

The Characteristic of Life

Organisms have characteristics that make them different from the nonliving world.

The basic characteristic of living things involves:

1- Cellular structure

1. All living things being are made up of small unit called a cell.
2. Each cell is the structural and functional unit of the body containing protoplasm which performs all the functions of the body.
3. The protoplasm is composed of cytoplasm and nucleus.

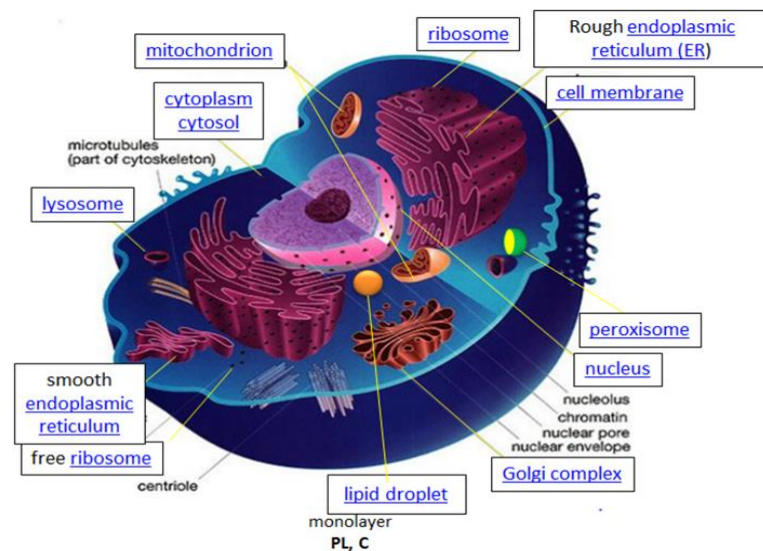
4. Chemically, the protoplasm is consist of:

A- **Organic compounds:** involved **large molecules** like proteins, lipids, polysaccharides, and **small molecules** of amino acids.

B- **Inorganic compounds:** include water (90%), mineral salts and nucleic acids and gases (O₂ and CO₂).

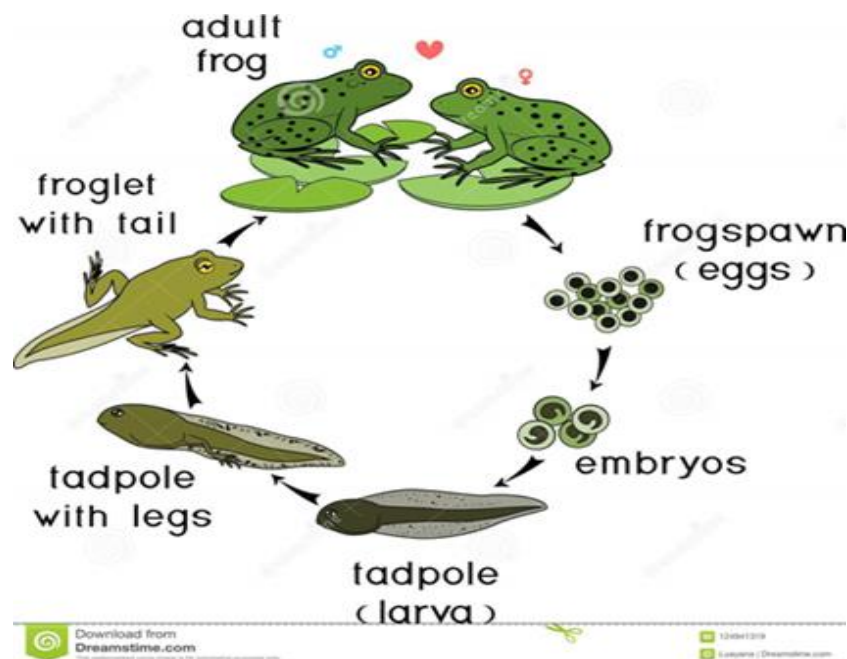
5. Animal's cells lack walls and store carbohydrate reserves as glycogen in most animals.

