SPRINGFIELD TECHNICAL COMMUNITY COLLEGE

ACADEMIC AFFAIRS

Course Number: CHEM 102 Department: Chemistry

Course Title: Survey of Chemistry II: Introduction to Organic and Biochemistry Semester: Spring Year: 2015

Objectives/Competencies

Course Objective	Competencies
1. To prepare students to use critical thinking in applying the laws and theories of chemistry to biological systems	1. Define major laws and theories of chemistry 2. Solve problems requiring the use of major laws and theories of chemistry 3. Demonstrate the ability to apply more than one law or theory of chemistry in a single scenario 4. Explain common daily phenomena utilizing the laws and theories of chemistry 5. Integrate knowledge of one or more biological systems and their governance referencing major laws and theories of chemistry
2. To allow students to apply the rules of mathematics to problems involving the laws and theories of chemistry	1. Demonstrate the ability to convert between English Standard Units and the Metric System 2. Solve mathematic problems using Dimensional Analysis and conversion factors. 3. Perform algebraic computations to solve chemistry word problems 4. Explain to a peer the methodology one used to extract information from a word problem and apply quantitative reasoning to solve said word problem
	1. Draw organic molecules based upon the IUPAC name

Course Objective	Competencies
3. To provide a foundation of general and organic chemistry principles that will allow the student to develop an understanding of the application of these principles in the field of biochemistry	2. Name organic molecules following the IUPAC naming system based upon chemical structure 3. Utilize Lewis Dot Structures as a visual representation to explain a chemical reaction 4. Recognize and identify common functional groups 5. Explain chirality and identify chiral centers 6. Recognize isomers, stereoisomers, and distinguish between *cis* and *trans* 7. Identify the end products of chemical reactions such as hydrolysis/decomposition reactions, hydration/synthesis reactions, hydrogenation, and halogenation reactions involving organic molecules 8. Demonstrate an understanding of the rules of oxidation and reduction. 9. Distinguish between substances that are being oxidized and substances that are being reduced 10. Classify carbohydrates based upon their organic structure, isomerization, and associated function groups 11. Apply the understanding of organic chemical reactions to carbohydrates such as condensation, hydrolysis, and oxidation/reduction 12. Relate oxidation/reduction to the role of NADH and NAD+ during cellular metabolism 13. Recognize isomerization, hydrogenation, and phosphorylation events in glycolysis 14. Calculate ATP yield through each step of cellular respiration 15. Define the attractive forces that occur between different molecules 16. Predict which attractive forces will exist between two chemical structures 17. Rank chemical structures by melting and/or boiling points based upon the attractive forces present 18. Predict the solubility of a molecule in water

Course Objective	Competencies
	19. Explain why lipids and water do not mix and the function of an emulsifier 20. Identify the relevance of emulsification to biological systems 21. Recognize structural differences between the various categories of lipids 22. Compare and contrast the categories of lipids based upon structure and function 23. Describe the properties of a phospholipid 24. Relate the rules solubility to plasma membrane exchange and transport 25. Solve word problems using Charles's and Boyle's Law 26. Predict temperature and pressure effects on gasses in solution 27. Express concentration in mEq, molarity, percent weight/volume, ppm/ppb. 28. Perform word problems using concentration formulas and units 29. Explain the processes of diffusion, osmosis, and transport across the plasma membrane of the cell 30. Compare the properties of a strong acid/base to a weak acid/base 31. Compare and contrast an Arrhenius acid or base to a Bronsted-Lowry acid or base 32. Balance a neutralization reaction 33. Predict product formation using Le Chatelier's Principle and apply it to acid-base equilibrium 34. Rank acids and bases by strength in regard to K_a 35. Identify conjugate acid/base pairs 36. Calculate pH or hydronium concentration when given a word problem and classify the solution as acidic, basic, or neutral 37. Describe the buffer systems in the human body 38. Predict the direction the bicarbonate buffer equilibrium will shift with changes in ventilation rate 39. Draw a non-descript amino acid 40. Classify amino acids by structure as polar, non-polar, acidic, or basic

Course Objective	Competencies
	41. Predict the products of a biological condensation or hydrolysis reaction to form or break a peptide bond between amino acids. 42. Define each level of protein structure 43. Predict how attractive forces will cause a protein to fold 44. Describe situations that may cause the folded protein to denature 45. List and describe the biological functions of proteins 46. Explain the specificity of enzymes 47. Compare enzymes to cellular receptor proteins 48. Explain enzyme inhibition 49. Graph changes in enzyme activity based upon changes in pH, temperature, and concentration 50. Relate the properties of the organic reactions, condensation, hydrolysis, oxidation, and reduction to nucleotide chemistry 51. Predict the product of a condensation of nucleotides such as that might occur during DNA Replication 52. Utilize base pairing from a strand of DNA to predict DNA and RNA products 53. Distinguish between DNA synthesis, transcription, and translation 54. Synthesize a protein's primary structure when provided a nucleic acid 55. Describe the mechanism of action by which a virus manipulates a cell's nucleotide and protein synthesis processes.
4. To provide students with the skills to research and write about the laws and theories of chemistry in relation to biological processes	1. Demonstrate the ability to distinguish a primary and secondary source 2. Distinguish between a good internet source and a poor internet source

Course Objective	Competencies
	3. Demonstrate the ability to write about science using proper tone 4. Write an essay that has a introduction, body, and conclusion 5. Write an essay in which each paragraph provides a topic sentence and provides evidence to support this topic sentence 6. Develop an essay that transitions from one paragraph to the next in a logical and ordered fashion
5. To relate general, organic, and biochemistry to current issues in society	1. Synthesize short answer responses to issues in society or healthcare to concepts of chemistry 2. Demonstrate the ability to complete a case study problem set regarding issues in pharmacology, physiology, or toxicology relating concepts of chemistry

INSTRUCTIONS and GUIDELINES

The Department Chair's signature must be obtained (and dated) prior to moving to STEP II. Changes may include:

Attach reason for development of the course, including a list of departments, which will utilize the course. Also attach a course description appropriate for catalog entry. Use Academic Affairs templates to provide Objectives and Competencies. Please detail the number of credits (didactic + lab/clinical) for a 15 week schedule. Example:

NCRS: New course

STEP I

This change is pertinent to all programs for which chemistry is either a requirement or an elective.	Course for which changes are requested: CHEM-102 (new course) & CHEM-201		- Although this is listed as a new course, it is primarily an upgrade of the existing CHEM-201. We are doing this in two ways: 1. We are adding to the course title to more clearly express course content, and 2. We are updating the objectives and competencies to include reference to the STCC Core Competencies (Please see attached Objectives and Competencies). These changes will improve transferability of the course and make it more valuable to students. Courses similar to CHEM-201 are a pre-requisite for many nursing and other health programs at nearby four-year colleges. By offering a second semester chemistry course that is more in line with these courses we are increasing its transferability and making it a more useful part of the college's curriculum than the old CHEM-201. It will also be useful for students entering health programs at STCC. This new course will include biochemistry and it is true we currently offer a biochemistry course (BIOL-140), but BIOL-140 has no lab and thus is not always transferable. CHEM-102 as a lab science will provide a transferable option to students. The course number (CHEM-102) is based on the course renumbering plan intended to be put in place for the School of Math/Science in the fall of 2015. The new number (CHEM-102) will reflect this course's intended role as a continuation of CHEM-101. In addition we are proposing dropping the old Survey of Chemistry II because the new CHEM-102 fills essentially the same role.

Present justification to the Curriculum Committee. Fill out as follows: