

This syllabus is provided as a general informational guide. Some of the information may vary depending on the specific course section and instructor. Different sections of the same course may require different textbooks. Verify the section specific textbook information in the CUNY's Academic Course Schedule Web Page. Modifications of the grading system presented here will be communicated by the instructors of the sections when they meet the class.

## BOROUGH OF MANHATTAN COMMUNITY COLLEGE

The City University of New York

Department of Science

Title of Course College Chemistry II Class Hours 4

Course Code CHE 202 Laboratory Hours per Week 3

Semester \_\_\_\_\_

Instructor Information (Phone#, Office#, email) \_\_\_\_\_

Credits 4

**Course Description:** This is a two-semester course sequence that involves the study of chemical principles including atomic and molecular theories, molecular structure, and reactivity. The laboratory will include experiments illustrating the chemical principles.

CHE 201-202 two terms required. Required in A.S. (Science), A.S. (Engineering Science), A.S. (Science for Forensics), and A.S. (Biotechnology Science). Fulfills science requirement for A.A. (Liberal Arts)

Basic Skills ACR 094, ENG 088 or ESL 054, and MAT 056

Prerequisites CHE 201

Corequisites \_\_\_\_\_

Course Student Learning Outcomes (Students will be able to...)	Measurements (means of assessment for student learning outcomes listed in first column)
1. Identify and define key terminology in chemistry.	1. Examinations will measure students' ability to define terms in stoichiometric calculations
2. Explain chemical properties	2. Examinations will measure students' ability to explain atomic spectra from energy levels
3. Apply chemical concepts to chemical properties.	3. Examinations will measure students' ability to apply chemical bonding to properties of solids.
4. Compare chemical properties based on chemical models.	4. Examinations will measure student's ability to compare types of chemical reactions
5. Categorize chemical properties based atomic and molecular structure.	5. Examinations will measure student's ability to categorize periodicity of atomic properties.
6. Evaluate the effect of changes in variables on chemical properties.	6. Examinations will measure student's ability to evaluate enthalpy calculations.

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Below are the college's general education learning outcomes, the outcomes that are checked in the left-hand column indicate goals that will be covered and assessed in this course.

	General Education Learning Outcomes	Measurements (means of assessment for general education goals listed in first column)
<input type="checkbox"/>	<b>Communication Skills-</b> Students will be able to write, read, listen and speak critically and effectively.	
<input checked="" type="checkbox"/>	<b>Quantitative Reasoning-</b> Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.	Examinations will assess student's ability to mathematical analyze quantitative problems in chemistry.
<input checked="" type="checkbox"/>	<b>Scientific Reasoning-</b> Students will be able to apply the concepts and methods of the natural sciences.	Examinations will assess student's ability to interpret chemical properties based on chemical concepts and models.
<input type="checkbox"/>	<b>Social and Behavioral Sciences-</b> Students will be able to apply the concepts and methods of the social sciences.	
<input type="checkbox"/>	<b>Arts &amp; Humanities-</b> Students will be able to develop knowledge and understanding of the arts and literature through critiques of works of art, music, theatre or literature.	
<input type="checkbox"/>	<b>Information &amp; Technology Literacy-</b> Students will be able to collect, evaluate and interpret information and effectively use information technologies.	
<input type="checkbox"/>	<b>Values-</b> Students will be able to make informed choices based on an understanding of personal values, human diversity, multicultural awareness and social responsibility.	

