Fig. 1.3 – What is life?

- Order
- Evolutionary adaptation
- Response to the environment
- Reproduction
- Regulation
- Energy processing
- Growth and development
A fundamental characteristic of living organisms is their use of energy to carry out life’s activities. Work, including moving, growing, and reproducing, requires a source of energy. Living organisms transform energy from one form to another. For example, light energy is converted to chemical energy, then kinetic energy. Energy flows through an ecosystem, usually entering as light and exiting as heat.
Animals eat leaves and fruit from the tree, consume O\textsubscript{2}, & produce CO\textsubscript{2}.

Sunlight is the only input, everything else cycles.

Leaves take in carbon dioxide from the air and release oxygen.

Cycling of chemical nutrients

Leaves absorb light energy from the sun.

Leaves fall to the ground and are decomposed by organisms that return minerals to the soil.

Water and minerals in the soil are taken up by the tree through its roots.

Figure 1.5

Water and minerals in the soil are taken up by the tree through its roots.
The biosphere

Ecosystems

Communities

Populations

Tissues

Organs and organ systems

Organelles

Cells

Atoms

Molecules

Fig. 1.4 – The Hierarchy of Life
Diamond and Graphite are both composed of Carbon but have very different properties owing to the arrangement of the atoms of Carbon.
Fig. 1.8 – The Cell is the basic unit of living organisms
Fig. 1.15 – The three domains of Life

(a) Domain Bacteria (prokaryote)
(b) Domain Archaea (Prokaryote)
(c) Domain Eukarya

- Kingdom Plantae
- Kingdom Fungi
- Kingdom Animalia
- Protists
Fig. 1.16 – Unity Underlying the Diversity of Life

Cilia of *Paramecium*

Cross section of a cilium, as viewed with an electron microscope

- 15 μm
- 0.1 μm
- 5 μm
• Chromosomes contain most of a cell’s genetic material in the form of DNA (deoxyribonucleic acid)
• DNA is the substance of genes
• **Genes** are the units of inheritance that transmit information from parents to offspring
• The ability of cells to divide is the basis of all reproduction, growth, and repair of multicellular organisms
Fig. 1.11 – The DNA Double Helix and Genetic Code

(a) DNA double helix

(b) Single strand of DNA