

BASIC BIOLOGY 1 MODULE

STUDY OF LIFE (BIOLOGY)



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How to learn from this module

Before getting started, I have here some tips for you to successfully achieve the

objectives of this self-learning kit.

1. Read and follow instructions carefully.
2. Take note and record points for clarifications.
3. Work diligently and honestly.

CHAPTER 1. STUDY OF LIFE (BIOLOGY)



What you are expected to learn

Student able to explain characteristics of biology as science



What you learn about

Science is a process of **inquiry**, asking questions, the answers to which produce a body of knowledge, which is subject to **change** and **revision**. The goal of science is to investigate and understand the natural world, to explain events in the natural world and to use those explanations to make useful predictions. Science only deals with the **natural world**. Biology is a field in science that focuses on the study of life. An understanding of science and the scientific approach is essential to making intelligent decisions. So what is **Biology** ?

Biology comes from *bios* - life and *logos* - word (study of). So it is the scientific study of *life*. Then what is life? What are the characteristics of life?

Living things share the following characteristics:

1. . Living things are made up of units called cells

All living things show an orderly structure, known as **organization**. Although living things are very diverse, they are all unified in having cellular organization. A cell is a collection of living matter enclosed by a barrier (**cell membrane**) that separates the cell from its surroundings. The cell is the **lowest level** of structure capable of performing all of the activities of life.

Cells are complex and highly organized despite their small size. *Unicellular organisms* are living things that consist of only a single cell. *Multicellular organisms* contain hundreds, thousands or even trillions of cells with a variety of shapes and sizes. Each type of cell is specialized to perform a different function.

2. Organism Grow and Develop



Figure 1. Germination

Biological growth involves an increase in the size of individual cells of organism, in the number of cells, or in both. Growth may be uniform in the various parts of organism, or it may be greater in some parts than in others, causing the body proportion to change as growth occurs.

Living organisms develop as well as grow. Development includes all the changes that take place during an organism's life. Just like many other organisms, every human begins life as fertilized egg that then grows and develops.

3. Organism regulate their metabolic processes

Within all organisms, chemical reactions and energy transformations occur that are essential to nutrition, the growth and repair of cells, and conversion of energy into usable forms. The sum of all the chemical activities of organism is its metabolism.

4. Organisms respond to stimuli

Organisms live in a constant interface with their surroundings, or environment, which includes other living organisms (biotic factors) as well as non-living factors (abiotic factors) like air, water, temperature and weather. Anything in an organism's external or internal environment that causes to react is a stimulus. A reaction to a stimulus is a response. External stimuli, which come from the environment outside an organism, include light and temperature. Internal stimuli come from within an organism. For example, trees that drop their leaves in the fall conserve water and avoid freezing during the winter.

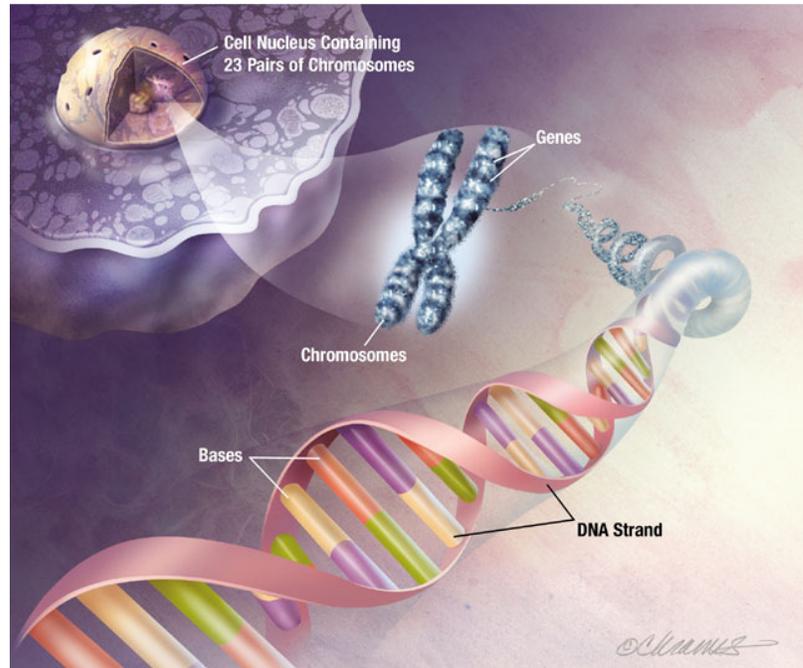
5. Living things reproduce

All organisms produce new organisms (offspring) through a process called reproduction. Reproduction is essential for the continuation of an organism's species (group of organisms that can interbreed and produce fertile offspring in nature). There are two types of reproduction:

a. Sexual reproduction: two cells from different parents unite to produce

the first cell of the new organism. Offspring differ from their parents in some ways.