- The protoplasm is surrounded by a plasma membrane in both animal and plant cells
- Protoplasm is called the **physical basis of life**.



2- Growth and development

- **Growth** is defined as the permanent increase in size and dry mass by an increase in cell number, cell size, or both.
- **Development** is defined as the process by which the first cell of a new individual becomes a multi-celled adult. For example: tadpoles change as they grow and develop into adult frogs.



Frog development stages

3- Movement

- Is an action by using an organism or part of an organism which causing a change of position or place .
- Due to the energy released within organisms bodies, living things are able to move.
- The movement of entire body of an organism from one place to another is called **locomotion**.
- Animals have a different locomotory organ which helps to move. **For example:** Amoeba moves by pseudopodium, paramecium by cilia, insects by wings and man by legs .

- Some organisms move in a very obvious way, such as a running animal, other living things move in a way that is more difficult to detect.

4- Reproduction

Reproduction is the process of producing new organisms of the same type. It is the passing on of genetic information to a new generation.

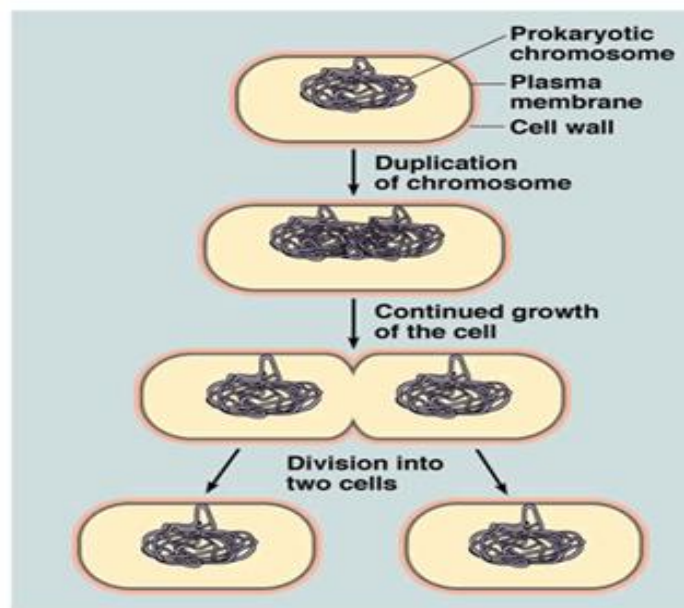
Living things have the ability to produce young one.

This process is essential to increase the number of its own kind and for continuation of race of the organism.

There are two types of reproduction:

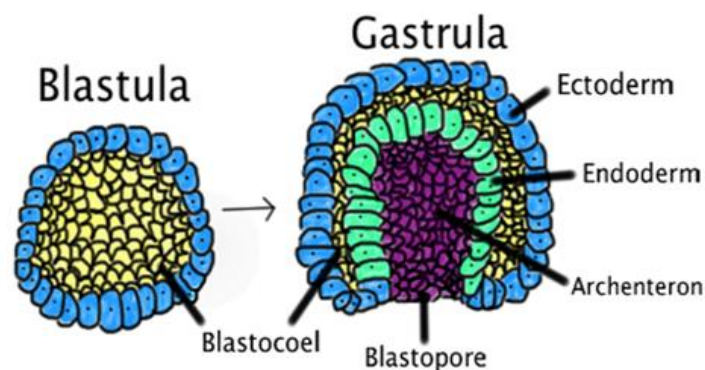
a- Asexual reproduction:

- Is the formation of new individuals from the cell of a single parent without fusion of male and female gametes.
- Asexual reproduction makes an identical copy of the DNA, which carries genetic instructions that help create a new living form.
- Invertebrates have asexual reproduction.
- This means does not involve meiosis and fertilization.
- Involves several types such as fission, budding, fragmentation-----ect.



b- Sexual reproduction

- Is the process to create a new organism by the fusion of female gamete (ovum) and male gamete (spermatozoon), which form a zygote that is develops into a new individual.
- The DNA from two separate organisms combines to form a unique new individual.
- Fertilization of an egg by a flagellated sperm initiates cleavage in the zygote and the formation of a hollow ball of cells called the blastula. The next stage in development is in folding of the blastula– ball called a gastrula (see below).



