

Course Title & Number: General Chemistry I CHE *H122

Competency Area: **SCIENTIFIC REASONING** (Goal: Students will become familiar with science as a method of inquiry. Students will develop a habit of mind that uses quantitative skills to solve problems and make informed decisions.)

Faculty submitting the Learning Outcomes: Alex J. Zozulin

Date: February 25, 2013

[Instructions: *Please match the Learning Outcomes in the left hand column to those of the course you are submitting for Gen Ed approval. List the corresponding course outcomes in the right hand column to indicate a match.***]**

BOR TAP's Learning Outcomes	Corresponding Outcomes for Course Named Above
1. Explain the methods of scientific inquiry that lead to the acquisition of knowledge. Such methods include observations, testable hypotheses, logical inferences, experimental design, data acquisition, interpretation, and reproducible outcomes.	Describe the scientific method and the development of theories Describe the difference between qualitative and quantitative data Explain the difference between hypotheses, scientific laws, and theory Explain the importance of an experimental design Explain the difference between precision and accuracy in measurements Explain the necessity of performing multiple measurements to solve a given problem
2. Apply scientific methods to investigate real-world phenomena, and routine and novel problems. This includes data acquisition and evaluation, and prediction.	Make measurements in the laboratory to solve a problem Use the scientific method to evaluate the quality of data Apply the information obtained through experimentation to make predictions related to the problem studied
3. Represent scientific data symbolically, graphically, numerically, and verbally.	Develop relationships between variables using data obtained from making measurements or from other sources. Express these relationships verbally, symbolically, graphically or numerically using appropriate terminology or mathematics
4. Interpret scientific information and draw logical references from representations such as formulas, equations, graphs, tables, and schematics.	Describe the meaning and significance between variables expressed in formulas, equations, graphs, and tables. Use the information provided in formulas, equations, graphs, and tables to make predictions between related variables
5. Evaluate the results obtained from scientific methods for accuracy and/or reasonableness.	Use available scientific sources such as online data bases, handbooks, etc. to assist in evaluating the measurements and results for accuracy and/or reasonableness Use chemical principles to make predictions about the accuracy and/or

	reasonableness of the results
	<p><i>Additional Outcomes</i></p> <p>Describe the factors determining the physical state of matter using appropriate terminology</p> <p>Explain the changes in physical properties of solutions, both quantitatively and qualitatively</p> <p>Describe the characteristics of crystalline solids including the factors holding the solid together, the packing in crystalline solids, physical properties, and method to obtain structure information</p> <p>Describe the three Laws of Thermodynamics and the information provided by each law using appropriate terminology</p> <p>Explain the information gained from the study of chemical kinetics and its the molecular basis.</p> <p>Describe chemical equilibrium, the information it provides, and its application to stoichiometry</p> <p>Describe oxidation – reduction reactions and its application to energy production</p> <p>Describe coordination compounds to include their bonding and structure</p> <p>Produce a written document containing experimental data, the results, and the significance of the results using appropriate terminology</p> <p>Identify chemical substances by applying their correct chemical names</p> <p>Categorize chemical reactions by name and provide names of reactants and products</p> <p>Apply the principles of dimensional analysis to problem solving</p>

	<p>Use bonding theories to describe the bonding in crystalline solids and predict physical properties of the substance</p> <p>Use the concept of intermolecular forces to predict physical properties of liquids</p> <p>Apply mathematical modeling to solutions to express the relationship between variables and to solve problems involving solution properties</p> <p>Use the Laws of Thermodynamics as the basis to describe the relationship between energy changes of a system</p> <p>Apply the Laws of Thermodynamics to solve for energy changes in a chemical system</p> <p>Use the concept of chemical equilibrium to solve stoichiometry</p> <p>Apply the mathematical model for chemical kinetics to predict reaction rates</p> <p>Analyze an experimental approach to solve a scientific question</p> <p>Collect laboratory data based on this approach such that the results will provide a solution to the scientific question</p> <p>Explain the role of experimentation in the development of theories</p> <p>Explain the significance and limitations of the theory describing properties of an ideal solution and the requirement for refinements in that theory</p> <p>Apply chemical principles to differentiate between reasonable and unreasonable scientific information</p>
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