



INTRODUCTION TO BIOLOGY

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Biology

First Semester

Week 2

Date 1/6/2025



Outline

- Define biology
- Characteristics of living organisms
- Level of organization of organism
- **Levels of organization beyond organism:**

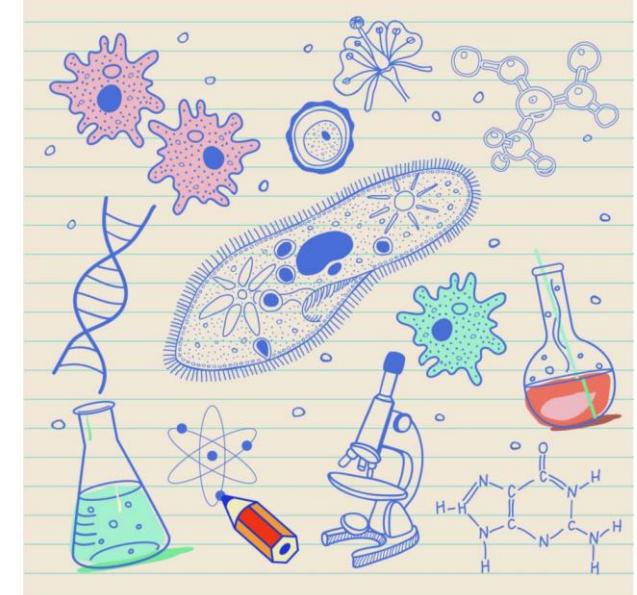
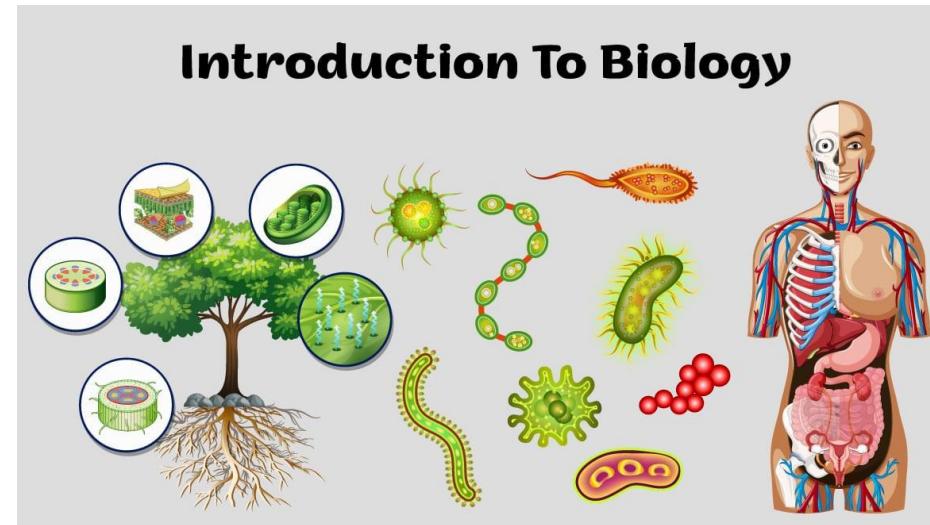


Objectives

- Introducing the characteristics of living organism
- Understanding different levels of organization of organisms
- Defining different fields of Biology

What is biology?

- Biology (Greek or Latin origin)
 - Bios = life
 - Logos = study of
- **Biology** is the branch of science which deals with the study of living organisms.
- The study of living organisms, divided into many specialized fields that cover their morphology, physiology, anatomy, behavior, origin, interaction with environment and distribution.

