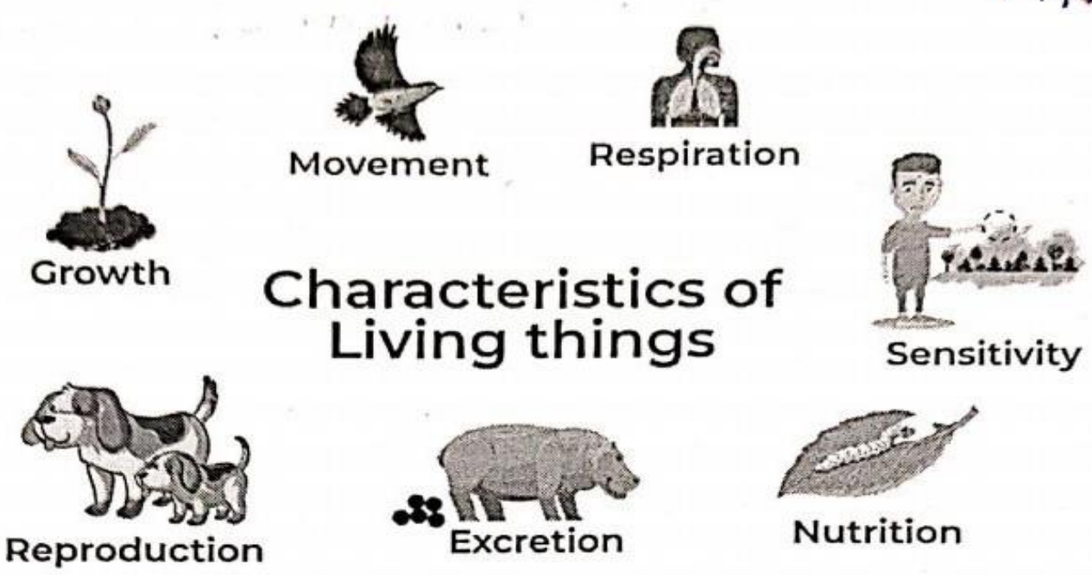
UNIT – I

INTRODUCTION TO LIFE

CHARACTERISTICS OF LIVING ORGANISMS

MRS H GIREN



Living organisms share several fundamental characteristics that distinguish them from non-living things. These characteristics include:

1. **Cellular Organization**: All living organisms are composed of one or more cells, which are considered the basic units of life. Cells can be prokaryotic (without a nucleus) or eukaryotic (with a nucleus).
2. **Metabolism**: Living organisms exhibit metabolism, which includes all the chemical reactions that occur within their bodies to maintain life. This includes processes for converting energy from food into usable forms (e.g., respiration and photosynthesis).
3. **Homeostasis**: Living organisms maintain a stable internal environment despite changes in their external environment. This regulation involves processes such as temperature control, pH balance, and the regulation of water and ion concentrations.
4. **Growth and Development**: Living organisms undergo growth and development. Growth is an increase in size and number of cells, while development is the process by which organisms undergo changes in shape and function during their life cycle.
5. **Reproduction**: Living organisms have the ability to reproduce, either sexually (involving the combination of genetic material from two parents) or asexually (without the combination of genetic material, resulting in offspring genetically identical to the parent).
6. **Response to Stimuli**: Living organisms can respond to environmental stimuli such as light, temperature, and touch. This responsiveness is critical for survival and adaptation.
7. **Adaptation through Evolution**: Populations of living organisms undergo changes over generations through the process of evolution. This adaptation to the environment is driven by natural selection, resulting in the survival of organisms best suited to their environment.

8. **Heredity**: Living organisms possess genetic material (DNA or RNA) that they pass on to their offspring. This genetic information determines the traits and characteristics of the organism.

DNA - Deoxyribonucleic acid
RNA - Ribonucleic Acid

CELL THEORY

The cell theory is a fundamental principle in biology that describes the properties of cells. It is one of the foundational concepts for understanding life and consists of three main tenets:

1. **All living organisms are composed of one or more cells**: This means that the cell is the basic unit of life. Whether an organism is unicellular (composed of a single cell) or multicellular (composed of multiple cells), the cell is the fundamental building block.
2. **The cell is the basic unit of structure and organization in organisms**: This tenet emphasizes that all the functions of an organism occur within cells. Cells are the smallest units that perform all vital physiological processes, including metabolism, energy conversion, and reproduction.
3. **All cells arise from pre-existing cells**: This principle states that cells are not spontaneously generated but come from the division of existing cells. This concept was crucial in understanding growth, development, and the continuity of life.

Historical Background

- **Robert Hooke (1665)**: Hooke was the first to observe cells under a microscope and coined the term "cell" after observing the cell walls in cork tissue.
- **Anton van Leeuwenhoek (1674)**: Leeuwenhoek improved the microscope and was the first to observe living cells, including bacteria and protozoa, which he called "animalcules."
- **Matthias Schleiden (1838)**: Schleiden, a botanist, concluded that all plant tissues are composed of cells.
- **Theodor Schwann (1839)**: Schwann, a zoologist, extended Schleiden's conclusion to animals, stating that all animal tissues are also composed of cells.
- **Rudolf Virchow (1855)**: Virchow proposed that "Omnis cellula e cellula," meaning "all cells come from cells," which solidified the idea that cell division is the means by which new cells are produced.
