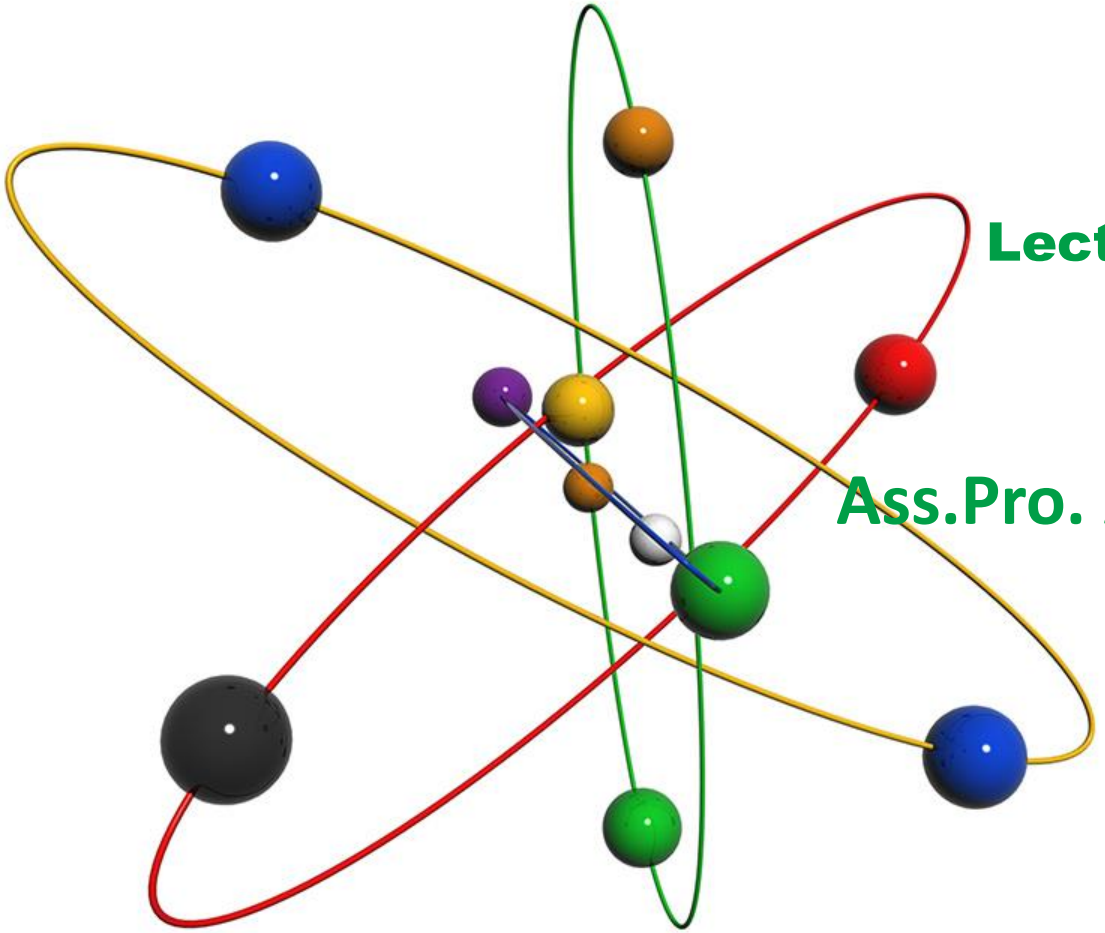
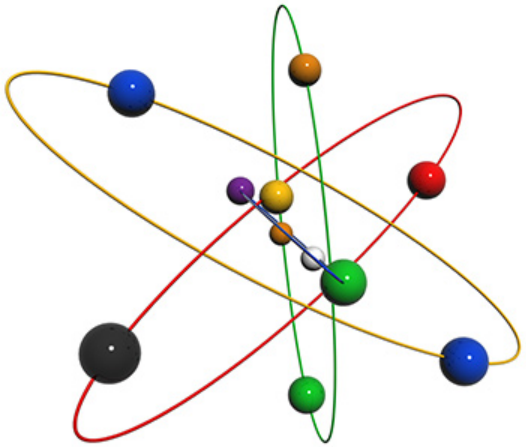
BIOLOGY

