What Is an Animal?

What characteristics do all animals have?

Animals come in many shapes, forms, and sizes.

- Scientists estimate that there are between 1 and 2 million species of animals!
- Some, like whales and elephants, are bigger than a truck.
- Others, like dust mites, are microscopic.

The Kingdom Animalia

- Scientists divide the Kingdom Animalia into two major groups: invertebrates and vertebrates.
  - A vertebrate is an animal with a backbone.
  - An invertebrate is an animal without a backbone.

About 98 percent of all animals are invertebrates.

- This diverse group includes sponges, jellyfish, worms, insects, and mollusks.

Only about two percent of all animals are vertebrates which belong to the Phylum Chordata.

- Vertebrates include fish, amphibians, reptiles, birds, and mammals.

All animals must perform certain functions to stay alive.

- These include response to the environment, feeding, digestion, respiration, transport of materials, and reproduction.
- The process of evolution has produced great diversity in adaptations to these functions.
Despite this diversity, most animals share all of the following characteristics.

1. Animals are multicellular and have eukaryotic cells.
   - Animals have different levels of organization.
   - Some animals consist of cells with a few tissue layers.
   - Others are complex with organ systems.

2. Except for sponges, animal cells are arranged into tissues.
   - Tissues are necessary to produce organs and organ systems.
   - Tissues, organs, and organ systems are what enabled the evolution of organisms with large, multicellular bodies.

3. Animals have a period of embryonic development.
   - Each animal starts out as a one-celled zygote (a fertilized egg) that divides into a multicellular embryo, an organism in its earliest stage of development.
   - During embryonic development, cells become specialized and tissues form.
   - The growth of tissues, organs, and organ systems requires a period of embryonic development.

4. Animals are consumers.
   - A consumer is an organism that eats other organisms.
   - Animals cannot make their own food.
   - To get energy and nutrients, they must eat other organisms or organic substances.
   - This is a major characteristic that sets animals apart from plants.
5. Animals can move.
   - Being a consumer often requires movement in order to capture prey.
   - Most animals can move during at least some part of their life cycle.

6. Most animals have muscle and nervous tissue.
   - Muscle tissue is made of muscle cells and allows animals to move.
   - Nervous tissue is made of nerve cells and enables coordinated movement and response to stimuli.

7. Animals are diploid (a matched set of chromosomes in the cell nucleus from each parent).
   - Their sex cells are haploid (a single set of chromosomes) and are produced by meiosis.

The body plan of an animal is called its symmetry.
   - Animals that do not have symmetry, like sponges, are called asymmetrical.

Some animals, like sea urchins, have radial symmetry.
   - Radial symmetry means that the body parts are arranged in a circle around a central point.

Other animals, like insects and all vertebrates, have bilateral symmetry.
   - In bilateral symmetry, the body consists of two similar halves.
The Gut

• The gut is the digestive tract.
• It enables an animal to digest food outside of its cells.
• In animals without a gut (like sponges), food is digested inside of their cells.

Simple animals have a *sac-like gut with only one opening.*

More complex animals have a complete gut that runs from a mouth to an anus.

The cross-section of an earthworm reveals its body cavity.

Complex animals also have a *body cavity that holds the gut and other organs.*

• The body cavity provides an open space for organs to grow and function.

Organ systems

• Recall that an organ system is a group of organs that work together to perform a function.
• The simplest animals do not have organ systems.
• As animals evolved and became more complex, they developed organ systems to perform basic functions.
Support and movement

- The skeletal system is a group of organs whose primary function is support.
- Some animals, like jellyfish and worms, do not have a skeletal system.
- Others, like lobsters, have external skeletons.
- All vertebrates have an internal skeleton that is made of organs called bones.

The muscular system is a group of organs whose primary function is movement.

- In vertebrates, the skeletal and muscular systems work together to provide movement and support.

Circulation

- Since animals are multicellular, they need to transport water and other materials to and from all of their cells.
- In simple animals, substances diffuse into cells from surrounding fluids and tissues.
- The circulatory system is a group of organs whose primary function is to transport materials to and from cells.

Since all animals use cellular respiration, their cells need oxygen.

- Complex animals have a respiratory system that allows them to take in oxygen and release carbon dioxide, a waste product of cellular respiration.

Digestion

- The digestive system is a group of organs whose primary function is to take in and digest food, and eliminate wastes.
- Simple animals do not have digestive systems.
- Others have simple cavities where food is digested by enzymes.
- Complex animals have complete digestive systems that run from mouth to anus.

Response

- To provide quick responses to stimuli, all animals except sponges have fibers called nerves.
- A nerve is a group of nerve cells whose function is to carry signals to control movements.
- Simple invertebrates have nerves arranged in fibers called nerve cords which run through their bodies.
The nervous system is a group of organs and nerves that gather, interpret, and respond to information.

- The nervous system of an earthworm consists of a primitive brain and ganglia.

Ganglia are bundles of nerves that control a body part.

- More complex animals have a nervous system with a brain stored in a well-formed head.

Reproduction

- All animals are capable of sexual reproduction.
- Some invertebrates are also capable of asexual reproduction.
- A planarian, for example, can be cut into several pieces, each of which grows into a complete worm.
- The new worms are genetically identical to the parent worm.

Sexual reproduction involves exchange of genetic material which creates genetic variation.

- More complex animals have a reproductive system that functions in all reproductive processes.

Reproductive processes include production of sex cells and fertilization.

- Some organisms, like earthworms, have both male and female reproductive systems on the same organism.
- Such an animal is called a hermaphrodite.
- More complex animals like vertebrates have separate male and female individuals.