- b. Asexual reproduction: new organism has a single parent. Offspring and parents have the same traits.
6. Living things are based on a universal genetic code.



Figur Figure 2. Chromosome and DNA Strand

The directions for inheritance are carried by a molecule called deoxyribonucleic acid (DNA). Every organism, with a few minor variations, interprets the genetic code of DNA in the same way.

7. Organisms maintain a stable internal environment

Even though conditions in the external environment may vary widely, the internal conditions of most organisms stay fairly constant. The process by which they do this is called **homeostasis**. A breakdown in homeostasis

can result in disease or even death. Homeostasis often involves internal feedback mechanisms, which respond to internal stimuli. A thermostat in your home maintains a constant temperature in your home

Biology as science has certain objects to study, the levels of which the objects are studied, and the themes by which the particular problem of objects are studied. The themes and the classification of the objects may subjects to change, but the structure of biological knowledge still good to understand biology comprehensively.

BSCS constructs a simple structure of biology, a building block, with objects, levels of organization, and themes. Biology as science has certain objects to study, the levels of which the objects are studied, and the themes by which the particular problem of objects are studied. The themes and the classification of the objects may subjects to change, but the structure of biological knowledge still good to understand biology comprehensively.

Living organism is the object of biology to study. In the previous structure, there are three kinds of object to study in biology, those are plants, animals, and protists. The objects may change if we use 5 kingdoms in classifying organism: 1) Prokaryotes and viruses, 2) Protists, 3) Fungi, 4) Plants, and 5) Animals.

Besides the object, there are also themes of biology. In the previous edition there are 9 themes in biology: 1) science as inquiry, 2) history of biological concepts, 3) evolution, 4) diversity and unity, 5) genetic continuity

of life, 6) organization and environment, 7) behavior, 8) structure and function, and 9) regulation (Figure 1). Themes also depict the problems to study in biology by which the contents of biology are organized and studied.

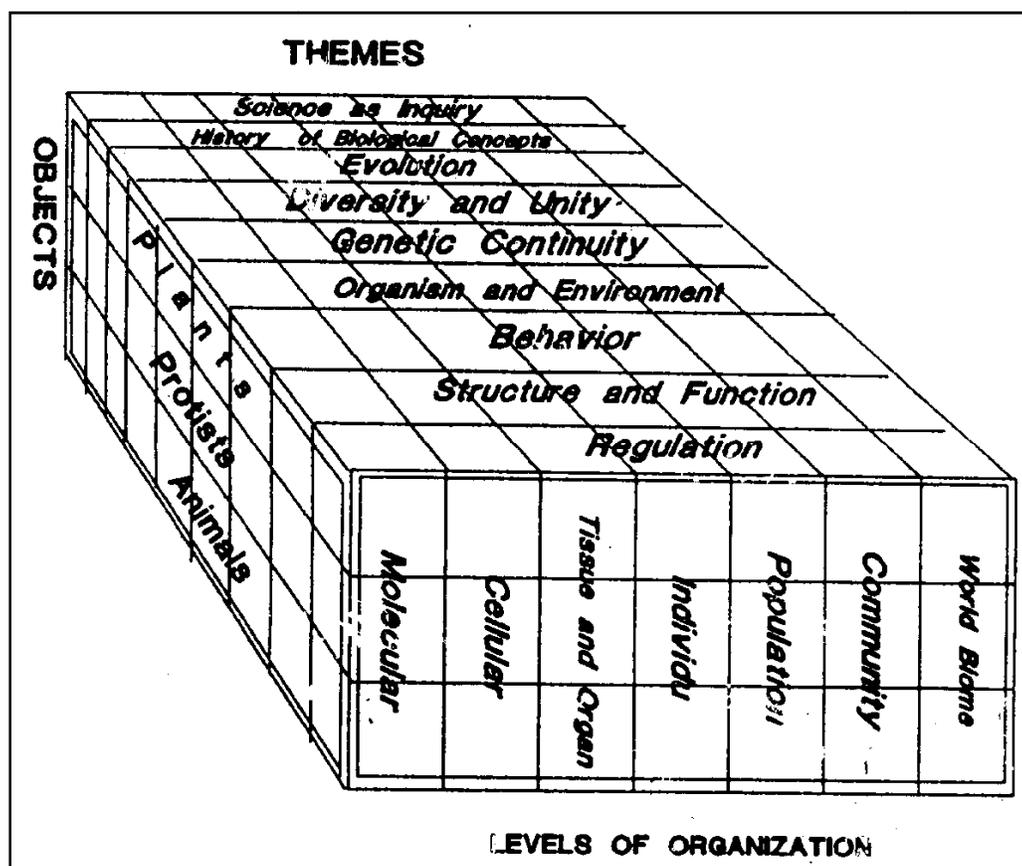


Figure 1. The structure of biological science according to BSCS.

