**Lecture 18 – Animal Form and Function**

* Diversity of Life is shaped by **evolution**.
  + **Anatomy** is the study of the biological *form*.
  + **Physiology** is the study of biological *function*.
* Animal body plans are organized in a hierarchical manner.

(Cell) 🡪 (Tissues) 🡪 (Organs) 🡪 (Organ System)

Example 1. Lung is… organ, part of respiratory system

Example 2. Neurons are… cells

Example 3. A bone is… tissue

* Table 40.1 (p. 855) is something you will need to know by heart before the exam 3.
* Animals constantly exchange materials with their environment.

Example 1. Food: digestive system

Example 2. Gas:

Example 3. Waste:

* Specialized and complex organ systems are built from a limited set of cell and tissue types.
* There are four main types of animal tissues

1. Epithelial tissues

* cover the outside of the body
* line the organs and cavities
* barrier against mechanical injury, pathogens, fluid loss
* form active interfaces with the environment

Examples: intestinal inner lining, specialized glands, skin, lining of lung air sacs

1. Connective tissues

* hold tissues and organs together
* built on liquid, jellylike, or solid foundation

Examples: bone, blood, adipose tissue, cartilage, tendon

1. Muscle tissues

* responsible for body movement
* filaments containing actin and myosin (important for muscle contraction)

Examples: Skeletal muscle (striated, voluntary, attached by tendons), smooth muscle (inner organs, involuntary), cardiac muscle (striated, synchronized heart contraction)

1. Nervous tissues

* receive, process, and transmit information
* contain neurons (nerve cells)
* a concentration of nervous tissues forms a brain

Examples: neuron (transmit nerve impulses through action potential), glial cells (nourish, insulate and replenish neurons)

* Tissues, organs, organ systems must act in concert

1. Endocrine system

* transmits hormones (different types of chemicals) to receptive cells throughout the body via blood
* affects one or more regions throughout the body
* relatively slow acting, but long-lasting effects

Examples: testosterone (M sex hormone)

1. Nervous system

* transmits nerve impulse between specific locations
* received by neurons, muscle cells, and endocrine cells
* very fast

Examples: sensory

* Animal’s internal environment needs to be maintained
  + **Homeostasis**: the steady-state physiological condition of the body
  + Homeostasis is maintained by *negative feedback*, which helps to return a temperature to either a normal range or a set point
    - Make sure you understand the concept of negative feedback in homeostasis. Study figures 40.8 (p. 861) and 40.16 (p. 868) to understand the similarities between two examples.
    - If homeostasis doesn’t work, you fail and break down
* Example of animal homeostasis: Thermoregulation

1. Endothermy

* generate heat by metabolism
* birds and mammals
* active at a greater range of external temperatures
* energetically expensive

1. Ectothermy

* gain heat from external sources
* most invertebrates, fishes, amphibians, and non-avian reptiles
* tolerate greater variation in internal temperature
* energetically inexpensive