

**RARITAN VALLEY COMMUNITY COLLEGE**  
**ACADEMIC COURSE OUTLINE**  
**CHEM 102 – Introduction to Chemistry**

**I. Basic Course Information**

- A. Course Number and Title: **CHEM-102 Introduction to Chemistry**
- B. New or Modified Course: Modified
- C. Date of Proposal: Fall 2017
- D. Effective Term: Fall 2018**
- E. Sponsoring Department: Science and Engineering
- F. Semester Credit Hours: 4
- G. Weekly Contact Hours:                      Lecture: 3  
  Laboratory: 3  
  Out of class student work per week: 7.5
- H. Prerequisites: MATH 020 Elementary Algebra
- I. Laboratory Fees: Yes
- J. Name and Telephone Number or E-Mail Address of Department Chair and Divisional Dean at time of approval: Marianne Baricevic, [Marianne.Baricevic@raritanval.edu](mailto:Marianne.Baricevic@raritanval.edu); Sarah Imbriglio, [sarah.imbriglio@raritanval.edu](mailto:sarah.imbriglio@raritanval.edu)

**II. Catalog Description**

Prerequisite: MATH-020 Elementary Algebra

An introduction to the fundamental principles of chemistry for students in some allied health fields. This course may be used as a preparation for General Chemistry by students with no prior chemistry, but credit will not be given for both Introduction to Chemistry and General Chemistry I. The course includes a study of selected basic principles of chemistry and an introduction to chemical laboratory techniques. Three hours of lecture/discussion and a three hour laboratory per week.

**III. Statement of Course Need**

- A. This course serves as an option in the Emergency Services A.S. and Emergency Services - Fire Science Option A.S.

- B. The course has a laboratory component, as is commonly found within chemistry programs. The laboratory offers the students the ability to work with equipment that they will see in further studies, and in their career work. The laboratory exercises are closely matched with the lecture material to both reinforce, and offer additional learning opportunities.
- C. This course generally transfers as a general education Science laboratory course, and as a program requirement in a variety of Allied Health programs (e.g., Dental Hygiene, some Chiropractic programs and some Nursing programs).

#### **IV. Place of Course in College Curriculum**

- A. Free Elective.
- B. This course is a Laboratory Science General Education course
- C. This course serves as an option in the Emergency Services A.S. and Emergency Services - Fire Science Option A.S. This course may also transfer into a variety of Allied Health programs (such as Dental Hygiene, some Chiropractic programs, some Nursing programs). Students must check with Transfer and Career Services and/or their prospective transfer institution to determine transferability.
- D. To see course transferability: a) for New Jersey schools, go to the NJ Transfer website, [www.njtransfer.org](http://www.njtransfer.org); for all other colleges and universities, go their individual websites.

#### **V. Outline of Course Content**

##### **A. Lecture topics:**

1. Basic Vocabulary of Chemistry
2. Measurement, and calculations:
  - a. Measurement and the metric system
  - b. Working with numbers (exponential notation, significant figures, unit analysis)
3. Atomic Structure
  - a. Basic atomic structure, isotopes
  - b. Atomic mass versus atomic mass number
4. Electronic structure and the Periodic Law:
  - a. The Periodic Table
  - b. Electronic arrangements, chemical properties
  - c. Electronic configurations
  - d. Periodic trends
  - e. Ions

