

Anatomy of a Generalized Cell

2. Complete the following table to fully describe the various cell parts. Insert your responses in the spaces provided under each heading.

Cell structure	Location	Function
Plasma membrane	External boundary of the cell	Confines cell contents; regulates entry and exit of materials
Lysosomes	Sarcoendocytoblast	Digestive enzymes
Mitochondria	Scattered throughout the cell	Control release of energy from foods; form ATP
Microvilli	Projections of the plasma membrane	Increase the membrane surface area
Golgi apparatus	near nucleus	package proteins
Nucleus	center (usually)	genetic material / direct activities
Centrioles	Two rod-shaped bodies near the nucleus	Direct formation of the mitotic spindle
Nucleolus	center of nucleus	make ribosomes
Smooth ER	Cytoplasm	synthesize lipids / transport
Rough ER	Cytoplasm - nucleus	synthesize proteins
Ribosomes	Attached to membrane systems or scattered in the cytoplasm	DNA
Chromatin	Nucleus	Detoxify alcohol, hydrogen peroxide, etc.
Peroxisomes	Scattered in cytoplasm	
Inclusions		

Key

3. Using the following list of terms, correctly label all cell parts indicated by leader lines in Figure 3-1. Then select different colors for each structure and use them to color the coding circles and the corresponding structures in the illustration. (May label)

- Plasma membrane
- Centriole(s)
- Chromatin threads(s)
- Golgi apparatus
- Microvilli
- Mitochondrion
- Nuclear membrane
- Nucleolus
- Rough endoplasmic reticulum (ER)
- Smooth endoplasmic reticulum (ER)

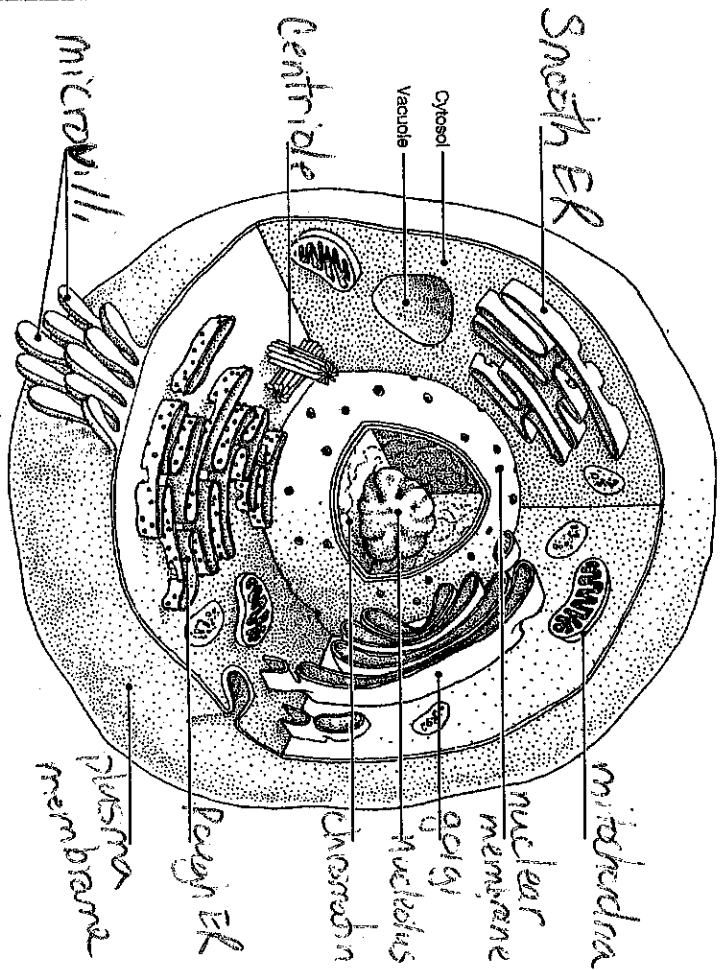


Figure 3-1

Cell Physiology

Membrane Transport

4. A semipermeable sac, containing 4% NaCl, 9% glucose, and 10% albumin, is suspended in a solution with the following composition: 10% NaCl, 10% glucose, and 40% albumin. Assume the sac is permeable to all substances except albumin. Using the key choices, insert the letter indicating the correct event in the answer blanks.

Key Choices

- A. Moves into the sac B. Moves out of the sac C. Does not move
 1. Glucose 3. Albumin
 2. Water 4. NaCl

5. Figure 3-2 shows three microscopic fields (A-C) containing red blood cells. Arrows indicate the direction of net osmosis. Respond to the following questions, referring to Figure 3-2, by inserting your responses in the spaces provided.

