

## Chemistry – General Education Courses

**College Learning Outcomes Matrix: Rate each course from 1 to 5 with 5 being the most important.**

| <b>CHEMISTRY</b>                               | Year of SLO Review | <b>1.<br/>EFFECTIVE<br/>Communicat<br/>ion</b> | <b>2. Scientific<br/>or<br/>Quantitative<br/>Reasoning:</b> | <b>3. Critical<br/>Thinking</b> | <b>4. Problem<br/>Solving</b> | <b>5.<br/>Information<br/>Literacy</b> | <b>GE</b> | <b>DEGREE</b> |
|------------------------------------------------|--------------------|------------------------------------------------|-------------------------------------------------------------|---------------------------------|-------------------------------|----------------------------------------|-----------|---------------|
| CHEM 105 Chemistry for Allied Health Sciences  | <b>Spring 12</b>   | 3                                              | 4                                                           | 3                               | 3                             | 3                                      | X         |               |
| CHEM 105L Chemistry for Allied Health Sciences | <b>Fall 12</b>     | 3                                              | 4                                                           | 3                               | 3                             | 2                                      | X         |               |
| CHEM 110 Chemistry for Allied Health Sciences  | <b>Spring 12</b>   | 3                                              | 5                                                           | 3                               | 3                             | 2                                      | X         |               |
| CHEM 114 Introduction to Chemistry             | <b>Fall 12</b>     | 3                                              | 5                                                           | 3                               | 3                             | 1                                      | X         |               |
| CHEM115 Survey of Organic and Biochemistry     | <b>Spring 12</b>   | 3                                              | 5                                                           | 3                               | 3                             | 3                                      | X         |               |
| CHEM 131 General Chemistry I                   | <b>Fall 12</b>     | 3                                              | 5                                                           | 3                               | 3                             | 2                                      | X         |               |
| CHEM 132 General Chemistry II                  | <b>Spring 12</b>   | 3                                              | 5                                                           | 3                               | 3                             | 2                                      | X         |               |
| CHEM 132E General Chemistry II, Lecture Only   | <b>Fall 12</b>     | 3                                              | 5                                                           | 3                               | 3                             | 2                                      | X         |               |
| CHEM 231 Organic Chemistry I                   | <b>Fall 12</b>     | 3                                              | 5                                                           | 3                               | 3                             | 2                                      | X         |               |
| CHEM 232 Organic Chemistry II                  | <b>Spring 12</b>   | 3                                              | 5                                                           | 3                               | 3                             | 3                                      | X         |               |
| CHEM 232E Organic Chemistry II, Lecture Only   | <b>Spring 12</b>   | 3                                              | 5                                                           | 3                               | 3                             | 3                                      | X         |               |

## Chemistry – General Education Courses

### GENERAL EDUCATION SLOS

**WHAT ASSIGNMENTS DO YOU GIVE IN THESE CLASSES THAT ASSESS THE FOLLOWING GE SLOS?**

**What assessment tools do you use? Assess only SLOs that you rated 4 or 5.**

| <b>CHEMISTRY</b>                               | <b>1. EFFECTIVE Communication</b> | <b>2. Scientific or Quantitative Reasoning:</b> | <b>3. Critical Thinking</b> | <b>4. Problem Solving</b>  | <b>5. Information Literacy</b> |
|------------------------------------------------|-----------------------------------|-------------------------------------------------|-----------------------------|----------------------------|--------------------------------|
| CHEM 105 Chemistry for Allied Health Sciences  | Research Paper                    | Exam Questions                                  | Exam Questions              | Exam Questions             | Research Paper                 |
| CHEM 105L Chemistry for Allied Health Sciences |                                   | Lab Reports                                     | Lab Reports                 | Lab Reports                |                                |
| CHEM 110 Chemistry for Allied Health Sciences  |                                   | Lab Reports, Exam Problems                      | Lab Reports, Exam Problems  | Lab Reports, Exam Problems |                                |
| CHEM 114 Introduction to Chemistry             |                                   | Lab Reports, Exam Problems                      | Lab Reports, Exam Problems  | Lab Reports, Exam Problems |                                |
| CHEM115 Survey of Organic and Biochemistry     |                                   | Lab Reports, Exam Problems                      | Lab Reports, Exam Problems  | Lab Reports, Exam Problems |                                |
| CHEM 131 General Chemistry I                   | Lab Reports, Exam Problems        | Lab Reports, Exam Problems                      | Lab Reports, Exam Problems  | Lab Reports, Exam Problems |                                |
| CHEM 132 General Chemistry II                  | Lab Reports, Exam Problems        | Lab Reports, Exam Problems                      | Lab Reports, Exam Problems  | Lab Reports, Exam Problems |                                |
| CHEM 132E General Chemistry II, Lecture Only   | Exam Problems                     | Exam Problems                                   | Exam Problems               | Exam Problems              |                                |

