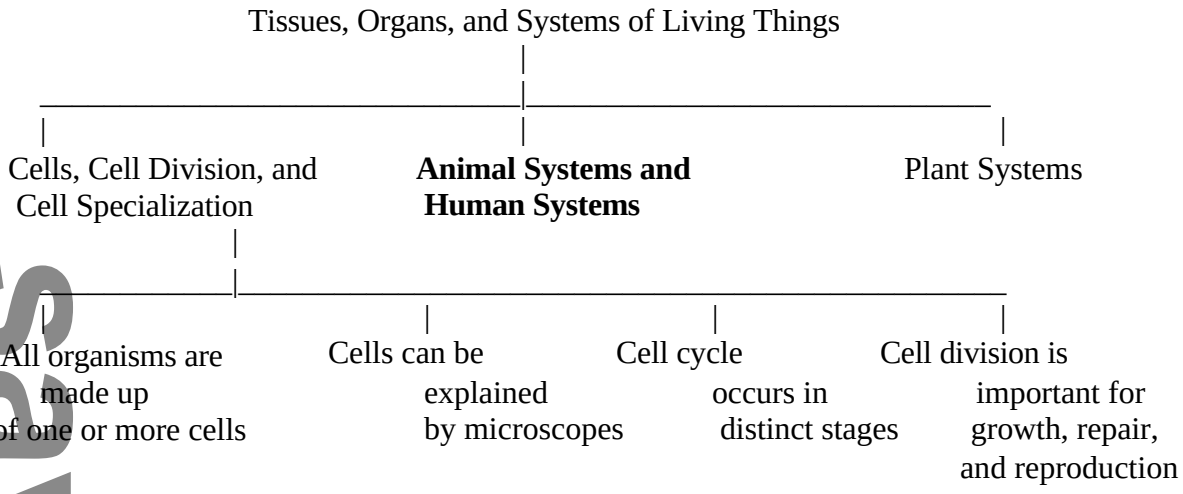
Animal Systems



The Animal Body—Levels of Organization

Multicellular organisms, such as animals are made up of cells, tissues, organs, and organ systems.

The levels of organization within each animal form a *hierarchy*, with the most complex at the top and the least complex at the bottom.

		made of		made of		made of	
organism	→	organ system	→	organs	→	tissue	→ cells
e.g.1. dog		circulatory system		heart		cardiac tissue	heart cell
e.g.2. house		plumbing		faucet		wall	brick
e.g.3. school system		school		grade		class	student

Hierarchy: an organizational structure, with more complex or more important things at the top and simpler or less important things below it.

Organism: several organ systems form an organism

Organ System: organs can work together with other organs to form an organism, (i.e. an organ system is composed of two or more organs), e.g. cardiovascular system: heart, lungs, blood vessels, blood

Organ: two or more tissues working together, e.g. brain, kidney, heart, lungs, stomach, etc. (The largest organ in the human body is skin: skin is made up of many different kinds of specialized cells and tissues, e.g. nervous tissue, hair, sweat and oil glands, and as a result has many different functions.)

Tissue: a group of cells with similar structure and function,(i.e. tissue is composed of many cells, all of the same cell type), e.g. skin, muscle tissue, lung tissue, etc.

Systems: are groups of tissues and/or organs that work together. An organ system is a group of organs that has related structures or functions.

All animals accomplish the same functions: obtain materials from outside, (digestive and respiratory system), eliminate wastes, (urinary and digestive systems), they all respond to their environment, (nervous and musculoskeletal system), transport material within the organism, (circulatory system), and reproduce, (reproductive system).

Each organ system has a specific function and corresponding specific structures.

All organ systems work together with other organ systems to keep the organism functioning.

For example, the digestive system breaks down food and delivers it to the circulatory system, which brings the digested food to the body cells. The circulatory system works with the respiratory system to bring oxygen along with food to the body cells, and get rid of carbon dioxide, etc.

The following table lists some organ systems, their functions, and the organs involved:

Organ system	**Musculo-skeletal**	**Nervous**	**Digestive**	**Circulatory**	**Respiratory**
Function	movement support	sends messages	breaks down food	transport nutrients, gases	gas exchange
Organs, tissues involved	bones, muscles	brain, nerves, and spinal cord	esophagus, gall bladder, stomach, intestines, pancreas, liver	heart, blood vessels (arteries, veins, capillaries)	lungs, trachea, blood vessels

Note: some other organ systems are not mentioned above, e.g. urinary, reproductive systems.

TISSUES

There are four main types of animal tissues: connective, epithelial, nerve and muscle tissue— each have specific characteristics.

Connective tissue: a specialized tissue that provides support and protection for various parts of the body.

Epithelial tissue: a thin sheet of tightly packed cells that covers body surfaces and lines internal organs and body cavities.

Nerve tissue: specialized tissue that conducts electrical signals from one part of the body to another.

Muscle tissue: a group of specialized tissues containing proteins that can contract and enable the body to move.

