BIOL 1B: FORM & FUNCTION IN PLANTS & ANIMALS

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2025
Units:	6
Hours:	4 lecture, 6 laboratory per week (120 total per quarter)
Prerequisite:	BIOL 1A.
Advisory:	Students taking the biology majors' sequence (BIOL 1A, 1B, 1C) are strongly advised to take the sequence in its entirety.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- The student will compare and contrast the functioning of physiological systems in plants and animals.
- Students will be able to communicate the results of scientific research to an audience of peers.

Description

An introduction to the structure and physiological processes of plants and animals. Transport systems, reproduction, digestion, gas exchange, regulation of the internal environment, responses to external stimuli, nervous systems, hormones, and locomotion. Intended for biology majors.

Course Objectives

The student will be able to:

1. Identify and apply the steps of the scientific method to study a question.
2. Explain the interrelationship of structure and function in multicellular organisms.
3. Describe the hierarchy of tissues, organs, and organ systems.
4. Describe the basic anatomy and morphology of flowering plants.
5. Explain transport of water, minerals, and organic compounds in vascular plants.
6. Explain how plants respond to external and internal stimuli, including plant growth regulators.
7. Describe the reproductive system of flowering plants.
8. Describe various animal organ systems with an emphasis on digestive, circulatory, respiratory, nervous, and excretory systems.
9. Compare and contrast the physiology of aquatic and terrestrial animals, especially with regards to the respiratory and excretory systems.
10. Explain mechanisms for homeostasis, including methods of thermoregulation and osmoregulation.
11. Describe the role of chemical coordination in animals.
12. Describe various animal skeletal systems and their role in locomotion.
13. Describe and explain muscle contraction; contrasting skeletal, smooth, and cardiac muscle.
14. Describe general patterns of animal reproduction and development.
15. Master basic laboratory techniques in plant and animal anatomy and physiology.
16. Explain experimental techniques and results orally and/or in writing.
17. Describe examples of contributions made by eminent and/or up-and-coming scientists, including women and minorities, to the fields of plant and animal form and function.

Course Content

1. Introduction
    a. Levels of organization in multicellular organisms
    b. Anatomy and physiology/structure and function
    c. Tissues, tissue systems, and organs in plants
    d. Tissues, organs, and organ systems in animals
2. Biology of plants
    a. Plant anatomy and morphology
        i. Cells and tissues
        ii. The root system
        iii. The shoot system
        iv. Primary and secondary growth of roots and shoots
    b. Transport processes in plants
        i. Review transport mechanisms
        ii. Water potential
        iii. Movement of water and minerals
            1. Absorption in roots
                a. Different routes
                b. Casparian strip
            2. Movement through xylem: Cohesion-tension theory
            3. Control of transpiration
        iv. Movement of organic compounds (sugars): Pressure-flow hypothesis
    c. Plant responses to internal and external signals, and the regulation of growth
        i. Plant growth regulators (hormones) and their functions
        ii. Tropisms
        iii. Photoperiodism
    d. Reproduction in flowering plants
        i. Sexual reproduction
            1. Alternation of generations
            2. The flower
                a. Structure
                b. Pollination and fertilization
                c. Mechanisms to promote outcrossing
            3. The seed and fruit
            4. Germination
        ii. Asexual reproduction
3. Biology of animals