## Chemistry – General Education Courses

| <b>CHEMISTRY</b>                             | <b>1. EFFECTIVE<br/>Communicati<br/>on</b> | <b>2. Scientific or<br/>Quantitative<br/>Reasoning:</b> | <b>3. Critical<br/>Thinking</b>  | <b>4. Problem<br/>Solving</b>    | <b>5. Information<br/>Literacy</b> |
|----------------------------------------------|--------------------------------------------|---------------------------------------------------------|----------------------------------|----------------------------------|------------------------------------|
| CHEM 231 Organic Chemistry I                 |                                            | Lab Reports,<br>Exam<br>Problems                        | Lab Reports,<br>Exam<br>Problems | Lab Reports,<br>Exam<br>Problems |                                    |
| CHEM 232 Organic Chemistry II                | Lab Reports,<br>Exam<br>Problems           | Lab Reports,<br>Exam<br>Problems                        | Lab Reports,<br>Exam<br>Problems | Lab Reports,<br>Exam<br>Problems |                                    |
| CHEM 232E Organic Chemistry II, Lecture Only | Exam<br>Problems                           | Exam<br>Problems                                        | Exam<br>Problems                 | Exam<br>Problems                 |                                    |

## Chemistry – General Education Courses

### Notes: **Communication**

Write a coherent logical explanation in a paragraph.

Write a full lab report, a coherent description/explanation of a whole experiment (method/data/analysis/conclusion)

Clearly articulate reasoning and methodology during problem solving

### **Scientific Reasoning / Critical Thinking / Problem Solving**

In most science classes, it is difficult to distinguish between these three categories. Problem solving in general is VERY important.

### **Information Literacy**

Most courses require locating data in appropriate tables within one textbook or standard reference source

Some courses require additional research to obtain information from print or internet sources

## Chemistry – General Education Courses

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                    |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------|
| CHEM_105                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Chemistry in the Human Environment | Revise Course |
| <b>Expected Outcomes for Student:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    |               |
| 1) Analyze everyday phenomena and current issues in modern society as they relate to the scientific method in general, and to chemical concepts in particular.<br>2) Provide a basic description of the organizational structure of matter from the subatomic to the macroscopic levels.<br>3) Demonstrate a basic understanding of how the properties of a material relate to its atomic-level structure, including concepts of energy, bonding, and chemical reactivity.<br>4) Recognize and apply several major classifications of chemical structure and patterns of reactivity. |                                    |               |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                |               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------|
| CHEM_105L                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Chemistry in the Human Environment: Laboratory | Revise Course |
| <b>Expected Outcomes for Student:</b>                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                |               |
| 1) Demonstrate the appropriate and safe use of basic Chemistry laboratory skills and equipment.<br>2) Use the Scientific Method to draw conclusions from laboratory observations and collected data.<br>3) Apply chemical theories and principles to the interpretation of experimental observations and data.<br>4) Demonstrate an understanding of the connection of chemical substances and concepts to common consumer, health and environmental applications. |                                                |               |

|                                                                                                                                                                                                                                                                                                                                                                                                                             |                                      |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------|
| CHEM_110                                                                                                                                                                                                                                                                                                                                                                                                                    | Chemistry for Allied Health Sciences | Revise Course |
| <b>Expected Outcomes for Student:</b>                                                                                                                                                                                                                                                                                                                                                                                       |                                      |               |
| 1. Demonstrate knowledge of selected inorganic and organic biochemicals necessary to sustain life; their names, structures and formulas, their function in biochemical processes.<br>2. Demonstrate knowledge of basic cellular metabolism at the molecular level.<br>3. Calculate concentrations of solutions.<br>4. Apply Stoichiometric calculations including mole to mole, mole to mass and mass to mass calculations. |                                      |               |

|                                                                                                                                                                                                                                                                                                                                                                           |                           |               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------|
| CHEM_114                                                                                                                                                                                                                                                                                                                                                                  | Introduction to Chemistry | Revise Course |
| <b>Expected Outcomes for Student:</b>                                                                                                                                                                                                                                                                                                                                     |                           |               |
| 1) Develop explanations of everyday situations at the level of individual atoms and molecules.<br>2) Solve different types of chemistry problems using quantitative and qualitative techniques, and articulate your answers.<br>3) Assess and record careful laboratory measurements and observations, and carry out qualitative and quantitative analyses of these data. |                           |               |

