BODY TISSUES

13. Twelve tissue types are diagrammed in Figure 3–6. Identify each tissue type by inserting the correct name in the blank below it on the diagram. Select different colors for the following structures and use them to color the coding circles and corresponding structures in the diagrams.

- Epithelial cells
- Muscle cells
- Nerve cells
- Matrix (Where found, matrix should be colored differently from the living cells of that tissue type. Be careful, this may not be as easy as it seems!)

Figure 3–6, A–F
14. Describe briefly how the particular structure of a neuron relates to its function in the body.
15. Using key choices, correctly identify the major tissue types described. Enter the appropriate letter or tissue type term in the answer blanks.

**Key Choices**

<table>
<thead>
<tr>
<th>A. Connective</th>
<th>B. Epithelium</th>
<th>C. Muscle</th>
<th>D. Nervous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Forms mucous, serous, and epidermal membranes</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2. Allows for organ movements within the body</td>
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<td></td>
<td>3. Transmits electrochemical impulses</td>
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<td></td>
<td>4. Supports body organs</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>5. Cells of this tissue may absorb and/or secrete substances</td>
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<tr>
<td></td>
<td>6. Basis of the major controlling system of the body</td>
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<td></td>
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<tr>
<td></td>
<td>7. The cells of this tissue shorten to exert force</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Forms hormones</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. Packages and protects body organs</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>10. Characterized by having large amounts of nonliving matrix</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>11. Allows you to smile, grasp, swim, ski, and shoot an arrow</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>12. Most widely distributed tissue type in the body</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13. Forms the brain and spinal cord</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16. Using key choices, identify the following specific type(s) of epithelial tissue. Enter the appropriate letter or classification term in the answer blanks.

**Key Choices**

<table>
<thead>
<tr>
<th>A. Pseudostratified columnar (ciliated)</th>
<th>B. Simple columnar</th>
<th>C. Simple cuboidal</th>
<th>D. Simple squamous</th>
<th>E. Stratified squamous</th>
<th>F. Transitional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Lines the esophagus and forms the skin epidermis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Forms the lining of the stomach and small intestine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Best suited for areas subjected to friction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Lines much of the respiratory tract</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Propels substances (e.g., mucus) across its surface</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>6. Found in the bladder lining; peculiar cells that slide over one another</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Forms thin serous membranes; a single layer of flattened cells</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
17. Epithelium exhibits many plasma membrane modifications. Figure 3–7 depicts some of these modifications.

First: Choose a color for the coding circles and the corresponding structures in the figure.

- [ ] Epithelial cell cytoplasm
- [ ] Connective tissue
- [ ] Epithelial cell nucleus
- [ ] Blood vessel
- [ ] Nerve fibers

Second: Correctly identify the following structures or regions by labeling the appropriate leader lines using terms from the list below:

A. Apical region  
B. Basement membrane  
C. Capillary  
D. Cilia  
E. Connective tissue  
F. Desmosome  
G. Epithelium  
H. Microvilli  
I. Tight junctions

![Figure 3–7](image-url)
18. The three types of muscle tissue exhibit certain similarities and differences. Check (✓) the appropriate spaces in the following table to indicate which muscle types exhibit each characteristic.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Skeletal</th>
<th>Cardiac</th>
<th>Smooth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Voluntarily controlled</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Involuntarily controlled</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>3. Banded appearance</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>4. Single nucleus in each cell</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>5. Multinucleate</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>6. Found attached to bones</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Allows you to direct your eyeballs</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>8. Found in the walls of stomach, uterus, and arteries</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>9. Contains spindle-shaped cells</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>10. Contains cylindrical cells with branching ends</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>11. Contains long, nonbranching cylindrical cells</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>12. Displays intercalated disks</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>13. Concerned with locomotion of the body as a whole</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>14. Changes the internal volume of an organ as it contracts</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>15. Tissue of the circulatory pump</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

19. Circle the term that does not belong in each of the following groupings.

1. Collagen  Cell  Matrix  Cell product
   - Collagen
   - Flagellum
   - Microvilli
   - Elastic fibers

2. Cilia  Flagellum  Microvilli  Elastic fibers
   - Cilia
   - Flagellum
   - Microvilli
   - Elastic fibers

3. Glands  Bones  Epidermis  Mucosae
   - Glands
   - Bones
   - Epidermis
   - Mucosae

4. Adipose  Hyaline  Osseous  Nervous
   - Adipose
   - Hyaline
   - Osseous
   - Nervous

5. Blood  Smooth  Cardiac  Skeletal
   - Blood
   - Smooth
   - Cardiac
   - Skeletal
20. Using key choices, identify the following connective tissue types. Insert the appropriate letter or corresponding term in the answer blanks.

