

**BROOKDALE COMMUNITY  
COLLEGE**

**CHEM. - 102 - GENERAL CHEMISTRY II**

**5.0 Credits**

**COURSE SYLLABUS**



## CHEM. II - GENERAL CHEMISTRY II

### COURSE GOAL

The students will study the concepts of inorganic chemistry involving theoretical and laboratory experiences. The four units to be covered are:

1. Chemical kinetics & Chemical Equilibrium
2. Acid and bases; Acid Base Equilibrium & Solubility Equilibrium
3. Thermochemistry; Entropy, Free Energy & Equilibrium; Electrochemistry
4. Transition Metal Chemistry, Nuclear Chemistry; Organic Chemistry

### METHOD OF EVALUATION

Formal testing

### PREREQUISITE

CHEM. 101, MATH 151

### REQUIRED MATERIALS

1. **TEXTBOOK:** Chemistry by Raymond Chang, 9th Edition, 2006, McGraw-Hill, Inc.
2. **LABORATORY:** Laboratory Experiments: Chemistry, The Central Science, by John H. Nelson and Kenneth C. Kemp, 10th Edition, 2003, Prentice Hall.
3. **SAFETY GOGGLES:** New Jersey State Law requires that all students wear appropriate splash and impact proof safety goggles while performing laboratory experiments. They are available at the College Store.
4. **FULL LENGTH LABORATORY COAT:** All students are required to wear full length lab coat during the laboratory period.

### OPTIONAL MATERIALS

Student Solution Manual by Brandon J. Cruickshank

### DISABILITY SERVICES OFFICE

If you have a documented disability and would like to request accommodations and/or academic adjustments, contact the Disability Services Office (732) 224-2730 or TTY (732) 842-4211.



**Brookdale Community College  
Chemistry Department Grading and Testing Policy**

**GRADING STANDARD:**

90 – 100	A
87 – 89.99	B+
80 – 86.99	B
75 - 79.99	C+
70 – 74.99	C
60 – 69.99	D
59 & Below	F

1. The total laboratory grade will be based on an average of fourteen (14) laboratory experiments and an average of six (6) laboratory quizzes given through the semester. The experiment average will make up 80% of the final grade and the quiz average will make up 20% of the final grade.
2. Any missed lab will be averaged in as a zero (0). Students will have the opportunity to make up one (1) missed laboratory experiment during the semester with a valid excuse. There will be time scheduled by the learning assistant in charge of the lab for this purpose.
3. Any missed laboratory quiz will not be made up.

**DEPARTMENT POLICIES**

**Chemistry Laboratory Policies**

1. Students must attend their scheduled laboratory section. Students are not allowed to attend any other lab section for any reason.
2. Students must pass both the lecture and the laboratory portion of the course.

**COLLEGE POLICIES:**

For information regarding:

- ◆ Brookdale's Academic Integrity Code
- ◆ Student Conduct Code
- ◆ Student Grade Appeal Process

Please refer to the **STUDENT HANDBOOK AND BCC CATALOG.**

**NOTIFICATION FOR STUDENTS WITH DISABILITIES:**

Brookdale Community College offers reasonable accommodations and/or services to persons with disabilities. Students with disabilities who wish to self-identify, must contact the Disabilities Services Office at 732-224-2730 or 732-842-4211 (TTY), provide appropriate documentation of the disability, and request specific accommodations or services. If a student qualifies, reasonable accommodations and/or services, which are appropriate for the college level and are recommended in the documentation, can be approved.

**ADDITIONAL SUPPORT/LABS:**

Learning assistants are available for help for both lab and lecture. The times of availability are posted at the learning assistants' office. For any additional information, please call the Chemistry Department at 732-224-2424.

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Prerequisites: MTH 151 & CHM 101.

Text book: Chemistry, 9th edition by Raymond Chang.

Number of Credits: 5

Number of Chapters: 13 & 14

Name of Chapters: Chemical Kinetics & Chemical Equilibrium

Method of evaluation: Formal testing

Number of tests: Four tests. Each test will be given at the end of each unit.

Unit: #1

LEARNING OBJECTIVES

RECOMMENDED PRACTICE EXERCISES

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| 1. | The rate of reaction  | Read: 13.1<br>Do exercise: 13.6, 13.8                                    |
| 2. | The rate laws   | Read: 13.2<br>Do exercises: 13.14, 13.16<br>13.18, 13.17<br>13.20, 13.22 |
| 3. | Relation between reactant concentrations<br>(or pressures) and time | Read: 13.3<br>Do exercises: 13.23, 13.26<br>13.28, 13.30                 |
| 4. | Activation energy and temperature<br>dependence of rate constants.  | Read: 13.4<br>Do exercise: 13.37, 13.38<br>13.40, 13.41<br>13.42         |
| 5. | Reaction Mechanisms.  | Read: 13.5<br>Do exercise: 13.45, 13.49<br>13.50, 13.52<br>13.54         |
| 6. | Catalysis   | Read: 13.6<br>Do exercises: 13.62, 13.68                                 |



