

Course Title & Number: Concepts of Chemistry CHE *H111

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

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[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 various theories (such as atomic theory, kinetic molecular theory and various bonding theories) using appropriate terminology as it applies to that theory</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 Categorize chemical reactions by name and provide names of reactants and products</p> <p>Use proper terminology to describe the Periodic Table and trends in chemical and physical properties of the elements</p> <p>Describe the characteristics of the solid, liquid and gas phase and the energy requirements to cause phase changes using correct terminology</p> <p>Describe the molecular geometry and polarity of molecular substances using the appropriate terminology</p> <p>Apply the principles of dimensional analysis to problem solving</p> <p>Use various bonding theories to describe the bonding in molecules and predict physical properties of the substance</p> <p>Apply mathematical modeling to the gas phase to represent the relationship between variables and to solve problems involving those variables</p> <p>Describe the factors that determine heat transfer and use the relationship between variables to determine the energy change in a system</p> <p>Use the quantitative relationships between chemical substances in a</p>

chemical reaction.

Analyze an experimental approach to solve a scientific question

Collect laboratory data based on this approach such that the results will provide a solution to the scientific question

Explain the role of experimentation in the development of theories

Explain the significance and limitations of various bonding theories

Explain the significance and limitations of early atomic theories

Apply chemical principles to differentiate between reasonable and unreasonable scientific information