General Terms

Science	A body of knowledge about the natural world and an evidence-based process for generating that knowledge. Biology is the scientific study of the living world.
Hypothesis	Hypotheses can be tested with observational studies, experiments, or both.
Scientific Theory	A major explanation about the natural world that has been repeatedly confirmed in diverse ways and is accepted as part of scientific knowledge.
Scientific Fact	A direct and repeatable observation of a particular aspect of the natural world.
Scientific Method	Involves making conjectures (hypotheses), deriving predictions from them as logical consequences, and then carrying out experiments or empirical observ-ations based on those predictions.
Correlation	Two or more aspects of the natural world behave in an interrelated manner.
Causation	The capacity of one variable to influence another.

The Biological Hierarchy

Atoms

Molecule(DNA)

Cell(Neuron)

Tissue(Nervous Tissue)

Organ(Brain)

Organ system(Nervous system)

Individual(Organism)

Population (All organisms of the same species in a particular enviro-nment)

Community (Environment and all living organisms)

The Biological Hierarchy (cont)

Ecosystem

Biome

Biosphere (Earth)

Eukarya

Protista	Algae, amoebas, and their relatives.
Plantae	All plants.
Fungi	From yeasts to mushrooms.
Animilia	All animals with backbones(vertebrates) and those without(invertebrates).

Characteristics

Prokar-yotes	Lacks an organized nucleus and other membrane--bound organelles. Prokaryotic DNA is found in a central part of the cell called the nucleoid. The cell wall of a prokaryote acts as an extra layer of protection, helps maintain cell shape, and prevents dehydration.
Eukaryotes	Larger than Prokaryote cells, has membrane-bound organelles a true nucleus and rod shaped chromo-somes. The nucleus houses the cell's DNA and directs the synthesis of proteins and ribosomes.

Prokaryotes Asexual Reproduction

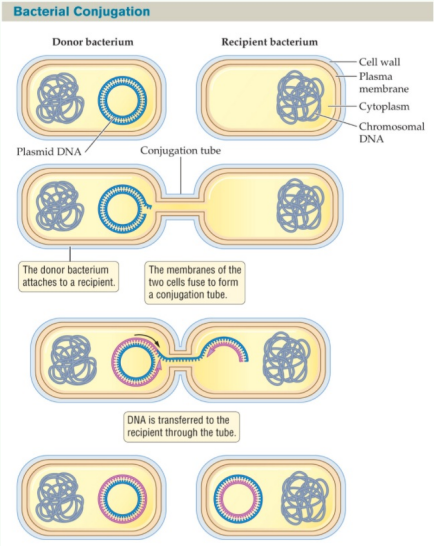
Binary fission	Asexual reproduction by a separation of the body into two new bodies. In the process of binary fission, an organism duplicates its DNA and then divides into two parts (cytokine-sis), with each new organism receiving one copy of DNA.

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Prokaryotes Asexual Reproduction (cont)

Lateral gene transfer (horizontal)	The acquisition of genetic material from another organism without being its offspring
Bacterial conjugation	A process in which bacterium actively trade DNA with another bacterium.
Transformation	When a bacterium dies, the cell may burst open and release DNA and may be taken up by another bacterium, or even different species. The bacterium that take on the DNA are transformed. Genes for bacterial resistance may move from one species to another in this way.

Bacterial Conjunction



Viruses

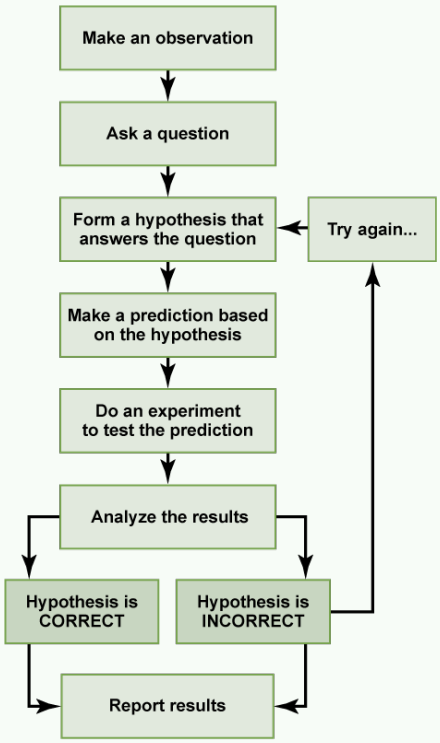
A virus is a microscopic, noncellular infectious particle. Most viruses are little more than genetic material wrapped in proteins, yet they can attack and devastate organisms in every kingdom of life—bacteria, archaeans, protists, fungi, plants, and animals.

