

Microbiology

PART ONE *Fundamentals of Microbiology*

Microbes in Our lives

1. Living things too small to be seen with the unaided eye are called microorganisms.
2. Microorganisms are important in maintaining Earth's ecological balance.
3. Some microorganisms live in humans and other animals and are needed to maintain good health.
4. Some microorganisms are used to produce foods and chemicals.
5. Some microorganisms cause disease.

Naming and Classifying Microorganisms

Nomenclature

1. In a nomenclature system designed by Carolus Linnaeus (1735), each living organism is assigned two names.
2. The two names consist of a genus and a specific epithet, both of which are underlined or italicized.

Types of Microorganisms

Bacteria

3. Bacteria are unicellular organisms. Because they have no nucleus, the cells are described as prokaryotic.
4. The three major basic shapes of bacteria are bacillus, coccus, and spiral.
5. Most bacteria have a peptidoglycan cell wall; they divide by binary fission, and they may possess flagella .
6. Bacteria can use a wide range of chemical substances for their nutrition.

Archaea

7. Archaea consist of prokaryotic cells; they lack peptidoglycan in their cell walls.
8. Archaea include methanogens, extreme halophiles, and extreme thermophiles.

Fungi

9. Fungi (mushrooms, molds, and yeasts) have eukaryotic cells (cells with a true nucleus). Most fungi are multicellular.
10. Fungi obtain nutrients by absorbing organic material from their environment.

Protozoa

11. Protozoa are unicellular eukaryotes.
12. Protozoa obtain nourishment by absorption or ingestion through specialized structures.

Algae

13. Algae are unicellular or multicellular eukaryotes that obtain nourishment by photosynthesis.
14. Algae produce oxygen and carbohydrates that are used by other organisms.

Viruses

15. Viruses are noncellular entities that are parasites of cells.
16. Viruses consist of a nucleic acid core (DNA or RNA) surrounded by a protein coat. An envelope may surround the coat.

Multicellular Animal Parasites

17. The principal groups of multicellular animal parasites are flatworms and roundworms, collectively called helminths.
18. The microscopic stages in the life cycle of helminths are identified by traditional microbiological procedures.

Classification of Microorganisms

19. All organisms are classified into Bacteria, Archaea, and Eukarya. Eukarya include protists, fungi, plants, and animals.

In 1978, Carl Woese devised a system of classification based on the cellular organization of organisms. It groups all organisms in three domains as follows:

1. Bacteria (cell walls contain a protein-carbohydrate complex called peptidoglycan)
2. Archaea (cell walls, if present, lack peptidoglycan)
3. Eukarya, which includes the following:
 - Protists (slime molds, protozoa, and algae)
 - Fungi (unicellular yeasts, multicellular molds, and mushrooms)
 - Plants (includes mosses, ferns, conifers, and flowering plants)
 - Animals (includes sponges, worms, insects, and vertebrates)

Q1/ Briefly state the role microorganisms play in each of the following:

- | | |
|---------------------------------|-----------------------|
| a. biological control of pests. | c. normal microbiota. |
| b. recycling of elements . | d. sewage treatment. |
| e. human insulin production. | f.vaccine production. |
| g. biofilms | |

Q/ Match the microorganisms in column A to their descriptions in column B?

(Column A)	(Column B)
a- Archaea	1. Not composed of cells
b-..... Algae	2. Cell wall made of chitin
c-..... Bacteria	3. Cell wall made of peptidoglycan
d-..... Fungi	4. Cell wall made of cellulose; photosynthetic
e-.... Helminths	5. Unicellular, complex cell structure lacking a cell wall
f-.... Protozoa	6. Multicellular animals
g-.... Viruses	7- Prokaryote without peptidoglycan cell wall

Q / Into which field of microbiology would the following scientists best fit?

<u>Researcher Who</u>	<u>Field</u>
a... Studies biodegradation of toxic wastes.	1. Biotechnology
b... Studies the causative agent of Ebola hemorrhagic fever .	2. Immunology
c.... Studies the production of human proteins by bacteria.	3. Microbial ecology
	4. Microbial genetics
	5. Microbial physiology

- d.... Studies the symptoms of AIDS.
- e... Studies the production of toxin by E coli.
- f.... Studies the life cycle of Cryptosporidium.
- g.... Develops gene therapy for a disease.
- h.... Studies the fungus *Candida albicans* .

- 6. Molecular biology
- 7. Mycology
- 8. Virology

References: 1- Microbiology an introduction TWELFTH EDITION. Gerard. Tortora.2016.

2- Microbiology an introduction TENTH EDITION. Gerard. Tortora.2010.