What is a tissue?

- A collection of cells of the same type that perform a common function
- There are 4 major tissue types in the body:
  1. Connective
  2. Muscular
  3. Nervous
  4. Epithelial

1. Connective tissue

- Binds and supports parts of the body
- All have specialized cells, ground substance and protein fibers
- Ground substance is noncellular and ranges from solid to fluid
- The ground substance and proteins fibers together make up the matrix of the tissue
- There are three main types of connective tissue: A. fibrous, B. supportive and C. fluid
A. Fibrous connective tissue

- There are two types: dense or loose, but both contain fibroblast cells with a matrix of collagen and elastic fibers
- Loose fibrous tissue is found supporting epithelium and many internal organs
- Adipose tissue is a special loose fibrous tissue where fat is stored

B. Supportive connective tissue:

**Cartilage**

- Cells are in chambers called lacunae
- Matrix is solid but flexible
- 3 types are distinguished by types of fibers
  1. Hyaline cartilage – fine collagen fibers
     Location: Nose, ends of long bones and fetal skeleton
  2. Elastic cartilage – more elastic fibers than cartilage fibers
     Location: Outer ear
  3. Fibrocartilage – strong collagen fibers
     Location: Disks between vertebrae

**Bone**

- Cells are in chambers called lacunae
- Matrix is solid and rigid that is made of collagen and calcium salts
- 2 types are distinguished by types of fibers
  1. Compact – made of repeating circular units called osteons which contain the hard matrix and living cells and blood vessels
     Location: Shafts of long bone
  2. Spongy – an open, latticework with irregular spaces
     Location: Ends of long bones
What do bone and cartilage look like?

C. Fluid connective tissue: Blood

- Made of a fluid matrix called plasma and cellular components that are called formed elements
- 3 formed elements:
  1. Red blood cells – cells that carry oxygen
  2. White blood cells – cells that fight infection
  3. Platelets – pieces of cells that clot blood

C. Fluid connective tissue: Lymph

- Matrix is a fluid called lymph
- White blood cells congregate in this tissue

2. Muscle tissue

- Allows for movement in the body
- Made of muscle fibers/cells and protein fibers called actin and myosin
- There are 3 types of muscle tissue in humans:
  A. Skeletal
  B. Smooth
  C. Cardiac
A. Muscle tissue - Skeletal
- Appearance: long, cylindrical cells, multiple nuclei, striated fibers
- Location: attached to bone for movement
- Nature: voluntary movement

B. Muscle tissue - Smooth
- Appearance: spindle-shaped cell with one nucleus, lack striations
- Location: walls of hollow organs and vessels
- Nature: involuntary movement

C. Muscle tissue - Cardiac
- Appearance: branched cells with a single nucleus, striations with darker striations called intercalated disks between cells
- Location: heart
- Nature: involuntary movement

3. Nervous tissue
- Allows for communication between cells through sensory input, integration of data and motor output
- Made of 2 major cell types:
  A. Neurons
  B. Neuroglia
A. Nervous tissue - neurons

- Made of dendrites, a cell body and an axon
- Dendrites carry information toward the cell body
- Axons carry information towards a cell body

A. Nervous tissue - neuroglia

- A collection of cells that support and nourish neurons
- Outnumber neurons 9:1
- Examples are oligodendrocytes, astrocytes and microglia

4. Epithelial tissue

- A groups of cells that form a tight, continuous network
- Lines body cavities, covers body surfaces and found in glands
- Cells are anchored by a basement membrane on one side and free on the other side
- Named after the appearance of cell layers and the shape of the cells
- There is transitional epithelium that changes in appearance in response to tension

How do we name epithelial tissue?

- Number of cell layers:
  - Simple: one layer of cells
  - Stratified: more than one layer of cells
  - Pseudostratified: appears to have layers but only has one layer
- Shape of cell:
  - Cuboidal: cube-shaped
  - Columnar: column-shaped
  - Squamous: flattened
What does epithelial tissue look like?

How are cells connected within a tissue?
- Tight junctions – proteins join and form an impermeable barrier between plasma membranes in a zipper-like fashion
- Adhesion junctions – cytoskeletal fibers join between cells and have flexibility
- Gap junctions – a fusion of adjacent plasma membranes with small channels between them that allow small molecules to diffuse

Cell junctions

Moving from tissue to organs and organ systems
- An organ is 2 or more tissue types working towards a particular function
- An organ system is a combination of organs that work together to carry out a particular function
What are the body cavities?

What about the body membranes that line the cavities?

- Mucous membranes – lining of the digestive, respiratory, urinary and reproductive systems
- Serous membranes – line lungs, heart, abdominal cavity and covers the internal organs, named after their location
  - Pleura: lungs
  - Peritoneum: abdominal cavity and organs
  - Pericardium: heart
- Synovial membranes – lines the cavities of freely movable joints
- Meninges – cover the brain and spinal cord

The integumentary system:

- Includes the skin and accessory organs such as hair, nails and gland
- The skin has two main regions called the epidermis and the dermis
- Under the skin there is a subcutaneous layer between the dermis and internal structures where fat is stored
- Is important for maintaining homeostasis

What are the functions of the integumentary system

1. Protects the body from physical trauma, invasion by pathogens and water loss
2. Helps regulate body temperature
3. Allows us to be aware of our surroundings through sensory receptors
4. Synthesizes chemicals such as melanin and vitamin D
There are two regions of the skin:

- Epidermis
- Dermis

The epidermis:

- The thin, outermost layer of the skin
- Made of epithelial tissue
- Cells in the uppermost cells are dead and become filled with keratin thus acting as a waterproof barrier
- Langerhans cells are a type of white blood cell that help fight pathogens
- Melanocytes produce melanin that lend to skin color and protection for UV light
- Some cells convert cholesterol to vitamin D

What you need to know about skin cancer?

- 2 of the 3 types that arise in the epidermis:
  - Basal cell carcinoma is the most common yet least deadly form of skin cancer
  - Melanoma is the most deadly form of skin cancer but is the least common

- What can you do to help prevent this?
  - Stay out of the sun between 10am-3pm
  - Wear protective clothing (tight weave, treated sunglasses, wide-brimmed hat)
  - Use sunscreen with an SPF of at least 15 and protects from UV-A and UV-B rays
  - Don’t use tanning beds

What might skin cancer look like?
**The dermis:**
- The thick, inner layer of the skin
- Made of dense fibrous connective tissue
- Contains elastic and collagen fibers
- Contains blood vessels, many sensory receptors and glands

**What are the accessory organs of the skin and why are they important?**
- Includes nails, hair and glands
- Nails are derived from the epidermis that offer a protective covering
- Hair follicles are derived from the dermis but hair grows from epidermal cells
- Oil glands are associated with hair and produce sebum that lubricates hair and skin as well as retards bacterial growth
- Sweat glands are derived from the dermis and helps to regulate body temperature

**What is homeostasis?**
- The ability to maintain a relatively constant internal environment in the body
- The nervous and endocrine systems are key in maintaining homeostasis
- Changes from the normal tolerance limits results in illness or even death

**Negative feedback**
- The primary mechanism for maintaining homeostasis
- Has two components:
  - sensor
  - control center
- The output of the system dampens the original stimulus
An example of negative feedback: body temperature

Positive feedback
- A mechanism for increasing the change of the internal environment in one direction
- An example is the secretion of oxytocin during birth to continually increase uterine contractions
- Can be harmful such as when a fever is too high and continues to rise