Biology-
Lecture (2-A)
The Characteristics of Life

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(2024-2025)

The Characteristics of Life

. LIVING THINGS ARE ORGANIZED

. LIVING THINGS ACQUIRE MATERIALS AND ENERGY

STABILITY AND HOMEOSTASI

. LIVING THINGS REPRODUCE AND DEVELOP

RESPONSIVENESS

The Characteristics of Life

I. LIVING THINGS ARE ORGANIZED

Atoms join together to form the **molecules** that make up a cell. A cell is the smallest structural and functional unit of an organism. Some organisms are single cells. Humans are multicellular because they are composed of many different types of cells. A nerve cell is one of the types of cells in the human body. It has a structure suitable to conducting a nerve impulse. A **tissue** is a group of similar cells that perform a particular function. Nervous tissue is composed of millions of nerve cells that transmit signals to all parts of the body. Several types of tissues make up an organ, and each organ belongs to an organ system. The organs of an organ system work together to accomplish a common purpose. The brain works with the spinal cord to send commands to body parts by way of nerves. Organisms, such as trees and humans, are a collection of organ systems. The levels of biological organization extend beyond the individual. All the members of one species (group of interbreeding organisms) in a particular area belong to a population. A tropical grassland may have a population of zebras, acacia trees, and humans, for example. The interacting populations of the grasslands make up a community. The community of populations interacts with the physical environment to form an ecosystem. Finally, all the Earth's ecosystems make up the biosphere