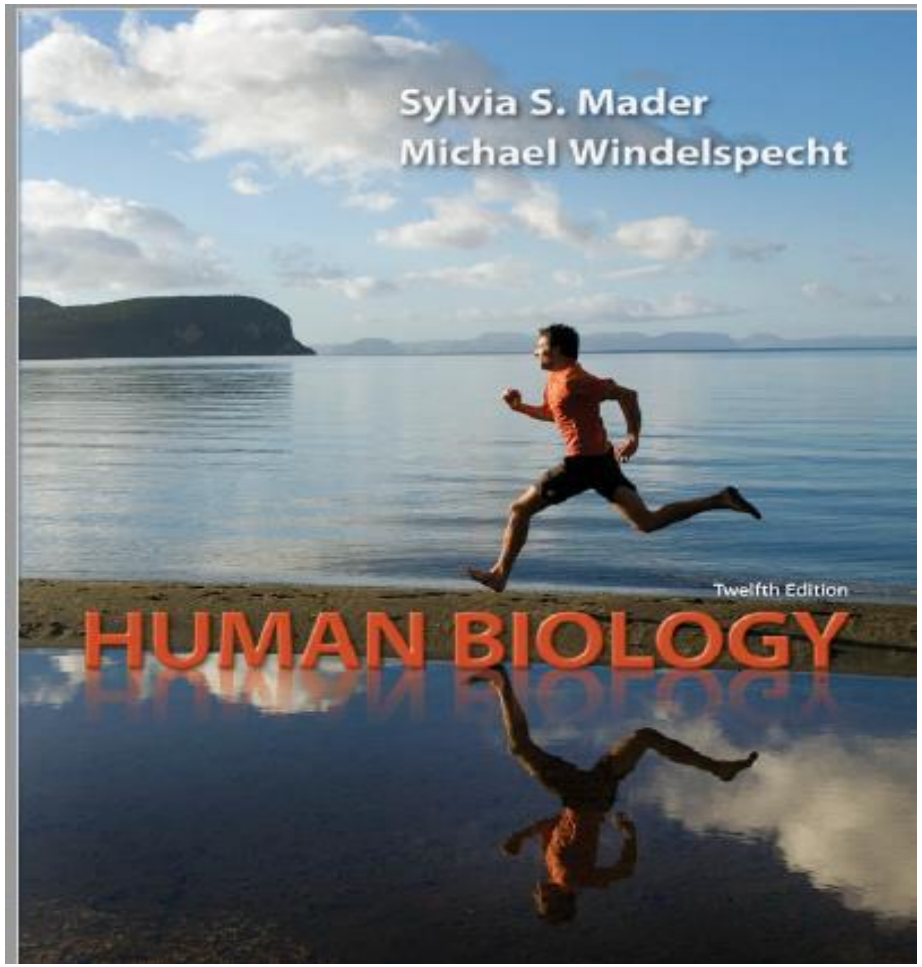


Lecture I – Introduction

Ass.Pro. Asra'a A. Abdul-Jalil

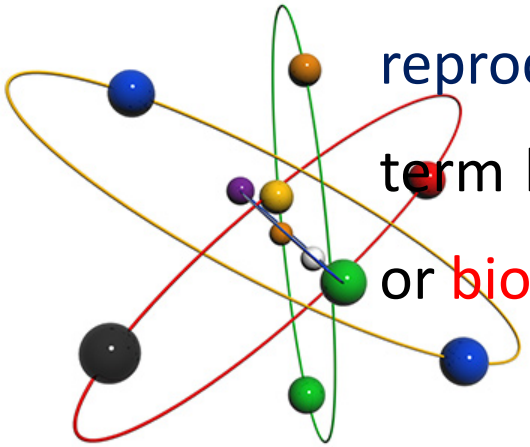
Reference





Definition

- The science which deals with the study of living objects and their life processes is called biology (Greek words, bios – life, logos – study). It covers all aspect of the study of living creatures like occurrence, classification, ecology, economic importance, organization, internal structure, nutrition, health and other body functions, reproduction, life history, inheritance and origin. The term biology is often replaced by the term life sciences or biological sciences.



