

BIOLOGY 100 SLOs

COURSE OUTLINE OBJECTIVES

- A. Read, discuss, and critically evaluate biological information, based on principles of scientific method and research design.
- B. Demonstrate an understanding of basic vocabulary and concepts in biology at the cellular, genetic, organismal, evolutionary, and ecosystem levels
- C. Compare and contrast basic anatomical, physiological, and ecological features of living organisms
- D. Illustrate how the application of basic biological concepts relates to human health and ecosystem issues
- E. Describe how natural selection works and impacts biological systems

Student Learning Objectives

The following questions would be given at the end of a course to test understanding in each of the following areas: **[total of 40 pts]**

SCIENTIFIC METHOD

Question-

Explain some of the major differences between science and other ways of thinking.

Scoring guidelines:

- Use of the scientific method - **[1pt]**
- Can only look at the natural world - **[1pt]**
- Ideas must be tested - **[1pt]**
- No absolutes - **[1pt]**

CELLS

Question-

Plant cells have both chloroplasts and mitochondria. Why are both of these organelles important for the functioning of a plant cell?

Scoring guidelines:

- Photosynthesis takes place in chloroplasts - **[1pt]**
- Aerobic respiration takes place in mitochondria - **[1pt]**
- Photosynthesis makes food (sugar) for the plant - **[1pt]**
- Aerobic respiration converts food (sugar) into energy (ATP) for the plant - **[1pt]**

Question –

Explain why DNA is important for the normal functioning (not reproduction) of a cell. How is this accomplished?

Scoring guidelines:

- DNA stores information - **[1pt]**
- The information on the DNA is used to make proteins - **[1pt]**
- Proteins can work as enzymes - **[1pt]**
- Enzymes control the metabolism of a cell to keep it functioning - **[1pt]**

GENETICS

Question –

Compare and contrast mitosis and meiosis in terms of their functions

Scoring guidelines:

- Mitosis makes exact copies of a cell - **[1pt]**
- Mitosis is asexual reproduction - **[1pt]**
- Meiosis reduces the number of chromosomes in a cell (diploid to haploid) - **[1pt]**
- Meiosis produces gametes that are used in sexual reproduction - **[1 pt]**

Question –

In humans, a single gene controls the ability to roll the tongue. A dominant allele enables the individual to roll their tongue and the recessive allele doesn't. If two people, a tongue-roller and a non-tongue-roller were to produce offspring, could they produce a child that could roll their tongue? Not roll their tongue? Explain using Punnett squares.

Scoring guidelines:

- Recognizes single trait with dominant and recessive alleles in the solving of the problem - **[1pt]**
- Sets up appropriate Punnett squares to solve the problem - **[1pt]**
- Demonstrates ability to read a Punnett square correctly - **[1 pt]**
- Solves the problem correctly - **[1pt]**

ORGANISM LEVEL

Question –

Explain some of the structures that a plant living in a desert environment might have and explain why they would be important for their survival.

Scoring guidelines:

- Identifies the function of plant structures: roots, stems, leaves (could include stomata, vascular tissue etc. and how they are connected - **[1pt]**
- Demonstrates understanding of how the plant structures are connected in function – **[1pt]**
- Describes modifications to the structures to adapt to environmental conditions - **[2pts]**

Or

Question –

For one organ system studied in class, discuss how that system is integrated into a functioning organism and how its activity is modified by environmental conditions.

Scoring guidelines:

- Correctly describes the function of the organ system - **[2pts]**
- Correctly indicates an environmental condition and the response by the organ system - **[2pts]**

EVOLUTION / NATURAL SELECTION

Question -

The Leaf-cutter Bee has long hairs on the underside of its abdomen. As the bee visits flowers, it collects pollen to carry back to its nest. It uses the long hairs on its abdomen to help hold the pollen. Explain how natural selection could explain this adaptation from ancestors with mostly normal sized hairs.

Or

Question -

Bacteria have evolved the ability to survive in the presence of toxic antibiotics. Explain how natural selection has produced populations of bacteria that have this resistance from populations that did not have resistance.

Scoring guidelines:

- Role of mutations - [1pt]
- Environmental selection pressure - [1pt]
- Differential reproduction - [1pt]
- Change in genetics/phenotype over time - [1pt]

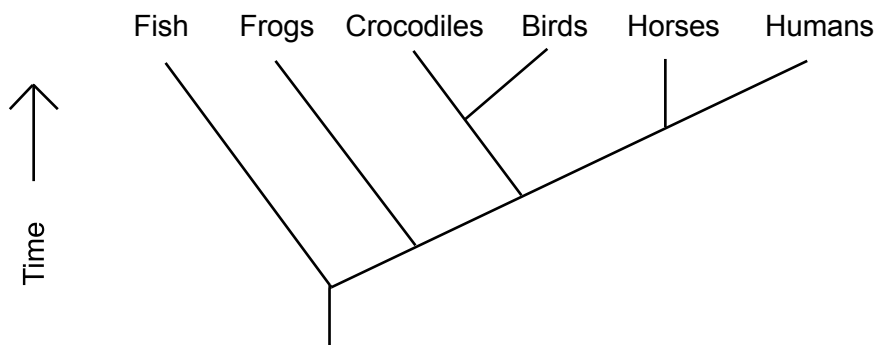
Question -

Discuss one method that new species can be formed

Scoring guidelines:

- Limitation of gene flow to create genetically isolated populations - [1pt]
- Allopatric speciation (geographic isolation) or Sympatric speciation (disruptive selection or polyploidy) - [1pt]

Question -



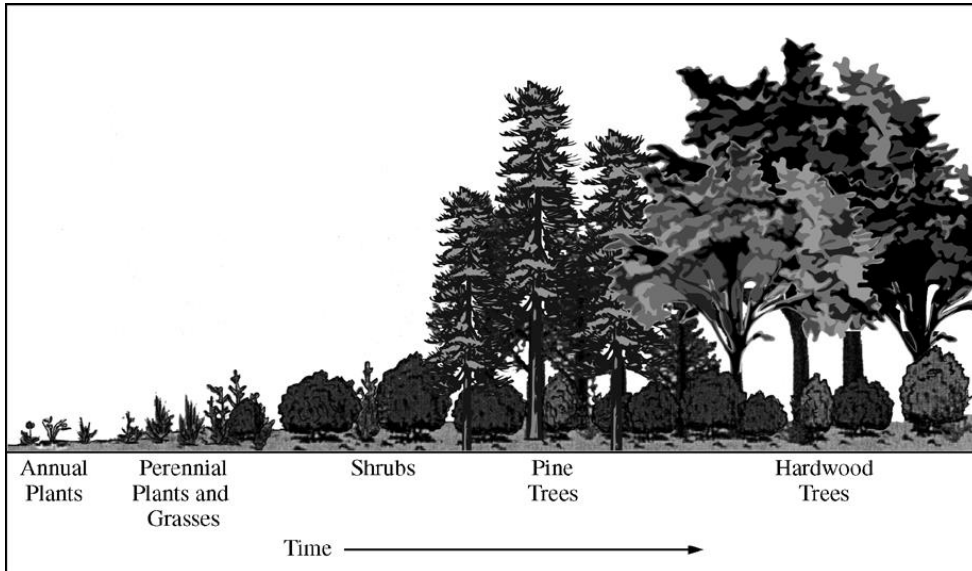
Using the information on the phylogeny above, which organism would share more characteristics in common with birds? Why?

Scoring guidelines:

- Crocodiles - [1pt]
- Share a more recent common ancestor - [1pt]

ECOLOGY

Question -



The diagram above shows a change from annual plants to hardwood trees in a specific area over a period of time.

Discuss the expected changes in biodiversity and community relationships that might occur as these changes occur.

Scoring guidelines:

- Increase in species producing a more complex food web - **[1pt]**
- Different species producing new population interactions (predator/prey etc.) - **[1pt]**
- Changes in the environment (more nutrients, deeper soil, etc. - **[1pt]**
- Recognition of succession - **[1pt]**

Question –

Discuss some of the ecological problems facing humans today and suggest possible solutions.

Scoring guidelines:

- Presentation of an appropriate ecological problem (can be local or global) - **[2pts]**
- Solution indicates understanding of possible cause(s) of the problem - **[2pts]**

LAB

COURSE OUTLINE OBJECTIVES

- A. Read, discuss, and critically evaluate biological information, based on principles of scientific method and research design.
- F. Collect scientific data using basic biological measurement tools such as metric rulers, analytical balances, thermometers, and microscopes.
- G. Manipulate and interpret biological data, by organizing data tables, calculating averages, preparing graphs, and evaluating results.
- H. Manipulate and interpret biological data, by organizing data tables, calculating averages, preparing graphs, and evaluating results.
- I. Prepare laboratory reports in scientific format

Student Learning Outcome

Students will demonstrate their ability to meet the above objectives by the following:

The last lab report that is written in standard report format will be graded using the following grading rubric.

Scoring guidelines:

INTRODUCTION - [5 pts]

- States the question/purpose of the lab
- States the hypothesis appropriate for the lab
- Explains why the hypothesis prediction is expected

MATERIALS & METHODS - [5 pts]

- Describes the methods of the experiment with enough detail to enable someone else to repeat the experiment.
- Does not list the material but includes them in the description of methods

RESULTS - [5 pts]

- Includes a statement of results with no conclusions
- Includes a neat appropriate data table of results
- Includes a neat graph(s) of the data that is complete and appropriate for the data.

DISCUSSION - [5 pts]

- States whether the results supported the hypothesis or not
- Provides an analysis of possible problems, other variables etc.
- Suggests future experiments following from the results obtained