7. The concept of equilibrium. Read: 14.1  
Do exercise: 14.4
8. Writing Equilibrium Constant Expression Read: 14.2  
Do exercise: 14.7, 14.9  
14.13, 14.14  
14.16, 14.17,  
14.18, 14.20  
14.22, 14.24  
14.28, 14.30
9. Relationship between chemical kinetics and chemical equilibrium. Read: 14.3  
Do exercises: 14.33, 14.34  
14.35, 14.36
10. What does the equilibrium constant tell us? Read: 14.4  
Do exercise: 14.38, 14.40  
14.42, 14.44  
14.46, 14.88
11. Factors that affect chemical equilibrium. Read: 14.5  
Do exercises: 14.52, 14.54  
14.56, 14.58  
14.60, 14.62

Number of Chapters: 15, 16

Name of Chapters: Acid and base, Acid base equilibria & solubility equilibria.

Unit : #II

LEARNING OBJECTIVES

RECOMMENDED PRACTICE EXERCISES

1.	Bronsted acids and bases.	Read: 15.1 Do exercise: 15.4, 15.6 15.8
2.	The acid-base properties of water.	Read: 15.2 Do exercise: 15.9, 15.11
3.	pH-A measure of acidity	Read: 15.3 Do exercise: 15.16, 15.18 15.20, 15.22 15.24, 15.26
4.	The strengths of acids and bases. Write the correct formula for a compound	Read: 15.4 Do exercise: 15.32, 15.34 15.36, 15.38
5.	Weak acids & acid ionization constants	Read: 15.5 Do exercise: 15.44, 15.46 15.48, 15.50
6.	Weak bases & Base Ionization constant	Read: 15.6 Do exercise: 15.54, 15.56
7.	The relationship between the ionization constants of acids and their conjugate bases. Diprotic & Polyprotic acids	Read: 15.7, 15.8 Do exercise: 15.57, 15.60 15.62, 15.64
8.	Molecular structure and the strength of acids.	Read: 15.9 Do exercise: 15.68, 15.70

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| 9.  | Acid base properties of salts solutions         | Read: 15.10, 15.11<br>Do exercise: 15.78, 15.80<br>15.82, 15.86<br>15.87, 15.88 |
| 10. | Lewis acids and bases                           | Read: 15.12<br>Do exercise: 15.89, 15.90<br>15.92, 15.94                        |
| 11. | The common ion effect                           | Read: 16.1 & 16.2<br>Do exercise: 16.2, 16.4<br>16.5, 16.6                      |
| 12. | Buffer solutions                                | Read: 16.3<br>Do exercise: 16.8, 16.10<br>16.12, 16.14<br>16.16, 16.18<br>16.20 |
| 13. | Acid-base titration.                            | Read: 16.4<br>Do exercise: 16.22, 16.24<br>16.26, 16.28<br>16.30, 16.32         |
| 14. | Acid-base indicators                            | Read: 16.5<br>Do exercise: 16.33, 16.36<br>16.38                                |
| 15. | Solubility and solubility product               | Read: 16.6<br>Do exercise: 16.44, 16.46<br>16.48, 16.50<br>16.52, 16.54         |
| 16. | Separation of ions by fractional precipitation. | Read: 16.7<br>Do exercise: 16.55, 16.56   |
| 17. | The common ion effect and solubility.           | Read: 16.8<br>Do exercise: 16.57, 16.58<br>16.60, 16.62                         |

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| 18. | pH and solubility                      | Read: 16.9<br>Do exercise: 16.64, 16.66,<br>16.68        |
| 19. | Complex ion equilibria and solubility. | Read: 16.10<br>Do exercise: 16.69, 16.70<br>16.72, 16.74 |
| 20. | Qualitative analysis.                  | Read: 16.11<br>Do exercise: 16.80, 16.82                 |

Number of Chapters: 6, 18 & 19

Name of Chapters: Thermochemistry, entropy, free energy, and electrochemistry

Unit: # III

LEARNING OBJECTIVES

RECOMMENDED PRACTICE EXERCISES

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| 1. | Energy, Energy changes in chemical reaction.                   | Read: 6.1 & 6.2<br>Do exercise: 6.2, 6.3<br>6.7, 6.10  |
| 2. | First law of thermodynamics and enthalpy of chemical reactions | Read: 6.3 & 6.4<br>Do exercise: 6.11, 6.12<br>6.14, 6.16<br>6.18, 6.20<br>6.23, 6.24<br>6.26, 6.28<br>6.76 |
| 3. | Calorimetry  | Read: 6.5<br>Do exercise: 6.29, 6.34<br>6.36, 6.38   |
| 4. | Standard enthalpy of formation and reaction                    | Read: 6.6<br>Do exercise: 6.39, 6.40<br>6.46, 6.48<br>6.50, 6.52<br>6.54, 6.56<br>6.60, 6.62               |
| 5. | Heat of solution and dilution.                                 | Read: 6.7<br>Do exercise: 6.71, 6.72<br>6.74, 6.76<br>6.80, 6.81<br>6.84, 6.86                             |
| 6. | The three laws of thermodynamics.                              | Read: 18.1   |
| 7. | Spontaneous processes and entropy                              | Read: 18.2 & 18.3<br>Do exercise: 18.4, 18.6<br>18.44  |

