

## ACTIVITY 2: HISTOLOGY AND INTEGUMENT

### Objectives:

- 1) **How to get ready:** Read Chapter 4 and 5, [McKinley et al., Human Anatomy, 4e](#). All text references are for this textbook.
- 2) Identify each tissue (26 tissues) in a histology photo or microscope slide.
- 3) Sketch each tissue in the space provided.
- 4) Identify the features of the integument (skin) on a slide and/or model.
- 5) **Before next class:** Preview axial skeleton terms lists from SLCC Anatomy Laboratory website or your printed laboratory manual and your textbook.

### EPITHELIAL TISSUES

#### Cell Shapes:

squamous  
cuboidal  
columnar

#### Number of Layers:

simple  
stratified  
pseudostratified

#### Things to Identify:

- each tissue as an epithelium
- specific type/name of epithelium
- shape of cells
- number of cell layers
- specific body location of each tissue
- specialized structures
- basement membrane, basal surface, apical surface

TABLE 1. TYPES OF EPITHELIUM (10 tissues to identify)

NAME	BODY LOCATIONS/ STRUCTURES	TEXT REFERENCES & SKETCH
<input type="checkbox"/> <b>simple squamous epithelium</b>	<p><b>body locations:</b> air sacs in lungs (alveoli), lining of blood vessels, serous membranes of body cavities</p> <p><b>structure:</b> single layer of thin, flat, shaped cells resembling floor tiles with a single nucleus in its center</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> basement membrane</li> <li><input type="checkbox"/> apical surface</li> <li><input type="checkbox"/> basal surface</li> </ul> <p><b>function:</b> rapid diffusion, filtration, and some secretion in serous membranes</p>	<p>p. 86, table 4.3a; description pp. 84-85</p>

<p><b>stratified squamous epithelium</b></p> <p><input type="checkbox"/> keratinized</p> <p><input type="checkbox"/> non-keratinized</p>	<p><b>body locations:</b> lining of oral cavity, esophagus, vagina, and anus (non-keratinized); epidermis of skin (keratinized)</p> <p><b>structure:</b> multiple layers of cells; basal cells cuboidal, apical cells squamous; surface cells are alive and kept moist in nonkeratinized; surface cells in keratinized are dead and filled with the protein keratin</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> basement membrane</li> <li><input type="checkbox"/> apical surface</li> <li><input type="checkbox"/> basal surface</li> </ul> <p><b>function:</b> protection of underlying tissue</p>	<p>p. 89 table 4.4a, b; description pp. 87-88</p>
<p><input type="checkbox"/> <b>simple cuboidal epithelium</b></p>	<p><b>body locations:</b> kidney tubules; ducts and secretory regions of most glands</p> <p><b>structure:</b> single layer of cells as tall as they are wide; spherical, centrally located nucleus</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> basement membrane</li> <li><input type="checkbox"/> apical surface</li> <li><input type="checkbox"/> basal surface</li> <li><input type="checkbox"/> lumen</li> </ul> <p><b>function:</b> absorption and secretion</p>	<p>p. 86 table 4.3b; description p. 85</p>
<p><input type="checkbox"/> <b>stratified cuboidal epithelium</b></p>	<p><b>body locations:</b> found in large ducts in most exocrine glands and in some parts of male urethra</p> <p><b>structure:</b> two or more layers of cells; cells at apical surface are cuboidal</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> basement membrane</li> <li><input type="checkbox"/> apical surface</li> <li><input type="checkbox"/> basal surface</li> </ul> <p><b>function:</b> protection and secretion</p>	<p>p. 90 table 4.4; description p. 88</p>
<p><b>simple columnar epithelium</b></p> <p><input type="checkbox"/> ciliated</p> <p><input type="checkbox"/> non-ciliated</p>	<p><b>body locations:</b> lining of most of the digestive tract (non-ciliated); lining of uterine tubes and larger bronchioles of respiratory tract (ciliated)</p> <p><b>structure:</b> single layer of tall, narrow cells; oval shaped nucleus in the basal region of cells</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> basement membrane</li> <li><input type="checkbox"/> apical surface</li> <li><input type="checkbox"/> basal surface</li> <li><input type="checkbox"/> goblet cells</li> <li><input type="checkbox"/> cilia (when present)</li> </ul> <p><b>function:</b> absorption and secretion (non-ciliated); secretion of mucin and movement of mucus along apical surface of epithelium by action of cilia (ciliated)</p>	<p>p. 86 table 4.3c, d; description pp. 85-86</p>