**Required Text:** Zumdahl, Steven S., Zumdahl, Susan A., and DeCoste D. *Chemistry 10<sup>th</sup> Ed with OWLv2* Cengage Learning (2017), Boston MA. ISBN-13: 978-1-305-95740-4

**Required Laboratory Manual:** Wentworth, R. A. D., and Munk, Barbara H., *Experiments in General Chemistry 11th Edition*, Cengage Learning (2017), Boston MA. ISBN 978-1-305-94498-5

**Other Resources** \_\_\_\_\_

**Use of Technology (If Applicable)** \_\_\_\_\_

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### Evaluation and Requirements of Students

Examinations 3@10%	30%
Homework	10%
Quiz & Attendance	10%
Final Examination (Comprehensive)	20%.
Laboratory	30%

Week	Ch/Sec	Topic
		<b>Organic and Biological Molecules</b>
1	22.1	Alkanes: Saturated Hydrocarbons
	22.2	Alkenes and Alkynes
	22.3	Aromatic Hydrocarbons
	22.4	Hydrocarbon Derivatives
	22.6	Natural Polymers
		<b>Properties of Solutions</b>
2	11.1	Solution Composition (Omit Normality)
	11.2	Energies of Solution Formation
	11.3	Factors Affecting Solubility
3	11.4	Vapor Pressure of Solutions
	11.5	Boiling Point Elevation and Freezing Point Depression
	11.6	Osmotic Pressure
	11.7	Colligative Properties of Electrolyte Solutions
		<b>Chemical Kinetics</b>
4	12.1	Reaction Rates
	12.2	Rate Laws
	12.3	Determining the Form of the Rate Law
	12.4	Integrated Rate Laws
	12.5	Reaction Mechanisms
	12.6	A Model for Chemical Kinetics
	12.7	Catalysis
		<b>Chemical Equilibrium</b>
5	13.1	The Equilibrium Condition
	13.2	The Equilibrium Constant
	13.3	Equilibrium Expressions Involving Pressures
	13.4	Heterogeneous Equilibria
	13.5	Applications of the Equilibrium Constant
	13.6	Solving Equilibrium Problems
	13.7	Le Chatelier's Principle
		<b>Acids and Bases</b>
6	14.1	The Nature of Acids and Bases
	14.2	Acid Strength

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	14.3	The pH Scale
	14.4	Calculating the pH of Strong Acid Solutions
	14.5	Calculating the pH of Weak Acid Solutions
	14.6	Bases
7	14.7	Polyprotic Acids
	14.8	Acid-Base Properties of Salts
	14.9	The Effect of Structure on Acid-Base Properties
	14.10	Acid-Base Properties of Oxides
	14.11	The Lewis Acid-Base Model
		<b>Acid –Base Equilibria</b>
8	15.1	Solutions of Acids or Bases Containing a Common Ion
	15.2	Buffered Solutions
	15.3	Buffering Capacity
	15.4	Titrations and pH Curves
	15.5	Acid-Base Indicators
	15.6	Polyprotic Acid Titrations
		<b>Solubility and Complex Ion Equilibria</b>
9	16.1	Solubility Equilibria and the Solubility Product
	16.2	Precipitation
		Precipitation Conditions
	16.3	Equilibria Involving Complex Ions
		<b>Spontaneity, Entropy and Free Energy</b>
10	17.1	Spontaneous Processes and Entropy
	17.2	Entropy and the Second Law of Thermodynamics
	17.3	The Effect of Temperature on Spontaneity
	17.5	Entropy Changes in Aqueous Solutions
	17.6	Entropy Changes in Chemical Reactions
11	17.4	Free Energy
	17.7	Free Energy and Chemical Reactions
	17.8	The Dependence of Free Energy on Pressure
	17.9	Free Energy and Equilibrium
	17.10	Free Energy and Work
		<b>Electrochemistry</b>
12	18.1	Galvanic Cells
	18.2	Standard Reduction Potentials
	18.3	Cell Potential, Electrical Work, and Free Energy
	18.4	Dependence of Cell Potential on Concentration
	18.6	Corrosion
	18.7	Electrolysis
		<b>The Nucleus: A Chemist's View</b>
13	19.1	Nuclear Stability and Radioactive Decay