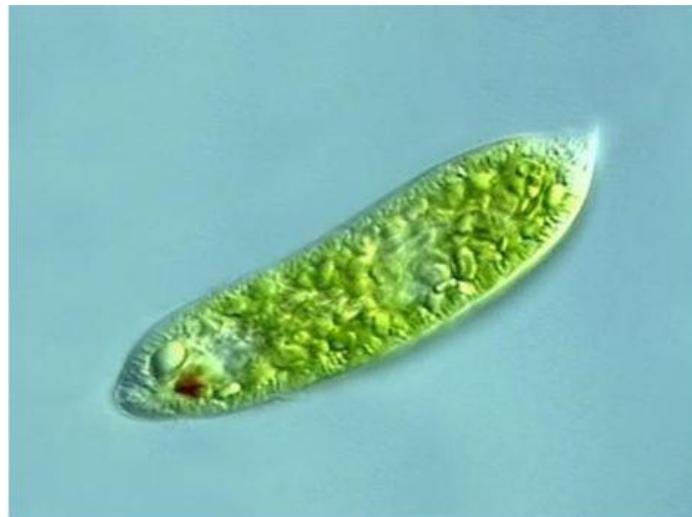


Characteristics of Life

1. Cellular composition
2. Growth
3. Movement
4. Reproduction
5. Adaptation
6. Metabolism
7. Specific organization
8. Homeostasis
9. Responsiveness

1-Cellular Composition

- Made up of at least one cell
- Unicellular - made of one cell (bacteria, amoeba, paramecium)
- Multicellular - made up of two or more cells (plants, fungi, animals)



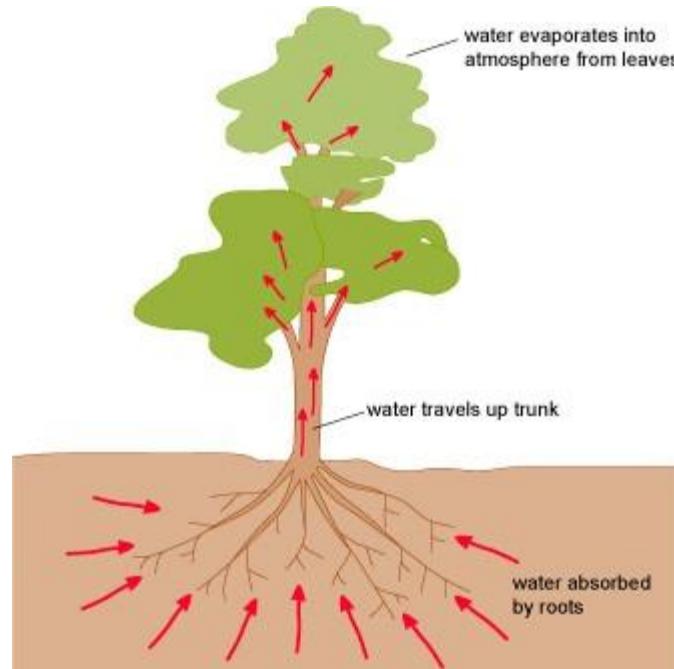
2-Growth and development

- **Growth** in means increase in the mass of an organism.
- Increase in cell size (unicellular) and/or an increase in cell number (multicellular)



