Department of Chemistry
Illinois State University

Assessment

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1) Chemistry is the science of the atoms and molecules that make up the entire visible universe, including all biological systems. Since these atoms and molecules obey the laws of physics and mathematics, our chemistry students will acquire the basic scientific problem solving skills and the mathematical skills necessary to describe and understand molecular and atomic behavior.

2) These atoms and molecules, along with all other entities, obey the most fundamental principle of science: thermodynamics. Hence our students will learn the laws of thermodynamics and be able to apply them to chemical and biological systems. Since thermodynamics is understood in terms of energy and entropy, our students will gain an understanding of chemical and biochemical processes by which energy and entropy in their various forms are exchanged and/or transformed.

3) Although atomic and molecular systems must obey the laws of thermodynamics, the most basic model that describes their world is quantum mechanics. Chemistry students will gain sufficient quantum mechanical skills to comprehend the concepts of the nature of matter at the atomic level. This quantum mechanical knowledge will lead to their basic understanding of chemical bonding and the geometry and properties of compounds. This will also lead to an understanding of laboratory procedures and instrumentation for the detection and quantization of matter. Hence, our students will gain an understanding of the basic operating principles of a broad range of scientific instrumentation.

4) We garnish empirical information concerning the behavior and morphology of molecular and atomic systems with the use of sophisticated computer interfaced scientific instrumentation. They will further gain the computer skills to effectively operate and interpret the data from this instrumentation.

5) Chemistry is traditionally thought of in terms of five intertwined areas: physical chemistry, organic chemistry, inorganic chemistry, biological chemistry, and analytical chemistry. Our students will acquire the fundamentals of each of these areas; specifically they will gain an understanding of the following:

- mechanisms of chemical reactions and the theory and practical application of reaction rates.
- structures, properties and function of common biological molecules and the principles of metabolic pathways.
- major aspects of main group and transition metal elements, their bonding and compounds.
- major aspects of carbon chemistry including structures, properties, reactions, mechanisms and basic synthetic schemes.

- nature and properties of molecules and phases in which they exist and about interactions of particles in solution such as acid-base chemistry.
- factors controlling chemical equilibrium.

6) Although discoveries in chemistry give humans the power to make new and useful materials that literally transform our planet, these discoveries are not pragmatic unless they can be properly communicated to the scientific and lay communities. Consequently our students will develop the oral, writing, and computer skills to successfully communicate their knowledge of the subject.

7) The ability to synthesize new and powerful materials and alter the nature of our surroundings gives rise to serious ethical and moral considerations. Our students will become aware of science issues that are of public concern. Ethical considerations, and the history of the development of the sciences will become issues that chemistry students need to consider.

8) As mentioned above, chemical materials can often have powerful and/or unknown properties. Hence, chemistry students will learn safe laboratory practices. They will possess fundamental laboratory skills including the ability to safely utilize basic laboratory equipment and chemicals.

9) As with any discipline, the most fundamental appreciation is gained through application. Hence, application of theory to practice experiences via undergraduate research, co-op UTA, service learning and/or student teaching will be stressed. They will obtain data and interpret data using both theory and experimental procedures.

10) At the end of their senior year they will successfully transition to gain entry to graduate or professional schools, obtain career positions in business, industry or government, begin teaching chemistry to high school students, and/or pursue other careers that take advantage of their problem solving skills.