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	19.2	The Kinetics of Radioactive Decay
	19.3	Nuclear Transformations
	19.4	Detection and Uses of Radioactivity
	19.5	Thermodynamic Stability of the Nucleus
	19.6	Nuclear Fission and Nuclear Fusion
		<b>Transition Metals and Coordination Chemistry</b>
14	21.1	Transition Metals: A Survey
	21.3	Coordination Compounds
	21.4	Isomerism
	21.6	The Crystal Field Model
	21.7	Biological Importance of Coordination Complexes
15		Examination Week

#### Laboratory Syllabus

Expt	Title	Page
	Laboratory Safety, Laboratory Rules and Check In	
<b>10</b>	Geometric Isomers	<b>169</b>
<b>4A</b>	Conductivity of Aqueous Solutions	<b>75</b>
<b>12B</b>	Softening Hard Water	<b>205</b>
<b>12A</b>	Molar Mass from Freezing Point Depression	<b>191</b>
<b>13</b>	Rate of Iodine Clock Reaction	<b>217</b>
<b>14A</b>	Le Chatelier's Principle	<b>231</b>
<b>14B</b>	Determining an Equilibrium Constant	<b>243</b>
<b>15</b>	Relative Strength of Some Acids	<b>255</b>
<b>16B</b>	An Acid Base Titration Curve	<b>273</b>
<b>17A</b>	A Solubility Product Constant	<b>289</b>
<b>18</b>	Spontaneity	<b>311</b>
<b>21B</b>	Strength of Laundry Bleach	<b>387</b>
<b>19B</b>	Electrochemistry	<b>333</b>
<b>20</b>	Natural Radioactivity	<b>365</b>
	<b>Examination Week</b>	

#### Class Participation

Participation in the academic activity of each course is a significant component of the learning process and plays a major role in determining overall student academic achievement. Academic

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activities may include, but are not limited to, attending class, submitting assignments, engaging in in-class or online activities, taking exams, and/or participating in group work. Each instructor has the right to establish their own class participation policy, and it is each student's responsibility to be familiar with and follow the participation policies for each course.

BMCC is committed to the health and well-being of all students. It is common for everyone to seek assistance at some point in their life, and there are free and confidential services on campus that can help.

**Single Stop** [www.bmcc.cuny.edu/singlestop](http://www.bmcc.cuny.edu/singlestop), room S230, 212-220-8195. If you are having problems with food or housing insecurity, finances, health insurance or anything else that might get in the way of your studies at BMCC, come by the Single Stop Office for advice and assistance. Assistance is also available through the Office of Student Affairs, S350, 212-220-8130.

**Counseling Center** [www.bmcc.cuny.edu/counseling](http://www.bmcc.cuny.edu/counseling), room S343, 212-220-8140. Counselors assist students in addressing psychological and adjustment issues (i.e., depression, anxiety, and relationships) and can help with stress, time management and more. Counselors are available for walk-in visits.

**Office of Compliance and Diversity** [www.bmcc.cuny.edu/aac](http://www.bmcc.cuny.edu/aac), room S701, 212-220-1236. BMCC is committed to promoting a diverse and inclusive learning environment free of unlawful discrimination/harassment, including sexual harassment, where all students are treated fairly. For information about BMCC's policies and resources, or to request additional assistance in this area, please visit or call the office, or email [olevy@bmcc.cuny.edu](mailto:olevy@bmcc.cuny.edu), or [twade@bmcc.cuny.edu](mailto:twade@bmcc.cuny.edu). If you need immediate assistance, please contact BMCC Public safety at 212-220-8080.

**Office of Accessibility** [www.bmcc.cuny.edu/accessibility](http://www.bmcc.cuny.edu/accessibility), room N360 (accessible entrance: 77 Harrison Street), 212-220-8180. This office collaborates with students who have documented disabilities, to coordinate support services, reasonable accommodations, and programs that enable equal access to education and college life. To request an accommodation due to a documented disability, please visit or call the office.

### **BMCC Policy on Plagiarism and Academic Integrity Statement**

Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's Web site, [www.bmcc.cuny.edu](http://www.bmcc.cuny.edu). For further information on integrity and behavior, please consult the college bulletin (also available online).