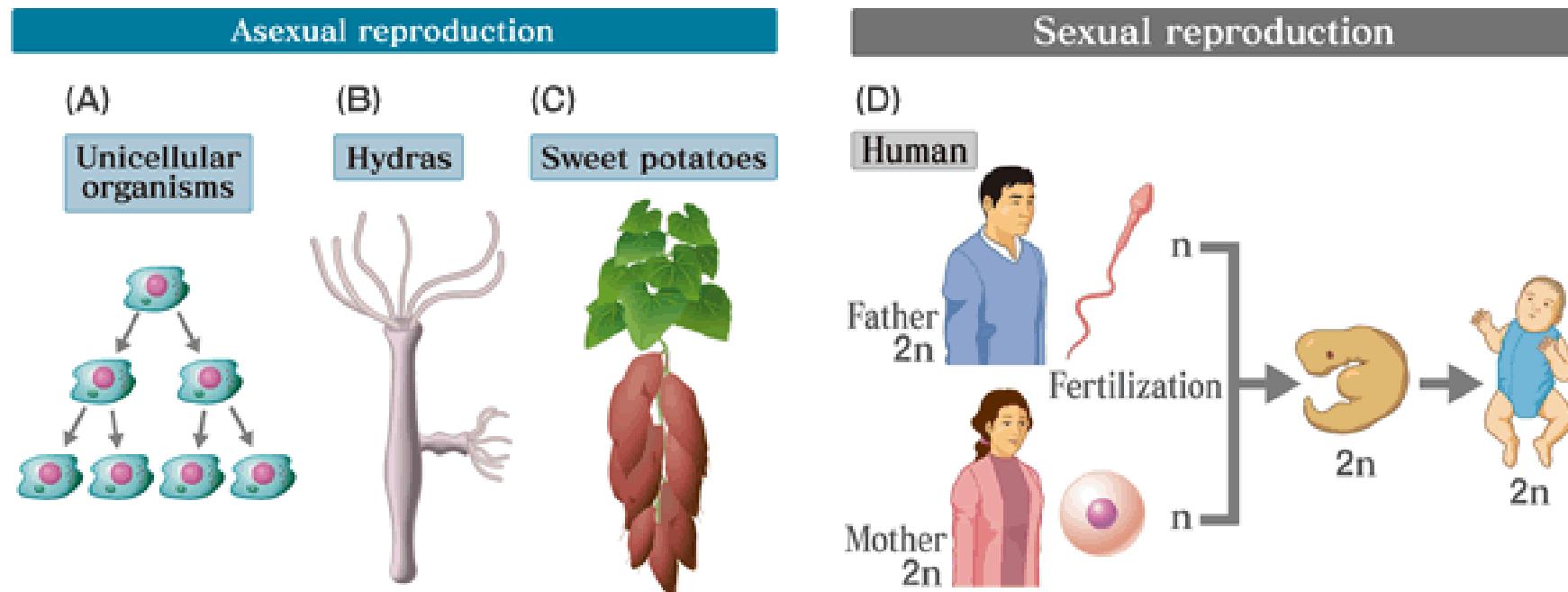
3- Movement:

- Internal movement: Characteristic of all life.
- Locomotion: Self-propelled movement from point A to point B. Not observed in all life forms



4- Reproduction

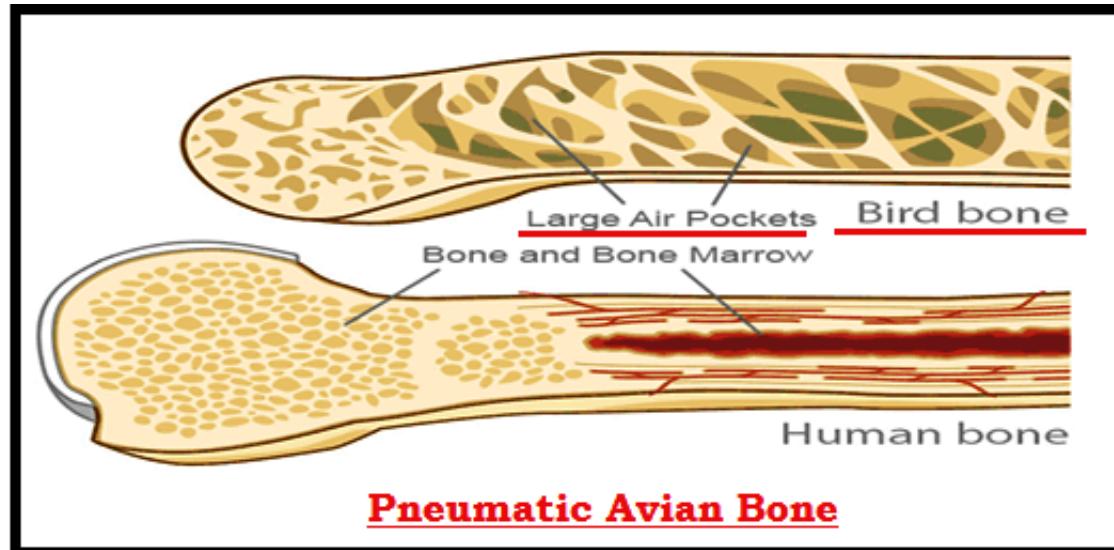
- **Asexual**- cell division (mitosis)—one cell becomes two Ex: bacteria
- **Sexual**- union of sex cells (sperm and egg) Ex: plants and animals