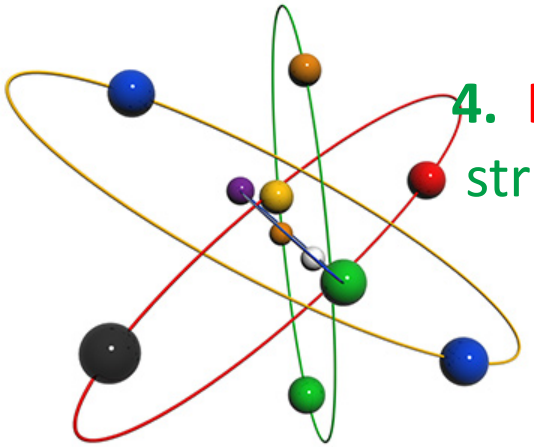
Branches of Biology

- **Some of the main branches of biology are briefly discussed below:**

1. **Taxonomy: I**t is the science of identification, nomenclature and classification of organisms.

2. **Morphology:** It is the study of external form, size, shape, colour, structure and relative position of various living organ of living beings.

3. **Anatomy:** It is the study of internal structure which can be observed with unaided eye after dissection.

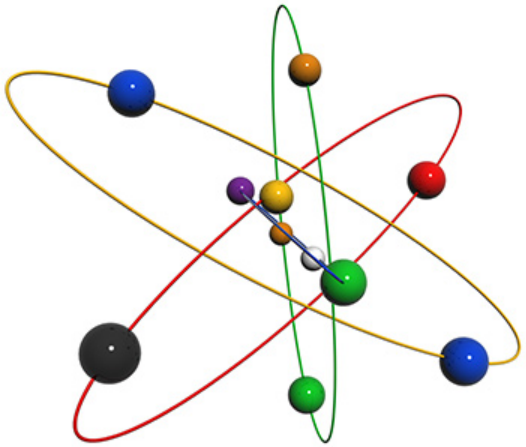


4. **Histology:** It is the study of tissue organization and structure as observed through light microscope.

Branches of Biology

5. **Cytology**: It is the study of form and structure of cells including the behavior of nucleus and other organelles.

6. **Molecular Biology**: It is the study of the nature, physicochemical organization, synthesis working and interaction of bio-molecules that bring about and control various activities of the protoplasm.

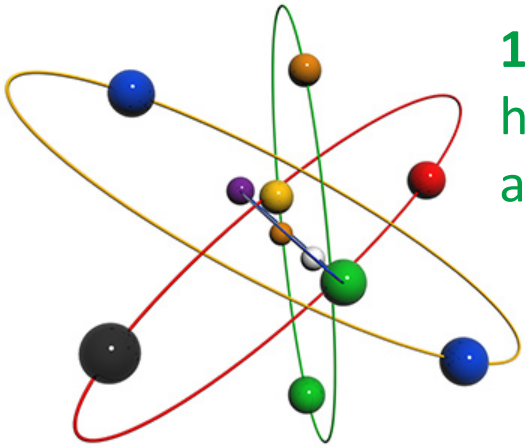


Branches of Biology

7. Physiology: It is the study of different types of body functions and processes.

8. Embryology: It is the study of fertilization, growth, division and differentiation of the zygote into embryo or early development of living beings before the attainment of structure and size of the offspring.

9. Ecology: It is the study of living organisms is relation to other organism and their environment.



10. Genetics: It is the study of inheritance of characters or heredity and variations. Heredity is the study of expression and transmission of traits from parents to offspring.

Branches of Biology

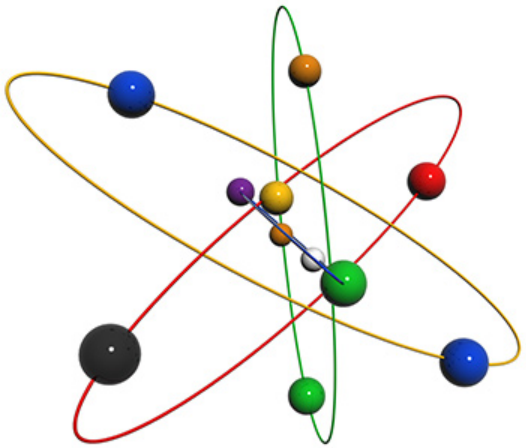
11. **Evolution:** It studies the origin of life as well as new types of organism from the previous ones by modifications involving genetic changes and adaptations.

12. **Palaeontology:** It deals with the study of fossils or remains and impressions of past organisms present in the rocks of different ages.