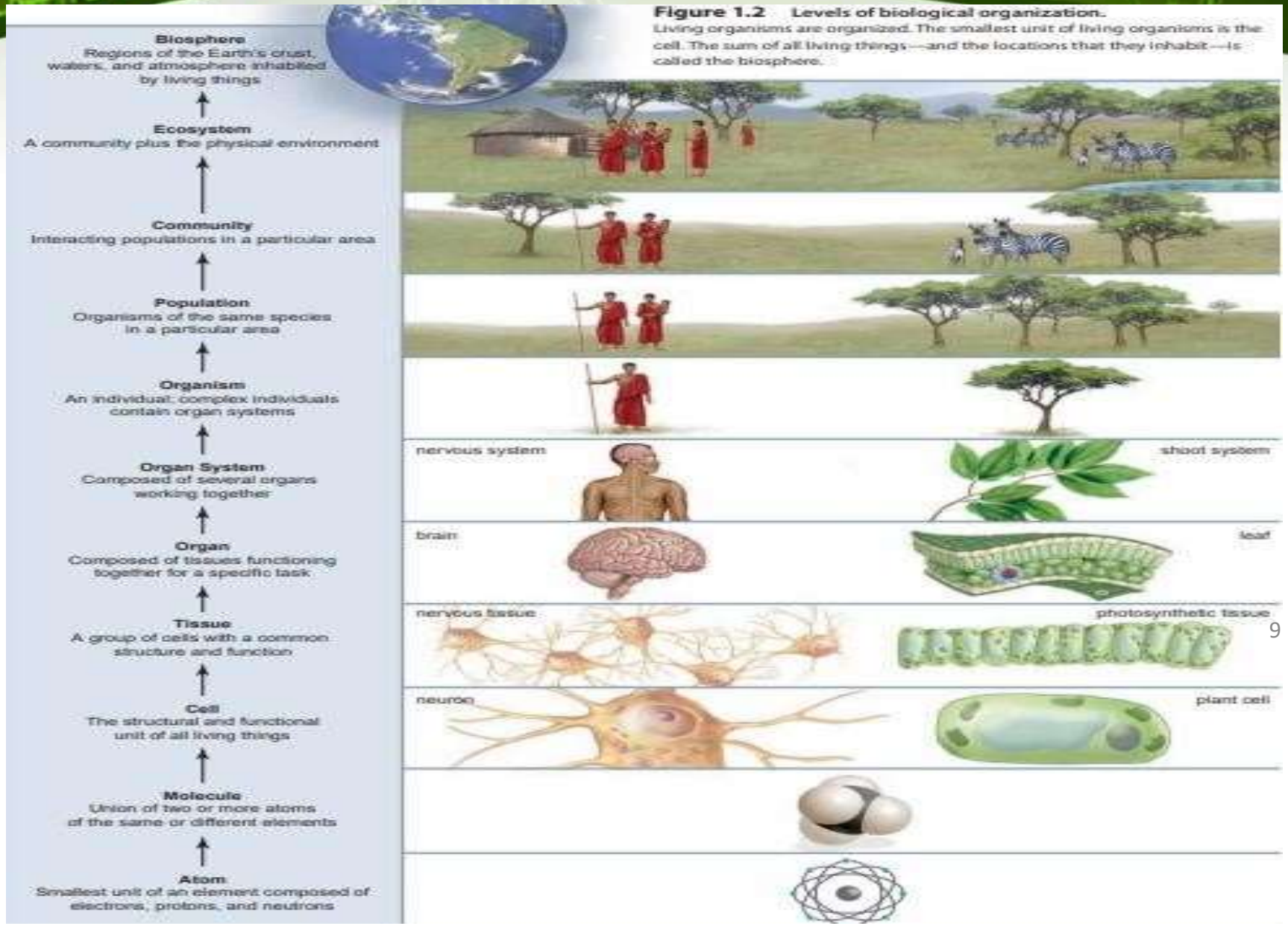

Figure 1.2 Levels of biological organization.
Living organisms are organized. The smallest unit of living organisms is the cell. The sum of all living things—and the locations that they inhabit—is called the biosphere.

The Characteristics of Life

II. LIVING THINGS ACQUIRE MATERIALS AND ENERGY

- ✓ Humans, like all living organisms, cannot maintain their organization or carry on life's activities without an outside source of materials and energy.

- ✓ Food provides nutrient molecules, which are used as building blocks for energy.

- ✓ Some nutrient molecules are broken down completely to provide the necessary energy to convert other nutrient molecules into the parts and products of cells. The term metabolism describes all of the chemical reactions that occur within a cell.

- ✓ The ultimate source of energy for the majority of life on Earth is the sun. Plants, algae, and some bacteria are able to harvest the energy of the sun and convert it to chemical energy by a process called photosynthesis. Photosynthesis produces organic molecules, such as sugars, that serve as the basis of the food chain for many other organisms, including humans and all other animals.

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III. STABILITY AND HOMEOSTASIS

- ✓ The abil ity of a cell or an organism to maintain an internal environment that operates under specific conditions is called **homeostasis**. In humans, many of our organ systems work to maintain homeostasis. For example, human body temperature normally fluctuates slightly between 36.5 and 37.5°C (97.7 and 99.5°F) during the day. **Temperature, water content, chemical content, etc. must be maintained.**

- ✓ This text emphasizes how all the systems of the human body help maintain homeostasis. The digestive system takes in nutrients, and the respiratory system exchanges gases with the environment. The cardiovascular system distributes nutrients and oxygen to the cells and picks up their wastes. The metabolic waste products of cells are excreted by the urinary system. The work of the nervous and endocrine systems is critical because these systems coordinate the functions of the other systems.

The Characteristics of Life

IV. LIVING THINGS REPRODUCE AND DEVELOP

- ✓ Reproduction is a fundamental characteristic of life. Cells come into being only from pre-existing cells, and all living things have parents. When living things reproduce, they create a copy of themselves and ensure the continuance of their own kind. Following the fertilization of the egg by a sperm cell, the resulting zygote undergoes a rapid period of growth and development.