5- Adaptation

Adaptation refers to the process of adjusting in behavior, physiology, or structure of organisms to become more suited to an environment. in order to improve their chances at survival in that environment.

e.g. The light bones of flying birds and mammals, and the long daggerlike canine teeth of carnivores.

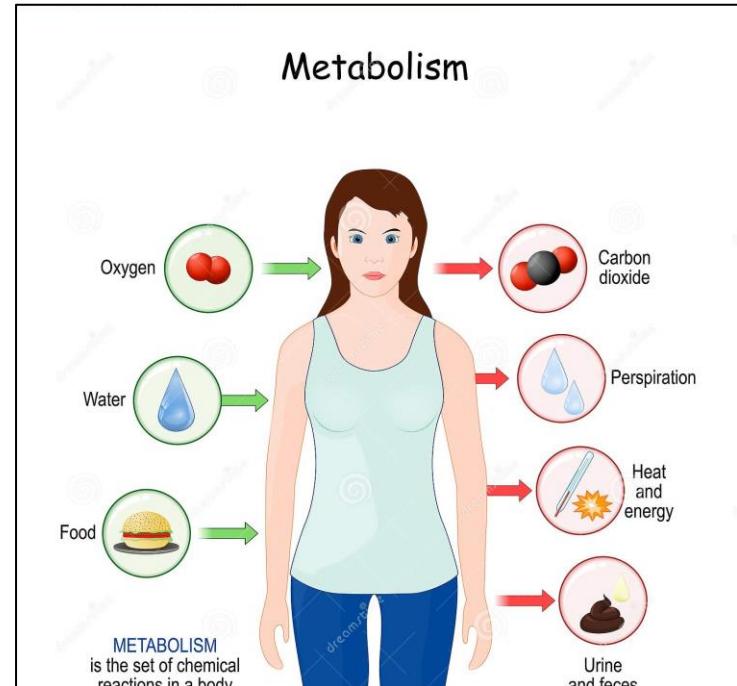




6- Energy use and metabolism:

- All organisms must take in and transform energy to do work, to live.
- Living things get their energy from food
- Most plants and some unicellular organisms use light energy from the Sun to make their own food and fuel their activities.
- Organisms that cannot make their own food get energy by consuming other organisms.

