

Standard Institutionally Developed College: N/A

EDGE Compatible: No

Pre-requisites

CHEM 1211 - Chemistry I (201003)
CHEM 1211L - Chemistry Lab I (201203)
MATH 1101 - Mathematical Modeling (201003)
MATH 1111 - College Algebra (201003)

Co-requisites

CHEM 1212L - Chemistry Lab II (201203)
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Course Description

Continues the exploration of basic chemical principles and concepts. Topics include equilibrium theory, kinetics, thermodynamics, solution chemistry, acid-base theory, and nuclear chemistry.

Course Length

	Minutes	Contact Unit
Lecture:	2250	
Lab 2:	0	
Lab 3:	0	
Practicum/Internship:	0	
Clinical:	0	
Total:	2250	3
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Semester Credit Hours:		3

Competencies

Order	Description	Lecture	Lab2	Lab3	Practicum/Internship	Clinical	Total Minutes	Semester Credit Hrs
1	Equilibrium Theory	338	0	0	0	0	338	0
2	Kinetics	225	0	0	0	0	225	0
3	Thermodynamics	225	0	0	0	0	225	0
4	Solution Chemistry	450	0	0	0	0	450	0
5	Acid-Base Theory	225	0	0	0	0	225	0
6	Electrochemistry	450	0	0	0	0	450	0

Order	Description	Lecture	Lab2	Lab3	Practicum/ Internship	Clinical	Total Minutes	Semester Credit Hrs
7	Nuclear Chemistry	337	0	0	0	0	337	0
	Totals for Course CHEM 1212 - Chemistry II (version 201003):	2250	0	0	0	0	2250	3

Learning Outcomes

Equilibrium Theory

Order	Description	Learning Domain	Level of Learning
1	Explain what is occurring in a chemical reaction, including bonding and energy changes.	Cognitive	Comprehension
2	Define the reversibility of reactions.	Cognitive	Knowledge
3	Discuss the underlying concepts of endothermic and exothermic reactions.	Cognitive	Comprehension
4	Define the role of enthalpy and entropy in these reaction types.	Cognitive	Knowledge

Kinetics

Order	Description	Learning	Level of Learning
1	Describe the concept of reaction kinetics. Summarize the primary factors that alter reaction rates.	Cognitive	Knowledge
2	Explain forward and reverse reaction rates.	Cognitive	Comprehension
3	Describe activation energy and catalysis.	Cognitive	Knowledge

Thermodynamics

Order	Description	Learning Domain	Level of Learning
1	Describe the concept of chemical equilibrium as a dynamic equilibrium.	Cognitive	Knowledge
2	Use equilibrium constants K_{eq} , K_a , and K_{sp} in chemical calculations.	Cognitive	Application
3	Explain the Law of Mass Action and Le Chatelier's Principle.	Cognitive	Comprehension

Solution Chemistry

Order	Description	Learning Domain	Level of Learning
1	Explain the interactive forces between solvent and solute particles in solution chemistry and the significance of these forces.	Cognitive	Comprehension
2	Describe the properties of electrolytes and non-electrolytes in solutions.	Cognitive	Knowledge
3	Specify and be able to calculate concentrations of solutions, including: percent w/w, percent w/v, molarity, and molality.	Cognitive	Knowledge
4	Explain the concept of colligative properties and calculate changes in their values based on solute concentrations, including the effects of ionic solutes and van't Hoff factors where appropriate.	Cognitive	Comprehension
5	Describe osmosis and reverse osmosis.	Cognitive	Knowledge