13. **Exobiology:** It is the branch of scientific inquiry dealing with the possibility of life in the outer space.

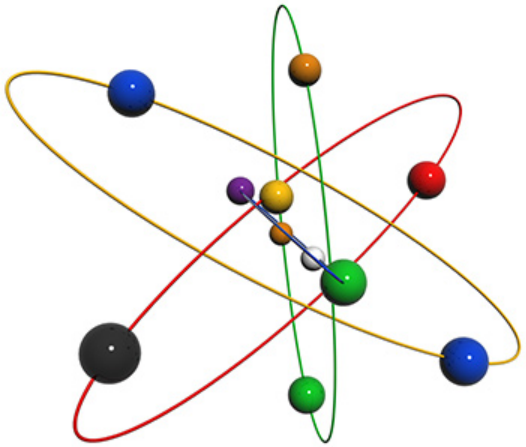
14. **Virology:** It is the study of viruses in all their aspects.

15. **Haematology : It is the study of blood.**



LEVELS OF BIOLOGICAL ORGANIZATION

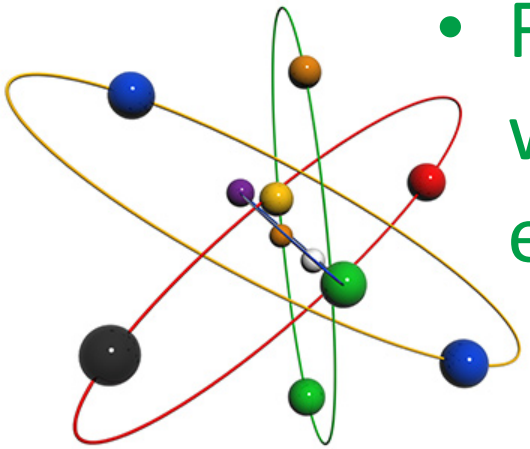
Image (Word)



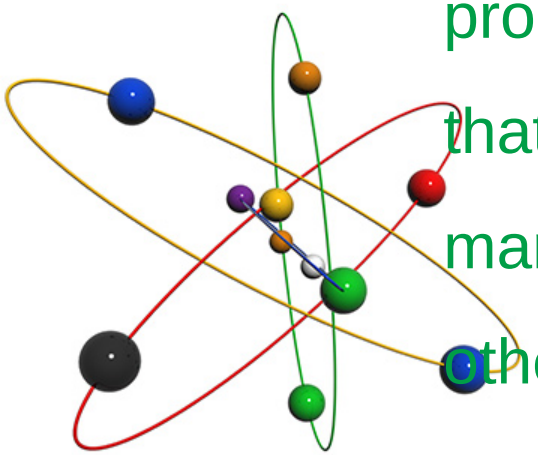
The Characteristics of Life

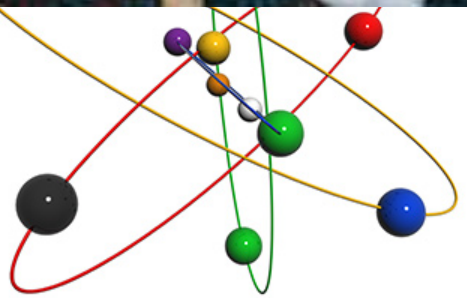
I. Living Things Acquire Materials and Energy

- Humans, like all living organisms, cannot maintain their organization
- or carry on life's activities without an outside source of materials and energy.
- Food provides nutrient molecules, which are used as building blocks for energy.



- The term **metabolism** describes all of the chemical reactions that occur within a cell. The ultimate source of energy for the majority of life on Earth is the sun. Plants, algae, and some bacteria are able to harvest the energy of the sun and convert it to chemical energy by a process called **photosynthesis.** Photosynthesis produces organic molecules, such as sugars, that serve as the basis of the food chain for many other organisms, including humans and all other animals.

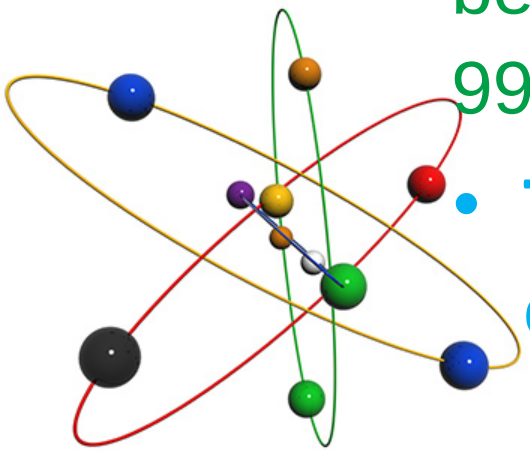




Any Question?

