

Learning goals for Biology 211 & Biology 211L

1. Intro, Nature of Science, History of Life, & Phylogenetic thinking (5- 15%)

- Learn that the words “theory” and “hypothesis” have a specific meaning in science.
- Understand that science is a social and interactive activity. Conclusions are open to change when sufficient evidence is presented.
- Life is ancient and diverse, but scientific names have only been given to a minority of extant species.
- Phylogenetic trees are hypothesized evolutionary relationships and assist us to categorizing organisms in the tree of life.
- Describe the evidence that is used for building phylogenetic trees.

2. Biological Diversity (35-50%)

- Describe the morphological and metabolic distinctions amongst the broad range of life on Earth. These will be addressed in the following order: prokaryotes -> protists -> animals -> fungi -> plants -> viruses.
- Describe the phylogenetic relationships amongst these various groups of organisms.
- Understand that species richness varies among the various different phyla.
- Introduce specific organisms from various clades and discuss their morphological features, as well as their phylogenetic relationships with other organisms.

Laboratory Learning Objectives associated with Biological Diversity (53%)

- Ability to recognize and name, at the large-scale taxonomic level, a wide range of organisms.
- More accurate conceptions of the proportion of known biological diversity represented by various groups of organisms.
- Improved ability to use information resources to independently learn about biological diversity.
- Improved ability to describe and document observations of biological organisms.

3. Genetic Inheritance and the Process of Evolution (20-40%)

- Learn an overview of the processes of mitosis and meiosis, emphasizing meiosis’ ability to increase genetic diversity.
- Demonstrate the core laws of Mendelian genetics: Segregation and Independent assortment.
- Describe the core ideas of evolutionary theory: Decent with Modification and Natural Selection.
- Identify and counter misconceptions about evolution.
- Differentiate Micro- (population-level) and Macro- (speciation) evolution and the processes that contribute to them.
- Differentiate the types of selection and the nature of adaptations.

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Note: The diversity of life section (above) focuses on the product of evolution and aspects of phylogenetic relationships.

Laboratory Learning Objectives associated with Evolution (26%)

- Improved understanding and direct observation of the inheritance of genetic information.
- Explore the impact of selection on allele frequency in populations.
- Compare of molecular and morphological phylogenetic trees.

4. Ecology (15-25%)

- The abundance and distribution of species are the result of abiotic factors, population attributes, and community interactions.
- Describe population growth processes, such as exponential and logistic growth.
- Identify the types of interactions among species within a community, including types of competition and niche partitioning.
- Learn that ecosystem processes control energy flow and nutrient cycling.
- Recognize the major human-caused drivers of global change threatening biodiversity: habitat destruction & degradation, overexploitation, invasive species, pollution, climate change.

Laboratory Learning Objectives associated with Ecology (6%)

- Improved understanding of how population sizes of particular species are estimated.