

6th Grade

The Diversity of Life

Chapter 1: Introduction to Living Things

Lesson 1 (What is Life?)

Organism – a living thing

Characteristics that all living things share:

1. All organisms are made of cells.

Cell – the basic unit of structure and function in all living things.

Unicellular – made of a single cell

Multicellular – composed of many cells that are specialized to do certain tasks.

– Each type of cell (muscle, skin, nerve, bone) has a different appearance and has a different job.

2. All living things contain similar chemicals in their cells.

Water – the most abundant chemical in cells

Carbohydrates – a cell's main energy source

Proteins
Lipids } The building materials of cells.

Nucleic Acids – the genetic material that gives chemical instructions to direct the cell's activities.

3. All living things use energy.

metabolism – the combination of reactions that break down and build up materials to provide a cell with energy

4. All living things respond to their surroundings.

Stimulus – a change in an organism's surroundings that causes it to react

Response – an action or change in behavior that occurs because of a stimulus

5. All living things grow and develop.

growth – the process of becoming larger

development – the process of change that occurs during an organism's life, producing a more complex organism

6. All living things reproduce.

Asexual reproduction – involves one parent
– produces offspring that are identical to the parents

Examples: unicellular organisms, some plants

Sexual reproduction – involves two parents
– combines their genetic material to produce a new organism that differs from both parents

Examples: mammals, birds, reptiles, amphibians, fish, most plants.

Hundreds of years ago, people thought that living things could appear from nonliving material.

Spontaneous generation – the mistaken idea that living things can arise from nonliving material

Controlled experiment – an experiment in which only one variable is changed at a time

Manipulated variable – the factor that is purposely changed in an experiment
– also called the **independent** variable

Responding variable – the factor that changes as a result of the manipulated variable

– also called the **dependent** variable

Controlled variables – the factors that are kept constant (unchanged) in an experiment

Redi – Italian doctor who helped disprove the idea of spontaneous generation
 – He tested whether or not flies arise from rotting meat.

Pasteur – French chemist who finally disproved spontaneous generation
 – He tested whether or not bacteria arise from broth.

The Needs of All Living Things:

1. All living things need **water**.
 - to obtain chemicals from their surroundings.
 - to break down food.
 - for growth.
 - to move substances within their bodies
 - for reproduction.

2. All living things need **food**. (a source of energy)
Autotrophs – organisms that make their own food from the sun's energy (plants and some bacteria)

Heterotrophs – obtain their food by feeding on others

3. All living things need **living space**.
 - Enough area to get food and water.
 - Enough area for shelter and protection.

4. All living things need **stable internal conditions**.
Homeostasis – the maintenance of stable internal conditions in an organism
 - Internal conditions must be just right for the cells to function.

Lesson 2 (Classifying Life)

Classification – the process of grouping things based on their similarities
 – Biologists use classification to organize living things into groups so that the organisms are easier to study.

Taxonomy – the scientific study of how living things are classified and named

Aristotle – Greek philosopher who developed the first classification system for organisms
 – He divided all living things into two groups – Plants and Animals
 – He divided the animal group into smaller groups, depending on where they lived. (land, water, or air)

Linnaeus – Swedish botanist who developed the classification system that divided organisms into groups called **Kingdoms**.

– Most of his system is still used today, with a few changes made as we discovered more and more organisms.

– He developed **binomial nomenclature**.

Binomial nomenclature – the system for naming organisms in which each organism is given a unique, two-part scientific name

Rules of Binomial Nomenclature:

1. The first part of the name is the organism's **genus**.
2. The second part of the name is the organism's **species** and often describes some distinctive feature of that organism (such as where it lives or its appearance).
3. Both parts are always written in **italics**.
4. Only the first letter of the first word is capitalized.

Genus – a classification grouping that contains similar, closely related organisms

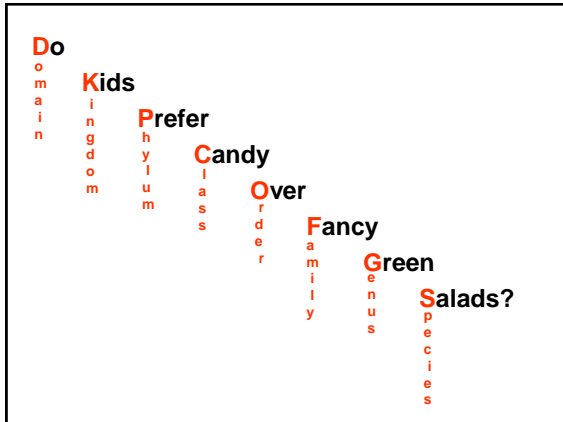
example: Many cats are in the genus "*Felis*" because they are closely related based on similar features.

