

OUTCOMES BASED LEARNING MATRIX

Course: BIOL 235: Topics in Molecular Biology Techniques **Department:** Biology

Course Description: The laboratory-intensive course will provide students with techniques in DNA manipulation, not covered in the Cellular Biology (i.e. emphasis will be on bacterial and viral genetics). The course's experimental theme-based approach will place students in the role of a technician / research assistant. They will make reagents, follow SOPs, perform experiments, keep a notebook, and analyze data in the forms of tables and graphs. 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) or successful performance on departmental challenge exam; Preparing for College Reading II (ENGL092); Introductory Writing (ENGL099); Intermediate Algebra (MATH 112) or higher, or waiver by placement testing results, 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"> • Performance of computer-based analysis on DNA/RNA/protein sequences <ul style="list-style-type: none"> ○ Microsoft Office suite ○ Web-based analysis programs <ul style="list-style-type: none"> ▪ NEBCutter ▪ NCBI 	<ul style="list-style-type: none"> • Read Text (CT,R) • Attend Lectures (W,R,CT) • Class Discussions (CT, OC) • Study Questions (R,W,CT) • Laboratory Activities (CT,TS,R,W,QS) 	<ul style="list-style-type: none"> • Essays (CT,R,W) • Lab Reports (CT,R,W,QS) • Keep daily lab journal (R,W)
<ul style="list-style-type: none"> • Demonstrate strong mathematic skills <ul style="list-style-type: none"> ○ Calculate molarities ○ Perform dilutions 	<ul style="list-style-type: none"> • Class Discussions (CT, OC) • Attend Lectures (W,R,CT) • Class Discussions (CT, OC) • Study Questions (R,W,CT) • Laboratory Activities (CT,TS,R,W,QS) 	<ul style="list-style-type: none"> • Exams (CT,R,W)
<ul style="list-style-type: none"> • Perform metric conversions <ul style="list-style-type: none"> ○ Freely convert between US standard and Metric units ○ Demonstrate abilities to move across the metric prefix conversion table 	<ul style="list-style-type: none"> • Laboratory Activities (CT, TS, R, W, QS) • Class Discussions (CT, OC) 	<ul style="list-style-type: none"> • Lab Reports (CT, R, W, TS) • Exams (CT, R, W, TS)
<ul style="list-style-type: none"> • DNA isolation from bacterial cells <ul style="list-style-type: none"> ○ Demonstrate knowledge for the basis of the procedure ○ Successfully isolate DNA using standard methods 	<ul style="list-style-type: none"> • Laboratory Activities (CT, TS, R, W, QS) • Read Text (CT,R) 	<ul style="list-style-type: none"> • Lab Reports (CT, R, W, TS) • Exams (CT, R, W, TS)
<ul style="list-style-type: none"> • Mutation of plasmid DNA <ul style="list-style-type: none"> ○ Plasmid extraction ○ Restriction enzyme digestion ○ Site-directed mutagenesis 	<ul style="list-style-type: none"> • Laboratory Activities (CT, TS, R, W, QS) 	<ul style="list-style-type: none"> • Lab Reports (CT, R, W, TS)
<ul style="list-style-type: none"> • Construction of plasmids <ul style="list-style-type: none"> ○ Cloning vectors ○ Expression vectors ○ Shuttle vectors 	<ul style="list-style-type: none"> • Laboratory Activities (CT, TS, R, W, QS) 	<ul style="list-style-type: none"> • Lab Reports (CT, R, W, TS)
<ul style="list-style-type: none"> • Transformation of bacterial cells and transfection of eukaryotic cells <ul style="list-style-type: none"> ○ Electroporation ○ Calcium chloride competent cells 	<ul style="list-style-type: none"> • Laboratory Activities (CT, TS, R, W, QS) 	<ul style="list-style-type: none"> • Lab Reports (CT, R, W, TS)

COURSE OUTCOMES	OUTCOMES ACTIVITIES	ASSESSMENT TOOLS
<ul style="list-style-type: none"> • Present data <ul style="list-style-type: none"> ○ PowerPoint presentation ○ Poster presentation 	<ul style="list-style-type: none"> • Technical skills (TS) 	<ul style="list-style-type: none"> • Log Reports
<ul style="list-style-type: none"> • Read SOPs 	<ul style="list-style-type: none"> • Laboratory Activities (CT, TS, R, W, QS) 	<ul style="list-style-type: none"> • Lab Reports (CT, R, W, TS) • Exams (CT, R, W, TS)
<ul style="list-style-type: none"> • Notebook entries using Industry Standards 	<ul style="list-style-type: none"> • Laboratory Reporting Skills (TS, R, W) 	<ul style="list-style-type: none"> • Written reports (TS, R, W)
<ul style="list-style-type: none"> • Literature Search 	<ul style="list-style-type: none"> • Use of computer databases to find information (CT, R) 	<ul style="list-style-type: none"> • Summary reports
<ul style="list-style-type: none"> • Use of Controls 	<ul style="list-style-type: none"> • Analyze data for improvement of interpretation (CT, R, W) 	<ul style="list-style-type: none"> Lab Reports (CT, R, W, TS) Exams (CT, R, W, TS)
<ul style="list-style-type: none"> • Data interpretation 	<ul style="list-style-type: none"> • Analyze results/ interpret their biological relevance (CT, R, W, TS) 	<ul style="list-style-type: none"> • Class discussion