## Chemistry – General Education Courses

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                    |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------|
| CHEM_115                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Survey of Organic and Biochemistry | Revise Course |
| <b>Expected Outcomes for Student:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |               |
| 1. Demonstrate knowledge of IUPAC nomenclature for a variety of functional groups and apply to a wide variety of organic compounds.<br>2. Compare and contrast the structure, properties, and stereochemistry of organic compounds and how they relate to reactivity both in the lab and in biological systems.<br>3. Predict and explain trends in physical properties of organic compounds;<br>4. Obtain and record careful laboratory measurements and observations, carry out qualitative and quantitative analyses of these data, and present the results in a formal laboratory report. |                                    |               |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------|
| CHEM_131                                                                                                                                                                                                                                                                                                                                                                                                                                             | General Chemistry I | Revise Course |
| <b>Expected Outcomes for Student:</b>                                                                                                                                                                                                                                                                                                                                                                                                                |                     |               |
| 1) Explain the macroscopic physical and chemical properties of a substance in terms of its atomic-level structure.<br>2) Develop solutions to complex chemistry problems using quantitative and qualitative techniques, and articulate your answers.<br>3) Obtain and record careful laboratory measurements and observations, carry out qualitative and quantitative analyses of these data, and present the results in a formal laboratory report. |                     |               |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                |                      |               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------|
| CHEM_132                                                                                                                                                                                                                                                                                                                                                                                                                                       | General Chemistry II | Revise Course |
| <b>Expected Outcomes for Student:</b>                                                                                                                                                                                                                                                                                                                                                                                                          |                      |               |
| 1) Predict chemical reactivity based on your knowledge of chemical kinetics, thermodynamics and equilibrium.<br>2) Develop solutions to complex chemistry problems using quantitative and qualitative techniques, and articulate your answers.<br>3) Obtain and record careful laboratory measurements and observations, carry out qualitative and quantitative analyses of these data, and present the results in a formal laboratory report. |                      |               |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    |               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------|
| CHEM_132E                                                                                                                                                                                                                                                                                                                                                                                                                                      | General Chemistry II, Lecture Only | Revise Course |
| <b>Expected Outcomes for Student:</b>                                                                                                                                                                                                                                                                                                                                                                                                          |                                    |               |
| 1) Predict chemical reactivity based on your knowledge of chemical kinetics, thermodynamics and equilibrium.<br>2) Develop solutions to complex chemistry problems using quantitative and qualitative techniques, and articulate your answers.<br>3) Obtain and record careful laboratory measurements and observations, carry out qualitative and quantitative analyses of these data, and present the results in a formal laboratory report. |                                    |               |

## Chemistry – General Education Courses

|          |                     |               |
|----------|---------------------|---------------|
| CHEM_231 | Organic Chemistry I | Revise Course |
|----------|---------------------|---------------|

### **Expected Outcomes for Student:**

Upon completion of the course, students will be able to:

1. gain knowledge of structure, properties, and stereochemistry of organic compounds and use this information in a comprehensive analysis to explain reactivity.
2. compare and contrast functional group transformations with carbon carbon bond forming reactions to synthesize (theoretically and practically) compounds from these reactions.
3. demonstrate knowledge of IUPAC nomenclature for functional groups and apply knowledge to a wide variety of organic compounds to communicate them to the scientific community.
4. use nuclear magnetic resonance, infrared spectroscopy, mass spectrometry and/or UV/Vis data to identify unknown compounds and/or confirm the structure of a target molecule in a synthesis.

|          |                      |               |
|----------|----------------------|---------------|
| CHEM_232 | Organic Chemistry II | Revise Course |
|----------|----------------------|---------------|

### **Expected Outcomes for Student:**

Upon completion of the course, students will be able to:

- 1) synthesize a target molecule given a list of starting materials and readily available reagents, while following common safety protocols.
- 2) use analytical techniques such as HNMR, CNMR, FTIR, GC/MS, chemical analysis and physical properties to identify the structure of an unknown compound or confirm the structure of a known compound or synthetic target molecule.
- 3) interpret patterns of reactivity on the basis of mechanistic reasoning and report results in scientific terms.

|           |                                    |               |
|-----------|------------------------------------|---------------|
| CHEM_232E | Organic Chemistry II, Lecture Only | Revise Course |
|-----------|------------------------------------|---------------|

### **Expected Outcomes for Student:**

Upon completion of the course, students will be able to:

- 1) synthesize a target molecule given a list of starting materials and readily available reagents, while following common safety protocols.
- 2) use analytical techniques such as HNMR, CNMR, FTIR, GC/MS, chemical analysis and physical properties to identify the structure of an unknown compound or confirm the structure of a known compound or synthetic target molecule.
- 3) interpret patterns of reactivity on the basis of mechanistic reasoning and report results in scientific terms.