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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 Fall, 2017
Credits 4

Instructor Information

Name:
Telephone:
Office:
Email:

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).
Prerequisite for CHE 202 is CHE 201.

Basic Skills Prerequisites ACR 094, ENG 088 or ESL 062, and MAT 056.

Prerequisites CHE 201

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 chemical dynamics.
2. explain chemical properties	2. Examinations will measure students' ability to explain solubility based on intermolecular forces.
3. apply chemical concepts to chemical properties.	3. Examinations will measure students' ability to apply equilibrium concepts to chemical reactions.
4. compare chemical properties based on chemical models.	4. Examinations will measure student's ability to compare solutions based on composition.
5. categorize chemical properties based atomic and molecular structure.	5. Examinations will measure student's ability to categorize electrochemical cell reactions.
6. evaluate the effect of changes in variables on chemical properties.	6. Examinations will measure student's ability to evaluate the effect of changing the temperature of chemical reactions.

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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. (Check at least one.)

	General Education Learning Outcomes	**Measurements (means of assessment for general education goals listed in first column)**
	Communication Skills- Students will be able to write, read, listen and speak critically and effectively.	
x	**Quantitative Reasoning-** 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.
x	**Scientific Reasoning-** 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.
☐	**Social and Behavioral Sciences-** Students will be able to apply the concepts and methods of the social sciences.	
☐	**Arts & Humanities-** Students will be able to develop knowledge and understanding of the arts and literature through critiques of works of art, music, theatre or literature.	
☐	**Information & Technology Literacy-** Students will be able to collect, evaluate and interpret information and effectively use information technologies.	
☐	**Values-** Students will be able to make informed choices based on an understanding of personal values, human diversity, multicultural awareness and social responsibility.	

Required Text and Readings

1. Required Textbook

a Zumdahl, Steven S., and Zumdahl, Susan A., *Chemistry 9th Edition* with OWLv2 + ebook Access Code, Brooks/Cole Cengage Learning (2014), Belmont, CA,
ISBN # 978-1-285-71642-8

AND

2. Required Laboratory Manual

Wentworth, R. A. D., and Munk, Barbara H., *Experiments in General Chemistry 10th Edition*, Brooks/Cole, Cengage Learning (2013), SBN 978-1-111-98942-2

Other Resources

Use of Technology (if applicable)

Evaluation & Requirements of Students

Examinations 5@12%	60%
Final Examination (Comprehensive)	15%.
Laboratory	25%

College Attendance Policy

At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a three-hour class. In that class, you would be allowed 4 hours of absence (not 4 days). In the case of excessive absences, the instructor has the option to lower the grade or assign an F or WU grade.

Academic Adjustments for Students with Disabilities

Students with disabilities who require reasonable accommodations or academic adjustments for this course must contact the Office of Services for Students with Disabilities. BMCC is committed to providing equal access to all programs and curricula to all students.

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. For further information on integrity and behavior, please consult the college bulletin (also available online).

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Outline of Topics

Week	Ch/ Sec	Topic	
		Organic and Biological Molecules	
1	22.1	Alkanes: Saturated Hydrocarbons	1024 - 1032
	22.2	Alkenes and Alkynes	1032 - 1035
	22.3	Aromatic Hydrocarbons	1035 - 1037
	22.4	Hydrocarbon Derivatives	1037 - 1044
	22.6	Natural Polymers	1052 - 1066
		Properties of Solutions	
2	11.1	Solution Composition	511 - 514
	11.2	Energies of Solution Formation	514 - 517
	11.3	Factors Affecting Solubility	517 - 521
3	11.4	Vapor Pressure of Solutions	521 - 526
	11.5	Boiling Point Elevation and Freezing Point Depression	527 - 530
	11.6	Osmotic Pressure	531 - 535
	11.7	Colligative Properties of Electrolyte Solutions	535 - 538
	11.8	Colloids	538 - 540
		Chemical KInetics	
4	12.1	Reaction Rates	553 - 557
	12.2	Rate Laws	557 - 547
	12.3	Determining the Form of the Rate Law	559 - 563
5	12.4	Integrated Rate Laws	563 - 574
	12.5	Reaction Mechanisms	574 - 577
	12.6	A Model for Chemical Kinetics	577 - 583
	12.7	Catalysis	583 - 589
		Chemical Equilibrium	
6	13.1	The Equilibrium Condition	607 - 610
	13.2	The Equilibrium Constant	610 - 614
	13.3	Equilibrium Expressions Involving Pressures	614 - 617
	13.4	Heterogenous Equilibria	617 - 618
	13.5	Applications of the Equilibrium Constant	618 - 627
	13.6	Solving Equilibrium Problems	628 - 633
	13.7	Le Chatelier's Princple	633 - 639
		Acids and Bases	
7	14.1	The Nature of Acids and Bases	653 - 656
	14.2	Acid Strength	656 - 661
	14.3	The pH Scale	661 - 664