**Key Choices**

A. Adipose connective tissue  
B. Areolar connective tissue  
C. Dense fibrous connective tissue  
D. Osseous tissue  
E. Reticular connective tissue  
F. Hyaline cartilage

_______________ 1. Provides great strength through parallel bundles of collagenic fibers; found in tendons

_______________ 2. Acts as a storage depot for fat

_______________ 3. Composes the dermis of the skin

_______________ 4. Forms the bony skeleton

_______________ 5. Composes the basement membrane and packages organs; includes a gel-like matrix with all categories of fibers and many cell types

_______________ 6. Forms the embryonic skeleton and the surfaces of bones at the joints; reinforces the trachea

_______________ 7. Provides insulation for the body

_______________ 8. Structurally amorphous matrix, heavily invaded with fibers; appears glassy and smooth

_______________ 9. Contains cells arranged concentrically around a nutrient canal; matrix is hard due to calcium salts

_______________ 10. Forms the stroma or internal "skeleton" of lymph nodes, the spleen, and other lymphoid organs

**Tissue Repair**

21. For each of the following statements about tissue repair that is true, enter \( T \) in the answer blank. For each false statement, correct the underlined words by writing the correct words in the answer blank.

_______________ 1. The nonspecific response of the body to injury is called **regeneration**.

_______________ 2. Intact capillaries near an injury dilate, leaking plasma, blood cells, and **antibodies**, which cause the blood to clot. The clot at the surface dries to form a scab.

_______________ 3. During the first phase of tissue repair, capillary buds invade the clot, forming a delicate pink tissue called **endodermal** tissue.

_______________ 4. When damage is not too severe, the surface epithelium migrates beneath the dry scab and across the surface of the granulation tissue. This repair process is called **proliferation**.
5. If tissue damage is very severe, tissue repair is more likely to occur by fibrosis, or scarring.

6. During fibrosis, fibroblasts in the granulation tissue lay down keratin fibers, which form a strong, compact, but inflexible mass.

7. The repair of cardiac muscle and nervous tissue occurs only by fibrosis.

DEVELOPMENTAL ASPECTS OF CELLS AND TISSUES

22. Correctly complete each statement by inserting your responses in the answer blanks:

1. During embryonic development, cells specialize to form \( \text{---} \).

2. Mitotic cell division is very important for overall body \( \text{---} \).

3. All tissues except \( \text{---} \) tissue continue to undergo cell division until the end of adolescence. After this time, \( \text{---} \) tissue also becomes amitotic. When amitotic tissues are damaged, they are replaced by \( \text{---} \) tissue, which does not function in the same way as the original tissue. This is a serious problem when heart cells are damaged:

4. Aging begins almost as soon as we are born. Three explanations of the aging process have been offered. One states that \( \text{---} \) insults, such as the presence of toxic substances in the blood, are important. Another theory states that external \( \text{---} \) factors, such as X-rays, help to cause aging. A third theory suggests that aging is programmed in our \( \text{---} \). Three examples of aging processes seen in all people are \( \text{---} \), \( \text{---} \), and \( \text{---} \):

5. Neoplasms occur when cells "go wild" and the normal controls of cell \( \text{---} \) are lost. The two types of neoplasms are \( \text{---} \) and \( \text{---} \). The \( \text{---} \) type tends to stay localized and have a capsule. The \( \text{---} \) type is likely to invade other body tissues and spread to other (distant) parts of the body. To correctly diagnose the type of neoplasm, a microscopic examination of the tissue called a \( \text{---} \) is usually done. Whenever possible; \( \text{---} \) is the treatment of choice for neoplasms:

6. An overgrowth of tissue that is not considered to be a neoplasm is referred to as \( \text{---} \). Conversely, a decrease in the size of an organ or tissue, resulting from loss of normal stimulation, is called \( \text{---} \).
23. Where necessary, complete statements by inserting the missing words in the answer blanks.