<input type="checkbox"/> <b>stratified columnar epithelium</b>	<p><b>body locations:</b> rare, found in large ducts of some exocrine glands and in some regions of the male urethra</p> <p><b>structure:</b> two or more layers of cells; cells at the apical surface are columnar</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> basement membrane</li> <li><input type="checkbox"/> basal surface</li> <li><input type="checkbox"/> apical surface</li> </ul> <p><b>function:</b> protection and secretion</p>	<p>p. 90 table 4.4d; description p. 88</p>
<input type="checkbox"/> <b>pseudostratified columnar epithelium</b>	<p><b>body locations:</b> ciliated form lines most of the respiratory tract; non-ciliated form is rare and lines the epididymis and part of male urethra</p> <p><b>structure:</b> single layer of cells with varying heights that appear multi-layered; all cells connect to the basement membrane but not all cells reach the apical surface</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> basement membrane</li> <li><input type="checkbox"/> apical surface</li> <li><input type="checkbox"/> basal surface</li> <li><input type="checkbox"/> cilia</li> <li><input type="checkbox"/> goblet cells</li> </ul> <p><b>function:</b> protection; ciliated form also involved with secretion of mucin and movement of mucus across surface with ciliary action</p>	<p>p. 91 table 4.5a; description p. 88</p>
<input type="checkbox"/> <b>transitional epithelium</b>	<p><b>body locations:</b> lining of urinary bladder, ureters, and part of urethra</p> <p><b>structure:</b> epithelial appearance varies, depending on whether the tissue is stretched or relaxed; shape of cells on the apical surface changes.</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> basement membrane</li> <li><input type="checkbox"/> apical surface</li> <li><input type="checkbox"/> basal surface</li> </ul> <p><b>function:</b> distention and relaxation to accommodate urine volume changes in the bladder, ureters, and urethra</p>	<p>p. 91 table 4.5b; description p. 88</p>

**CONNECTIVE TISSUES**

**Identify on each slide:**

- each tissue as a connective tissue
- fluid vs. connective tissue proper vs. supporting connective tissue
- for connective tissues proper: identify loose vs. dense connective tissues
- specific name of each connective tissue
- cells, fibers, ground substance or matrix
- any special structure

**TABLE 2. TYPES OF CONNECTIVE TISSUE (12 tissues to identify)**

NAME	BODY LOCATIONS/ STRUCTURES	TEXT REFERENCES & SKETCH
<b>FLUID CONNECTIVE TISSUE (1 tissue)</b>		
<input type="checkbox"/> <b>blood</b>	<p><b>location:</b> primarily within blood vessels (arteries, veins, and capillaries), and the heart</p> <p><b>structure:</b> contains</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> erythrocytes</li> <li><input type="checkbox"/> leukocytes</li> <li><input type="checkbox"/> platelets</li> <li><input type="checkbox"/> plasma (matrix)</li> </ul> <p><b>function:</b> erythrocytes transport gases, leukocytes control immune response, platelets help with blood clotting; plasma transports nutrients, wastes, and hormones throughout the body, and contains clotting elements to stop blood loss.</p>	<p>p. 108, table 4.13; description p. 105</p>
<p><b>CONNECTIVE TISSUES PROPER:</b> include the LOOSE CONNECTIVE TISSUES and the DENSE CONNECTIVE TISSUES</p>		
<p><b>LOOSE CONNECTIVE TISSUES (3 tissues):</b> generally have a loose association of fibers in extracellular matrix</p>		
<input type="checkbox"/> <b>areolar connective tissue</b>	<p><b>location:</b> subcutaneous layer under the skin; surrounds organs</p> <p><b>structure:</b> vascularized, ground substance is gel-like with</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> fibroblasts</li> <li><input type="checkbox"/> collagen fibers</li> <li><input type="checkbox"/> elastic fibers</li> <li><input type="checkbox"/> ground substance</li> </ul> <p><b>function:</b> surrounds and protects tissues and organs; loosely binds epithelium to deeper tissues; provides nerve and blood vessel packing.</p>	<p>p. 102 table 4.9a; description p. 100</p>

