

Bergen Community College  
Division of Mathematics, Science and Technology  
Department of Physical Sciences

Course Syllabus  
CHM 112 College Chemistry

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COURSE TITLE:	CHM 112 College Chemistry
PRE-REQUISITE:	MAT011 or equivalent by an appropriate placement as a result of the New Jersey Basic Skills Placement test (computational sections only) CHM100 or a recent college-prep high school chemistry course is a recommended prerequisite.
TEXTBOOK:	<u>Karen C. Timberlake, General, Organic and Biological Chemistry: Structure of Life, 5th Edition, Pearson, 2015; ISBN# 978-0-321-96746-6</u>
COURSE DESCRIPTION:	College Chemistry is a survey of the fundamentals of inorganic chemistry, organic chemistry, and biochemistry. Topics in inorganic chemistry include atomic theory, chemical bonding, chemical reactions, nomenclature, gas laws, and acid-base buffers. The structure and function of the major classes of organic compounds are studied. Topics in biochemistry include proteins, carbohydrates, lipids, nucleic acids, and enzymes. The course includes a writing and communications requirement that relates the topics covered to a broad historical, social, and cultural context. This is a General Education course.
STUDENT LEARNING OBJECTIVES:	As a result of meeting the requirements in this course, students will be able to: <ol style="list-style-type: none"><li>1. Students will learn how to use metric units and carry out chemical calculations. Students will be evaluated based on performance on written examinations and quizzes. Assessment will also be based on performance in the laboratory.</li><li>2. Students will be able to explain the way in which the structure of inorganic, organic and biochemical molecules determines the properties of these types of compounds. Students will be evaluated based on performance on written examinations and quizzes. Students will also be assessed based on performance in the laboratory and on their laboratory reports.</li><li>3. Students will be able to demonstrate knowledge of technical terms used in chemistry including appropriate nomenclature. Students will be evaluated based on performance on written examinations and quizzes.</li><li>4. Students will be able to explain the nature of acids, bases and acid-base buffers. Students will be evaluated based on performance on written examinations and quizzes.</li><li>5. Students will be able to explain the application of chemical principles to the health sciences. Students will be evaluated based on performance on written examinations and quizzes.</li></ol>

At the discretion of the instructor, assessment measures may be somewhat modified.

COURSE CONTENT:

<u>CHAPTER</u>	<u>TOPIC</u>	<u>STUDENT LEARNING OBJECTIVES:</u>
1 <b>Sec. 1.2 &amp; 1.4</b>	<b>Chemistry in Our Lives</b>	1

