# OUTCOMES BASED LEARNING MATRIX

**Course: Biol-122 Biology of Organisms** **Department: Biology**

**Course Description**

This course is a study of the domains, kingdoms and major phyla comprising the living world. The evolution of the diverse forms of life on the earth today, from the earliest life forms to the present, serves as a unifying theme throughout the course. Topics include classification, anatomy, physiology and ecology. Observation and dissection skills will be developed while studying selected organisms, both plant and animal, in the laboratory portion of the course. The dissection component of the lab work is required for successful completion of the course.

Lecture: 3 hours and Laboratory: 2 hours

**Prerequisite:** Biological Principles (Biol-121) and Preparing for College Reading II (Engl-092), Introductory Writing (Engl-099), and Fundamentals of Mathematics (Math-010) 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 |
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| **Evolution**<br>Explain why evolution is the central theme in biology. Identify the three patterns of natural selection and five patterns of evolution. Differentiate between homologous and analogous structures. Give two examples in which the heterozygote has an advantage. Describe the Hardy-Weinberg Principle. Explain a cladogram and cladistic classification. | • Attend lecture/discussion (W,OC,CT) Evolution used as a central theme over many lecture topics (CT,W)<br>• Conduct Peppered Moth experiments in lab, developing hypotheses, collecting data, drawing graphs, interpreting data, and drawing conclusions (CT,R,W,TS,QS)<br>• Conduct experiments stressing importance of controls (CT,R,W,TS,QS)<br>• Read text (CT,R)<br>• Do study guide (R,W,CT)<br>• Write a scenario on speciation of Darwin's Finches<br>• Trip to Museum of Natural History | • Tests<br>• Quizzes (CT R,W)<br>• Short papers (CT,R,W,TS)<br>• Formal Lab reports (CT,R,W,QS)<br>• Oral presentations (R,W,TS,QS,OC) |

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| **Domains**<br>Describe the three domains and list the kingdoms in each domain<br>Use a key for identification living things to kingdom. Describe origin of life and be familiar with the Eras: Proterozoic (Precambrian), Paleozoic, Mesozoic and Cenozoic | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Conduct identification labs (CT,R,W,OC,TS,QS)<br>• Look at electron micrographs of various cells (CT,TS) | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab reports (CT,R,W,QS)<br>• Lab practical exams (CT R,W) |
| **Bacteria**<br>Perform the Gram stain and describe the difference between Gram + and Gram- bacteria. | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Conduct bacterial identification lab (CT,R,W,OC,TS,QS)<br>• Look at electron micrographs of various bacteria (CT,TS). | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab reports and drawings (CT,R,W,QS)<br>• Lab practical exams (CT R,W) |
| **Viruses**<br>Define and include nucleic acid and a protein coat.<br>Be able to differentiate between and diagram reproductive patterns of naked viruses, T4 bacteriophage, envelope viruses, HIV infection, prion, bacteria | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Look at electron micrographs of various viruses (CT,TS). | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Drawings of the life cycle (CT,R,W,QS) |
| **Protista**<br>Define the kingdom and describe 10 phyla.<br>Draw and label the life cycle of *Chlamydomonas* | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Conduct protista identification lab (CT,R,W,OC,TS,QS) | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab drawings (CT,R,W,QS)<br>• Drawings of the life cycles (CT, R, TS) |

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| **Animals**<br>Define Kingdom Animalia and explain its origins and draw a typical life cycle. Relate structure to function in each of following phyla and differentiate between the major classes in each where appropriate: Porifera, 3 classes; Coelenterates, 3 classes; Flat Worms, 3 classes; Round Worms; Rotifera: Mollusks, 4 classes; Annelida, 3 classes; Arthropods, 6 classes; Echinoderms, 5 classes; Chordates, 9 classes. | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Conduct identification labs with the aid of a key.(CT,R,W,OC,TS,QS)<br>• Dissection of selected organisms and a major dissection mammal (R,CT)<br>• Lab drawings (R,CT,TS)<br>• Gather primary information from the Museum of Comparative Zoology | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab drawings (CT,R,W,QS)<br>• Lab reports and drawings (CT,R,W,QS)<br>• Formal papers based on primary research (CT,R,W,TS) |
| **Identification**<br>With the aid of keys be able to identify members of the 4 orders of Class **Arachnida**, 26 orders of Class **Insecta** and all of the major orders of Class **Amphibia,** Class **Reptilia,** Class **Aves** and Class **Mammals**. Be able to compare and contrast any major groups, relate them to the evolutionary tree and to the geological periods. Be able to identify the major organs and blood vessels on the fetal pig as a representative mammal. | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Conduct identification labs with the aid of a key.(CT,R,W,OC,TS,QS)<br>• Dissection of selected organisms (R, CT, TS)<br>• Lab drawings (R, CT, TS) | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab drawings (CT,R,W,QS)<br>• Lab reports and drawings (CT,R,W,QS) |
| **Evolutionary Trends**<br>Within the Animal Kingdom the student should be able to discuss evolutionary trends in the following areas: skeleton, body coverings, reproduction, water needs, circulatory system including heart chambers, oxygen demand, body temperature, brain, vision, sex determination. | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Trip to Museum of Natural History | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab drawings (CT,R,W,QS)<br>• Oral presentations (R,W,TS,QS,OC) |

