

MIDDLESEX COUNTY COLLEGE
EDISON, NEW JERSEY
DEPARTMENT OF NATURAL SCIENCES

Course ID and Name: CHM 122: General Chemistry II Lecture

Department: Department of Natural Sciences

Chairperson: Dr. Donna Howell
Office Location: SH 104
E-mail Address: DHowell@Middlesexcc.edu
Telephone: 732-906-2592

Prerequisites: CHM 121 with a grade of “C” or better.

Co-requisites: N/A

Course Description:

A continuation of CHM 121, concentrating on properties of liquids, solids and solutions, kinetics, equilibrium, properties of acids and bases, acid-base and solubility equilibria, thermodynamics and electrochemistry.

General Education Status: Science

Credits: 3 **Lecture Hours:** 4 **Laboratory Hours:** 0

Learning Outcomes:

Upon successful completion of this course, student will be able to:

1. Apply the scientific method to understand chemical nature of our world
2. Describe colligative properties and their use in determining the characteristic of solutions.
3. Determine the rate of a reaction and its dependence on concentration, time, and temperature.
4. Determine whether equilibrium has been established and calculate equilibrium concentrations.
5. Describe the properties of acids and bases related to molecular structure and their behavior related to the factors that affect aqueous solubility.
6. Perform calculations with the thermodynamic functions, enthalpy, entropy, free energy and to apply these functions to chemical reactions.
7. Construct and describe two types electrochemical cells, (voltaic and electrolytic cells), the relationship between the free energy and the cell potential and explain thermodynamically the operation of a concentration cell.

Course Requirements:

Students must attend every lecture session. Lecture performance is evaluated by exams, homework assignments, and quizzes. Course grades should be assigned using percentages that are similar to those given below:

Assessment tool	% of Final Grade
In-class exams	60%
Homework and/or quizzes	15%
Final Exam	25%

GRADING STANDARD:

Upon completion of the course, grades will be assigned using a similar scale as that given below:

92 – 100%	A
89 – 91%	A minus
86 – 88%	B plus
82 – 85%	B
79 – 81%	B minus
76 – 78%	C plus
70 – 75%	C
60 – 69%	D
Below 60%	F

Course Content Areas:

- A. States of Matter; Liquids and Solids
- B. Solutions
- C. Rates of Reactions
- D. Chemical Equilibrium
- E. Acids and Bases
- F. Acid-Base Equilibria
- G. Solubility and Complex-Ion Equilibria
- H. Thermodynamics and Equilibrium
- I. Electrochemistry

Textbook for Course:

<u>Author</u>	<u>Title</u>	<u>Publisher</u>	<u>Copyright</u>
D.D Ebbing & S.D Gammon	General Chemistry 11 th Edition	Cengage Learning	2017

Lecture Outline

- A. States of Matter; Liquids and Solids
 - 1. Intermolecular Forces

2. Properties of Liquids
3. Crystal Structure
4. Types of Crystals
5. Amorphous Solids
6. Phase Changes
7. Phase Diagrams

B. Solutions

1. Types of Solutions
2. The Solution Process
3. Concentration Units
4. Factors that Affect Solubility
5. Colligative Properties
6. Calculations Using Colligative Properties
7. Colloids

C. Rates of Reactions

1. Reaction Rates
2. Dependence of Reaction Rate on Reactant Concentration
3. Dependence of Reactant Concentration on Time
4. Dependence of Reaction Rate on Temperature
5. Reaction Mechanisms; Catalysis

D. Chemical Equilibrium

1. The Concept of Equilibrium
2. The Equilibrium Constant
3. Equilibrium Expressions
4. Using Equilibrium Expressions to Solve Problems
5. Factors That Affect Chemical Equilibrium

E. Acids and Bases

1. Brønsted Acids and Bases
2. The Acid-Base Properties of Water
3. The pH Scale; Strong Acids and Bases
4. Weak Acids and Acid Ionization Constants
5. Weak Bases and Base Ionization Constants
6. Conjugate Acid-Base Pairs; Diprotic and Polyprotic Acids
7. Molecular Structure and Acid Strength
8. Acid-Base Properties of Salt Solutions
9. Acid-Base Properties of Oxides and Hydroxides
10. Lewis Acids and Bases

F. Acid-Base Equilibria

1. The Common Ion Effect
2. Buffer Solutions
3. Acid-Base Titrations
4. Solubility Equilibria
5. Factors Effecting Solubility
6. Separation of Ions Using Differences in Solubility

G. Solubility and Complex-Ion Equilibria

1. Solubility Equilibria
2. Complex-ion Equilibria
3. An Application of Solubility Equilibria

H. Thermodynamics and Equilibrium

1. Spontaneous Processes
2. Entropy; Entropy Changes in a System\
3. Entropy Changes in the Universe
4. Predicting Spontaneity
5. Free Energy and Chemical Equilibrium

I. Electrochemistry

1. Balancing Redox Reactions
2. Galvanic Cells
3. Standard Reduction Potentials
4. Spontaneity of Redox Reactions Under Standard-State Conditions
5. Spontaneity of Redox Reactions Under Conditions Other Than Standard State
6. Electrolysis