- ✓ The purpose of reproduction is to pass on a copy of the genetic information to the offspring. DNA contains the hereditary information that directs not only the structure of each cell but also its function. The information in the DNA is contained within genes, short sequences of hereditary material that specify the instructions for a specifi c trait. Before reproduction occurs, DNA is replicated so that an exact copy of each gene may be passed on to the offspring

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V. RESPONSIVENESS

- ✓ Respond to stimuli in the external environment Detect and respond to changes in light, heat, sound and chemical and mechanical contact**.**

- ✓ when we quickly remove a hand from a hot stove. Certain sensory receptors also detect a change in the internal environment, and then the central nervous system brings about an appropriate response. When you are startled by a loud noise, your heartbeat increases, which causes your blood pressure to increase. If blood pressure rises too high, the brain directs blood vessels to dilate, helping to restore normal blood pressure

CLASSIFICATION OF ORGANISMS

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(Lec.2 - B)

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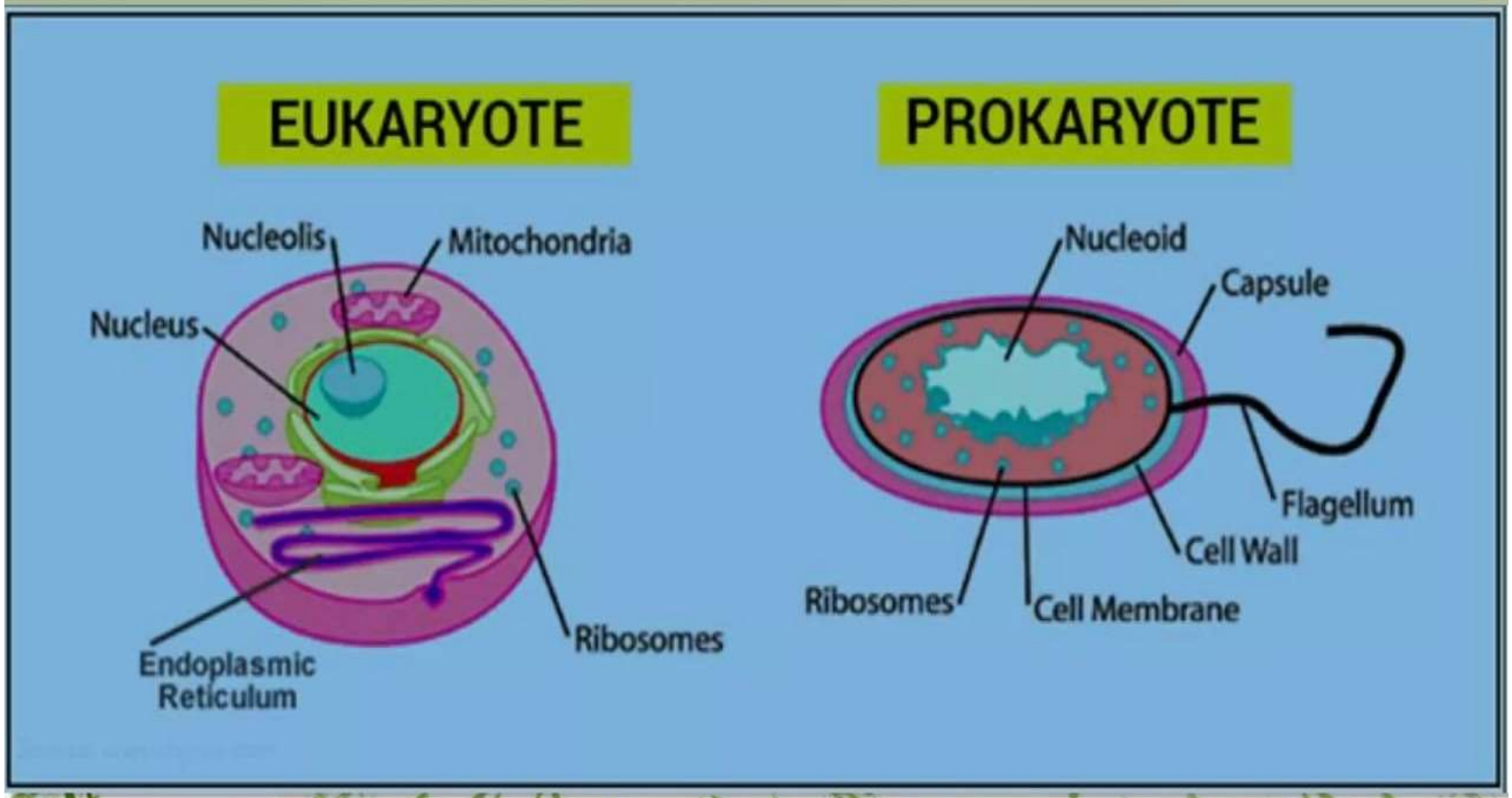
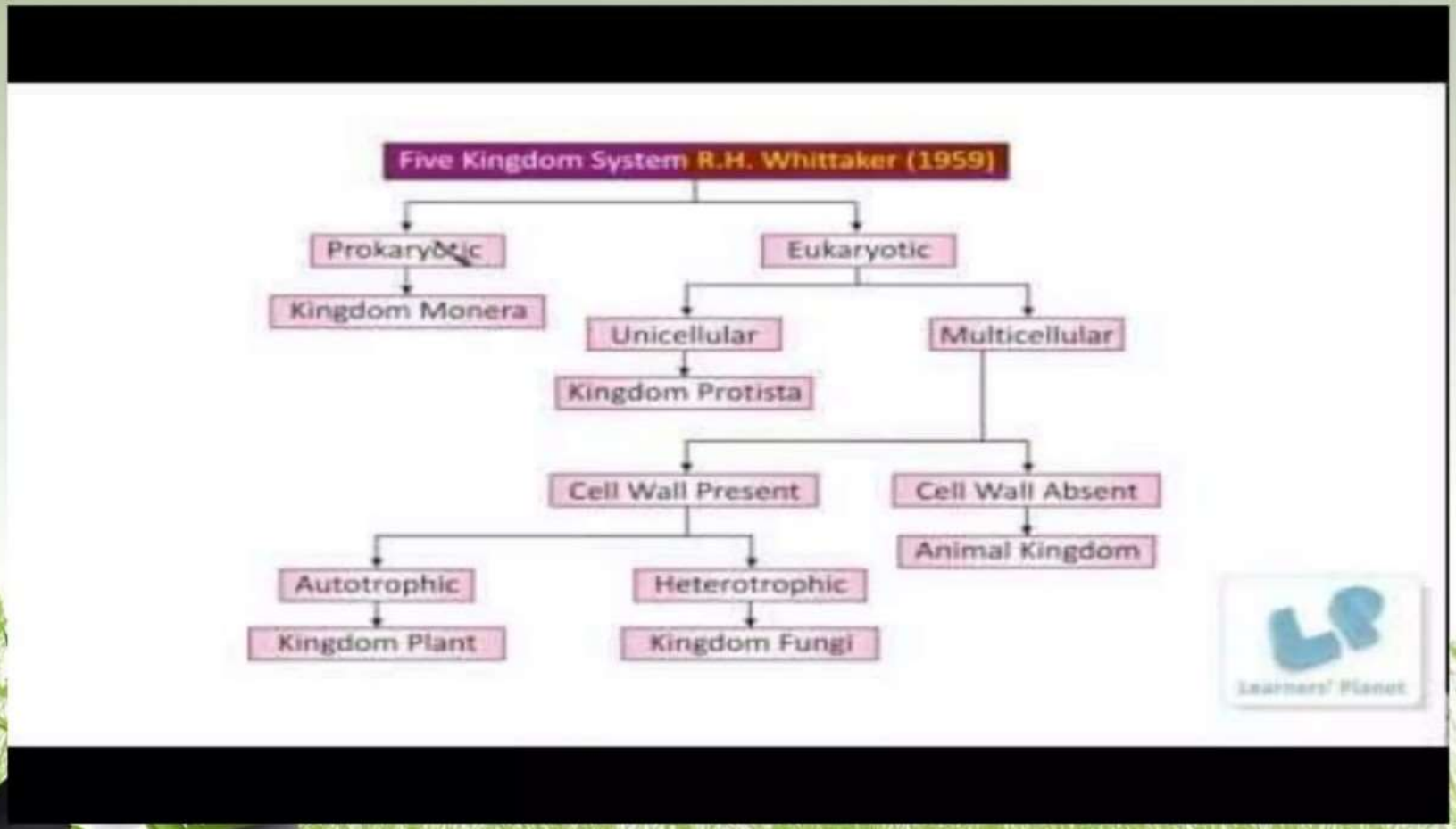
CELL



