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Note: 3

Biology and Technology

* **BIOLOGY**: is a branch of natural science which studies about living things.

Biology has various sub-branches of study. Among these, some of them include:-

~ **Zoology**:- is the branch of biology which studies about animals.

~ **Botany**:- is the branch of biology which studies about plants.

~ **Taxonomy**:- is the study of classification and diversity of organisms.

~ **Anatomy**:- is the study of internal structure of an organism's body.

~ **Physiology**:- is the study of functioning of internal structure of living things.

~ **Ornithology**:- is the study of birds.

~ **Microbiology**:- is the study microorganisms.

~ **Parasitology**:- is the study of parasites.

~ **Entomology**:- is the study of insects.

~ **Mycology**:- is the study of Fungus.

~ **Fishery**:- is the study of fishes.

Scientific Method

-Is a method that is used by scientists to solve problems in the society.

There are five steps which are used in scientific method.

1. Identifying the problem

2. Stating hypothesis:- Hypothesis is a tentative idea or statement that explains the observed facts and predicts the new outcomes.

3. Testing hypothesis by making observations, developing models and carrying out experiments.

4. Repeat the tests as often as necessary to determine whether the results will be consistent and as predicted.

5. Report the results of the tests and draw conclusions.

QUESTIONS

Choose the correct answer.

1. The process in which published works of biologists is evaluated by others in the same field is called -----

A. Hypothesis B. Journal C. Peer review D. Report

2. In scientific method which one comes first?

A. Testing the hypothesis B. Drawing conclusion
C. Identification of problem D. Formulating hypothesis

1.1 Renowned Ethiopian and their contributions

Renowned Ethiopian Biologist	Contributions
Professor Aklilu Lemma	He made a soup berry to eradicate snail, which is intermediate host for bilharzia.
Dr. Tewolde Berhan Gebre Egziabher	Exemplary work to safeguard the biodiversity.
Professor Tilahun Yilma	Vaccines against terrible cattle disease called rinderpest. And also working on HIV/AIDS vaccine.
Professor Yealemtsehay Mekonnen	Effect of chemical pesticide hazard on humans. Research on the use of plants as medicine against human and animal diseases.
Dr. Melaku Worede	Research to save genetic diversity of Ethiopian domestic plants. Preserved traditional crop varieties.
Dr. Gebissa Ejeta	Highly recognized for his work on developing strains of sorghum which are resistant to drought and high yield which is up to ten times.
Professor Beyene Petros	He produced more than 43 publications in Journals and books.
Professor Sebsibe Demisew	He is plant taxonomist
Dr. Zeresenay Alemseged	Is known for his discovery of a 3.3 million years old humanoid fossil in 2006.
Dr. Tsehaynesh Meselle	She worked as a director of Ethiopian Health and Nutrition Research Institute.(EHNRI)
Dr. Berhane Asfaw	Is an evolutionist who discovered two 160,000 year old human skulls which have a big impact in the study of human evolution.
Professor Legesse Negash	He is the pioneer in propagation of Ethiopian indigenous trees.
Professor Mogessie Ashenafi	He is an international researcher in to food

	microbiology.
Professor Ensermu Kelbessa	Is a systematic botanist who discovered and named various new plants.

1.2 Biological Research In Ethiopia

Addis Ababa University (Biology Department)

Biology department which is located at faculty of science in Addis Ababa University plays a major role in development of biology as a science in Ethiopia:

- A center for biological research in Ethiopia.
- Home for the Aklilu Lemma institute of pathobiology
- Consists of much more modern and high level equipments to help biologists in their research.
- A work place for most Ethiopian renowned biologists.

Armauer Hansen research Institute (AHEI)

- Founded in 1969 around the place which is called Zenebe Work in Addis Ababa
- It was highly dedicated to patients with Leprosy and research only to Leprosy.
- Starting from 1996 it deversified its areas of work in tuberculosis, Leshmaniasis, Malaria and HIV/ AIDS, in addition to their work on to leprosy.

Aklilu Lemma Institute Of Pathobiology (ALIPB)

- It was previously known as Department of pathology at A.A.U which is currently name as ALIPB.
- Works on issues of biomedical research and training.
- ALIPB has five major areas:
 - 1) Microbiology research programme in to major infectious disease.
 - 2) Vectors of diseases and how to control.
 - 3) Human parasitic diseases
 - 4) Animal health and disease
 - 5) Research in to Endod and use of other plants as a source of medicine.