II. STABILITY AND HOMEOSTASIS

The ability of a cell or an organism to maintain an internal environment that operates under specific conditions is called **homeostasis.** In humans, many of our organ systems work to maintain homeostasis. For example, human body temperature normally fluctuates slightly between 36.5 and 37.5°C (97.7 and 99.5°F) during the day.

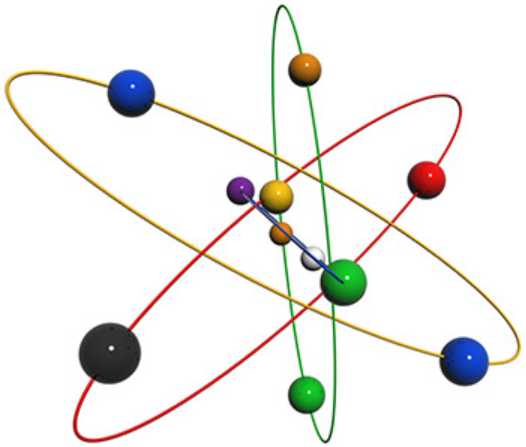


- **Temperature, water content,chemical content, etc. must be maintained**

III. REPRODUCTION AND INHERITANCE

- All organisms produce new organisms like themselves REPRODUCE

- Organisms transmit hereditary information to their offspring INHERITANCE



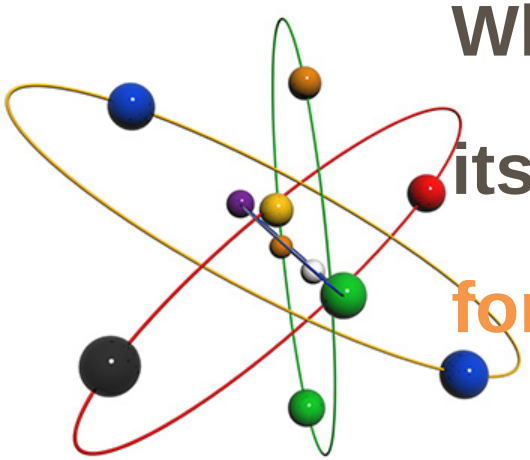
IV. Growth

Grow occurs as the result of **cell division and cell enlargement**

Cell division is the formation of two cells from a **preexisting cell**

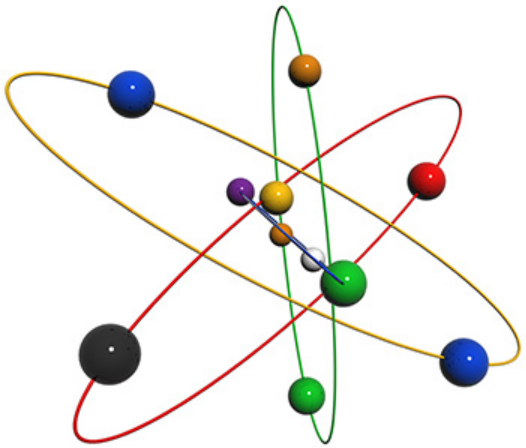
New cells enlarge as they mature

When a cell grows to a size where its **surface area isn't big enough** for its volume, the cell **divides.**



V. Responsiveness

Respond to stimuli in the external environment Detect and respond to changes in light, heat, sound and chemical and mechanical contact.