The following table summarizes the four main types of animal tissues, their description and function:

Type	**Example**	**Description**	**Function**
Epithelial tissue	skin, lining of the digestive system	thin sheets of tightly packed cells covering surfaces and lining internal organs	protection from dehydration, protects body cavities
Connective tissue	bone, tendons, blood	various types of cells and fibres held together by a liquid, a solid, or a gel, known as a matrix	hold bones and muscles together and cushion bones from rubbing against each other
Muscle tissue	muscles that make bones move, muscles surrounding the digestive tract, heart	bundles of long cells called fibres that contain specialized proteins capable of shortening or contracting	allows for movement, heart beat
Nerve tissue	brain, nerves in sensory organs	long, thin cells, (neurons), with fine branches at the ends capable of conducting electrical impulses	sensory, communication with the body, coordination of body functions

Summary

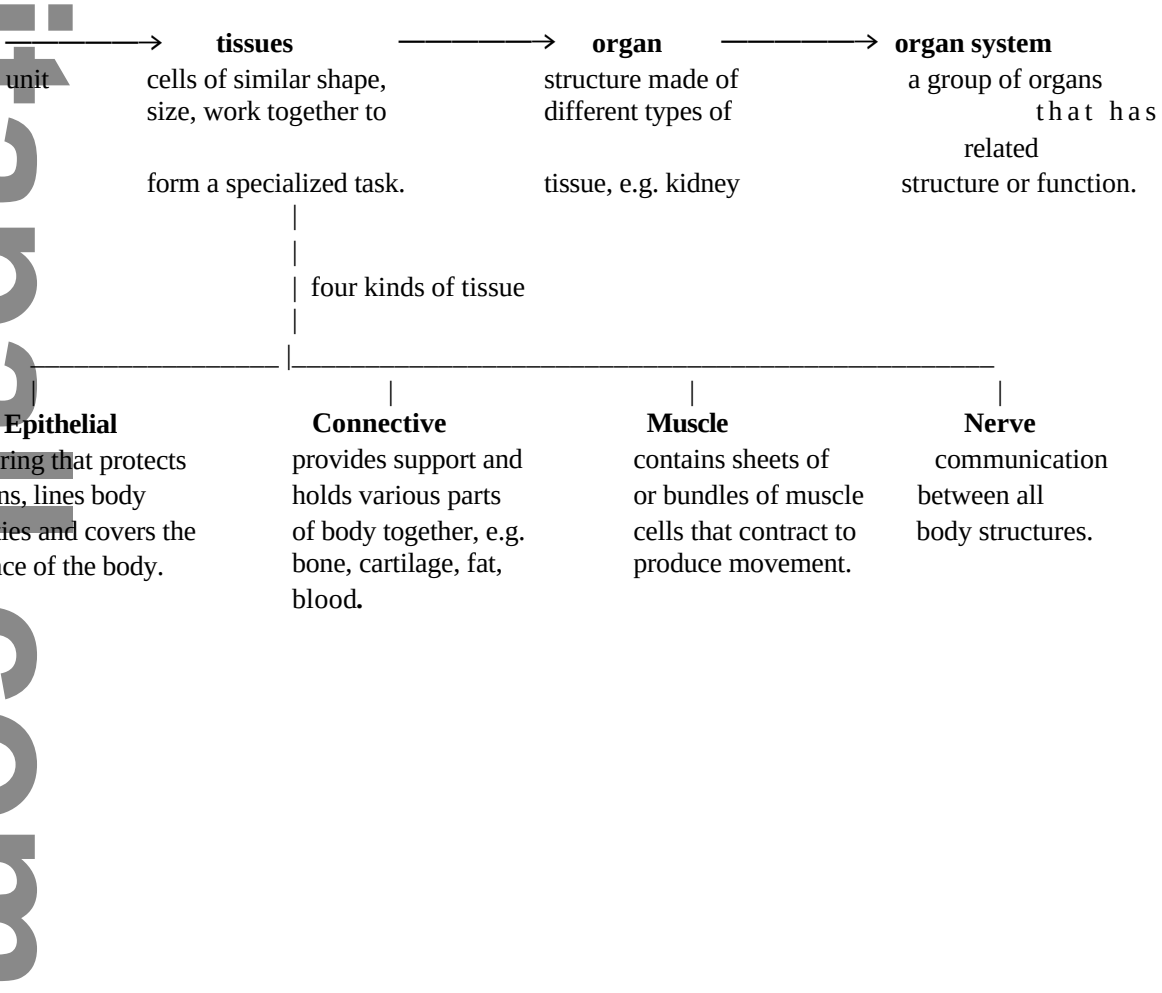
The term “tissue” refers to groups of cells that function together to perform specialized tasks.

The link between specialized cells and tissues is that tissues are made of specialized cells that work together.

Epithelial tissue: closely packed cells in layers. These cells protect the body by forming the outer layer and covering inner body cavities.

Nervous tissue: very branched and irregularly shaped cells. Their structure allows for collecting and sending information.

Muscle tissue: closely packed cells in strips.



Assignment: The Animal Body – Levels of Organization

1. An organizational structure with more complex or important things at the top and simpler or less important things below it is called _____.

2. The complete body of a mouse would be at the _____of the structural hierarchy

3. The tongue, esophagus, and intestines of a human would all be considered parts of a(n) _____ _____.

4. A collection of similar cells that perform a particular, but limited, function is called a _____ .

5. Nerve tissue is made up of special cells called _____.

6. The body's main form of transportation for things it needs, like oxygen and nutrients, is the _____ system.

7. The function of muscle tissue is _____

8. The brain is an example of _____ tissue.

9. Bundles of long cells called muscle fibres that contain specialized proteins capable of shortening or contracting are called _____tissue.

10. Examples of connective tissue include: _____, _____, _____.

11. Various types of cells and fibres held together by a matrix are called _____ _____.

12. The tissue type that covers and protects the human body is the _____ _____.

13. Long, thin cells that conduct electrical impulses are _____ _____.

14. Give an example of an organ that is found in:
a, only one organ system, b. more than one organ system

15. Why is there no hierarchy of organization within single-celled organisms?

16. What two general ways are used to classify organs into organ systems?

17. Give an example of an organ that plays a major role in more than one organ system.

18. "Organ systems often interact." Use the table on page 2 of the organ systems to help you explain what this statement means.

19. What is the difference between a cell, a tissue, an organ, and an organ system? Give suitable examples to illustrate your explanation.

20. Use the dictionary to write a definition of the word "system" and then explain why this word is used to classify structures and functions within the human body.