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| **Plants**<br>To state the unique properties of species in the Kingdom Plantae which unite them and set them apart from all other living organisms. Identify the four major groups of plants: Nonvascular plants (Bryophytes), Vascular seedless plants, Gymnosperms, Angiosperms. Be able to compare and contrast any two major groups and relate them to the evolutionary tree and to the geological periods. | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Look at and draw from prepared slides various plan structures (CT,R,W,OC,TS,QS)<br>• Draw the life cycles (CT, R,, TS)<br>• Conduct identification with the aid of a key.(CT,R,W,OC,TS,QS) | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab drawings (CT,R,W,QS)<br>• Drawings of the life cycles (CT, R, TS) |
| Be able to label drawings of the flowering plant organs: shoots, roots, leaves, flowers & fruits. Describe the control of plant growth and differentiation. | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Look at and draw from prepared slides various plan structures (CT,R,W,OC,TS,QS<br>• Dissection of selected organs(R,CT,TS)<br>• Label drawings of organs (R, CT, TS) | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab drawings (CT,R,W,QS) |
| Describe primary and secondary growth of seed plants. | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Look at and draw stems from prepared slides CT,R,,OC,TS,QS<br>• Label drawings of stems (R, CT) | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab drawings (CT,R,W,QS) |
| With the aid of a key, identify any flowering New England plant from domain to family. | • Specimen collection (CT,TS)<br>• Conduct identification labs with the aid of a key (CT,R,W,OC,TS,QS) | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab reports (CT,R,W,QS) |

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| **Fungi**<br>State the unique properties of species in the Kingdom Fungi which unite them and set them apart from all other living organisms. Identify the microscopic sexual spore forming structures and be able to use this information to classify a fungus. Draw and explain the life cycle of each of the three phyla. | • Read text (CT,R)<br>• Attend lecture/discussion (W,OC,CT)<br>• Do study guide (R,W,CT)<br>• Conduct fungal identification lab (CT,R,W,OC,TS,QS)<br>• Look at and draw from prepared slides various fungal spore forming structures (CT,R,W,OC,TS,QS) | • Tests (CT R,W)<br>• Quizzes (CT R,W)<br>• Lab drawings (CT,R,W,QS)<br>• Drawings of the life cycles (CT, R, TS) |
| **Laboratory Skills**<br>Work safely in the laboratory and follow simple laboratory protocols in order to work cooperatively to complete laboratory exercises.<br>Use the microscope to observe structure and function in order to develop good technique in preparation for more advanced courses.<br>To be able to perform good dissections in order to make precise observations. | • Read and sign the safety sheet (CT,R)<br>• Follow directions carefully in the lab (CT,R)<br>• Use simple math and graphing where appropriate in lab exercises (CT,QS,TS,R,W)<br>• Focus the microscope use it for an independent project and /or in several laboratory exercises (CT,R,TS,QS)<br>• Use dissection where appropriate in lab exercises and papers (CT,QS,TS,R,W) | • Observe student working safely in the lab (CT)<br>• Lab quiz or assignment requiring each student to focus and use the microscope (CT,OC,W,R)<br>• Evaluate dissected specimens (W, QS)<br>• Tests (R,W,CT)<br>• Quizzes (R,W,CT) |
| **Study Skills**<br>Apply a study skills method to learning biology and have improved success academically rigorous courses. | • Attend lecture/discussion (W,CT,OC)<br>• Develop note taking skills by progressively taking away class aids such as power point handouts, lecture outlines, questions to be answered, list of objectives (CT,R,W,TS)<br>• Develop test taking skills by giving quizzes that model types of questions on exams (CT,R,W)<br>• Recommend ARC as a resource (CT) | • Workshops (CT, TS, OC, R)<br>• Collect class notes for grade (CT,W)<br>• Quizzes (CT R,W) |

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| To strengthen Core Competencies in order to increase success in this and other courses and in the workplace. | Referenced above | Referenced above. |