Table 1. Comparison of Themes in BSCS, new and old versions

No.	Old Themes	New Themes
1	Evolution	Evolution: patterns and products of change
2	Organism and Environment	Interaction and interdependence
3	Genetic continuity	Genetic continuity
4	Regulation	Maintenance of a dynamic equilibrium
5	Diversity and Unity	Growth, development, and differentiation
6	Structure and function	Energy, matter, and organization
7	Science as inquiry	Science, technology and society

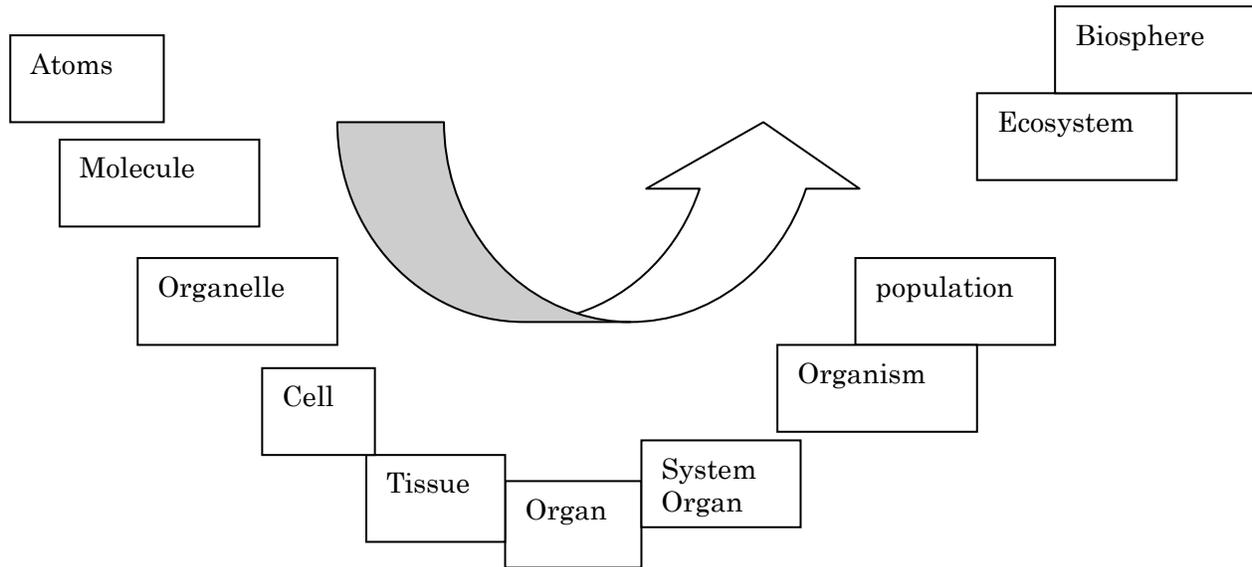
8	History of biological concepts	
9	Behavior	

Table 1 shows that several themes are alike, and several others are different. Themes 1 to 4 are similar. Evolution, Interaction between organism and environment, Genetic continuity, and Regulation are similar. Although the four themes are similar, however, indeed the issues addressed and the concepts presented in that themes are different.

Themes 5 to 9 are very different from the new ones. Theme of diversity and unity is different from theme of growth, development, and differentiation. Diversity and unity theme focuses on the variety of the characteristics of living organism. In addition, themes of growth, development, and differentiation emphasize on the life-cycle process.

The other old themes such as history of biological concepts and behavior are not included in the new version. There are new emerging themes, however, such as energy, matter, and organization. This new theme probably comes from physic; but it is very essential to understand biological phenomena. Therefore it is important to be included in the new version. The theme of Science as inquiry is changed into Science, Technology, and Society (STS). This change is much better because biology is not separate from society along with the societal needs and the advancement of technology.

The Hierarchy of biological organization (Solomon, 2006: 6)



Organisms have several levels of organization. The chemical level, the most basic level of organization, includes atoms and molecules. An atom is the smallest unit of chemical element that retains the characteristic properties of that element. Atoms join to form molecules of varying size, including very large macromolecules such as proteins and DNA. Atoms and molecules form organelles such as the cell's nucleus or mitochondria. Many organelle work together to perform the various functions of the cell. Cells associate to form tissues. Tissues form organs, that in turn comprise organ systems. The skeletal system and other organ systems work together to make up the functioning organism. A population consists of organism the same species. The populations of diffeent species that inhabit a particular area make up a community, which together with the non living environment form an ecosystem. Earth and all its communities constitute the biosphere.