Review

Chapter 1. Introduction: biology today

- **The properties of life**

  1) Order: all living things exhibit complex but ordered organization.

  2) Regulation: the environment outside an organism may change drastically, but the organism can adjust its internal environment, keeping it within appropriate limits.

  3) Growth and development: information carried by DNA controls the pattern of growth and development in all organisms.

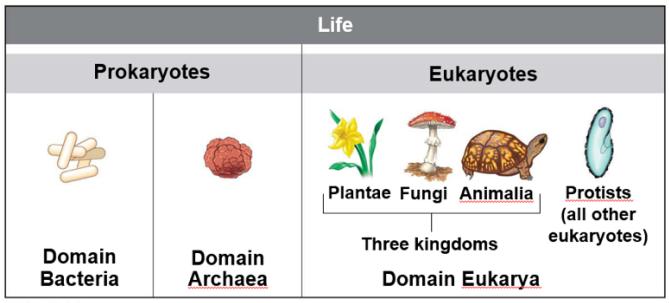
  4) Energy processing: organisms take in energy and use it to perform all of life's activities; they emit energy as heat.

  5) Response to the environment: all organisms respond to environmental stimuli.

  6) Reproduction: organisms reproduce their own kind.

  7) Evolution: reproduction underlies the capacity of populations to change (evolve) over time.

- **Species:** a group of organisms that live in the same place and time and have the potential to interbreed with one another in nature to produce healthy offspring.
  - ✧ **Taxonomy:** the branch of biology that names and classifies species, is the arrangement of species into a hierarchy of broader and broader groups.
- **The three domains of life:** bacteria, archaea, eukarya



1）Prokaryotic cells: relatively small and simple cells that lack a nucleus or other compartments bounded by internal membranes.

2）Eukaryotic cells: relatively large and complex cells that contain a nucleus and other membrane-enclosed compartments.

- ✧ **The domain Eukarya in turn includes three smaller divisions called kingdoms:** plantae, fungi, Animalia.

1）Plants: produce their own sugars and other foods by photosynthesis.

2）Fungi: are mostly decomposer, obtaining food by digesting dead organisms and organic wastes.

3）Animals: obtain food by ingesting (eating) and digesting other organisms.

- **Evolution**

  1）Natural selection: in the struggle for existence, those individuals with heritable traits best suited to the local environment are more likely to survive and leave the

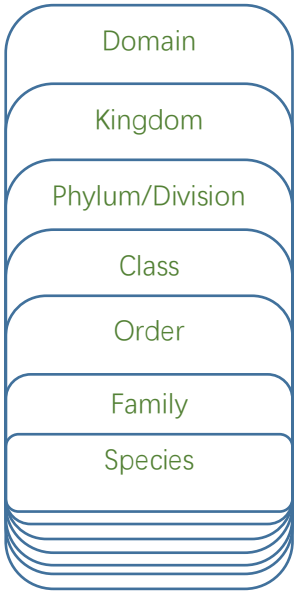
greatest number of healthy offspring. Therefore, the traits that enhance survival and reproductive success will be represented in greater numbers in the next generation.
2）Artificial selection: the purposeful breeding of domesticated plants and animals by humans.

- **Information flow**
  1) Genes: hereditary units of information consisting of specific sequences of DNA passed on from the previous generation.
  2) Genome: the entire set of genetic information that an organism inherits.
- **Most ecosystems are solar powered.** The energy that enters an ecosystem as sunlight is captured by plants and other photosynthetic organisms that absorb the sun's energy and convert it, storing it as chemical bonds within sugars and other complex molecules. Energy flows through an ecosystem, entering as light and exiting as heat.

---

*

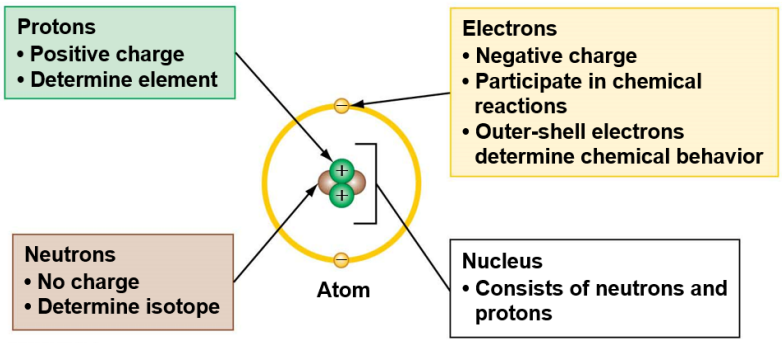
Classification of Living Things



Domain
Archea, Eubacteria, Eukaryote
Kingdom
Plantae, Animalia, Fungi, Protists, and others
Phylum (Division)
Chordata, Arthropoda, Magnoliophyta (Flowering plant)
Class
Mammalia, Insecta, Amphibia, Arachnida, Magnoliopsida
Order
Primates, Anura, Orthoptera, Araneae, Rosales
Family
Hominidae, Cercopithecidae, Ranidae, Rosaceae, Liliaceae
Genus
Homo, Macaca, Rana, Latrodectus, Trifolium, Prunus
Species - smallest classification
Homo sapiens, Macaca mulatta, Rana pipiens, Trifolium repens, Lilium philadelphicum

Chapter 2. Essential chemistry for biology

- **Matter:** anything that occupies space and has mass.
- **Mass:** a measure of the amount of material in an object.
- **Element:** a substance that cannot be broken down into other substances by chemical reactions.
- Oxygen(O), carbon(C), hydrogen(H), and nitrogen(N)—make up about 96% of the weight of the body.
- **Trace elements:** are required in only very small amounts and cannot live without them.
- **Compounds:** substances that contain two or more elements in a fixed ratio.
- **Atom:** the smallest unit of matter that still retains the properties of an element.



  - ✧ **Isotope:** some elements can exit in different forms, which have the same numbers of protons and electrons as a standard atom of that element but different numbers of neutrons.
  - ✧ **Radioactive isotope:** one in which the nucleus decays spontaneously, shedding particles and energy.
- **Chemical bonding:** ionic bonds, covalent bonds, hydrogen bonds.
  - ✧ **Polar molecule:** one with an uneven distribution of charge that creates two poles, one positive pole and one negative pole.
- **Alternative ways to represent a molecule:** molecular formula, electron configuration, structural formula, space-filling model, ball-and-stick model.
- **Four properties of water:**
  1) The cohesion nature of water;
  2) The ability of water to moderate temperature;
  3) The biological significance of ice floating;
  4) The versatility of water as a solvent.
  - ✧ **Evaporative cooling:** when a substance evaporates (change from a liquid to a gas), the surface of the liquid that remains cools down.
- **Acid:** a chemical compound that releases H^+ to a solution.
- **Base:** a compound that accepts H^+ and removes them from solution.
- **pH scale:** a measure of the hydrogen ion (H^+) concentration in a solution.
- **Buffer:** substances that minimize changes in pH by accepting H^+ when that ion is in excess and donating H^+ when it is depleted.