

Degree Credit   X    
Non Credit         
Nondegree Credit         
Comm Service       

RIVERSIDE COMMUNITY COLLEGE

COURSE OUTLINE

CHEMISTRY 1B

COURSE DESCRIPTION

5 Unit

1B GENERAL CHEMISTRY, II

PREREQUISITE: Chemistry 1A.

Continued exploration of the principles of chemistry with emphasis on kinetics, thermodynamics, acid-base theory, equilibrium and electrochemistry. Special topics from descriptive inorganic chemistry, nuclear chemistry and introductory organic chemistry. Laboratory techniques in the investigation of chemical systems. 54 hours lecture and 108 hours laboratory.

SHORT DESCRIPTION FOR CLASS SCHEDULE

Sequel to Chemistry 1A – reaction rates, equilibrium, acid-base, thermodynamics, electrochemistry, nuclear, inorganic and organic chemistry.

LEARNING OBJECTIVES

Upon successful completion of the course the student should be able to:

1. Solve multi-step problems (using formulae and unit-analysis) relating to kinetics, equilibria, thermodynamics, electrochemistry, and other course content.
2. Collect and analyze data from chemical experiments, including graphing, calculations and qualitative understanding of how data relates to the concept studied.
3. Construct and manipulate equipment to secure reasonably accurate measurements.
4. Describe and apply chemical concepts of kinetics, equilibria, thermodynamics, and electrochemistry.
5. Describe and apply a chemical vocabulary of approximately 400 words.

## COURSE CONTENT

Lectures and/or laboratories contain the following content:

### TOPICS

#### Kinetics (Reaction Rates)

- Factors effecting the rate (concentration, temperature, and catalyst)
- Rate law equation and the order of a reaction
- Activation energy
- Reaction mechanisms
- Collision Theory of reaction rates

#### Equilibrium

- Equilibrium constant expression and applications
- Effects of concentration, temperature, and pressure on an equilibrium
- LeChatelier's Principle

#### Acids and Bases

- Properties of water solutions of acids and bases
- pH and  $K_w$
- Weak acid and base equilibria ( $K_a$  and  $K_b$ )
- Molecular structure as a basis of relative acid and base strengths
- Buffers

#### Precipitation Equilibria

- Net ionic equations
- Solubility and solubility product constant ( $K_{sp}$ )
- Solubility and pH
- Separation of ions by fractional precipitation

#### Complex ions

- Composition and geometry
- Lewis acid and base chemistry
- Formation constant ( $K_f$ )

#### Thermodynamics

- Enthalpy and entropy (concept and calculations)
- Free energy
- Equilibrium constant

#### Electrochemistry

- Oxidation and reduction reactions (including reactions of oxygen and hydrogen)
- Galvanic cells (diagrams, cell notation, standard vs. nonstandard)
- Calculation of cell potentials from standard reduction potential data
- Calculation of cell potentials of nonstandard cells using the Nernst equation
- Relationship between  $\Delta G$  and the cell potential
- Oxidizing and reducing agents

#### Special Topics (selected from some or all of the following)

- Nuclear Chemistry
- Organic Chemistry
- Inorganic (Coordination) Chemistry

Students are also assigned reading, writing and other outside assignments equivalent to two hours per one hour lecture.

## METHODS OF INSTRUCTION

Methods of instruction may include, but are not limited to:

Lecture presentations that demonstrate problem-solving approaches and strategies as well as concepts and their applications  
Multimedia Presentation  
In-class problem solving with instructor assistance  
Use of visual aids (models, charts, videos, transparencies, demonstrations, computer presentations)  
Instructor guided collection, calculation, and analysis of data from experimental procedures  
Small Group Activities  
Computer Aided Instruction (including tutorials)  
Distance learning

## METHODS OF EVALUATION

Students will demonstrate mastery of learning objectives by methods of evaluation which may include, but are not limited to:

Exams and quizzes testing for problem solving ability, knowledge of concepts, and the ability to apply the concepts.  
Oral reports.  
Written assignments.  
Laboratory reports.  
Laboratory projects and/or performance through assessment of accuracy and precision of results.

## COURSE MATERIALS

All materials used in this course will be periodically reviewed to insure that they are appropriate for college level instruction. Possible texts include:

Kotz, John C. and Paul Treichel, Jr. Chemistry & Chemical Reactivity, 5th ed., Saunders College Publishing, 2002.

Chang, Raymond. Chemistry, 6<sup>th</sup> edition, McGraw-Hill, 1998

Radel, Stanley R. and Marjorie H. Navidi. Chemistry, 2nd ed., West, 1994.

Chemistry Dept. RCC, Laboratory Manual, last revised: 1996

Moreno Valley Campus RCC, Laboratory Manual, last revised: 2002

Chemistry Dept. RCC, Laboratory Manual, last revised: 2002