1. For your second journey, you will be miniaturized to the size of a small protein molecule and will travel in a microsubmarine, specially designed to enable you to pass easily through living membranes. You are injected into the intercellular space between two epithelial cells, and you are instructed to observe one of these cells firsthand, and to identify as many of its structures as possible.

2. You struggle briefly with the controls and then maneuver your microsub into one of these cells. Once inside the cell, you find yourself in a kind of "sea." This salty fluid that surrounds you is the (1) of the cell.

3. Far below looms a large, dark, oval structure, much larger than anything else you can see. You conclude that it is the (2). As you move downward, you pass a cigar-shaped structure with strange-looking folds on its inner surface. Although you have a pretty good idea that it must be a (3), you decide to investigate more thoroughly. After passing through the external membrane of the structure, you are confronted with yet another membrane. Once past this membrane, you are inside the strange-looking structure. You activate the analyzer switch in your microsub for a readout indicating which molecules are in your immediate vicinity. As suspected, there is an abundance of energy-rich (4) molecules. Having satisfied your curiosity, you leave this structure to continue the investigation.

A long, meandering membrane with dark globules clinging to its outer surface now comes into sight. You maneuver closer and sit back to watch the activity. As you watch, amino acids are joined together and a long, threadlike protein molecule is built. The globules must be (5) and the membrane, therefore, is the (6). Once again, you head toward the large dark structure seen and tentatively identified earlier. On approach, you observe that this huge structure has very large openings in its outer wall; these openings must be the (7). Passing through one of these openings, you discover that from the inside the color of this structure is a result of dark, coiled, intertwined masses of (8) which your analyzer confirms contain genetic material, or (9) molecules. Making your way through this tangled mass, you pass two round, dense structures that appear to be full of the same type of globules you saw outside. These two round structures are (10). All this information confirms your earlier identification of this cellular structure, so now you move to its exterior to continue observations.
Anatomy & Physiology Coloring Workbook

11. Just ahead, you see what appears to be a mountain of flattened sacs with hundreds of small sac-like vesicles at its edges. The vesicles seem to be migrating away from this area and heading toward the outer edges of the cell. The mountain of sacs must be the _________. Eventually, you come upon a rather simple-looking membrane-bound sac. Although it doesn't look too exciting, and has few distinguishing marks, it does not resemble anything else you have seen so far. Deciding to obtain a chemical analysis before entering this sac, you activate the analyzer and on the screen you see "Enzymes — Enzymes — Hydrolases — Hydrolases — Danger — Danger." There is little doubt that this innocent-appearing structure is actually a _________.

Completing your journey, you count the number of organelles identified so far. Satisfied that you have observed most of them, you request retrieval from the intercellular space.

**AT THE CLINIC**

24. Johnny lacerated his arm and rushed home to Mom so she could "fix it." His mother poured hydrogen peroxide over the area and it bubbled vigorously where it came in contact with the wound. Since you can expect that cells were ruptured in the injured area, what do you think was happening here?

25. The epidermis (epithelium of the cutaneous membrane or skin) is a keratinized stratified squamous epithelium. Explain why that epithelium is much better suited for protecting the body's external surface than a mucosa consisting of a simple columnar epithelium would be.

26. Streptomycin (an antibiotic) binds to the small ribosomal subunit of bacteria (but not to the ribosomes of the host cells infected by bacteria). The result is the misreading of bacteria mRNA and the breakup of polysomes. What process is being affected, and how does this kill the bacterial cells?
27. Systemic lupus erythematosus (often simply called lupus) is a condition that sometimes affects young women. It is a chronic (persistent) inflammation that affects all or most of the connective tissue proper in the body. Suzy is told by her doctor that she has lupus, and she asks if it will have widespread or merely localized effects within the body. What would the physician answer?

28. Mrs. Linsey sees her gynecologist because she is unable to become pregnant. The doctor discovers granulation tissue in her vaginal canal and explains that sperm are susceptible to some of the same chemicals as bacteria. What is inhibiting the sperm?

29. Sarah, a trainee of the electron microscopist at the local hospital, is reviewing some micrographs of muscle cells and macrophages (phagocytic cells). She notices that the muscle cells are loaded with mitochondria while the macrophages have abundant lysosomes. Why is this so?

30. Bradley tripped and tore one of the tendons surrounding his ankle. In anguish with pain, he asked his doctor how quickly he could expect it to heal. What do you think the doctor's response was and why?