- Which microscopic field contains a hypertonic solution A
 The cells in this field are said to be dehydrated (crenated) B
- Which microscopic field contains an isotonic bathing solution? B
 What does isotonic mean? Same on both sides of
cell. Isolate concentration
- Which microscopic field contains a hypotonic solution C
 What is happening to the cells in this field and why? lysis / burst

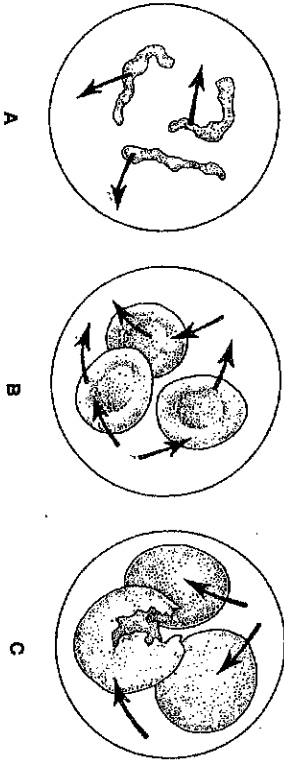


Figure 3-2

6. Select the key choices that characterize each of the following statements. Insert the appropriate letter(s) or corresponding term(s) in the answer blanks.

Key Choices

- A. Diffusion, simple C. Endocytosis, phagocytosis E. Filtration
 B. Diffusion, osmosis D. Exocytosis F. Solute pumping
 1. Require ATP (cellular energy)

- Require ATP (cellular energy) C, D, F
- Driven by kinetic energy of the molecules A, B, E
- Driven by hydrostatic (fluid) pressure A, B, E
- Follow a concentration gradient A, B, F
- Proceeds against a concentration gradient; require(s) a carrier D
- A means of secreting cell products B, F
- Moves water through a semipermeable membrane B, F
- Transports amino acids, some sugars, and Na⁺ through the plasma membrane C
- Provides for cellular uptake of solid or large particles from the cell exterior A
- Moves small or lipid-soluble solutes through the membrane A

7. Figure 3-3 represents a portion of a plasma membrane. Select two different colors for lipid and protein molecules. Color the coding circles and the corresponding molecules in the illustration. Then add a colored arrow for each substance shown inside and outside the cell indicating (a) its direction of transport through the membrane; and (b) its means of transport (that is, either directly through the lipid portion or by attachment to a protein carrier). (May label)

Lipid molecules
 Protein molecules

Two types of molecules not shown here that contribute to plasma membrane structure are cholesterol and sugar groups (carbs)

Figure 3-3

9. Identify the phases of mitosis depicted in Figure 3-4 by inserting the correct name in the blank under the appropriate diagram. Then select different colors to represent the structures listed below and use them to color in the coding circles and the corresponding structures in the illustration. (May 1981)

- Nuclear membrane(s), if present
- Centrioles
- Nucleoli, if present
- Spindle fibers
- Chromosomes

