

Module 1: Biology - The Study of Life

Keys to Success & Study Guide

Learning Objectives

By the end of this module, you should be able to:

1. **Identify** and explain the seven fundamental characteristics shared by all living organisms.
2. **Order** the levels of biological organization from atom to biosphere.
3. **Differentiate** between the three domains of life (Bacteria, Archaea, Eukarya) and the kingdoms within Eukarya.
4. **Apply** the scientific method to hypothetical scenarios, distinguishing between hypothesis, theory, and law.
5. **Explain** the flow of energy and cycling of nutrients in ecosystems.

Key Terminology Checklist

Define these terms in your own words to ensure mastery.

- [] **Homeostasis:** The maintenance of stable internal conditions despite external changes.
- [] **Metabolism:** The sum of all chemical reactions in an organism, including anabolism (building) and catabolism (breaking down).
- [] **Binomial Nomenclature:** The two-part naming system for species (*Genus species*).
- [] **Prokaryote vs. Eukaryote:** Cells lacking a membrane-bound nucleus vs. cells with a true nucleus.
- [] **Autotroph vs. Heterotroph:** Organisms that produce their own food vs. organisms that consume others.
- [] **Natural Selection:** The differential survival and reproduction of individuals due to heritable variation.

Concept Check

1. The Characteristics of Life

- **Question:** What are the 7 characteristics shared by all living organisms?
- **Key Answer:** Organization, metabolism, homeostasis, growth and development, reproduction, response to stimuli, and evolution/adaptation.

2. The Hierarchy of Life

- **Question:** What are the levels of biological organization, from smallest to largest?
- **Key Answer:** Atom → Molecule → Organelle → Cell → Tissue → Organ → Organ System → Organism → Population → Community → Ecosystem → Biosphere.
- **Distinction:** A **Community** includes only the living organisms in an area, while an **Ecosystem** includes both living (biotic) and non-living (abiotic) factors.

3. Energy Flow and Nutrient Cycling

- **Question:** How does energy flow through an ecosystem differ from nutrient cycling?
- **Key Answer:** Energy flows one-way (Sun → Producers → Consumers → Heat). Nutrients cycle (Carbon, Nitrogen move between organisms and environment repeatedly).

4. The Science of Biology

- **Question:** What is the difference between a scientific theory and a scientific law?
- **Key Answer:** A **Law** describes *what* happens under certain conditions (e.g., Law of Gravity). A **Theory** explains *why* phenomena occur, supported by extensive evidence (e.g., Theory of Evolution). Theories do not become laws; they serve different purposes.