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| 8.  | The second law of thermodynamics                         | Read: 18.4<br>Do exercise: 18.10, 18.12<br>18.13, 18.14   |
| 9.  | Gibbs free energy (Gibbs Function)                       | Read: 18.5<br>Do exercise: 18.17, 18.18<br>18.20  |
| 10. | Free energy and chemical equilibrium                     | Read: 18.6<br>Do exercise: 18.24, 18.26<br>18.28, 18.30<br>18.32, 18.38<br>18.42, 18.48<br>18.50, 18.64 |
| 11. | Balancing Redox Equations                                | Read: 19.1<br>Do exercise: 19.1, 19.2   |
| 12. | Electrochemical Cells (Galvanic Cells) and Standard Emfs | Read: 19.2, 19.3<br>Do exercise: 19.3, 19.6<br>19.12, 19.14<br>19.16, 19.18                             |
| 13. | Spontaneity of Redox Reactions                           | Read: 19.4<br>Do exercise: 19.22, 19.24<br>19.25, 19.26   |
| 14. | Effect of concentration on cell emf.                     | Read: 19.5<br>Do exercise: 19.27, 19.28<br>19.30, 19.32<br>19.34  |
| 15. | Batteries.   | Read: 19.6<br>Do exercise: 19.37, 19.38   |
| 16. | Corrosion.   | Read: 19.7<br>Do exercise: 19.39, 19.40<br>19.42  |
| 17. | Electrolysis.  | Read: 19.8<br>Do exercise: 19.46, 19.48<br>19.54, 19.52   |

Number of Chapters: 22, 23 & 24

Name of Chapters: Transition metal chemistry, coordination compounds, organic chemistry & Nuclear Chemistry

Unit: # IV

<u>LEARNING OBJECTIVES</u>		<u>RECOMMENDED PRACTICE EXERCISES</u>
1.	Properties of the transition metals.	Read: 22.1 Do exercise: 22.1, 22.4 22.6, 22.8
2.	Chemistry of Iron and Copper.	Read: 22.2 Do exercise: 22.50
3.	Coordination Compounds.	Read: 22.3 Do exercise: 22.12, 23.14 22.16, 22.18
4.	Structure of coordination compounds.	Read: 22.4 Do exercise: 22.21, 22.22 22.24, 22.26
5.	Bonding in coordination compounds	Read: 22.5 Do exercise: 22.27, 22.30 22.34, 22.36 22.38
6.	Reaction of coordination compounds.	Read: 22.6 Do exercise: 22.42, 22.44 23.46
7.	Application of coordination compounds.	Read: 22.7 Do exercise: 22.60, 22.61
8.	The nature of nuclear reaction	Read: 23.1 Do exercise: 23.5, 23.6
9.	Nuclear stability	Read: 23.2 Do exercise: 23.14, 23.16 23.18, 23.20

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| 10. | Natural radioactivity              | Read: 23.3<br>Do exercise: 23.24, 23.26<br>23.28, 23.30   |
| 11. | Nuclear Transmutation              | Read: 23.4<br>Do exercise: 23.34, 23.36   |
| 12. | Nuclear Fission                    | Read: 23.5<br>Do exercise: 23.37, 23.41   |
| 13. | Nuclear Fusion                     | Read: 23.6<br>Do exercise: 23.43, 23.44<br>23.45, 23.46   |
| 14. | Uses of isotopes                   | Read: 23.7<br>Do exercise: 23.48, 23.50   |
| 15. | Classes of organic compounds       | Read: 24.1<br>Do exercise: 24.1, 24.2   |
| 16. | Aliphatic hydrocarbons             | Read: 24.2<br>Do exercise: 24.3, 24.7<br>24.12, 24.14<br>24.16, 24.18<br>24.20, 24.24<br>24.26, 24.28 |
| 17. | Aromatic hydrocarbons              | Read: 24.3<br>Do exercise: 24.29, 24.30<br>24.31, 24.32   |
| 18. | Chemistry of the functional groups | Read: 24.4<br>Do exercise: 24.36, 24.38<br>24.40, 24.42<br>24.44, 24.46<br>24.48, 24.50               |

