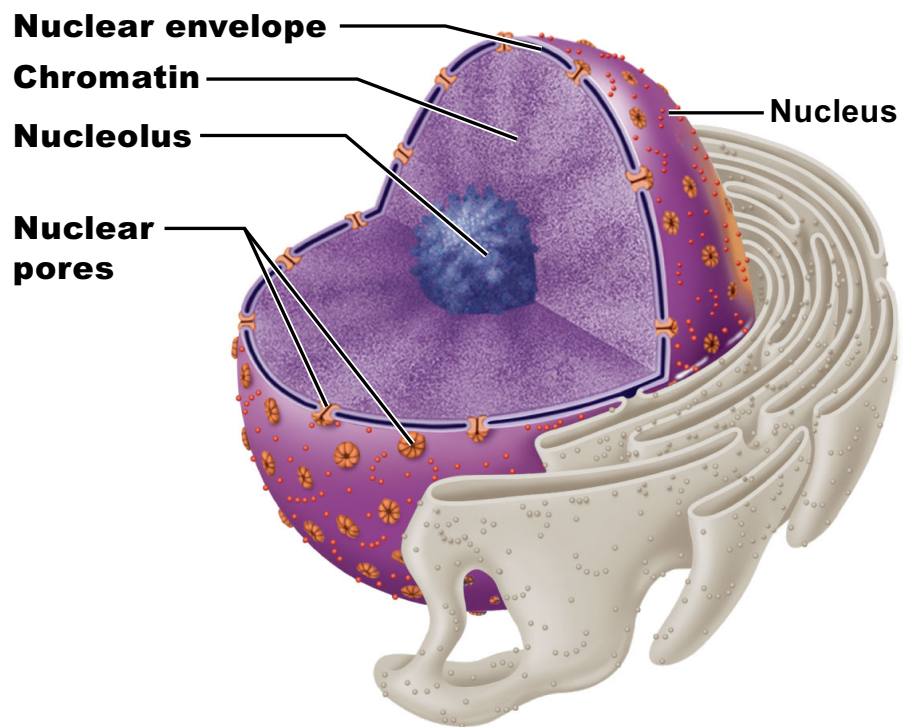
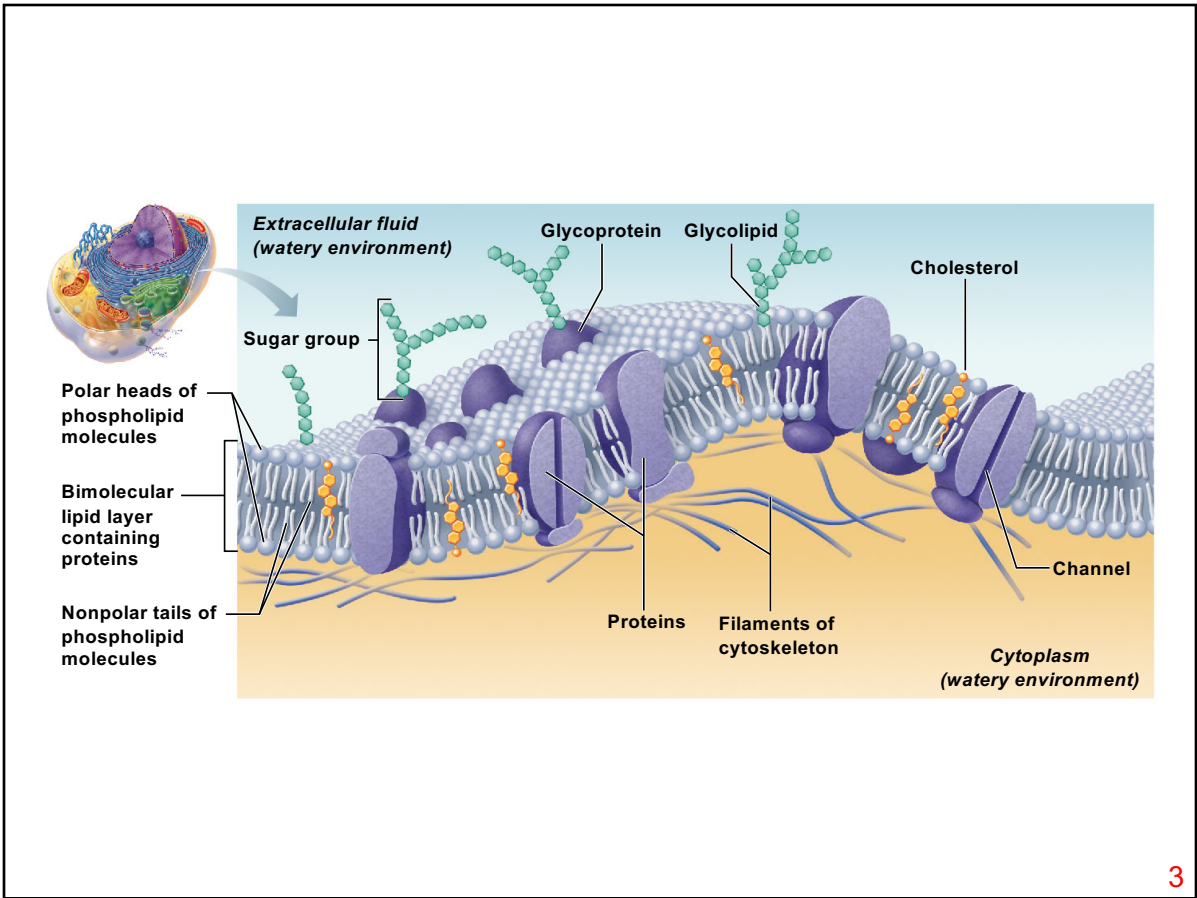