Differences

Prokaryotic Cell	Eukaryotic cell
Size is 0.1- 5.0 um	Size is 5-100 um
Nucleus is absent	Nucleus is present
Membrane bound nucleus absent.	Membrane bound Nucleus is present.
One chromosome is present, but not true chromosome plastids	More than one number of chromosomes is present.
Unicellular	Multicellular
Lysosomes and Peroxisomes absent	Lysosomes and Peroxisomes present
Microtubules absent	Microtubules present
Endoplasmic reticulum absent	Endoplasmic reticulum present
Mitochondria absent	Mitochondria present
Cytoskeleton absent	Cytoskeleton present
Ribosomes smaller	Ribosomes larger
Vesicles present	Vesicles present
Golgi apparatus absent	Golgi apparatus present
Chloroplasts absent; chlorophyll scattered in the cytoplasm	Chloroplasts present in plants
Submicroscopic in size Flagella is present made up of only one fibre	Microscopic in size, membrane bound
Cell wall chemically complexed	Cell wall is present in plants and fungi and chemically simpler
Vacuoles absent	Vacuoles absent

Permeability of Nuclear membrane is not present	Permeability of Nuclear membrane is selective
Sexual reproduction is absent	Sexual reproduction is present



classification of living things includes

Kingdoms

The most basic classification of living things is kingdoms. Currently there are five kingdoms. Living things are placed into certain kingdoms based on how they obtain their food, the types of cells that make up their body, and the number of cells they contain.

Phylum

The phylum is the next level following kingdom in the classification of living things. It is an attempt to find some kind of physical similarities among organisms within a kingdom. These physical similarities suggest that there is a common ancestry among those organisms in a particular phylum.

Classes

Classes are way to further divide organisms of a phylum. As you could probably guess, organisms of a class have even more in common than those in an entire phylum. Humans belong to the Mammal Class because we drink milk as a baby.

Order

Organisms in each class are further broken down into orders. which order an organism belongs. A taxonomy key is nothing more than a checklist of characteristics that determines how organisms are grouped together.

Families

Orders are divided into families. Organisms within a family have more in common than with organisms in any classification level above it. Because they share so much in common, organisms of a family are said to be related to each other. Humans are in the Hominidae Family.

Genus

Genus is a way to describe the generic name for an organism. The genus classification is very specific so there are fewer organisms within each one. For this reason there are a lot of different genera among both animals and plants. When using taxonomy to name an organism, the genus is used to determine the first part of its two-part name.

Species

Species are as specific as you can get. It is the lowest and most strict level of classification of living things. The main criterion for an organism to be placed in a particular species is the ability to breed with other organisms of that same species. The species of an organism determines the second part of its two-part name.

- **DOMAIN : EUKARYA**
- Kingdom : Animalia
- Phylum : Chordata
- Class : Mammalia
- Order : Carnivora
- Family : Felidae
- Genus : *Panthera*
- Species : ***P. tigris***

THANK YOU

Thanks

a.

b.

Figure 1.12 **Biologists work in many environments.**
Data collection can be done **(a)** in the laboratory or **(b)** in the field. Biologists discover basic information about the natural world, including the effects of technology on human health and the environment.