Scientific Method, Key Math Skills for Chemistry

2	<b>Chemistry and Measurements</b>	1,3
	Review of Problem Solving, Metric System, Significant Figures, Conversion Factors, Density	
3	<b>Matter and Energy</b>	1,3
	Classification of Matter, States of Matter, Temperature, Energy, Energy from Food, Specific Heat, Changes of State	
4	<b>Sec. 4.7 - Omit</b>	
	<i>Orbital Diagrams</i>	
	<b>Atoms</b>	1,2,3
	Symbols, Periodic Table, Structure of the Atom, Atomic Mass, Electron configurations, Periodic Trends, Lewis Structures of Elements	
6	<b>Ionic and Molecular Compounds</b>	1,2,3
	Ionic and Covalent Bonding, Writing Formulas and Naming Compounds, Lewis Structures, Electronegativity, Shapes and Polarity of Molecules, Attractive Forces in Compounds	
7	<b>Sec. 7.8 - Omit</b>	
	<i>Limiting Reagent</i>	
	<b>Chemical Reactions and Quantities</b>	1,2,3,5
	Balancing Equations, Types of Chemical Reactions, Mole and Mass Calculations in Reactions, % yield, Energy in Chemical Reactions	
8	<b>Sec. 8.7 - Gas Laws and</b>	
	<i>Chemical Reactions,</i>	
	<i>Optional</i>	
	<b>Gases</b>	1,2,3,5
	Kinetic Molecular Theory, Gas Laws,	
9	<b>Sec. 9.4 - Omit Chemical</b>	
	<i>Reactions in Solution</i>	
	<b>Omit Sec. 9.5</b>	
	<b>Sec. 9.6, Omit Boiling</b>	
	<i>Point Elevation and</i>	
	<i>Freezing Point Depression</i>	
	<b>Solutions</b>	1,2,3,5
	Electrolytes, Solubility, Concentration, Colloids, Osmosis, Dialysis	
10	<b>Omit Sec. 10.3 &amp; 10.4</b>	
	<b>Reaction Rates and Chemical Equilibrium</b>	1,2,3,5
	Rates of Reactions, Equilibrium, Le Chatelier's Principle	
11	<b>Omit Sec. 11.8</b>	
	<b>Sec. 11.9 - Omit Buffer</b>	
	<i>Calculations</i>	
	<b>Acids and Bases</b>	1,2,3,4,5
	Definitions, Nomenclature, Ionization of Water and pH, Reactions, Buffers	
12	<b>Introduction to Organic Chemistry: Hydrocarbons</b>	2,3,5
	Alkanes, Naming Alkanes, Properties, Reactions, Alkanes and Alkynes, Naming Alkenes and Alkynes, Isomers, Addition Reactions, Aromatic Compounds	
13	<b>Sec. 13.1 - Omit</b>	
	<i>IUPAC Nomenclature</i>	
	<b>Sec. 13.2 - Omit</b>	
	<i>IUPAC Nomenclature</i>	
	<b>Alcohols, Phenols, Thiols and Ethers</b>	2,3,4,5
	Properties, Reactions	
14	<b>Sec. 14.1 - Omit</b>	
	<i>IUPAC Nomenclature</i>	
	<b>Omit Sec. 14.5</b>	
	<b>Aldehydes, Ketones and Chiral Molecules</b>	2,3,4,5
	Aldehydes, Ketones, Properties, Reactions	
16	<b>Sec. 16.1 - Omit</b>	
	<i>IUPAC Nomenclature</i>	
	<b>Omit Sec. 16.4</b>	
	<b>Carboxylic Acids and Esters</b>	2,3,4,5
	Properties, Reactions	
18	<b>Sec. 18.1 - Omit</b>	
	<i>IUPAC Nomenclature</i>	
	<b>Sec. 18.4 - Optional</b>	
	<b>Sec. 18.5 - Omit</b>	
	<i>IUPAC Nomenclature</i>	
	<b>Amines and Amides</b>	2,3,5
	Classification of Amines, Properties, Preparation of Amides, Reactions	
15 & Sec. 14.5	<b>Carbohydrates</b>	2,3,5

Monosaccharides, Fischer Projections,  
Disaccharides, Polysaccharides,  
Chirality,  
Reducing Sugars

19	<b>Amino Acids and Proteins</b> Amino acids, Protein formation, Protein Structure, Denaturation	2,3,4,5
20 <i>Sec. 20.2 - Optional</i> <i>Sec. 20.6 - Optional</i>	<b>Enzymes and Vitamins</b> Enzyme activity, Factors affecting enzyme activity, Inhibition, Regulation,	2,3,5
17 <i>Omit Sec. 17.5-17.7</i>	<b>Lipids</b> Fatty acids, Triacylglycerols, Physical properties, Chemical properties	2,3,4,5
5	<b>Nuclear Chemistry</b> ( <i>Optional Topic</i> )	2,3,5
21	<b>Nucleic Acids and Protein Synthesis</b> ( <i>Optional Topic</i> )	2,3,5
22 & 23	<b>Metabolic Pathways for Carbohydrates &amp; Metabolism and Energy Production</b> ( <i>Optional Topics</i> )	2,3,5

NOTES: 1. A knowledge of Algebra is helpful.  
2. The laboratory work is an integral part of the course. Students must complete the laboratory work in order to receive a passing grade in the course.

EVALUATION: A. Examination (and quizzes)..... 75%  
B. Laboratory work..... 25%  
TOTAL 100%

Evaluation may be modified at the instructor's discretion.