Order	Description	Learning Domain	Level of Learning
Acid-Base Theory			
Order	Description	Learning Domain	Level of Learning
1	Define acid, base, and neutralization in terms of the Arrhenius theory and Bronsted-Lowry acid-base theory.	Cognitive	Knowledge
2	Apply thermodynamic equilibrium theory to acid-base dissociation.	Cognitive	Application
3	Apply the Bronsted-Lowry acid-base theory to identify conjugate acid-base pairs in neutralization reactions.	Cognitive	Application
4	Write balanced molecular equations, total ionic equations, and net ionic equations for neutralization reactions of acids and bases to form salts.	Cognitive	Knowledge
5	Perform calculations for titrations and neutralizations.	Cognitive	Synthesis
6	Perform calculations involving pH and pOH.	Cognitive	Synthesis
7	Define an acid-base buffer system. Relate to Le Chatelier's Principle.	Cognitive	Knowledge
8	Use the Henderson-Hasselbach equation to calculate the pH of a buffer.	Cognitive	Application
Electrochemistry			
Order	Description	Learning Domain	Level of Learning
1	Show and be able to write oxidation and reduction half reactions and overall redox reactions.	Cognitive	Application
2	Describe and understand the construction of a simple voltaic cell from half-cells and a salt bridge and understand the function of each component.	Cognitive	Knowledge
3	Use standard reduction potentials to identify the cathode and the anode in a standard cell, predict the spontaneity of a redox action, and identify oxidizing and reducing agents in a cell or in a redox reaction.	Cognitive	Application
4	Relate the standard cell potential to the standard Gibbs free energy change and equilibrium constant.	Cognitive	Application
Nuclear Chemistry			
Order	Description	Learning Domain	Level of Learning
1	Describe the processes involved in radioactive decay.	Cognitive	Knowledge
2	Define the major radioactive decay products: alpha particles, beta particles, gamma radiation, x-rays.	Cognitive	Knowledge
3	Discuss neutron/proton ratios (magic numbers) and how these relate to decay.	Cognitive	Comprehension
4	Define half-life and calculate remaining activity in a radioactive sample.	Cognitive	Knowledge

References

Order	Reference Type	Description
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Order	Reference Type	Description
1	Essays or Chapters in Edited Books - One Author	Adamson, A.. (1986). A textbook of physical chemistry. 3rd. pp. 971 New York, NY: Elsevier
2	Essays or Chapters in Edited Books - One Author	Bettelheim, B.. (2006). Introduction to general, organic, and biochemistry. 8th. pp. 928 Belmont, CA: Brooks Cole
3	Essays or Chapters in Edited Books - One Author	Bettelheim, B.. (2006). Introduction to general, organic, and biochemistry: Student solutions manual. 8th. pp. 192 Clifton Park, NY: Centage Delmar
4	Book with Author(s) Listed	Block & McKelvy. (2006). Lab experiments for general chemistry. (5th). Clifton Park, NY: Centage Delmar.
5	Book with Author(s) Listed	Brady & Senese. (2007). Chemistry: The study of matter and its change. (5th). New York, NY: John Wiley & Sons.
6	Essays or Chapters in Edited Books - One Author	Bretherick, L.. (1986). Hazards in the chemical laboratory. 4th. pp. 618 London: Royal Society of Chemistry
7	Book with Author(s) Listed	Brown, LeMay & Bursten. (2005). Chemistry: The central science. (10th). New York, NY: Prentice Hall.
8	Book with Author(s) Listed	Burns, R.. (2004). Fundamentals of chemistry. (4th). New York: Prentice Hall.
9	Book with Author(s) Listed	Chang, R.. (2005). Chemistry. (8th). New York, NY: McGraw Hill.
10	Essays or Chapters in Edited Books - One Author	Cotton, F. & Wilkinson, G.. (1999). Advanced inorganic chemistry. 6th. pp. 1376 New York, NY: John Wiley & Sons
11	Book with Author(s) Listed	CRC edition. (?). Handbook of Chemistry and physics. (?). ? : CRC Press.
12	Book with Author(s) Listed	Davis, R.. (1988). Study guide to accompany general chemistry with qualitative analysis. (3rd). Philadelphia, PA: Saunders.
13	Essays or Chapters in Edited Books - One Author	Hein, M.. (1988). College chemistry: An introduction to general, organic, and biochemistry. 4th. pp. 903 Pacific Grove, CA: Brooks Cole
14	Essays or Chapters in Edited Books - One Author	Kanare, H.. (1985). Writing the laboratory notebook. ?. pp. 145 Washington, DC: Oxford University Press
15	Book with Author(s) Listed	Kotz, Treichel & Wege. (2005). Chemistry and chemistry reactivity. (6th). Belmont, CA: Brooks Cole.
16	Essays or Chapters in Edited Books - One Author	Lefevre, M.. (1990). First aid manual for chemical accidents. 2nd. pp. 272 New York, NY: John Wiley & Sons
17	Essays or Chapters in Edited Books - One Author	Loebel, A.. (1987). Chemical problem solving by dimensional analysis. 3rd. pp. 417 Boston, MA: Centage Delmar
18	Book with Author(s) Listed	Masterton & Hurley. (2008). Chemistry: Principles and reactions. (6th). Belmont, CA: Brooks Cole.

Order	Reference Type	Description
19	Book with Author(s) Listed	Moore, Stanitski & Jurs. (2007). Chemistry: The molecular science. (3rd). Boston, MA: Centage Delmar.
20	Book with Author(s) Listed	Olmsted & Williams. (2004). Chemistry. (4th). New York, NY: John Wiley & Sons.