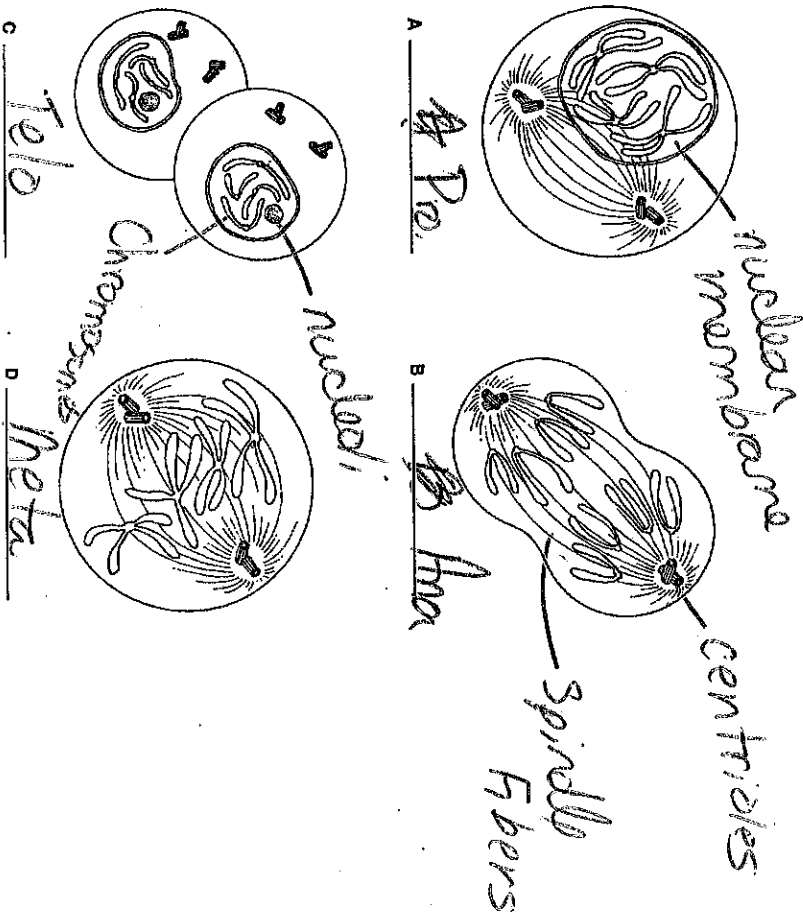


Figure 3-4

10. The following statements describe events that occur during the different phases of mitosis. Identify the phase by choosing the correct response(s) from key choices and inserting the letter(s) or term(s) in the answer blanks.

Key Choices

- A. Anaphase
- C. Prophase
- E. None of these
- B. Metaphase
- D. Telophase

1. Chromatin coils and condenses to form deeply staining bodies. C
2. Centrioles break, and chromosomes begin migration toward opposite poles of the cell. A
3. The nuclear membrane and nucleoli reappear. D
4. When chromosomes cease their poleward movement, this phase begins. D
5. Chromosomes align on the equator of the spindle. B
6. The nucleoli and nuclear membrane disappear. C
7. The spindle forms through the migration of the centrioles. C
8. Chromosomal material replicates. E
9. Chromosomes first appear to be duplex structures. C
10. Chromosomes attach to the spindle fibers. C
11. A cleavage furrow forms during this phase. D
12. The nuclear membrane is absent during the entire phase. ProB
13. Period during which a cell carries out its usual metabolic activities. E

11. Complete the following statements. Insert your answers in the answer blanks.

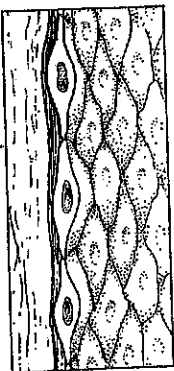
1. Nucleus
2. Cytoplasm
3. Cell
4. Centrioles
5. Reticulated cells
6. Spindle
7. Interphase

Division of the (1) is referred to as mitosis. Cytokinesis is division of the (2). The major structural difference between chromatin and chromosomes is that the latter are (3). Chromosomes attach to the spindle fibers by undivided structures called (4). If a cell undergoes nuclear division but not cytoplasmic division, the product is a (5). The structure that acts as a scaffolding for chromosomal attachment and movement is called the (6). (7) is the period of cell life when the cell is not involved in division.

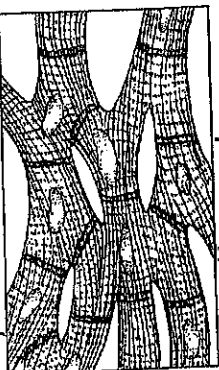
BODY TISSUES

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 in the diagrams. (may label)

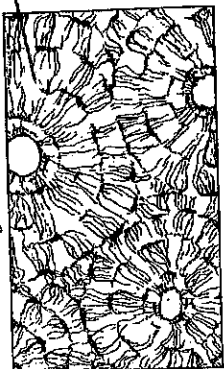
- Epithelial cells
- Muscle cells
- Connective Tissue
- Nerve cells
- Matrix (Where found, matrix should be colored differently from the living cells of that tissue type. Be careful, this may not be as easy as it seems!)



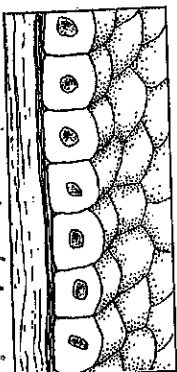
A Simple Squamous epithelium



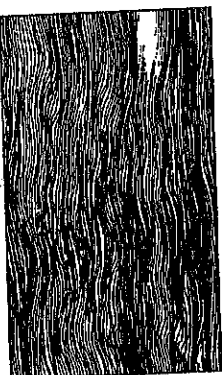
C Cardiac muscle



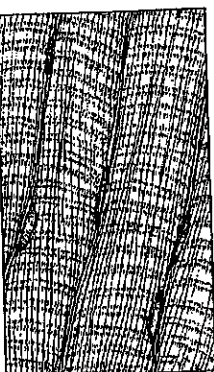
E Bone CT



B Simple cuboidal epith.

