

OUTCOMES BASED LEARNING MATRIX

Course: BIOL 234 Cellular Biology

Department: Biology

Course Description: This laboratory-intensive course provides an overview of the cellular and molecular basis for living systems, focusing on eukaryotic cells. Lecture topics include DNA replication, gene expression and regulation, plasma membrane dynamics, signal transduction, cell cycle control, metabolism, intracellular compartments, and protein sorting. In the laboratory, students will apply the theory and practice of modern cell biology techniques by designing and executing experiments. Emphasis in the laboratory will be placed on Good Manufacturing Practices (GMP), Standard Operating Protocols (SOPs), aseptic techniques, and trouble shooting. This course is intended for students intending on transferring into bachelor's programs in biology, chemistry or biochemistry, or those interested in pursuing careers in biotechnology or pharmacy.

Prerequisites: A grade of 'C-' or higher in Biological Principles I (BIOL121) and in Biological Principles II (BIOL122); Preparing for College Reading II (ENGL092); Introductory Writing (ENGL099); Intermediate Algebra (MATH 112) or higher, or waiver by placement testing results, or Departmental Approval.

Pre/Corequisites: General Chemistry II (CHEM 152); or Departmental Approval

The individual outcomes listed in the first column answer the question: **What must the learner know and be able to do at the end of the course?** Items in the third column should answer the question: **How do we know?** The second column is where teachers can be most creative; it's for pedagogy. Each rectangle in column one contains just one outcome; the corresponding rectangles in columns two and three, however, may contain more than one item.

The code indicates the core competencies being strengthened by the outcomes activities and the assessment tools. Critical Thinking (CT); technology skills (TS); oral communications (OC); quantitative skills (QS); reading (R); writing (W).

| COURSE OUTCOMES | OUTCOMES ACTIVITIES | ASSESSMENT TOOLS |
|---|--|--|
| <ul style="list-style-type: none"> • Summarize cell and molecular biology history including use of model organisms. | <ul style="list-style-type: none"> • Read Text (CT,R) • Attend Lectures (W,R,CT) • Class Discussions (CT, OC) • Study Questions (R,W,CT) | <ul style="list-style-type: none"> • Exams (CT,R,W) • Essays (CT,R,W) |
| <ul style="list-style-type: none"> • Demonstrate knowledge about the role of molecular structure of the major biomolecules and their functions within cells. <ul style="list-style-type: none"> ○ Describe protein structure and function and be able to explain how properties of amino acid side chains determine diversity of structure and function. ○ Describe molecular structure of cellular and their role in cell membrane functions. ○ Describe basic molecular genetic mechanisms. ○ Describe the structure and role of carbohydrates in energy, mechanical supports and cell recognition | <ul style="list-style-type: none"> • Read Text (CT,R) • Attend Lectures (W,R,CT) • Class Discussions (CT, OC) • Laboratory Activities (CT,TS,R,W,QS) | <ul style="list-style-type: none"> • Exams (CT,R,W,TS) • Essays (CT,R,W,TS) • Lab Reports (CT,R,W,QS) • Keep daily lab journal (R,W) |
| <ul style="list-style-type: none"> • Demonstrate knowledge about the structure and main functions of all of the major organelles in eukaryotic cells <ul style="list-style-type: none"> ○ Summarize the Cell Cycle ○ Describe the signaling pathways that control gene activity. ○ Summarize the transport of ions and small molecules across cell membranes. | <ul style="list-style-type: none"> • Read Text (CT,R) • Attend Lectures (W,R,CT) • Class Discussions (CT, OC) | <ul style="list-style-type: none"> • Exams (CT,R,W) • Essays (CT,R,W) |

