

URSULINE COLLEGE  
SCHOOL OF ARTS AND SCIENCES

CH 103: GENERAL CHEMISTRY I

CH 103: 3 credits; CH 103L: 1 credit

TEST OUT GUIDE

**Course Description:**

General Chemistry I is a one semester course designed to provide a survey of inorganic and physical chemistry and an introduction to organic chemistry for non-science and allied health majors. Topics studied in this course include atomic structure, covalent and ionic bonding, chemical reactions, chemical calculations, acid, base and solution chemistry, radiochemistry and chemistry of hydrocarbons. Quantitative reasoning skills are developed and used where appropriate to enhance the understanding of these concepts. The medical and environmental applications of topics covered in lecture are highlighted.

**Test Out Prerequisite:**

To be eligible for this test-out, the student must have had a previous learning in chemistry for which college credit was not received. Since both lab and lecture credit is given, the previous experience must include a lab experience.

**Instructional Objectives:**

*Knowledge:*

1. Learn the basic concepts of chemistry and their applications in current events and health sciences
2. Understand the experimental basis for the growth and development of modern chemistry
3. Become familiar with the language of chemistry in measurements and nomenclature, and with the representation of chemical reactions using equations.

*Skills:*

1. Apply mathematics to solve numerical problems relating to the application of chemical concepts.
2. Become familiar with the unit conversion method of problem solving
3. Use both qualitative and quantitative reasoning skills to illustrate and analyze chemical phenomena.
4. Express numerical results which reflect an appreciation of their level of uncertainty.
5. Develop powers of observation and classification

*Attitudes:*

1. Appreciate the role of experimentation in answering science related questions
2. Develop curiosity and interest in scientific topics and applications

3. Add a scientific dimension or perspective to your view of the natural world
4. Recognize the role of chemistry in medical and clinical sciences.

*Values:*

1. Become aware that science and chemistry reflect and reinforce general human values.
2. Develop informed belief about the social value of technology.

**Learning Resources:**

*Textbook:* Denniston, K.; Topping, J. and Caret, R.; "General, Organic and Biochemistry", 4<sup>th</sup> Edn, 2004, McGraw Hill.

- *Study Guide:* Denniston, K. and Topping, J.; "Student Study Guide/Solutions Manual to accompany General, Organic and Biochemistry", 4<sup>th</sup> Edn, 2004, McGraw Hill.
- *Web Resources:* [www.mhhe.com/physsci/chemistry/denniston](http://www.mhhe.com/physsci/chemistry/denniston). This web site is for the previous edition of the text; the new one does not yet have its own web resources, but those for the third edition are still relevant.

A review sheet will be provided with this guide to highlight the key areas that will be tested.

**Test Out Format:**

There are 50 multiple choice questions. A passing score is 76 %.

**Course Outline:**

Chapter 1: Chemistry: Methods and Measurement

Chapter 2: The Composition and Structure of the Atom

Chapter 3: Elements, Atoms, Ions and the Periodic Table

Chapter 4: Structure and Properties of Ionic and Covalent Compounds

Chapter 5: Calculations and the Chemical Equation

Chapter 6: States of Matter: Gases, Liquids and Solids

Chapter 7: Reactions and Solutions

Chapter 8: Chemical and Physical Change: Energy, Rate and Equilibrium

Chapter 9: Charge-Transfer Reactions: Acids and Bases and Oxidation-Reduction

Chapter 10: The Nucleus, Radioactivity and Nuclear Medicine

Chapter 11: An Introduction to Organic Chemistry: The Saturated Hydrocarbons

Chapter 12: The Unsaturated Hydrocarbons: Alkenes, Alkynes and Aromatics

GENERAL CHEMISTRY I: TEST OUT REVIEW SHEET

*This list names every topic that may appear on the test out exam paper. Not all facets of each topic are listed – you need to fully understand each subject area named and be able to perform associated calculations illustrated in the text book, except where otherwise noted.*

*You will need to bring a scientific calculator with a log function for the exam.  
A periodic table, Avogadro's number, R and  $K_w$  will be provided.*

Chapter 1:

- ↻ Measurements and associated units, calculation of density
- ↻ metric prefixes for units; conversion between them
- ↻ scientific notation
- ↻ significant digits; also in  $x/\div$  and  $+/-$  sums
- ↻ accuracy and precision

Chapter 2:

- ↻ physical and chemical changes
- ↻ mixtures and compounds – differences in terms of particles and properties
- ↻ atomic structure – protons, neutrons and electrons
- ↻ mass number and atomic number

Chapter 3:

- ↻ periodic table – metals/non-metals, groups, periods, know major groups
- ↻ write electron configurations for atoms **and ions**, including sub-levels
- ↻ predict charges on ions from position on periodic table
- ↻ trends in table: atomic size, ionization energy, electron affinity

Chapter 4:

- ↻ ionic and covalent bonding – what happens in terms of electrons
- ↻ naming and formula writing for ionic and molecular substances
- ↻ formulas and charges of polyatomic ions
- ↻ Lewis structures and shapes of molecules
- ↻ electronegativity and polar bonds
- ↻ polarity of molecules - recognize it and know its effect on m.p., b.p., solubility and vapor pressure

## Chapter 5:

- ↻ convert # moles to mass and v.v.
- ↻ balance equations (formulas will be given if this is the task requested)
- ↻ calculate mass of one substance in the equation given the mass of another
- ↻ calculate % yield

## Chapter 6:

- ↻ arrangement and behavior of particles in solids, liquids and gases
- ↻ ideal gas behavior and assumptions – Charles' Boyles' and Avogadro's laws (ideas only, you will be asked to use them, not quote them verbatim)
- ↻  $p_1V_1/T_1 = p_2V_2/T_2$  and  $pV=nRT$  and associated calculations
- ↻ definition of standard temperature and pressure
- ↻ intermolecular forces: London, dipole-dipole and hydrogen bonds
- ↻ effect of varying strength of i-m forces on vapor pressure, mp and bp.

## Chapter 7:

- ↻ Suspension, colloid and solution characteristics
- ↻ Factors affecting solubility
- ↻ Concentration measurements and associated calculations for %w/v, %w/w, molarity, osmolarity
- ↻ Colligative properties: effect of osmolarity on fp, bp, vapor pressure and osmotic pressure; be able to rank solutions in order of these properties (no calculations)
- ↻ Osmosis – generally and in cells

## Chapter 8:

- ↻ Enthalpy, exo- and endothermic reactions, graphs
- ↻ Calculate  $\Delta H$  from bond energy data
- ↻ Entropy changes and spontaneity of reactions
- ↻ Collision theory of reacting particles, graphs, activation energy, transition state
- ↻ Factors affecting speed of reaction and reasons for their effect
- ↻ Equilibrium and K
- ↻ Le Chatalier for predicting changes in concentration, pressure, temperature, catalyst

## Chapter 9:

- ↻ Brønsted-Lowry definitions of acid and base, strong and weak acids and bases
- ↻ Chemical equations for acid-base reactions, conjugate acids and bases
- ↻ pH of acidic and alkaline solutions from molarity and vice versa
- ↻ neutralization reactions – recognize process and do calculations on given equations
- ↻ buffers – what they are made of and how they work
- ↻ Redox definitions

- ↻ Write net ionic from regular equations, pick out substances being oxidized or reduced from equation, oxidizing and reducing agents
- ↻ Application of redox reactions

#### Chapter 10:

- ↻ Definitions of radiation and radioactivity
- ↻ Types of ionizing radiation and their properties
- ↻ Half life
- ↻ Fusion and fission reactions
- ↻ Applications and measurement of radiation

#### Chapter 11:

- ↻ Recognize functional groups in organic molecules and name the families they come from
- ↻ Name alkanes and substituted alkanes using the IUPAC system
- ↻ Constitutional isomerism
- ↻ Combustion reactions of alkanes – complete and incomplete

#### Chapter 12:

- ↻ Draw and name alkenes (IUPAC system)
- ↻ Stereoisomerism in alkenes
- ↻ Addition of hydrogen and halogens to alkenes
- ↻ Addition of water to alkenes; Markovnikov's rule