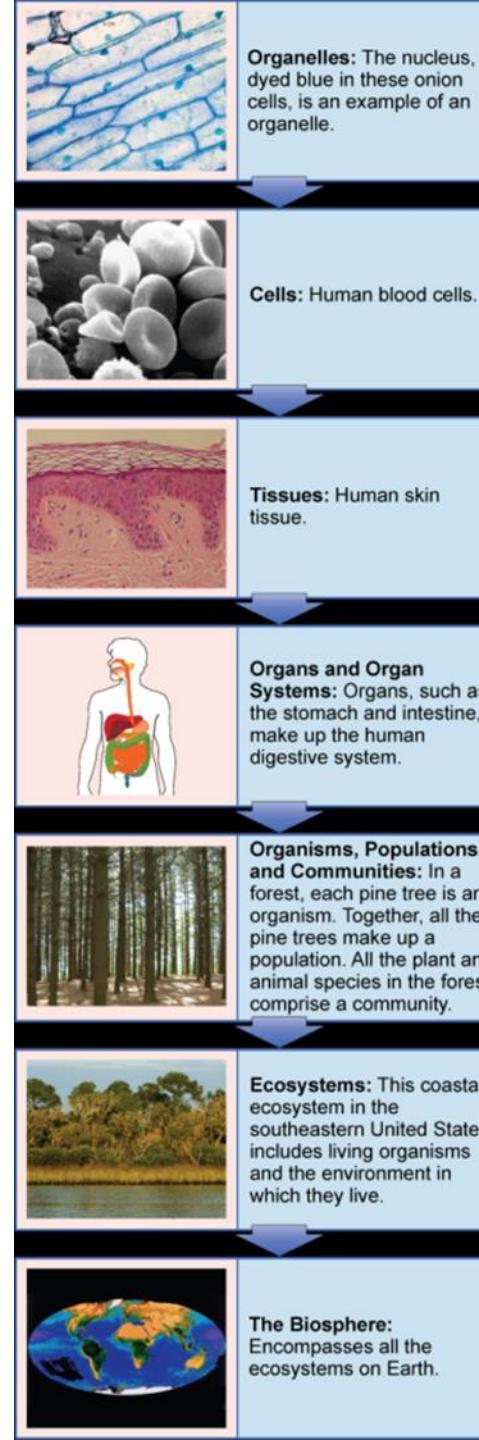
Metabolism: All chemical reactions and energy transformations, essential for growth, maintenance, and reproduction.



7- Specific organization

All living things are both complex and highly ordered. Your body is composed of many different kinds of cells, each containing many complex molecular structures.

Many nonliving things may also be complex, but they do not exhibit this degree of ordered complexity



8- Regulation (Homeostasis)

- **External environment may change, but internal environment remains fairly constant.** All organisms maintain relatively constant internal conditions that are different from their environment, a process called **homeostasis**



9- Responsiveness

- Reaction(s) to various **stimuli**

Examples of stimuli: light, heat, pH, vibration, smell.

Some Branches of Biology



Branch	Studies
Paleontology	history of life using fossils
Molecular biology and Biochemistry	biological processes at the molecular and chemical level.
Microbiology	structure and function of single-celled organisms.
Neurobiology	the nervous system
Zoology	animals
Botany	plants
Genetics	heredity and genes
Ecology	how organisms interact with other organisms and with their environment
Biotechnology	how to use biological processes, for example manipulating micro-organisms to produce medicines
Forensic Biology	applications of biology to law
Physiology	functions of organisms and their parts
And many more!	

Levels of Organization of living things

- The organization of the biological world is hierarchical—that is, each level builds on the level below it.
- **Levels of biological organization:**
 1. Atoms
 2. Molecules
 3. Subcellular organelles
 4. Cells

