

1.2 Pure and applied fields of biology

Objectives

At the end of this section, the student will be able to:

- *Classify the different sub-fields of Biology into pure and applied*
- *Define each sub-field of biology*



What do we mean by pure and applied fields of biology?

Pure biology is the study of how life functions in nature (behavior, internal and external structure, reproduction, etc.) whereas applied biology refers to using what you have learned in biology for (gardening, nursery work, agriculture, plant disease, forestry, poultry, etc.). Therefore, applied biology is the use of your knowledge of biology to manage life. The relationship is similar to anatomy and surgery.

Recall

The previous section described and briefly addressed various sub-fields of biology. Now, you will learn the category of biology as pure and applied sub-fields.

Activity 1.4: Categorizing pure and applied fields of biology

Select pure and applied fields of biology from the list given in the columns on the left side in the table below and categorize them in their appropriate column on the right side (columns A & B).

Table 1.4 Pure and Applied fields of Biology

Fields of Biology		Pure Biology (A)	Applied Biology (B)
Agriculture	Biotechnology		
Morphology	Molecular Biology		
Taxonomy	Evolution		
Horticulture	Pathology		
Cytology	Physiology		
Embryology	Forestry		
Histology	Pharmacognosy		
Poultry	Pisciculture		
Agroforestry	Paleontology		
Apiculture	Bacteriology		
Animal Husbandry	Entomology		
	Sericulture		

Unit One: Sub-fields of Biology

Activity 1.5: THINK-PAIR-SHARE

In the previous parts of this unit, you have studied the different branches of biology. Now, in pair, take at least 3 fields of biology and think of their importance in other branches of science. Finally, share your ideas with each other.

In some branches of science, biology has become very important in this millennium. With the above idea, let us discuss some of the biological importance of the branches of biology in other branches of sciences.

- 1) **Biotechnology:** is the use of living organisms or their products for the welfare of humanity. It involves the technical manipulation of a living organism's genetic makeup (Genetic Engineering). A genetically modified and improved variety of crops and animals have been produced by biotechnology.
- 2) **Bioinformatics:** is concerned with the acquisition, storage, analysis, and dissemination of biological data, most often DNA and amino acid sequences. Bioinformatics uses computer programs for a variety of applications, including determining gene and protein functions, establishing evolutionary relationships, and predicting the three-dimensional shapes of proteins.

- 3) Genetic Engineering: is a means of extracting selected genes from an organism or synthesizing selected genes and these genes are inserted into another organism; as a result, an organism develops with a new combination of genes, and this process is called genetic engineering.
- 4) Biomedical Engineering: is the application of the principles and problem-solving techniques of engineering to biology and medicine. Biomedical engineering focuses on the advances that improve human health and health care at all levels
- 5) Environment Management: deals with environmental observation and finding out the solution to maintain the balance of nature.
- 6) Forensic Science: is the application of the knowledge of biological science (DNA fingerprints (unique patterns in DNA molecule), blood typing) to criminal and civil laws.

Question 1

Which statement best captures the core distinction between pure biology and applied biology as described in the text?

- A. Pure biology deals exclusively with extinct species, while applied biology investigates living populations.
- B. Pure biology applies biological concepts to industrial manufacturing, while applied biology studies theoretical behavior.
- C. Pure biology is limited strictly to laboratory experiments, whereas applied biology is conducted exclusively outdoors.
- D. Pure biology focuses on studying how life functions in nature, while applied biology uses this knowledge to manage life.

Question 2

The text compares the relationship between pure biology and applied biology to which of the following medical analogies?

- A. Neurology and psychiatry.
- B. Diagnosis and prescription.
- C. Anatomy and surgery.
- D. Cardiology and pediatrics.

Question 3

Based on the curriculum text, which of the following represents a pure biology discipline rather than an applied one?

- A. Forestry.
- B. Cytology.
- C. Agriculture.
- D. Horticulture.

Question 4

Which of the following is categorized under applied fields of biology in the curriculum text?

- A. Morphology.
- B. Embryology.
- C. Paleontology.
- D. Pisciculture.

Question 5

What is the primary definition and focus of biotechnology according to the modern biological perspective provided in the text?

- A. The digital storage and dissemination of macromolecular amino acid sequences.
- B. The observation of natural ecosystems to maintain environmental balance.
- C. The enforcement of civil and criminal law using DNA fingerprinting.
- D. The use of living organisms or their products for the welfare of humanity.

Question 6

Which branch of biology utilizes computer programs to determine gene and protein functions and predict three-dimensional protein shapes?

- A. Genetic Engineering.
- B. Bioinformatics.
- C. Biomedical Engineering.
- D. Forensic Science.

Question 7

In the context of modern biology applications, what defines genetic engineering?

- A. Analyzing large databases of DNA sequences using specialized bioinformatics software.
- B. Applying engineering problem-solving techniques directly to human medicine and healthcare devices.
- C. Extracting or synthesizing selected genes and inserting them into another organism to create a new gene combination.
- D. Managing natural environmental observations to preserve ecological equilibrium.

Question 8

How does biomedical engineering contribute to human welfare based on the text?

- A. By breeding superior varieties of crops and livestock through selective cultivation.
- B. By applying the principles and problem-solving techniques of engineering to biology and medicine to improve human health.
- C. By utilizing blood typing and DNA fingerprints to resolve legal disputes.
- D. By observing environmental changes to maintain nature's balance.

Question 9

What is the primary role of environment management within applied biological fields?

- A. Environmental observation and finding solutions to maintain the balance of nature.
- B. Investigating criminal activity through biological markers like blood groups.
- C. Cataloging the evolutionary relationships between ancient fossilized organisms.
- D. Synthesizing artificial genes for insertion into host plants and animals.

Question 10

Which interdisciplinary field applies biological knowledge such as DNA fingerprints and blood typing to legal contexts?

- A. Forensic Science.
- B. Pathology.
- C. Biotechnology.
- D. Pharmacognosy.

Question 11

Which of the following fields is classified as a pure biological sub-field dealing specifically with the microscopic study of tissues?

- A. Apiculture.
- B. Sericulture.
- C. Histology.
- D. Agroforestry.

Question 12

Which of the following specialized applied fields specifically involves the rearing of silkworms?

- A. Taxonomy.
- B. Apiculture.
- C. Physiology.
- D. Sericulture.

Question 13

What primary type of biological data is bioinformatics primarily concerned with acquiring, storing, and analyzing?

- A. Clinical patient symptom records and medical imaging scans.
- B. Fossil records and skeletal bone structures.
- C. Ecosystem population counts and meteorological weather patterns.
- D. DNA and amino acid sequences.

Question 14

An agronomist working on improving crop disease resistance using biological principles is operating primarily within which domain?

- A. Pure cytology.
- B. Applied biology.
- C. Pure biology.
- D. Evolutionary morphology.

Question 15

Which of the following is considered a pure biological discipline focusing on how life forms change over generations?

- A. Forestry.
- B. Evolution.
- C. Poultry.
- D. Agriculture.