	14.4	Calculating the pH of Strong Acid Solutions	665 - 666
	14.5	Calculating the pH of Weak Acid Solutions	666 - 675
	14.6	Bases	675 - 680
	14.7	Polyprotic Acids	681 - 686
	14.8	Acid-Base Properties of Salts	686 - 691
	14.9	The Effect of Structure on Acid-Base Properties	691 - 693
	14.10	Acid-Base Properties of Oxides	693 - 694
	14.11	The Lewis Acid-Base Model	694 - 696
	14.12	Strategy for Solving Acid-Base Problems: A Summary	696 - 697
		Acid-Base Equilibria	
8	15.1	Solutions of Acids or Bases Containing a Common Ion	712 - 714
	15.2	Buffered Solutions	715 - 724
	15.3	Buffering Capacity	724 - 727
	15.4	Titrations and pH Curves	727 - 745
	15.5	Acid-Base Indicators	745 - 748
		Solubility and Complex Ion Equilibria	
9	16.1	Solubility Equilibria and the Solubility Product	759 - 768
	16.2	Precipitation	768 - 770
	16.3	Equilibria Involving Complex Ions	774 - 779
		Spontaneity, Entropy and Free Energy	
10	17.1	Spontaneous Processes and Entropy	778 - 794
	17.2	Entropy and the Second Law of Thermodynamics	794 - 795
	17.3	The Effect of Temperature on Spontaneity	795 - 798
	17.5	Entropy Changes in Chemical Reactions	801 - 805
11	17.4	Free Energy	798 - 801
	17.6	Free Energy and Chemical Reactions	805 - 810
	17.7	The Dependence of Free Energy on Pressure	810 - 812
		The Meaning of ΔG for a Chemical Reaction	812 - 813
	17.8	Free Energy and Equilibrium	813 - 817
	17.9	Free Energy and Work	817 - 819
		Electrochemistry	
12	18.1	Balancing Oxidation-Reduction Reactions	833 - 839
	18.2	Galvanic Cells	839 - 842
	18.3	Standard Reduction Potentials	842 - 849
	18.4	Cell Potential, Electrical Work, and Free Energy	849 - 852
	18.5	Dependence of Cell Potential on Concentration	852 - 858
	18.7	Corrosion	861 - 864
	18.8	Electrolysis	864 - 868

		The Nucleus: A Chemist's View	
13	19.1	Nuclear Stability and Radioactive Decay	891 - 896
	19.2	The Kinetics of Radioactive Decay	896 - 899
	19.3	Nuclear Transformations	899 - 902
	19.4	Detection and Uses of Radioactivity	902 - 905
	19.5	Thermodynamic Stability of the Nucleus	905 - 910
	19.6	Nuclear Fission and Nuclear Fusion	910 - 915
		Transition Metals and Coordination Chemistry	
14	21.1	Transition Metals: A Survey	973 - 978
	21.3	Coordination Compounds	983 - 987
	21.4	Isomerism	987 - 992
	21.6	Crystal Field Model	994 - 1000
	21.7	The Biological Importance of Coordination Complexes	1000 - 1004
15		Examination Week	

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Laboratory Syllabus

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