Mt. San Jacinto College
Honors Course Outline Addendum

Submitted by: Joshua Hartman **Date:** 12/17/2020

Course Discipline: Chemistry
Course Number: CHEM 101H Honors Courses End in "H"
Title: Honors General Chemistry I Must begin with "Honors"

Honors Course Objectives:

1. Students will conduct an investigation of a chemistry topic, including developing a testable hypothesis, reviewing the relevant literature, and testing the hypothesis by conducting a series of experiments.
2. Students will investigate a topic to develop skills that are required to work independently or collaboratively in a research lab. Students will learn relevant lab techniques required to collect data and perform analysis to support their research.
3. Students will develop scientific writing and presentation skills by reporting and/or presenting their experimental findings.

Honors Course Content:

1. Topics covered in CHEM-101H are identical to the topics in CHEM-101, but honors students will choose and investigate a topic of interest that is possible with existing resources included in the course curriculum in a more in-depth fashion compared to the regular section. Examples include but are not limited to computational investigations related to molecular structure and drug design, crystal structure and packing, and exploring spectroscopic properties of atoms and molecules. The chemistry department has two computational servers dedicated to student projects.

2. Students will work on a chemistry project to gain broader, in-depth knowledge of topics covered in CHEM-101 such as, but not limited to, atomic structure; spectroscopy; electromagnetic radiation; stoichiometry; energy relationships; properties of gases; chemical bonding; periodic relationships among the elements; molecular orbitals; molecular geometry; intermolecular forces and aqueous solutions.

3. Students will conduct an in-depth exploration of the chosen topics related to general chemistry that connects theory to practical everyday application. Examples include air and water quality assessment using a particle counter and in-house analytical equipment.

Honors Course Assignments:

Honors students are expected to successfully complete all regular CHEM-101 assignments in addition to the following requirements. Students must complete requirements A, B and in addition, must complete either activity C or D or both.

A) Original research and written report. A research topic will be selected by the student in collaboration with the instructor.

Original Research by designing and executing a research project. Examples of possible honors research projects include, but not limited to:

i. Investigation of a drug using acid/base titration or other analytical techniques to compare drugs sold under different names (brands vs generic) to find any correlation between price and quality. Different samples of the same brand can be tested for their composition consistency. Students will refer to their textbook and scientific literature to learn more about the analytical techniques and their application in the food and drug industry.

ii. Measure electromagnetic radiation absorption using UV-VIS spectrophotometry to determine analyte concentrations. Use spectrophotometry to investigate and compare amounts of different compounds in food/drug or other samples. Different samples of a specified drug collected before and after the expiration date can be assessed to determine changes in composition or degradation. Students will refer to their textbook and scientific literature to learn more about the analytical techniques and their application in the food and drug industry.

The honors student will be required to submit a 1-2-page written proposal of the research project with an introduction and significance of the research topic along with the description of how the research will be conducted. This report will be required for approval by the instructor. In addition, a final report is required for research conducted for assignment *A*, which must be at least 8-10 pages long, typed, and double-spaced. The report should follow a standard scientific writing format that includes but is not limited to: title page, introduction, materials and methods, results, discussion and/or conclusion, and references. A minimum of 5 academic sources is required. The title page and reference page are not included in the 8-10-page report requirement.

B) Presentation of research findings for assignment *A* is required in addition to the final report requirement. The student will fulfill this requirement by presenting their findings by completing option i or ii (see below) in front of other honors students or during the regular section of the class. The presentation should follow the standard format of scientific writing including introduction, materials and methods, results and discussion along with the references mentioned in A (see above).

i. Poster presentation.

ii. Oral presentation, a minimum of 20 minutes long

C) Students can attend lectures, seminars, and/or webinars. The American Chemical Society regularly hosts webinars and in-person conferences in the region. Also, students are encouraged to attend research seminars at local four-year institutions. The topic for the lecture/seminar/webinar is not limited to the topic of research being conducted but can be any topic relevant to CHEM-101H.

D) Students can make field trips to pharmaceutical companies, chemistry research labs in universities, and other relevant locations.

Both options C and D require a 3-4-page written report. The student must follow the standard format of scientific writing

and should include a title page, overview of the activity performed including the introduction, significance and summary of the activity.

Evaluation of Honors Course Assignments:

1. In order to receive honors credit, students must successfully complete the honors course assignment in addition to the regular course assignments.

2. Students will be expected to write an 8-10-page research paper (final report) and prepare an oral presentation, or present a poster. All written reports including the written proposal, research paper (final report), and the written assignment for activity D and E will be evaluated based on thoughtfulness, creativity, experimental design, accuracy, validity of data along with the quality of supportive literature and use of standard writing format. Oral presentations will be evaluated based on clarity, presentation skills, organization, critical thinking, and ability to answer research topic related queries.

Additional Methods of Instruction:

1. Students will be required to participate in meetings facilitated by the instructor in order to discuss progress on the chosen research project. A minimum of three meetings per semester is required outside of normal lecture and lab hours for the course. Meetings can be used to discuss ideas and challenges faced while working on the research project. The meetings may be used to develop the research topic and discuss progress and challenges. The topic is chosen based on its relevance to CHEM-101, taking into consideration current trends and resources available.

2. Students will be required to share their research findings through either a poster or oral presentation.

3. Students are encouraged to write summaries and a discussion of relevant content covered in lectures/seminars/webinars or research articles studied while enhancing their knowledge to better design their experiments and gain more in-depth understanding.

4. Students are encouraged to visit pharmaceutical companies, chemistry research labs in universities, and other relevant locations and provide a written report summarizing their experience.