<input type="checkbox"/> <b>reticular connective tissue</b>	<b>location:</b> forms stroma of lymph nodes, spleen, thymus, and bone marrow <b>structure:</b> ground substance is gel-like liquid; scattered arrangement of <ul style="list-style-type: none"> <li><input type="checkbox"/> reticular fibers</li> <li><input type="checkbox"/> extracellular matrix</li> </ul> <b>function:</b> provides supportive framework for spleen, lymph nodes, thymus, and bone marrow	p. 103 table 4.9c; description p. 100
<input type="checkbox"/> <b>adipose connective tissue</b>	<b>location:</b> subcutaneous layer; covers and surrounds some organs <b>structure:</b> closely packed <ul style="list-style-type: none"> <li><input type="checkbox"/> adipocytes, with nucleus squeezed to one side</li> <li><input type="checkbox"/> lipid vacuole (fat droplet)</li> </ul> <b>function:</b> stores energy; protects, cushions, and insulates.	p. 102 table 4.9b; description p. 100
<b>DENSE CONNECTIVE TISSUES</b> ( <i>3 tissues to identify</i> ): generally have a dense association of fibers in the extracellular matrix		
<input type="checkbox"/> <b>dense regular connective tissue</b>	<b>location:</b> forms tendons, most ligaments <b>structure:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> collagen fibers (densely packed, parallel)</li> <li><input type="checkbox"/> fibroblast nuclei</li> <li><input type="checkbox"/> ground substance (scarce)</li> </ul> <b>function:</b> attaches muscle to bone and bone to bone; resists stress applied in one direction	p. 104 table 4.10a; description p. 101
<input type="checkbox"/> <b>elastic connective tissue</b>	<b>location:</b> walls of elastic arteries; trachea; bronchial tubes; true vocal cords; suspensory ligaments of penis <b>structure:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> elastic fibers (parallel)</li> <li><input type="checkbox"/> fibroblast nuclei</li> <li><input type="checkbox"/> ground substance</li> </ul> <b>function:</b> allows stretching of some organs	p. 105 table 4.10c; description p. 101

<input type="checkbox"/> <b>dense irregular connective tissue</b>	<p><b>location:</b> dermis; periosteum covering bone; perichondrium covering cartilage, organ capsules</p> <p><b>structure:</b> predominantly</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> collagen fibers (bundled; randomly arranged)</li> <li><input type="checkbox"/> fibroblasts</li> <li><input type="checkbox"/> ground substance (more than in dense regular connective tissue)</li> </ul> <p><b>function:</b> withstands stresses applied in all directions; durable</p>	<p>p. 104 table 4.10b; description p. 101</p>
<p><b>SUPPORTING CONNECTIVE TISSUES:</b> includes bone tissue and 3 cartilage tissues</p>		
<p>BONE OR OSSEOUS TISSUE (<i>1 tissue to identify</i>)</p>		
<input type="checkbox"/> <b>compact bone</b>	<p><b>location:</b> exterior of bones of the body</p> <p><b>structure:</b> calcified matrix arranged in</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> osteons</li> <li><input type="checkbox"/> osteocytes in lacunae</li> <li><input type="checkbox"/> lamellae (concentric)</li> <li><input type="checkbox"/> central canal</li> <li><input type="checkbox"/> canaliculi</li> </ul> <p><b>function:</b> supports soft structures; protects vital organs; provides levers for movement; stores minerals</p>	<p>p. 107 table 4.12; description, p. 104-105</p>

CARTILAGE TISSUES (3 tissues to identify)		
<input type="checkbox"/> <b>hyaline cartilage</b>	<p><b>location:</b> most of fetal skeleton; covers articular ends of long bones; costal cartilage; most of the larynx, trachea, and nose.</p> <p><b>structure:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> extracellular matrix</li> <li><input type="checkbox"/> lacunae</li> <li><input type="checkbox"/> chondrocytes</li> <li><input type="checkbox"/> perichondrium (often visible)</li> </ul> <p><b>function:</b> smooth surfaces for movement at joints; model for bone growth; supports soft tissue.</p>	<p>p.106 table 4.11a; description p. 103</p>
<input type="checkbox"/> <b>fibrocartilage</b>	<p><b>location:</b> intervertebral discs; pubic symphysis; menisci of knee joints.</p> <p><b>structure:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> collagen fibers (parallel)</li> <li><input type="checkbox"/> extracellular matrix</li> <li><input type="checkbox"/> lacunae</li> <li><input type="checkbox"/> chondrocytes</li> </ul> <p><b>function:</b> resists compression; absorbs shock in some joints.</p>	<p>p. 106 table 4.11b; description p. 103</p>
<input type="checkbox"/> <b>elastic cartilage</b>	<p><b>location:</b> external ear; epiglottis of the larynx.</p> <p><b>structure:</b> contains abundant</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> elastic fibers (branching)</li> <li><input type="checkbox"/> lacunae</li> <li><input type="checkbox"/> chondrocytes</li> </ul> <p><b>function:</b> maintains structure and shape while permitting flexibility.</p>	<p>p. 107 table 4.11c; description p. 103</p>

