Chapter 1: An Introduction to Life on Earth

Life exists in just about every environment on the planet.

Oceans

Salt Flats
An Introduction to Life on Earth

Life exists in just about every environment on the planet.

Hot Springs and Hydrothermal Vents

What is Biology?

Biology: the Diversity of Life

Biology: the Diversity of Life
Biology: the Diversity of Life

Organization in Biological Systems

Atoms

- hydrogen
- carbon
- nitrogen
- oxygen

Single elements from which all life is formed.

An atom is the smallest particle of an element while maintaining the same chemical properties.

Organization in Biological Systems

Atoms

Molecules

Water, glucose, DNA

Molecules are mixtures of elements that form a structure.

Small molecules form spontaneously. Larger molecules require an input of energy during formation.

Organic molecules contain at least carbon and hydrogen.

Organization in Biological Systems

Atoms

Molecules

Cells

Red blood cells, epithelial cells, nerve cell

Cells are the smallest unit of life.

Most of known life exists as single cell acting independently.
Atoms are the building blocks of molecules. Molecules are the building blocks of cells. Cells are the building blocks of tissues. Tissues are collections of cells that work together. Most multi-cellular organisms are composed of several types of tissues.

Organs are collections of tissues that perform a specific function. Many organs functioning together form organ systems.

Many organ systems make up a multicellular organism. Organisms of the same type, a members of the same species.
**Organization in Biological Systems**

Atoms ➔ Molecules ➔ Cells ➔ Tissues ➔ Organs ➔ Organ Systems ➔ Multicellular Organisms ➔ Populations

Organisms of the same species living together are called a **population**.

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**Organization in Biological Systems**

Atoms ➔ Molecules ➔ Cells ➔ Tissues ➔ Organs ➔ Organ Systems ➔ Multicellular Organisms ➔ Populations ➔ Communities

Several populations living in the same area form a **community**.

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**What is Life?**

- “The quality of not being dead.”
  
  » Oxford English Dictionary.

**Characteristics of Living Things**

- Are composed of cell(s) that have a complex, organized structure.
- Respond to stimuli from their environment.
- Maintain their complex structure and internal environment (**homeostasis**).
- Acquire and use resources from the environment to convert them into energy.
- Grow.
- Reproduce themselves.
- Have the capacity to evolve.
Classification of Organisms

Science is a Process of Inquiry

- Science means ‘to know’ in Latin.
- Scientists are always curious, trying to find an explanation for what they see.

Observations lead to questions.

Hypothesis Based Science

- Form a hypothesis – an educated guess at an answer for an observation.
- Test the hypothesis in controlled experiments.

The Scientific Method

1. Observe
2. Question
3. Hypothesis
4. Prediction
5. Experiment
6. Conclusions
The Scientific Method

Observe

The flower is growing toward the right.

Question

Why is flower growing toward the right?

Hypothesis

The flower growing toward a light source.

Prediction

The flower will grow toward the light anywhere it is positioned.
The Scientific Method

Observe
Question
Hypothesis
Prediction
Experiment

Three flower pots with one light source in the center.

Scientific Principles underlie all scientific inquiry

- Derived from natural causes
- Remain uniform in space and time
- Common perception among all scientists

Theories have been thoroughly tested

- More reliable than a hypothesis
- Broader in scope than a hypothesis
- Inspire new hypotheses
- Extensive amount of evidence

Theory of Evolution

- Explains the diversity of organisms.
- Evolution is a change in the genetic make-up of a population over generations.

- Theory initiated by Charles Darwin and Alfred Russel Wallace, in the mid-1800s.
Theory of Evolution

- Modern organisms descended from preexisting life forms, with advantageous modifications.
- Driven by Natural Selection
  - The process by which organisms adapt to their environment and out compete others.
- Evolution is a theory because it cannot be proven conclusively.

How does Evolution Occur?

- Genetic Variation
  - Differences in DNA
- Heredity
  - Inherit genetic variation from parents
- Enhanced Reproduction

Genetic Variation and Inheritance

- Changes, or mutations, to our DNA sequence occur spontaneously throughout life.
- Mutations in DNA can lead to:
  - No effect
  - Deleterious or harmful effect
  - Beneficial effect
    - Leads to Genetic Variation

Genetic Variation and Inheritance

- Beneficial mutations can be passed on to offspring.
  - Can result in increased fitness or survival in an environment.
  - Can result in increased reproduction and passage of the beneficial mutations on to new generations.
Natural Selection
- Preserves genes that help organisms flourish in their environment.

Adaptation:
a form of Natural Selection
- Structure, physiological process, or behavior that helps survival and reproduction in a particular environment

Homework
Bring in 7 SCAN-TRON forms (E-882) paper-clipped with your name on a post-it note. I will bring them to each test for you so you do not forget them.

Chapter 1
Thinking Through the Concepts.
Review Questions 4 and 5