

The Study of Life
Biology 1114
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What is LIFE?

What is BIOLOGY?

Characteristics of Life

Living things

- are organized
- acquire materials and energy
- reproduce
- respond to stimuli
- are homeostatic
- grow and develop
- are adapted to their environment

Living Things are Organized

- Atoms → Molecules → Cells → Tissues → Organs → Organ Systems → Organism
- The **cell** is lowest level to have characteristics of life
- A **tissue** is a group of similar cells that perform a particular function
- An **organ** is a group of tissues that perform a particular function
- Organs work together to form an **organ system**
- An **Organism** is an individual animal or plant

Can you think of examples?

Living Things Acquire Materials and Energy

- Living things need outside sources of materials and energy
- **Energy** is the capacity to do work; takes work to maintain organization
- *What are “outside sources of materials and energy” for plants...for humans?*
- Some nutrient molecules are broken down to provide the energy to carry out synthetic reactions
- Most living things can convert energy into motion

Living Things Reproduce

- Life comes only from life
- **Genes** are units of heredity composed of DNA
- *What is DNA?*
- **Metabolism** is the sum total of all chemical reactions occurring within a cell
- Unicellular organisms reproduce asexually
- Multicellular organisms usually reproduce sexually; each parent usually contributes one-half of genes to offspring

Living Things Respond to Stimuli

- *What are **stimuli**?*
 - *Any agent, act, or influence that produces a functional reaction*
- Living things respond to external stimuli by moving toward or away from the stimulus
- In animals, response to stimuli is dependent upon the nervous and musculoskeletal systems
- Examples?

Living Things Are Homeostatic

- **Homeostasis** means staying the same
- All organ systems contribute to homeostasis
 - Digestive system?
 - Cardiovascular system?
 - Urinary system?
 - Nervous system?

Living Things Grow and Develop

- **Growth** is recognized by an increase in the size and often number of cells
- **Development** includes all the changes that take place between conception and death
- *What are the stages of development in the human?*

Living Things are Adapted

- **Adaptations** are modifications that make an organism suited to its way of life
- Adaptations come about through evolution
- **Evolution** is the process by which a species changes through time
- Organisms are diverse because they are adapted to different ways of life

The Classification of Living Things

- Taxonomy is the discipline of classifying organisms
- SPECIES?
- Species → Genus → Family → Order → Class → Phylum → Kingdom
- Domains?
 - Archae
 - Bacteria
 - Eukarya

The Classification of Living Things

- Domain Eukarya contains four kingdoms
 - Protista
 - Fungi
 - Plantae
 - Animalia

The Classification of Living Things

- Each successive classification above species contains more different types of organisms than the one preceding
- Most genera contain several species, and these share similar characteristics; species in the same kingdom share only general characteristics

The Classification of Living Things

- Each living things has a two-part name (binomial)
- The first word is the genus
- The second word is the species
- Both words are written in italic, but only the genus is capitalized
- The genus can be abbreviated to a single letter if used with the specific epithet
- Scientific names are based on Latin

The Organization of Biosphere

- The **biosphere** is the zone of air, land, and water at the surface of the earth where living organisms are found
- A **population** is all the members of a species within a particular area
- *What is a community?*
- A Community plus the physical environment forms an ecosystem

The Process of Science

- Biology is the study of life
- *What is a biologist?*
- All scientists use the general process of science to find answers

Observation or Problem

- Scientists use all their senses to make observations
- They also extend the ability of their senses by using instruments
 - *What are examples of instruments that scientists may use?*
- They may expand their knowledge even further by taking advantage of knowledge and experiences of other scientists

Hypothesis

- A hypothesis is a possible explanation for the natural event
- All of a scientist's past experiences will likely influence the formation of a hypothesis
- A hypothesis must be tested

Experiments

- Testing the hypothesis
- The manner in which a scientist intends to conduct an experiment is called the **experimental design**
- A **control group** goes through all the steps of an experiment but lacks the factor or is not exposed to the factor being tested
- Scientists often use a **model** or representation of an actual object

Data

- The results of an experiment are referred to as **data**
- Should be observable and objective
- Graphs, charts, statistics, pictures

Conclusion

- Hypothesis? Supported or Not?
- Scientists must analyze data in order to reach a conclusion
- Scientists report their findings in peer reviewed journals—*WHY?*
- Experiments and observation must be repeatable

Scientists carry out studies in which they test hypotheses. The conclusion of many different types of related experiments eventually enable scientists to arrive at a scientific theory that is generally accepted by all.