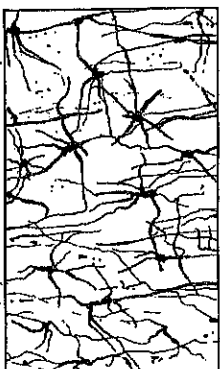


D Dense fibrous connective tissue

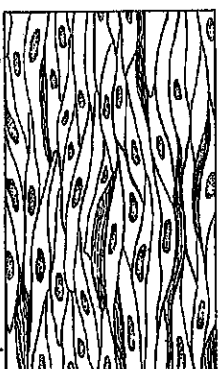


F Skeletal muscle

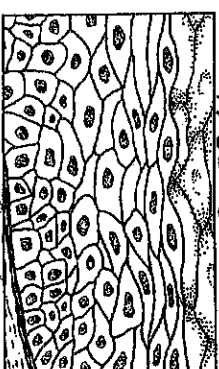
Matrix
E Bone CT
Figure 3-6, A-F



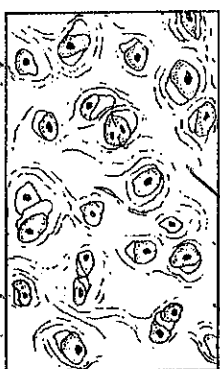
G Nervous tissue



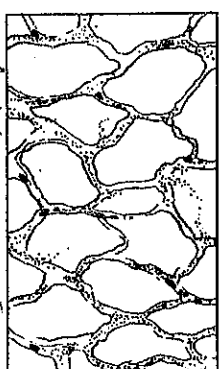
I Smooth muscle tissue



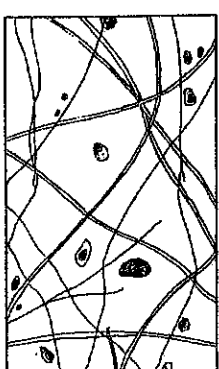
K Stratified squamous epith.



H Hyaline cartilage CT



J Adipose CT



L Areolar CT

14. Describe briefly how the particular structure of a neuron relates to its function in the body.
 long cytoplasmic extensions transmit electric impulses over long distances

Figure 3-6, G-L

Matrix

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

- A. Connective B. Epithelium C. Muscle D. Nervous

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

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

- A. Pseudostratified columnar (ciliated) C. Simple cuboidal E. Stratified squamous
 B. Simple columnar D. Simple squamous F. Transitional

1. Lines the esophagus and forms the skin epidermis E
2. Forms the lining of the stomach and small intestine B
3. Best suited for areas subjected to friction A
4. Lines much of the respiratory tract A
5. Propels substances (e.g., mucus) across its surface A
6. Found in the bladder lining; peculiar cells that slide over one another F
7. Forms thin serous membranes; a single layer of flattened cells D

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.

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

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

- | | | | |
|-----------------|--------------|------------|----------------|
| 1. Collagen | <u>Cell</u> | Matrix | Cell product |
| 2. Cilia | Flagellum | Microvilli | Elastic fibers |
| 3. Glands | <u>Bones</u> | Epidermis | Mucosae |
| 4. Adipose | Hyaline | Osseous | <u>Nervous</u> |
| <u>5. Blood</u> | 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 C. Dense fibrous connective tissue E. Reticular connective tissue
 B. Areolar connective tissue D. Osseous tissue F. Hyaline cartilage

1. Provides great strength through parallel bundles of collagenic fibers; found in tendons C
 2. Acts as a storage depot for fat A
 3. Composes the dermis of the skin S
 4. Forms the bony skeleton D
 5. Composes the basement membrane and packages organs; includes a gel-like matrix with all categories of fibers and many cell types B
 6. Forms the embryonic skeleton and the surfaces of bones at the joints; reinforces the trachea F
 7. Provides insulation for the body A
 8. Structurally amorphous matrix, heavily invaded with fibers; appears glassy and smooth F
 9. Contains cells arranged concentrically around a nutrient canal; matrix is hard due to calcium salts D
 10. Forms the stroma or internal "skeleton" of lymph nodes, the spleen, and other lymphoid organs E