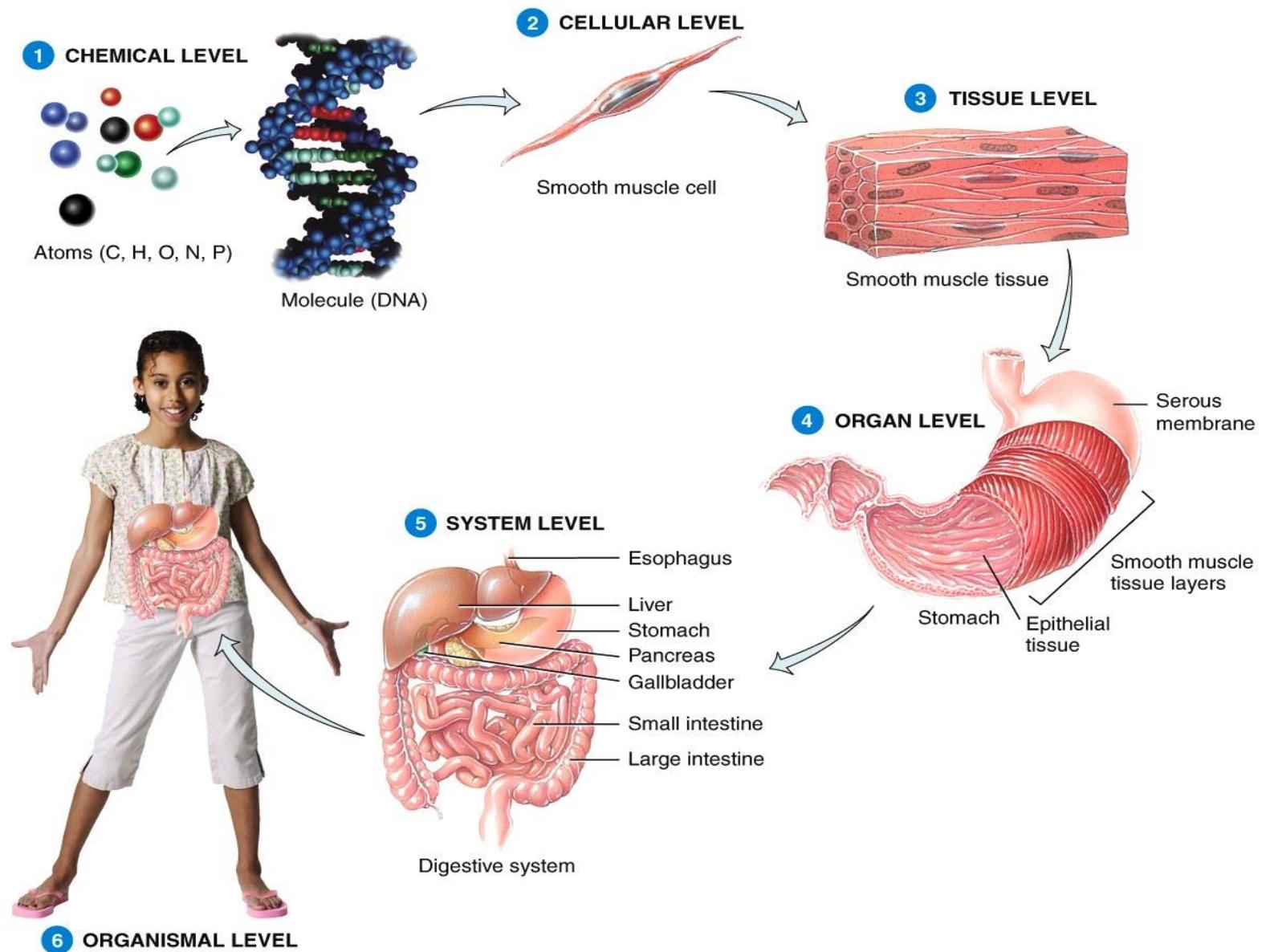
4. Tissues*

5. Organs*

6. Organ systems*

7. Organism: May consist of a single cell or a complex multicellular organism.

*** Level of organization not found in all organisms**



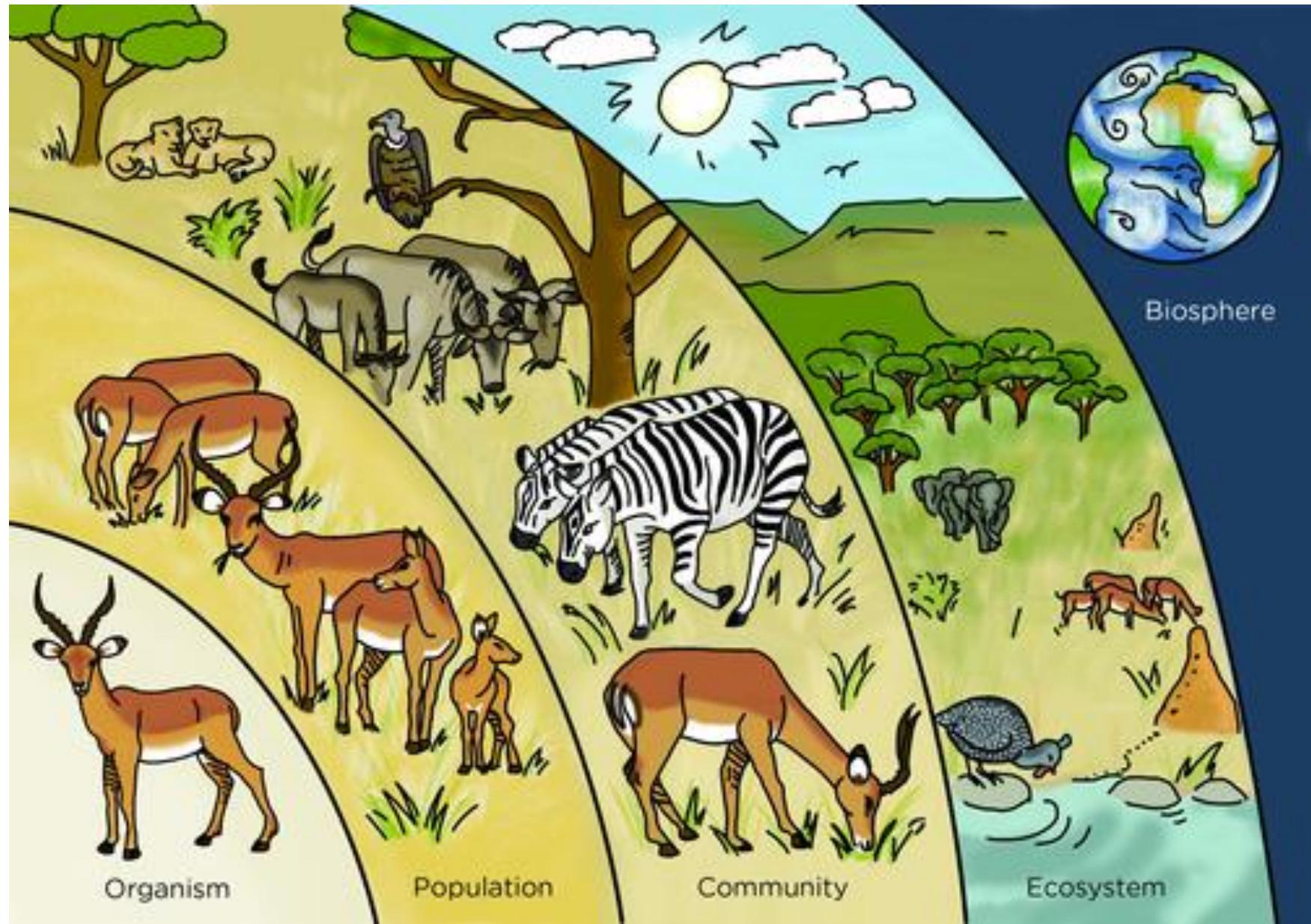
8. **The Population level**: refers to a group of individuals of the same species that live in a specific geographic area and are capable of interbreeding.

All populations of a particular kind of organism together form a species, its members similar in appearance and able to interbreed.

e.g. Humans, regardless of differences in skin color, hair type, or other features, belong to the same species. Humans can interbreed and produce fertile offspring, which is a key criterion for being classified as members of the same species.

A **species** is fundamental concept to the field of biology and is defined as a group of organisms that are capable of interbreeding and producing fertile offspring in nature.