5- Respirations

All living things (plants and animals) perform respiration .

- In this process oxygen is taken in to oxidize the foods in order to release energy.
- Carbon dioxide and oxygen are released as by product.
- Various respiratory organs are found in living organisms such as tracheal tubes in insect, gills in fish, and lungs in frog, birds and mammals.

6- Metabolism: The total of all chemical reactions in an organism.

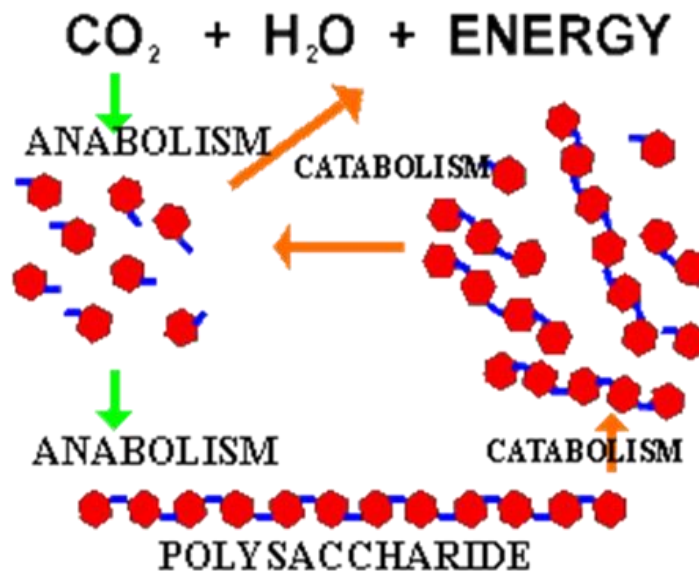
Metabolism is divided in two parts:

a- Anabolism

Is a constructive process that an organism converts simple compounds into complex substances, with the storage of energy such as photosynthesis. In this process, glucose is synthesized.

b- Catabolism

The process of breaking down complex substances into simpler substances to release energy, one of such processes is glucose which is broken down into water, carbon dioxide and energy.

**7-Excretion**

Means discharge of toxic materials and metabolic waste as well as excess substance from the body of an organism.

Due to metabolic processes inside the body of living things, many excretory products like CO_2 , H_2O , inorganic salts, urea, uric acid, etc. are formed.

- As these substances are very toxic, so, they are immediately required to remove from the body .
- The waste products in unicellular organisms are removed through the general body surface by diffusion.

- Special excretory organs are found in more complex organisms such as :
 - a. Nephridia in annelids
 - b. Malpighian tubules in insects
 - c. Kidney in vertebrates

8- Adaptation and Evolution

Living things respond and adapt to their environment. Adaptation refers to structural, physiological, and behavioral traits which enhance an organism's chance of survival and reproduction in its environment.

It is any modification that makes an organism more suited to its way of life. Organisms, become modified over time

- Adaptation indicates to fitness and survival of individual
- Evolution is a genetic change in a population over generations
- All living things adapt to their environment through evolution.

9- Irritability

- Is the ability of an organism to respond to the stimuli
- Any change in the environment is called the stimulus .
- The reaction to stimulus is called response
- Animals have sense organs like nerves and muscle which used to monitor and respond to changes in their environment .
- For example: contraction and expansion of the pupil due to change in the intensity of light.

10- Homeostasis

- Is defined as the ability of an organism to keep a stable internal environment even when the external environment changes.
- The environment outside of an organism frequently changes, but mechanisms regulate the organism's internal environment, keeping it within limits that sustain life .