Ethiopian Health about Nutritional Research Institute (EHNRI)

- Works on public health issues of health and nutrition.
 - In addition (EHNRI) is working in the following specified areas:
 - Research in to immunology and viral disease
-

- Trial on HIV vaccine
- Battle against tuberculosis (TB)
- Nutritional states of mothers and babies
- Infectious disease.

Ethiopian Institute of Agricultural Research (EIAR) or (IAR)

◇ Working on the following areas of research

- Development of crop technology to achieve food security and nutritional quality.
- Ways of managing our animals. Breeding and feeding programmes and health improvement of our livestock.
- Soil and water.
 - Improving soil fertility to avoid buying expensive inorganic fertilizers.
- Forestry which is involved in rehabilitating restoring and conserving forest ecosystems.
- Mechanizing farming which involves mechanized harvesting.

Institute of Biodiversity Conservation (IBC)

- The issue of biodiversity conservation is an internationally recognized issue.
- NB. Biodiversity - All the life forms in an area.
- IBC is working on issues related to endemic plants and animals of Ethiopia, conserving genes of Ethiopian plants and research management in ecosystem.
- IBC is researching on the following major areas:

- ◇ Forest
- ◇ Aquatic plants
- ◇ Medicinal plants
- ◇ Animal genetic resources
- ◇ Biotechnology and safety
- ◇ Ecosystem conservation

- IBC founded on of the leading gene banks in Africa with over 300 species of plants.

Home work

1. Ethiopian biological research center which is highly devoted on researchers related to Leprosy is:

- A. ALIPB
- B. AHRI
- C. EHNRI
- D. IAR

2. Which of the following are NOT the major work areas EHNRI?

- A. Battle against TB
 - B. Improving nutritional state of mothers and babies.
 - C. Mechanized Farming
 - D. Trial on HIV/AIDS vaccine
-

UNIT TWO

CELL BIOLOGY

1.1 The Microscope

Microscope is an instrument that is used to view or study very small objects. It is a basic tool for a biologist since it's used to study living parts of an organism and microscopic organisms such as bacteria and protozoan's.

The first light microscope is discovered by a Dutch biologist Antoine Van Leuwenhoek.

The abilities of microscope

Microscope has two major abilities:

- 1) Magnification - Increasing the size of an object or specimen to be viewed.
- 2) Resolution - The ability of the microscope to show the detail or the scattered parts of an object. It helps to separate to very close points.

Types of Microscope

Basically there are two major types of microscopes; Namely,

- 1) Light microscope - Is a type of microscope that uses beam of light.
- 2) Electron microscope - Is a microscope that uses beam of electrons. It is the most advanced type of microscope.

Light Microscope	Electron Microscope
<ul style="list-style-type: none">• It uses beam of light• It has relatively less magnification and resolution power• The highest magnification capacity of light microscope is 2000× and resolution of up to 500 times than human eye	<ul style="list-style-type: none">• It uses beam of electrons• It has highest magnification and resolution power.• The maximum magnification capacity of electron microscope is up to 2,000,000× and resolution of up to 200,000 times greater than human eye
Advantages	Advantages
<ul style="list-style-type: none">• It helps to study living cells.• It is relatively cheap• Easy to move from place to place• Do not rely on electric source	<ul style="list-style-type: none">• High magnification and resolution capacity• Gives three dimensional picture of surface of the specimen
Disadvantage	Disadvantage
<ul style="list-style-type: none">• It has less magnification and resolution capacity	<ul style="list-style-type: none">• It cannot help to study living cells• It is too expensive• It relies on electric source• It is not easily movable

Table 2.1: Comparison of light Microscope and electron Microscope

Types of Electron microscope

The image formed by electron microscope cannot be seen directly. The electron beam itself consists of the charged electrons, which are focused by glass lenses in a light microscope.

Electron Microscope	
Transmission electron Microscope	Scanning Electron Microscope
<ul style="list-style-type: none">• Image is focused on to a fluorescent screen.• Electron beam passes through the specimen and then falls on a photographic plates or a fluorescent screen.• Shows the fine detail of cell structure.	<ul style="list-style-type: none">• Image is viewed on a type of “television” screen.• The specimen is coated with a thin gold film. when the electron beam strikes various points on the surface of a specimen, secondary electrons are emitted whose intensity varies with the countour of the surface• Views only the surface of an object