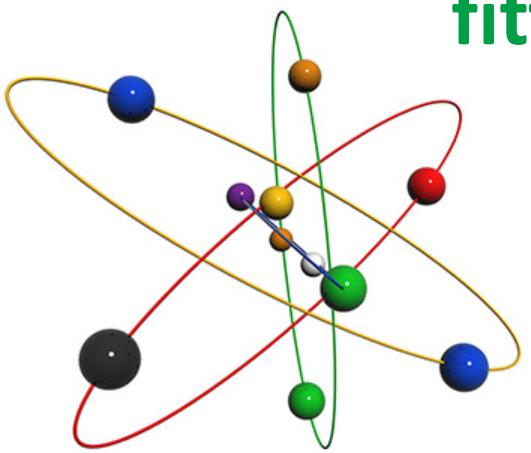


VI. EVOLVE

Ability to adapt to their environment through the process of evolution

Favorable characteristics are selected for and passed on to offspring

Called adaptations Driven by natural selection or “survival of the fittest”



Humans Are Related to Other Animals

- Biologists classify living things as belonging to one of three **domains**

✓**Bacteria**

✓**Archea**

✓**Eukarya**

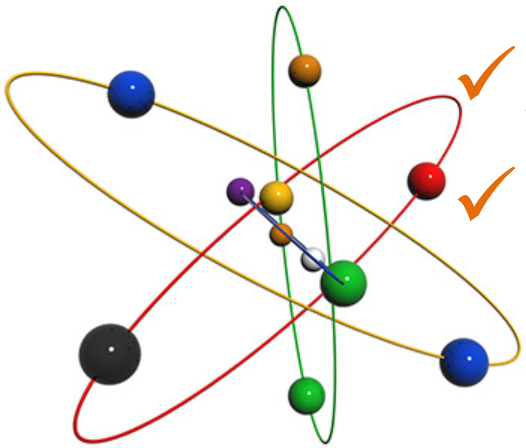
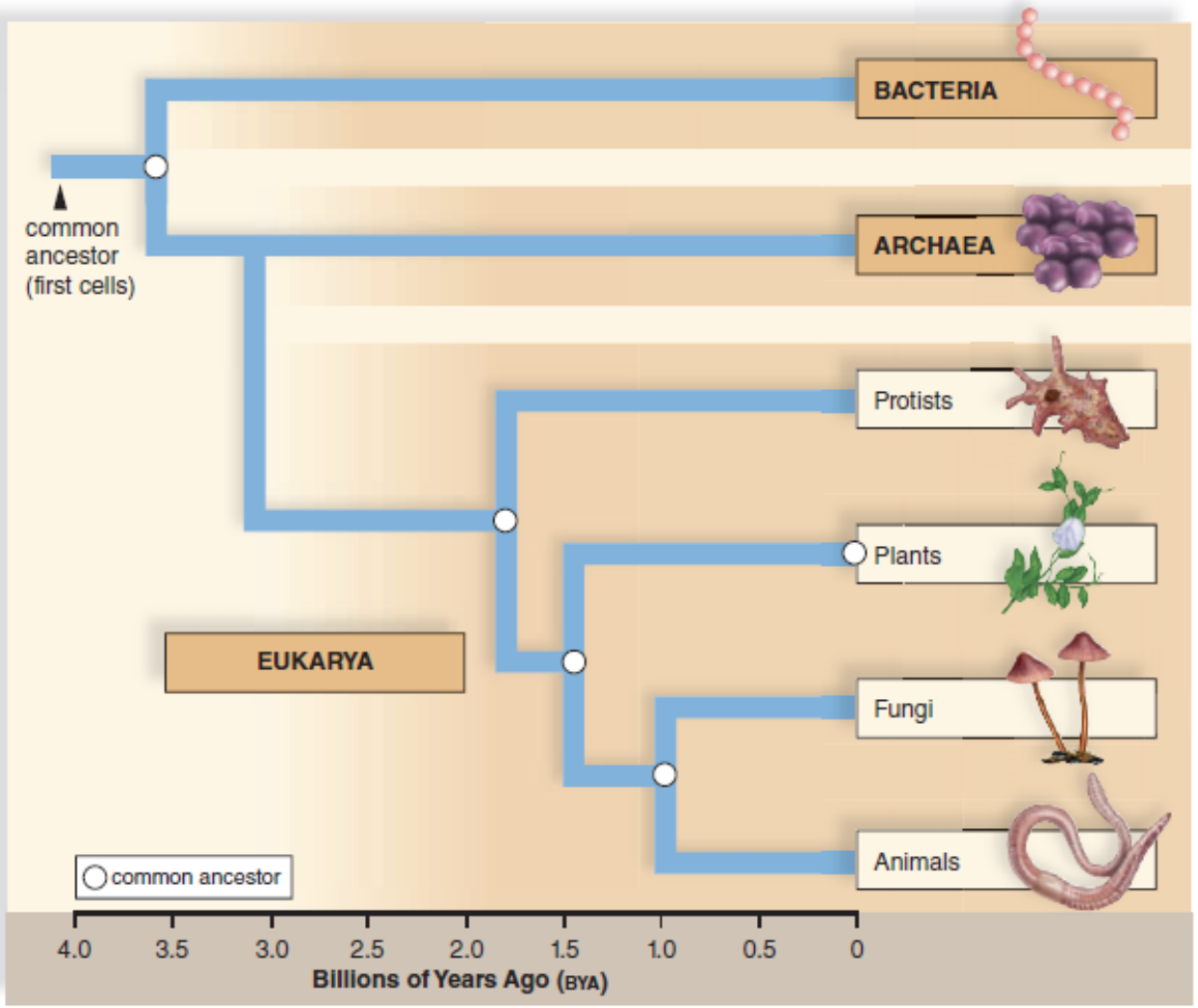
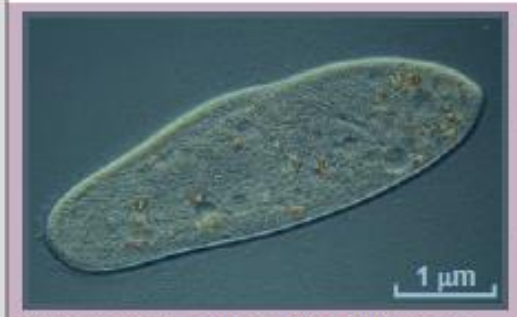


