COURSE INFORMATION FORM

DISCIPLINE
Chemistry

COURSE TITLE
General College Chemistry I

CR.HR  5  LECT HR.  4  LAB HR.  3  CLIN/INTERN HR.  _______  CLOCK HR.  _______

CATALOG DESCRIPTION
Introduction to the understanding of atoms and molecules: their qualitative and quantitative reactions and interactions.

PREREQUISITES
Both MATH 120 (or equivalent score on placement test) or two units of high school algebra and CHEM 107 or high school chemistry.

EXPECTED STUDENT OUTCOMES IN THE COURSE
Upon completion of this course, the student will be able to:

1. Demonstrate understanding of the scientific method, differentiating between scientific fact and theory.
2. Employ modern atomic and molecular theories to assess general physical and chemical properties of matter.
3. Develop and execute strategies for solving chemical problems.
4. Demonstrate safe and proper laboratory techniques for experimental chemistry procedures.
5. Collect, organize, analyze, and evaluate experimental data.
6. Use chemical reference materials to locate information on chemical topics.
7. Evaluate and make informed appraisals of social and political issues involving chemical processes.
8. Communicate chemical information clearly.
CLASS-LEVEL ASSESSMENT MEASURES
Student accomplishment of expected student outcomes will be assessed using the following measures.
(Identify which measures are used to assess which outcomes.)
1. Quizzes, examinations, written laboratory reports
2. Worksheets, quizzes, examinations, written laboratory reports
3. Worksheets, quizzes, examinations, written laboratory reports
4. Instructor evaluation of performance of laboratory work
5. Written laboratory reports, quizzes, examinations
6. Written laboratory reports, papers and oral presentations
7. Worksheets, quizzes, examinations, papers and oral presentations
8. Written laboratory reports, worksheets, quizzes, examinations, papers and oral presentations

PROGRAM-LEVEL OUTCOMES ADDRESSED

GENERAL EDUCATION OUTCOMES
Specify which general education outcomes, if any, are substantially addressed by the course by completing the “Course/Program Assessment Matrix” to show the relationships between course and program outcomes and assessment measures.

OCCUPATIONAL PROGRAM OUTCOMES
Specify which occupational program outcomes, if any, are substantially addressed by the course by completing the “Course/Program Assessment Matrix” to show the relationships between course and program outcomes to assessment measures.
Individual instructors may order this outline as fits the needs of their individual courses. In addition, they may place more emphasis on some areas than on others. What is assured is that this particular list is covered in the course. Other topics may be added to a course as the instructor sees fit, and as time and interest allow. An *asterisk can be used to mark an item as optional.

I. Introduction to the study of chemistry
   A. Scientific method
   B. Science versus technology
   C. Measurement systems
      1. Uncertainty in science
      2. Accuracy and precision
      3. Systematic and random errors
      4. Significant figures
      5. Calculations with significant figures
   D. Math skills for general chemistry
      1. Exponential notation and logarithms
      2. Dimensional analysis and unit conversion
      3. Graphical analysis of data

II. Matter and energy
   A. Extensive and intensive physical properties
   B. Chemical properties
   C. Energy changes and the properties of matter
   D. Classifying matter

III. Brief history of chemistry*
   A. Chemistry in ancient times
   B. Greek elements and the emergence of atomism
   C. Modern definition of “element”
   D. Early studies of combustion
      1. Priestley and oxygen
      2. Lavoisier and the true nature of combustion

IV. Development of modern atomic theory and the periodic chart
   A. The law of conservation of matter
   B. The law of definite proportions
C. Dalton’s atomic theory
D. The law of multiple proportions
E. The law of combining volumes and Avogadro’s explanation
F. Berzelius and relative atomic masses*
G. Mendeleev and the periodic chart
H. Isotopes and isotope notation
I. Physical and chemical properties of metals, nonmetals, and metalloids

V. Development of the quantum mechanical model of the atom
A. Cathode ray studies
B. Discovery and description of subatomic particles
C. The plum pudding model*
D. Rutherford’s scattering experiments and the nuclear model
E. Electromagnetic radiation and the line spectra
F. Bohr’s model of the atom and the quantization of energy
G. The wave mechanical model
H. Electron configurations and the periodic chart
I. Periodic trends in properties

VI. Formulas and nomenclature for inorganic ions and compounds

VII. Chemical composition
A. The mole concept
B. Calculating formula mass
C. Percent composition by mass
D. Empirical and molecular formula calculations

VIII. Chemical reactions
A. Non-redox reactions
B. Oxidation states
C. Oxidation-reduction reactions
D. Writing and balancing chemical equations
   1. Molecular, total ionic, and net ionic equations
   2. Balancing by inspection
   3. Balancing redox reactions

IX. Reaction stoichiometry
A. The mole concept and chemical reactions
B. Masses of products and reactants
C. Limiting reagent calculations
D. Solution stoichiometry
X. Gases
   A. Laws of gas behavior
   B. Kinetic molecular theory and the definition of temperature
   C. Real gases versus ideal gases
   D. Gas stoichiometry

XI. Thermochemistry
   A. Specific heat and calorimetry
   B. The law of conservation of energy
   C. Enthalpy
   D. Thermochemical equations and calculations

XII. Bonding
   A. Ionic, covalent, and metallic bonding
   B. Lewis formulas
   C. VSEPR theory
   D. Valence bond theory
   E. Molecular orbital theory*

XIII. Introduction to the condensed phases of matter
   A. Intermolecular forces
   B. Properties of liquids and solids*
   C. Energy and changes of state*

XIV. Solutions
   A. Concentration measurements
   B. Dilution calculations
   C. Colligative properties*
   D. Acid-base theory*

XV. Laboratory component
   A. Measurement
      1. Proper use of mass balances and volumetric glassware
      2. Precision and accuracy of laboratory measuring devices
   B. Observations and qualitative chemical and physical properties
   C. Quantitative determination of density
   D. Graphical analysis of data
   E. Separation and purification methods
      1. Filtration
      2. Evaporation
      3. Recrystallization
      4. Verifying purity with melting points
5. Distillation*

E. Determination of an empirical formula

F. Electrolytes and chemical bonding

G. Ionic reactions

H. Classifying chemical reactions

I. Analytical techniques
   1. Titration*
   2. Gravimetric analysis*
   3. Visible spectroscopy*

J. Single replacement redox reactions and the activity series*

K. Thermochemistry*

L. Molecular models*