| COURSE OUTCOMES | OUTCOMES ACTIVITIES | ASSESSMENT TOOLS |
|---|--|--|
| <ul style="list-style-type: none"> Acquire knowledge on how cellular organelles communicate with each other. | <ul style="list-style-type: none"> Read Text (CT,R) Attend Lectures (W,R,CT) Class Discussions (CT, OC) Laboratory Activities (CT,TS,R,W,QS) | <ul style="list-style-type: none"> Exams (CT,R,W,TS) Essays (CT,R,W,TS) Lab Reports (CT,R,W,QS) Keep daily lab journal (R,W) |
| <ul style="list-style-type: none"> Maintain, harvest, and transfect eukaryotic cell lines | <ul style="list-style-type: none"> Laboratory Activities: maintain cells in tissue culture, harvest and freeze cells, and check cell viability/purity from contamination (CT,TS,R,W,QS) | <ul style="list-style-type: none"> Lab Reports (CT,R,W,QS) Keep daily lab journal (R,W) |
| <ul style="list-style-type: none"> Follow standard SOPs for protein, DNA and RNA isolation | <ul style="list-style-type: none"> Read Text (CT,R) Attend Lectures (W,R,CT) Class Discussions (CT, OC) Laboratory Activities: demonstrate ability to follow SOPs by recording outcomes of experimental results (CT,TS,R,W,QS) | <ul style="list-style-type: none"> Exams (CT,R,W,TS) Essays (CT,R,W,TS) Lab Reports (CT,R,W,QS) Keep daily lab journal (R,W) |
| <ul style="list-style-type: none"> Understanding lab safety procedures when handling cell lines | <ul style="list-style-type: none"> Read Text (CT,R) Attend Lectures (W,R,CT) Class Discussions: disposing of biohazard waste, potential safety concerns associated with handling cells (CT, OC) Laboratory Activities (CT,TS,R,W,QS) | <ul style="list-style-type: none"> Exams (CT,R,W,TS) Essays (CT,R,W,TS) Lab Reports (CT,R,W,QS) Keep daily lab journal (R,W) |
| <ul style="list-style-type: none"> Demonstrate standard laboratory skills in both chemistry and biology <ul style="list-style-type: none"> Display a strong understanding of basic cellular laboratory techniques used in academic, commercial, and biotechnology laboratories | <ul style="list-style-type: none"> Read Text (CT,R) Attend Lectures (W,R,CT) Class Discussions (CT, OC) Laboratory Activities: (CT,TS,R,W,QS) | <ul style="list-style-type: none"> Exams (CT,R,W,TS) Essays (CT,R,W,TS) Lab Reports (CT,R,W,QS) Keep daily lab journal (R,W) |
| <ul style="list-style-type: none"> Be familiar with the usage, monitoring, and maintenance of tissue culture equipment | <ul style="list-style-type: none"> Laboratory Activities (CT,TS,R,W,QS) | <ul style="list-style-type: none"> Lab Reports (CT,R,W,QS) Keep daily lab journal (R,W) |

| COURSE OUTCOMES | OUTCOMES ACTIVITIES | ASSESSMENT TOOLS |
|---|--|---|
| <ul style="list-style-type: none"> • Troubleshoot experimental results (Problem solving) <ul style="list-style-type: none"> ○ Understanding the importance of proper controls ○ Execute relevant mathematical calculations ○ Ability to perform computer data analysis using relevant software | <ul style="list-style-type: none"> • Laboratory Activities (CT,TS,R,W,QS) | <ul style="list-style-type: none"> • Lab Reports (CT,R,W,QS) • Keep daily lab journal (R,W) |
| <ul style="list-style-type: none"> • Maintain a laboratory notebook as required by industrial standards | <ul style="list-style-type: none"> • Laboratory Activities (CT,TS,R,W,QS) | <ul style="list-style-type: none"> • Lab Reports (CT,R,W,QS) • Keep daily lab journal (R,W) |
| <ul style="list-style-type: none"> • Demonstrate competence in scientific writing, which includes: <ul style="list-style-type: none"> ○ Scientific/critical thinking; Ability to formulate and test an hypothesis; and ○ Analysis of evidence and ability to draw conclusions. | <ul style="list-style-type: none"> • Laboratory Activities (CT,TS,R,W,QS) | <ul style="list-style-type: none"> • Lab Reports (CT,R,W,QS) • Keep daily lab journal (R,W) |
| <ul style="list-style-type: none"> • Demonstrate knowledge of the central concept for cellular functioning, DNA to RNA to Protein, by integrating biomolecules, biotechnology, regulating mechanisms, signals, signaling pathways and cancer. | <ul style="list-style-type: none"> • Laboratory Activities (CT,TS,R,W,QS) | <ul style="list-style-type: none"> • Lab Reports (CT,R,W,QS) • Keep daily lab journal (R,W) |