Figure 1.5 The evolutionary relationships of the three domains of life.

Living organisms are classified into three domains: Bacteria, Archaea, and Eukarya. A geologic time scale is provided on the bottom for reference.



Domain Eukarya; Kingdom Protists



Paramecium, a unicellular protozoan

- Algae, protozoans, slime molds, and water molds
- Complex single cell (sometimes filaments, colonies, or even multicellular)
- Absorb, photosynthesize, or ingest food

Domain Eukarya; Kingdom Animals

Vulpes, a red fox

- Sponges, worms, insects, fishes, frogs, turtles, birds, and mammals
- Multicellular with specialized tissues containing complex cells
- Ingest food

Domain Eukarya; Kingdom Fungi

Coprinus, a shaggy mane mushroom

- Molds, mushrooms, yeasts, and ringworms
- Mostly multicellular filaments with specialized, complex cells
- Absorb food

Domain Archaea

Methanosarcina mazei, an archaeon

- Prokaryotic cells of various shapes
- Adaptations to extreme environments
- Absorb or chemosynthesize food
- Unique chemical characteristics

Domain Eukarya; Kingdom Plants

Passiflora, passion flower, a flowering plant

- Certain algae, mosses, ferns, conifers, and flowering plants
- Multicellular, usually with specialized tissues, containing complex cells
- Photosynthesize food

Domain Bacteria

E.coli, a bacterium

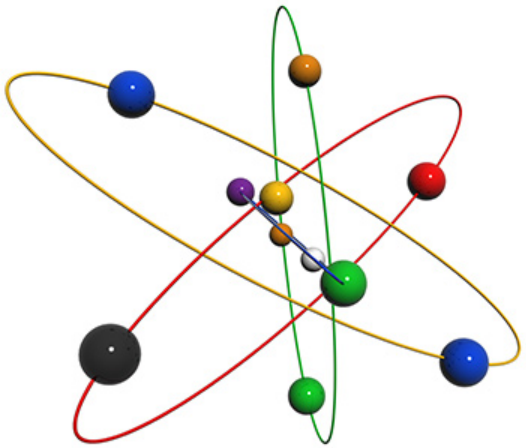
- Prokaryotic cells of various shapes
- Adaptations to all environments
- Absorb, photosynthesize, or chemosynthesize food
- Unique chemical characteristics