Like living organisms, viruses can have DNA, they can reproduce, and they evolve.

A virus is much smaller and simpler than a cell and usually consists of genetic material (DNA or RNA) wrapped in a coat of proteins.

Viruses lack organelles needed for critical cellular functions so they make the cells of other organisms do the work for them.

Scientific Method



Characteristics of Life

Composed of one or more cells.

Reproduce using DNA.

Obtain energy from their environment to support metabolism.

Sense their environment and respond to it.

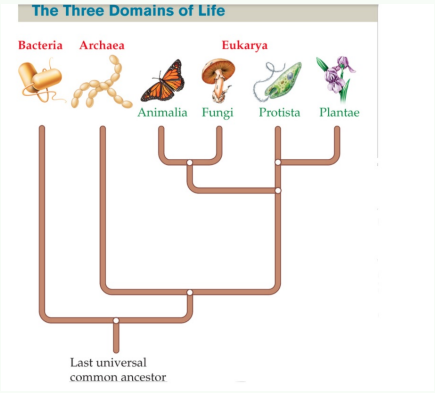
Maintain a constant internal environment (homeostasis).

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Characteristics of Life (cont)

Can evolve as groups.

Three Domains of Life



Bacteria and Archaea: Composed of single-celled organisms. Bacteria and Archaea are substantially different because they diverged from each other billions of years ago and have been evolving separately ever since. Because they are superficially similar, they have been lumped together as Prokaryotes.

Eukarya: Includes single-celled and multicellular forms.

Energy Flow

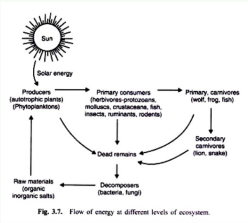
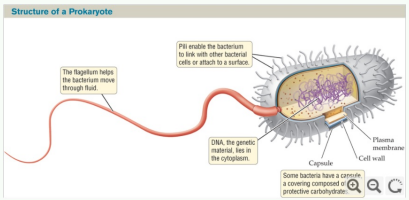


Fig. 3.7. Flow of energy at different levels of ecosystem.

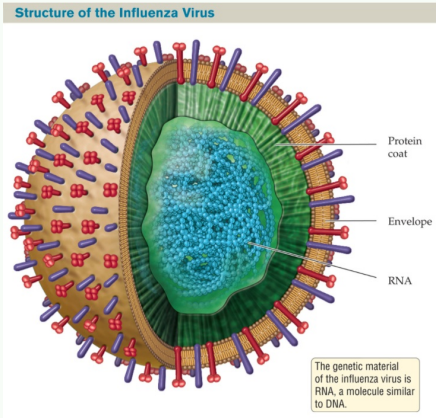
Anatomy of Typical Bacteria



Energy Use

Autotrophs	They obtain energy from the nonliving part of their environment, such as sunlight or inorganic chemical compounds.
Hetero-trophs	They obtain energy from the living or once-living part of their environment, such as by consuming other organisms or organic matter.
Photoa-utotropha	They absorb the energy of sunlight and take in carbon dioxide to conduct photosynthesis.
Chemoa-utotrophs	Organisms that make food from carbon dioxide and energy extracted from chemicals in their environment.
Lithoauto-rophs	Chemoautothrophs that tap energy from minerals.
Chemoh-eterot-rophs	Organisms that obtain energy and carbon from organic molecules. These are simply organisms that consume other organisms. All animals and fungi, and many protists, are chemoheterotrophs.
Photoh-eterot-rophs	Use light as an energy source (as do plants) but get their carbon from organic material (not from carbon dioxide as plants do).

Virus Structure



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