## MUSCLE TISSUES

**TABLE 3. TYPES OF MUSCLE TISSUE (3 tissues to identify)**

NAME	BODY LOCATIONS/ STRUCTURES	TEXT REFERENCES AND SKETCH
<input type="checkbox"/> <b>smooth muscle</b>	<b>location:</b> walls of hollow internal organs, such as vessels, airways, stomach, bladder, and uterus <b>structure:</b> <ul style="list-style-type: none"><li><input type="checkbox"/> muscle fiber (spindle-shaped)</li><li><input type="checkbox"/> nucleus (centrally located)</li></ul> <b>function:</b> involuntary movements and motion; moves materials through internal organs.	p. 111 table 4.14c; description, p.109
<input type="checkbox"/> <b>skeletal muscle</b>	<b>location:</b> attaches to bones or sometimes skin <b>structure:</b> <ul style="list-style-type: none"><li><input type="checkbox"/> muscle fiber (long, cylindrical, unbranched)</li><li><input type="checkbox"/> nuclei (multiple per fiber)</li><li><input type="checkbox"/> striations</li></ul> <b>function:</b> moves skeleton; responsible for voluntary body movements, locomotion, and heat production.	p.110 table 4.14a; description p. 109
<input type="checkbox"/> <b>cardiac muscle</b>	<b>location:</b> heart wall (myocardium) <b>structure:</b> <ul style="list-style-type: none"><li><input type="checkbox"/> muscle fiber (or cardiomyocyte; short, branched)</li><li><input type="checkbox"/> nucleus (one per cell)</li><li><input type="checkbox"/> striations</li><li><input type="checkbox"/> intercalated discs (between cells)</li></ul> <b>function:</b> involuntary contraction and relaxation pump blood in the heart.	p. 110 table 4.14b; description p. 109

## NERVOUS TISSUE

**TABLE 4. NERVOUS TISSUE (1 tissue to identify)**

NAME	BODY LOCATIONS/ STRUCTURES	TEXT REFERENCES AND SKETCH
<input type="checkbox"/> <b>nervous tissue</b> (from multipolar neuron smear slide)	<b>location:</b> brain, spinal cord, peripheral nervous tissue <b>structures:</b> <ul style="list-style-type: none"><li><input type="checkbox"/> neuron</li><li><input type="checkbox"/> soma (cell body)</li><li><input type="checkbox"/> axon</li><li><input type="checkbox"/> dendrites</li><li><input type="checkbox"/> neuroglia (glial cells)</li></ul> <b>function:</b> control and communication between tissues	p. 112 table 4.15; description p. 111

**INTEGUMENTARY SYSTEM:** skin and accessory structures

### **STRUCTURES TO IDENTIFY ON SKIN MODEL AND/OR SLIDES**

### **TEXT REFERENCES**

Layers of the skin/ integument/ cutaneous membrane, from superficial to deep:

p.119; fig. 5.1; table 5.2

- EPIDERMIS** -- most superficial layer; keratinized stratified squamous epithelium

LAYERS OF THE EPIDERMIS: FROM BASEMENT MEMBRANE TO APICAL SURFACE

p.121; fig. 5.2

- stratum basale
  - melanocytes
  - keratinocytes
- stratum spinosum
  - epidermal dendritic (Langerhans) cells
- stratum granulosum
- stratum lucidum (thick skin only)
- stratum corneum
  
- epidermal ridges
  
- DERMIS** – deep to the epidermis
  - papillary layer (areolar connective tissue)
    - dermal papillae
  - reticular layer (dense irregular connective tissue)
    - hair follicles
    - sebaceous glands
    - sudoriferous glands
    - sensory receptors

p.126; fig. 5.6

- HYPODERMIS OR SUBCUTANEOUS LAYER** (not part of the integument proper) – areolar connective tissue and adipose tissue; often called superficial fascia