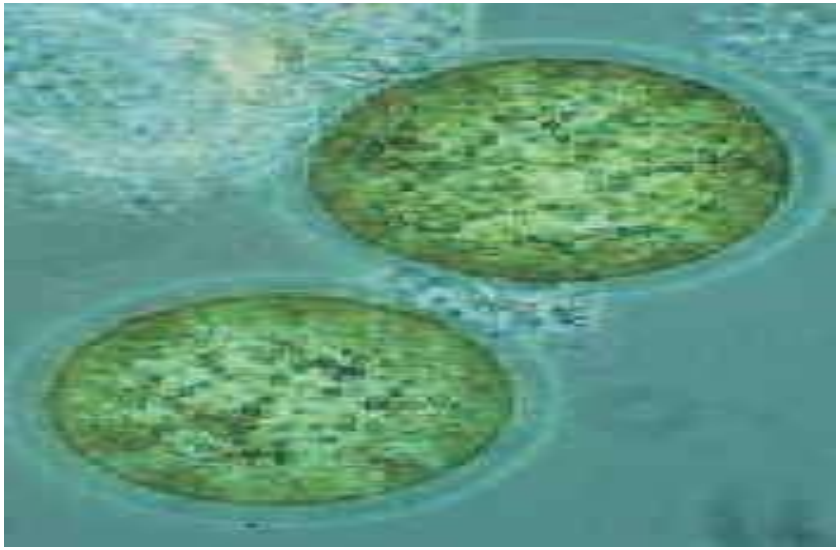
Figure 1.6 The classification of life.

This figure provides some of the characteristics of the organisms of each of the major domains and kingdoms of life. Humans belong to the domain Eukarya and kingdom Animalia.

CELLS

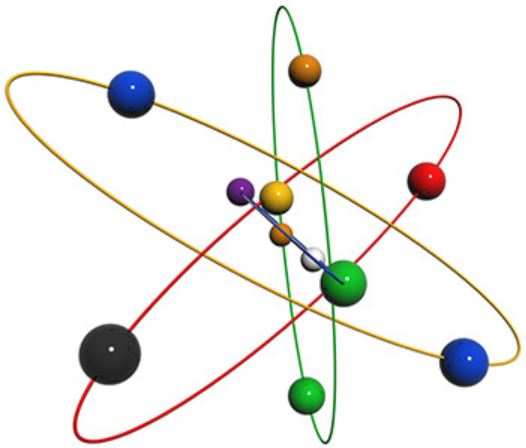
- Cell basic unit of life.
- All organisms are made of and developed from cells.
- Some composed of only a single cell (unicellular).

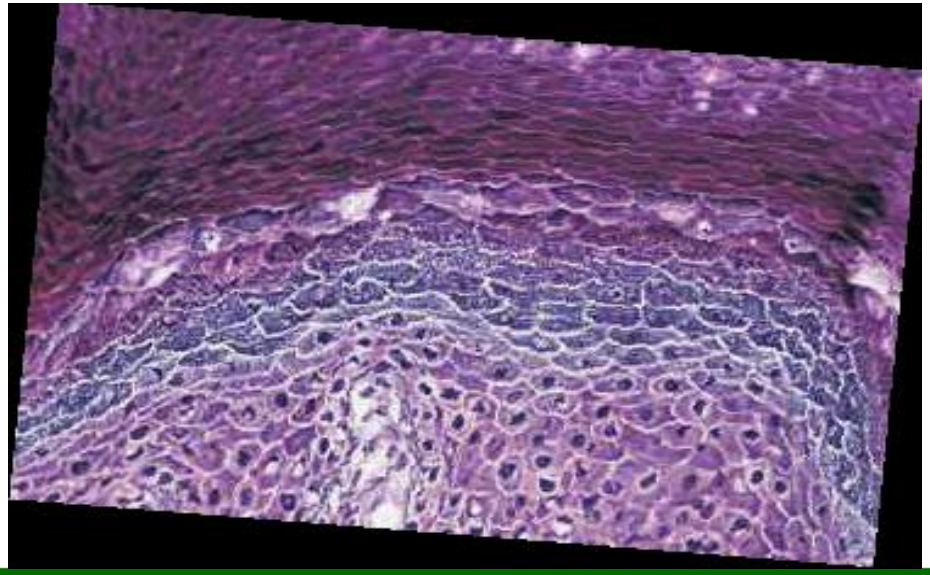




- Most organisms are composed of many cells (multicellular).

- Cells are different (undergo **differentiation**).





How many cells are in your body?

The number of cells in a human body varies depending on the size of the person and whether cells have been damaged or lost. However, most estimates suggest that there are well over 100 trillion cells in a human body.