ADDITIONAL  
NOTES:

1. Students will be required to demonstrate the ability to explain concepts studied in this course. Examinations will include essay questions. Instructors may require additional writing assignments.
2. The scheduled examinations must be completed in order for the student to receive a grade in the course. A student will be allowed either to take one make-up exam or to use his/her final examination grade in place of one missed examination (policy to be established by the instructor).
3. The course material is cumulative. Students experiencing difficulty with any segment of the course should see the instructor promptly. Students experiencing difficulty with the arithmetic or problem solving aspects of this course should acquaint themselves with the tutorial services at the Tutoring Center.

INSTRUCTIONAL RESOURCES:

- a. Spencer L. Seager and Michael R. Slabaugh, Chemistry for Today: General Organic and Biochemistry, 7<sup>th</sup> Edition, Brooks/ Cole, 2011
- b. John McMurray, Mary Castellion, David S. Ballantine, Carl A. Hoeger and Virginia E. Peterson, Fundamentals of General, Organic and Biological

Chemistry, 6<sup>th</sup> Edition, Pearson/Prentice Hall, 2010.

- c. Katherine J. Denniston, Joseph J. Topping and Robert L. Caret, General, Organic and Biochemistry, 7<sup>th</sup> Edition, McGraw-Hill, 2011.
- d. James Armstrong, General, Organic and Biochemistry: An Applied Approach, Thomson/ Brooks/Cole, Belmont, 2012.

#### SPECIAL NOTES:

The scheduled examinations must be completed in order for the student to receive a grade in the course. A student will be allowed either to take one make-up exam or to use his/her final examination grade in place of one missed examination (policy to be established by the instructor).

The course material is cumulative. Students experiencing difficulty with any segment of the course should see the instructor promptly. Students experiencing difficulty with the arithmetic or problem solving aspects of this course should acquaint themselves with the tutorial services of the Tutoring Center.

#### FACULTY ABSENCE PROCEDURE

A daily listing of cancelled classes will appear in the Main Hall Lobby near the student center. If students find a class cancelled which has not been listed, they should report this to the Evening and Saturday Office Room C-107 or the Divisional Dean's Office, Room A-304.

#### SERVICES FOR STUDENTS WITH DISABILITIES

Bergen Community College aims to create inclusive learning environments where all students have maximum opportunities for success. Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Specialized Services at 201-612-5269 or via email at [ossinfo@bergen.edu](mailto:ossinfo@bergen.edu) for assistance.

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All BCC students enrolled in credit courses are entitled to a WebAdvisor account. With WebAdvisor, you may register online, pay your bill, check your schedule, room assignments, GPA, and find out what courses you need to take. To find out more about WebAdvisor or to sign up online, visit <http://go.bergen.edu>! While there, please make sure you give us your preferred email address. You'll find directions how to do this at <http://go.bergen.edu/email>.

## **CHM-112 LAB SCHEDULE**

<u>WEEK</u>	<u>EXPERIMENT</u>	<u>STUDENT LEARNING OBJECTIVES</u>
1	Check-in, Math Review	
2	Exp. 1      Measurements and Significant Figures	1,3
3	Exp. 2      Conversion Factors and Problem Solving	1,3
4	Exp. 3      Density and Specific Gravity	1,3
5	Exp. 10     Chemical Reactions and Equations	1,2,3
6	Exp. 12     Gas Laws: Boyle's (handout) and Charles Exp. 13     Dalton's Law of Partial Pressures: Parts B and C (Instructor Demonstration)	1,2,3
7	Exp. 17     Solutions, Colloids, and Suspensions	1,2,3
8	Demonstrations of Equilibrium - Handout	1,2,3
9	Exp. 19     Acids, Bases, pH, and Buffers	1,2,3,4
10	Exp. 21     Organic Compounds: Alkanes Exp. 22     Reactions of Unsaturated Hydrocarbons Parts A, C, & D	2,3
11	Exp. 25     Carboxylic Acids and Esters	1,2,3,4
12	Exp. 26     Aspirin and Other Analgesics Part C Optional	1,2,3,4
13	Exp. 30     Tests for Carbohydrates - Omit Part C	1,2,3
14-15	Exp. 34     Peptides and Proteins Omit Parts C & D Exp. 35     Enzymes	1,2,3

*Exp. 4: Temperature and Specific Heat and Exp. 9: Compounds and Their Bonds may be substituted at the Instructor's Discretion.*