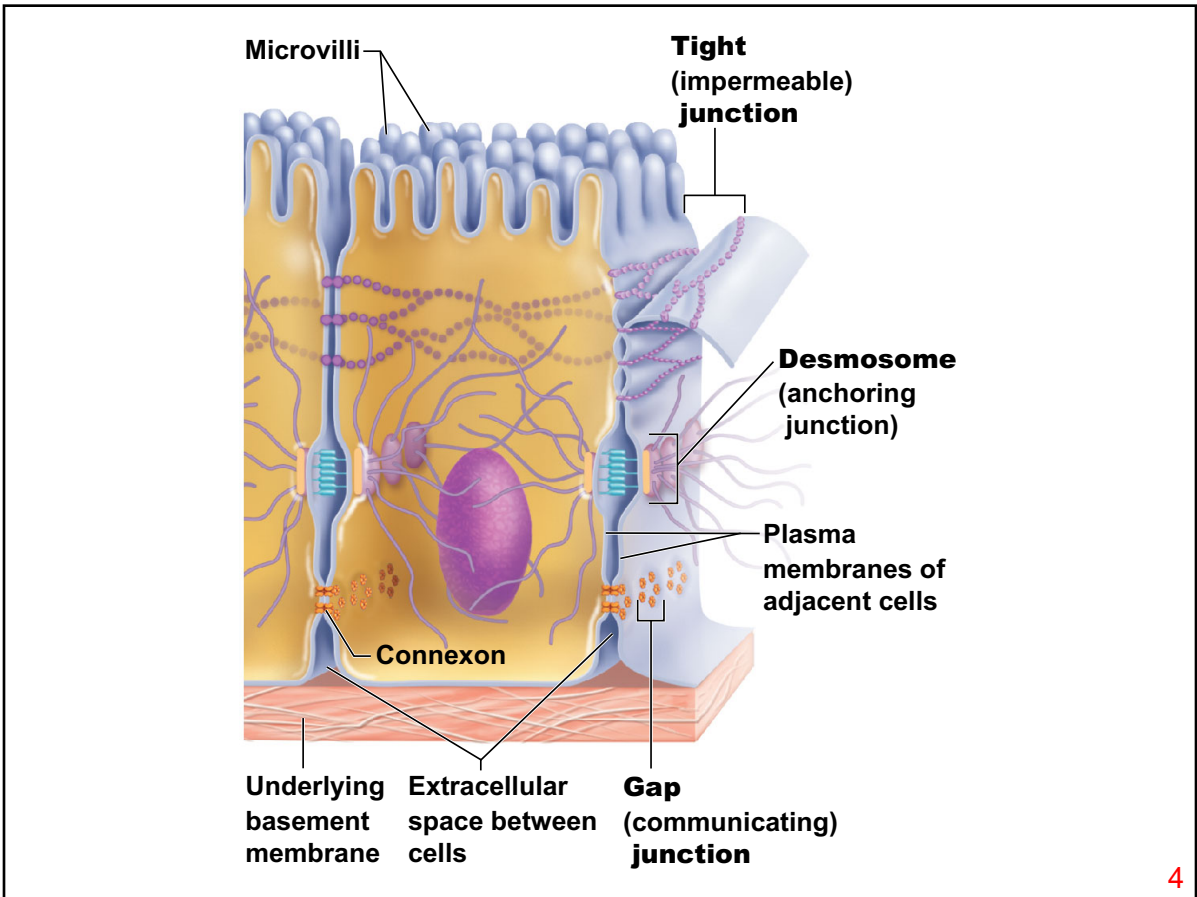
**(a) Generalized animal cell**



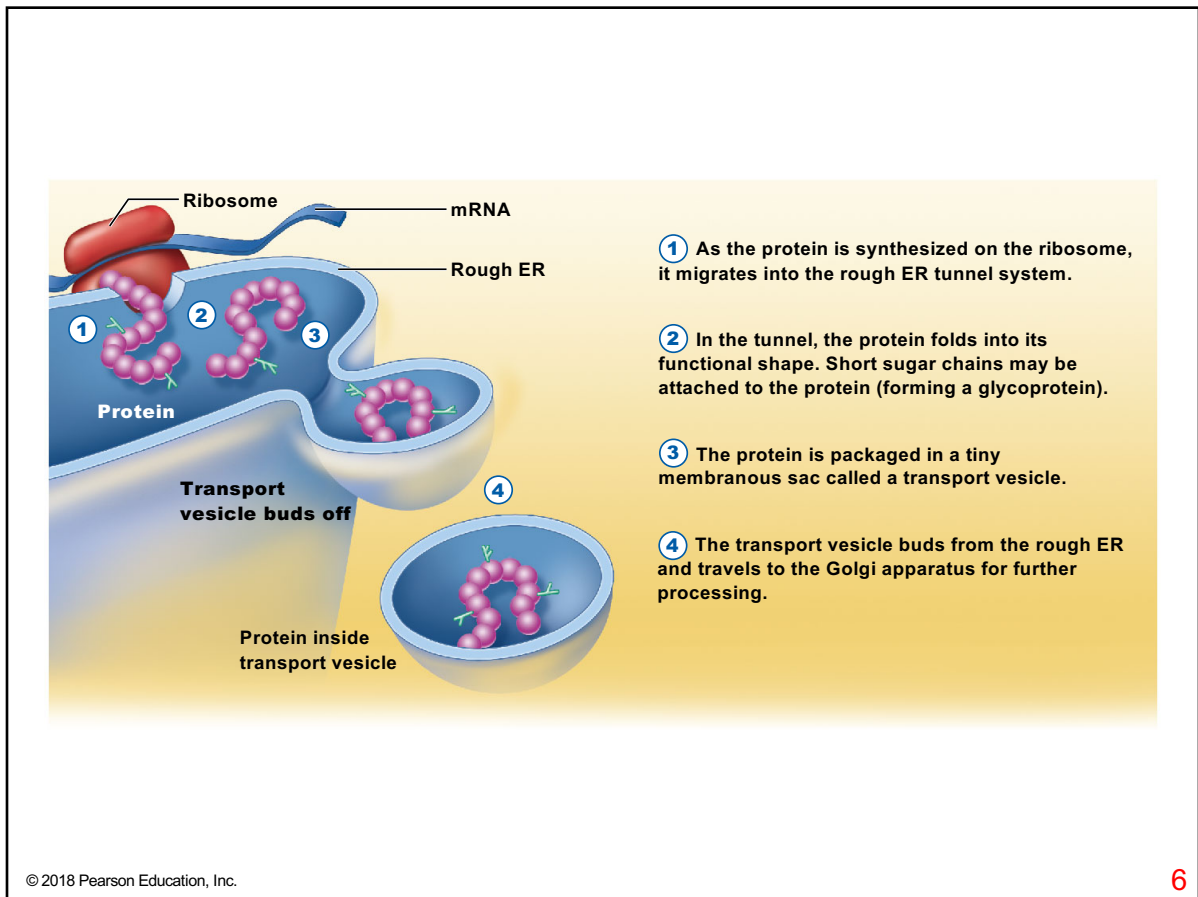