5. Chemical Bonding:
  - a. Noble gas configuration; ionic bonding
  - b. Covalent bonding, molecular geometry and polarity
6. Formula Writing and Nomenclature
  - a. Naming binary compounds
  - b. Using The Stock System
  - c. Formula writing
7. Molar Mass and the Mole
  - a. Calculating molar mass using Periodic Table
  - b. Converting between grams and moles
  - c. Using Avogadro's number in calculations
  - d. Calculating empirical and molecular formulas
8. Chemical Reactions:
  - a. Chemical equations
  - b. Types of reactions (synthesis, decomposition, single and double replacement, combustion)
9. Stoichiometry
  - a. Solving various stoichiometric problems
  - b. Solving Limiting Reactant stoichiometry problems
10. The States of Matter
  - a. Kinetic theory of matter
  - b. Solids, liquids, and gases
  - c. Changes in state (boiling, melting, sublimation, vapor pressure)
  - d. Energy and the states of matter
11. Gases
  - a. Pressure, volume and temperature and STP
  - b. Dalton's Law of gas pressure
  - c. Various gas law problems
  - d. Ideal Gas Law problems
12. Solutions:
  - a. Physical states of solutions
  - b. Solubility and the solution process
  - c. Solution stoichiometry (concentrations units, preparation of solutions, calculations)
  - d. Dissociation and ionization
  - e. Colligative properties
13. Acids, bases, and salts:
  - a. Theories of acidity
  - b. Naming acids
  - c. The pH Scale
  - d. Properties of acids, bases, and salts
  - e. Analysis of acids, bases, and salts (titration calculations)

**B. Laboratory Experiments (suggested):**

1. Measurements and Significant Figures/Use of Chemical Balances

2. Volumetric Ware/Determination of Density
3. Physical and Chemical Changes
4. Separations and Analyses
5. Empirical Formula of Magnesium Oxide
6. Classification of Chemical Reactions
7. Stoichiometric Analysis using Decomposition Reactions
8. Temperature of the Bunsen Burner by Indirect Means
9. Molar Volume of a Gas
10. Solution Formation and Characteristics
11. Colligative Properties of Solutions
12. Acids, Bases, Salts, and Buffers
13. Titrimetric Analysis of Vinegar
14. The Acidic Hydrogens of Acids (Titrimetric Analysis)

## **VI. General Education and Course Learning Outcomes**

### **A. General Education Learning Outcomes:**

**At the completion of the course, students will be able to:**

1. Describe the basic principles of chemistry. (NJ-GE 3)
2. Solve quantitative problems representative of the scope of the course. (NJ-GE 2, 3)
3. Apply basic laboratory techniques of chemistry to the performance of a variety of experiments relevant to the course material. (NJ-GE 3)

### **B. Course Learning Outcomes:**

**At the completion of the course, students will be able to:**

1. Perform calculations on measurements of length, volume, and temperature using the appropriate units and conversion factors.
2. Demonstrate a basic understanding of atomic structure and its relationship to elemental properties and the periodic table.
3. Demonstrate an understanding of covalent and ionic bonding.
4. Determine empirical and molecular formulas.
5. Apply stoichiometric techniques to complete and balance simple chemical equations.
6. Demonstrate a qualitative understanding of the properties of gases, liquids, and solids.
7. Calculate molarity and other concentrations of solutions, and apply calculations to solution stoichiometry problems, including titrations.
8. Solve quantitative problems of acid/base solutions.
9. Demonstrate appropriate and safe laboratory techniques when performing experiments, and collaborate with partners.
10. Determine unknown concentrations using titrimetric techniques.

11. Report results of laboratory experiments, including quantitative calculations, and interpretation of the results.

### **C. Assessment Instruments**

1. Semester exams
2. Homework and quizzes
3. Cumulative Final Exam
4. Laboratory reports
5. Laboratory practical

## **VII. Grade Determinants**

- A. Performance on graded exams, quizzes, homework, final exam
- B. Performance in the laboratory
- C. Graded laboratory reports

Given the goals and outcomes described above, LIST the primary formats, modes, and methods for teaching and learning that may be used in the course:

- A. lecture/discussion
- B. problem solving sessions
- C. laboratory (including data gathering and analysis using computers)

## **VIII. Texts and Materials**

- A. Suggested Textbooks:
  - Seager, S. L., and Slabaugh, M. R., *Introductory Chemistry for Today*, Latest Ed., Thomson Brooks/Cole.
  - Seager, S. L., and Slabaugh, M. R., *Safety-Scale Experiments for General, Organic, and Biochemistry*, Latest Ed., Thomson Brooks/Cole.

## **IX. Resources**

- A. Laboratory facilities and instrumentation in the Christine Todd Whitman Science center.

## **X. Honors Option**

Not Applicable