a. Introduction to form and function in animals
    i. Animal tissue types
    ii. Relationship between morphology and surface to volume ratio
        1. Size
        2. Shape
    iii. The internal environment
    iv. Negative and positive feedback control systems
b. Animal digestive systems
    i. Feeding strategies
    ii. Enzymatic hydrolysis
    iii. Organs of digestive system and their roles
    iv. Types of digestive systems
        1. Gastrovascular cavities
        2. Alimentary canals
        3. Comparison of herbivore, carnivore, and omnivore adaptations
c. Circulation
    i. Gastrovascular systems
    ii. Open circulatory systems
    iii. Closed circulatory systems
        1. The heart
            a. Comparative morphology of vertebrate hearts
            b. Structure and function of the mammalian heart
        2. Blood vessels
            a. Structure
            b. Fluid dynamics of blood flow
        3. Blood
        4. Lymphatic system
d. Gas exchange
    i. General problems of gas exchange
        1. Comparison of diffusion in air and water
        2. Moist respiratory surfaces
        3. Comparison of oxygen and carbon dioxide diffusion
    ii. Animals that do not require respiratory systems
    iii. Aquatic respiration
        1. Gills
        2. Counter-current exchange
    iv. Terrestrial respiration
        1. Tracheal tubes - insects
        2. Lungs in mammals and birds
    v. Oxygen transport
        1. Respiratory pigments
            a. Hemoglobin
            b. Myoglobin
            c. Hemocyanin
        2. Oxygen dissociation curves
    vi. Carbon dioxide transport
e. The nervous system
    i. Diversity of nervous systems
    ii. Vertebrate nervous system organization
    iii. The nerve impulse
    iv. The synapse
f. Homeostasis
    i. Thermoregulation
        1. Mechanisms of heat gain and loss
        2. Ectothermy
        3. Endothermy
    ii. Osmoregulation
    iii. Nitrogenous waste excretion
        1. Comparison of ammonia, urea, and uric acid
        2. Invertebrate excretory organs
        3. The vertebrate kidney
            a. Anatomy and physiology
            b. Adaptations for water conservation
            c. Regulation of kidney function
g. Chemical coordination
    i. Selected endocrine glands and their products
    ii. Mechanisms of hormone action
    iii. Link between nervous and endocrine systems
        1. Hypothalamus
        2. Pituitary gland
h. Movement and locomotion
    i. Skeletal systems
    ii. Muscle contraction
i. Reproduction and development
    i. Vertebrate male and female anatomy
    ii. Hormonal regulation of gametogenesis
    iii. Embryology

Lab Content

1. General lab skills
    a. Application of scientific method
    b. Presentation of experimental research results in oral, poster, and/or written format
    c. Dissection
    d. Microscopy
    e. Elementary statistical analysis
2. Plant form and function
    a. Cells and tissues
    b. Monocots versus dicots: anatomical and morphological differences
    c. Root, shoot, and leaf anatomy and morphology
    d. Reproductive anatomy and morphology
    e. Angiosperm life cycle
    f. Plant growth
3. Animal anatomy and morphology
    a. Histology
    b. Nervous system and brain anatomy
    c. Mammalian digestive system
    d. Mammalian cardiovascular system
    e. Mammalian excretory system
    f. Mammalian reproductive system
    g. Contrast mammalian and non-mammalian systems
    h. Comparative skeletal morphology
    i. Physiological data analysis

Special Facilities and/or Equipment

1. Fully equipped biology laboratory and multimedia lecture room.
2. Students need internet access.

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

One or more midterm exam(s)
Two or more practical lab exam(s)
Quizzes
Written and/or oral presentation of results from laboratory exercises
Comprehensive final exam
Participation in the laboratory

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture
Cooperative learning exercises
Oral presentations
Laboratory

Representative Text(s) and Other Materials

Urry, et al.. Campbell Biology, 12th ed.. 2021.

Laboratory exercises are authored by course instructors and provided at no cost to students, other than printing costs if they choose to use hard-copies.

One of the following photo guides is RECOMMENDED:
Rust, Thomas. A Guide to Biology Lab, 3rd ed. 1983. ISBN: 9780937029015 (The photographs and labels in this guide are excellent. A newer edition is not available.)

Adams, B.J., and J.L. Crawley. Van De Graaff's Photographic Atlas for the Biology Laboratory, 8th ed. 2018.

The following dissection guide is also RECOMMENDED:
Bohensky, Fred. Photo Manual and Dissection Guide of the Fetal Pig. 2005. (This is the newest edition available.)

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Weekly reading assignments from college-level, lower division, biology majors text corresponding to lecture topics.
2. Biweekly lab exercises. Each lab exercise includes individual or group activities covering assigned readings in laboratory handouts.
3. Students present results from laboratory exercises in oral or written formats, or through demonstration of laboratory skills.

Discipline(s)

Biological Sciences