determining density
4. Chromatography
5. Decanting
6. Heating materials
7. Use of a gas cylinder equipped with a Gas Regulator

## IV. Course Assignments:

### A. Reading Assignments

1. text book chapters, internet searches

### B. Projects, Activities, and other Assignments

1. Exam(s)
2. Quizzes-covering assigned problems and reading assignments
3. OWL online homework
4. Using "clickers" (instantaneous feedback devices) during lectures

### C. Writing Assignments

1. Lab Report(s)-data collection, analysis of data, calculations, conclusions

## V. Methods of Evaluation/Assessment:

### A. Tests

### B. Quizzes

### C. Final Exam

D. which may include multiple choice, problem solving (qualitative and quantitative), writing equations, short-answer, or essay questions.

E. Lab reports which may include short answer, problem solving (qualitative and quantitative), writing balanced chemical equations and using these equations to answer questions, scientific reports

## VI. Methods of Instruction:

### A. Discussion

### B. Demonstration

### C. Audiovisual

### D. Computer Assisted Instruction

### E. Collaborative Learning

### F. Other

1. "clicker" technology which permits instantaneous electronic feedback from students

during lecture.

2. Camtasia and/or Power Point presentations enhanced by electronic notes made available on instructor's web page.

G. Lecture

H. Laboratory

## VII. Textbooks:

### Required

1. Kotz, Treichel & Weaver *Chemistry and Chemical Reactivity* 8th Edition, Thomson, 2007  
ISBN: 9780495271628
2. Text is customized and separated into two volumes for 101A and 101B respectively.
3. Klent, Jim. General Chemistry Experiments
4. .

### Optional

## VIII. Supplies:

- A. Goggles with indirect venting and side shielding
- B. Lab coat
- C. Lab gloves
- D. Lab notebook
- E. Scientific calculator

CID 2462