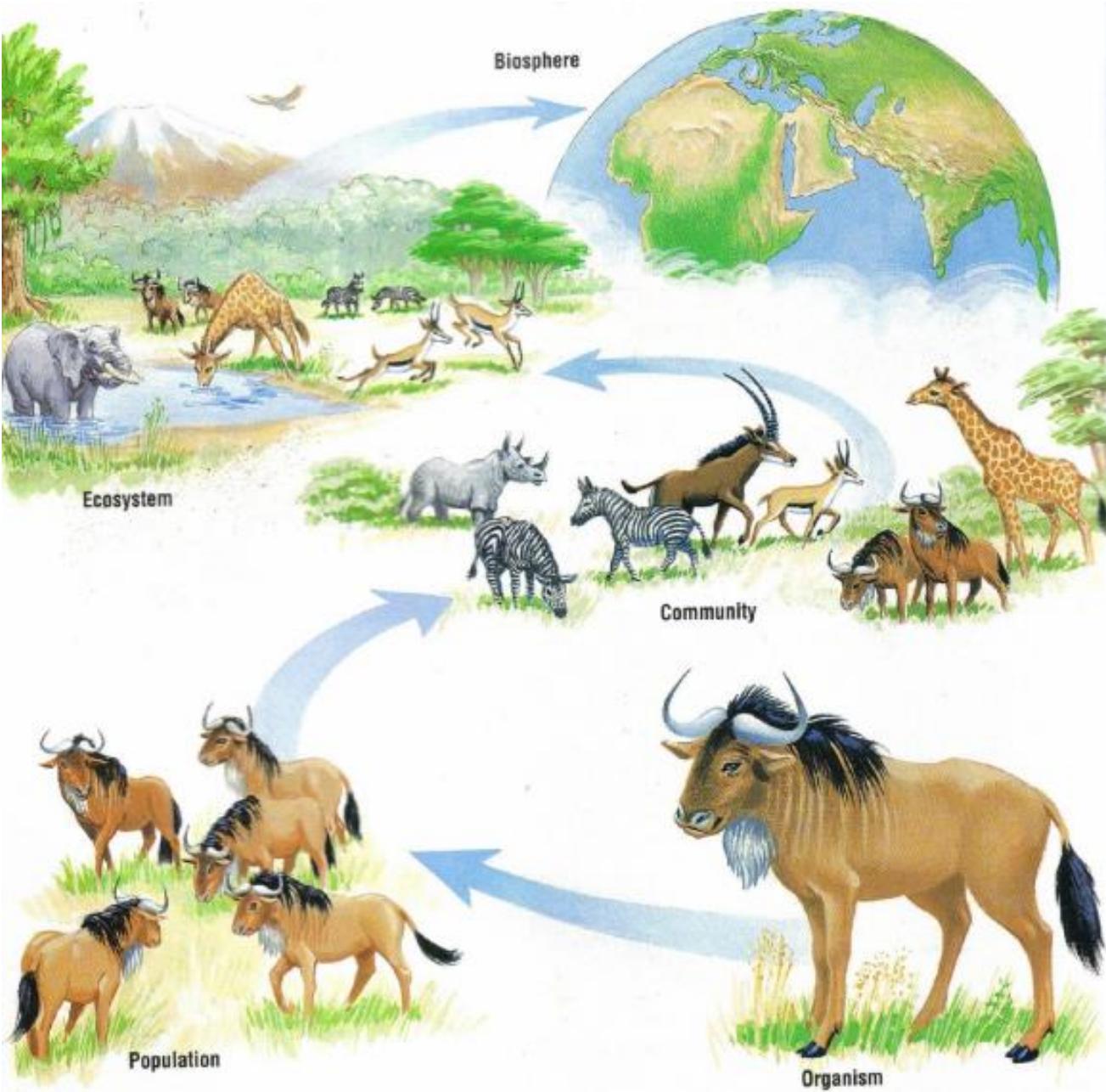
9. **The Community** : Several different populations living together in same area (e.g.: lake, forest, jungle).



10. The ecosystem level : Interactions of community with non-living environment (air, water, soil).

An ecosystem is a biological community of interacting organisms (including plants, animals, and microorganisms) and their physical environment. This concept encompasses both living organisms and their non-living surroundings

11. Biosphere(Ecosphere): All ecosystems on planet earth: It is made up of the parts of earth where life exists and it include **lithosphere, atmosphere and hydrosphere.**



References

- Urry, L. A., Cain, M. L. 1., Wasserman, S. A., Minorsky, P. V., Reece, J. B., & Campbell, N. A. (2017). *Campbell biology*. Eleventh edition. New York, NY, Pearson Education, Inc.
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