Species – a group of similar organisms that can mate with each other and produce offspring that can also mate and reproduce

Example: All cats are not the same species because a lion and a housecat do not reproduce with each other.

The Major Levels of Classification:

1. **Domain** – the largest and most general level of organization
2. Within each domain, there are **kingdoms**.
3. Within each kingdom, there are **phyla**. (singular is **phylum**)
4. Within each phylum, there are **classes**.
5. Within each class, there are **orders**.
6. Within each order, there are **families**.
7. Within each family, there are **genera**. (singular is **genus**)
8. Each genus is divided into separate **species**.



Taxonomic key – a step-by-step guide for identifying organisms that requires making a choice between statements

Lesson 3 (Domains and Kingdoms)

3 Domains Used Today:

1. Bacteria

- are unicellular
- Some are beneficial to us, some are harmful to us.
- Some are autotrophs, some are heterotrophs.
- They are **prokaryotes**.

Prokaryotes – organisms whose cells lack a nucleus

Nucleus – a dense area in the center of a cell that controls all the cell's activities.

2. Archaea

- are unicellular
- They are **prokaryotes**.
- Some are autotrophs, some are heterotrophs.
- Live in very extreme conditions. (hot springs, very salty water)
- Are very similar to bacteria, but their structure is different enough to separate them.

3. Eukarya

- They are eukaryotes.
- The domain Eukarya is divided into 4 kingdoms.

Eukaryotes – organisms with cells that have a nucleus

The Four Kingdoms in the Domain Eukarya:

- 1. Protists** – any eukaryote that cannot be classified as a plant, animal, or fungus
 - Sometimes called the “odds and ends” kingdom.
 - Some are **autotrophs**, and some are **heterotrophs**
 - **Most** are unicellular. (But a few are multicellular.)
- 2. Fungi** – includes mushrooms, molds, mildew, and yeast
 - **Most** are multicellular. (Yeast is unicellular.)
 - Most feed by absorbing nutrients from dead or decaying organisms.
- 3. Plants** – are all multicellular autotrophs that provide food for most of the heterotrophs.
- 4. Animals** – are all multicellular heterotrophs

Lesson 4 (Evolution and Classification)

Evolution – the gradual change in a species over time

Charles Darwin – developed the **Theory of Evolution**

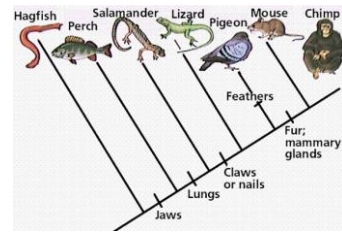
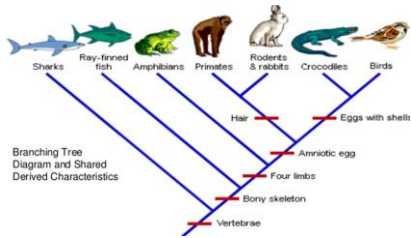
- He reasoned that species could change over time through the process of **natural selection**.

Natural selection – process by which individuals that are better adapted to their environment are more likely to survive and reproduce than other members of the same species

Branching tree diagram – a diagram that shows how organisms are related through evolution and the order in which specific characteristics may have evolved

- They begin at the base with the common ancestor of all the organisms in the diagram.
- Organisms are grouped according to their **shared derived characteristics**.

Shared derived characteristic – a trait, such as fur feathers, or having four legs, that the common ancestor of a group had, and passed on to its descendants (future generations)

Examples:**How do scientists determine the evolutionary history of a species?**

1. Look for **homologous structures** between different organisms.

Homologous structures – features that very different organisms have that appear similar in form and function

Examples: A dolphin's flipper, a bird's wing, a cat's leg, and the human arm are homologous structures.

Humans, dogs, and giraffes all have similar bones that differ only in size and shape.

2. Look for similarities in the chemical makeup of organisms' cells. (Look at their DNA.)

Convergent evolution – the process by which unrelated organisms evolve similar characteristics

– Evolving in similar environments can result in similar characteristics over time.

Examples: Turtles, frogs, and ducks have all developed webbed feet to help them swim, but are not closely related.

Birds, insects, and bats have all developed wings to help them fly, but are not closely related.