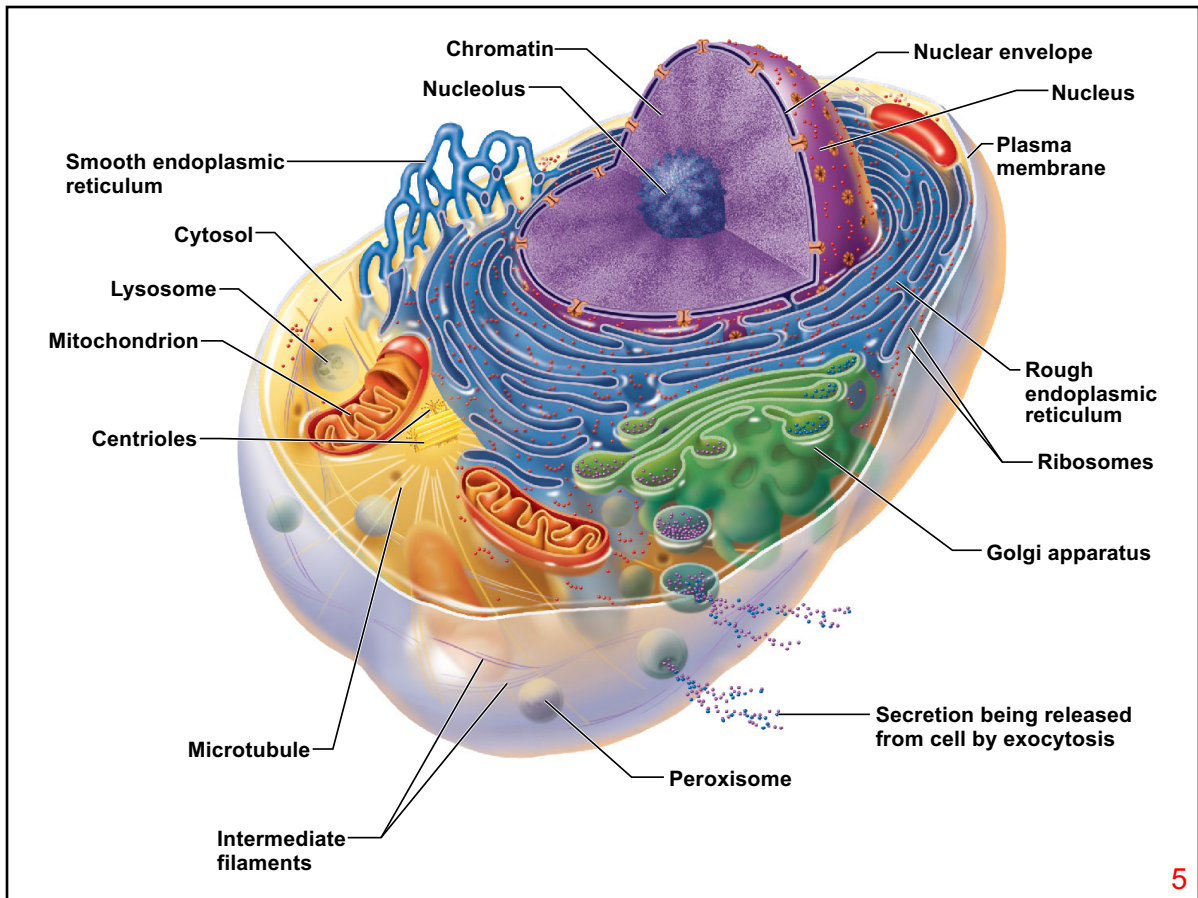
**(b) Nucleus**

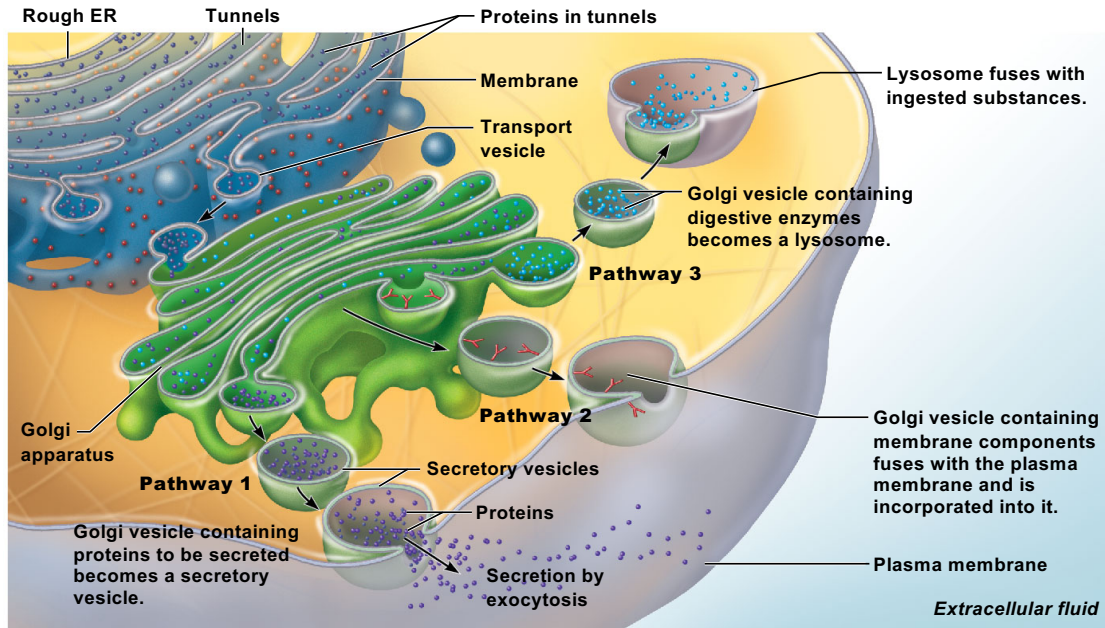


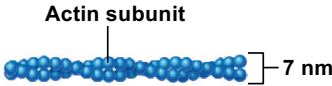


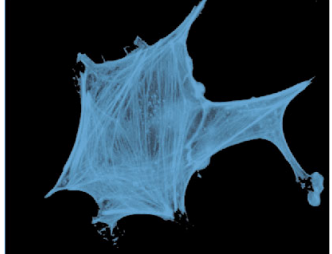
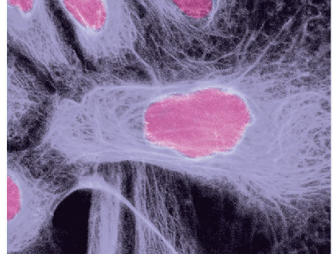
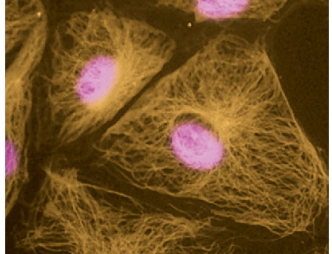
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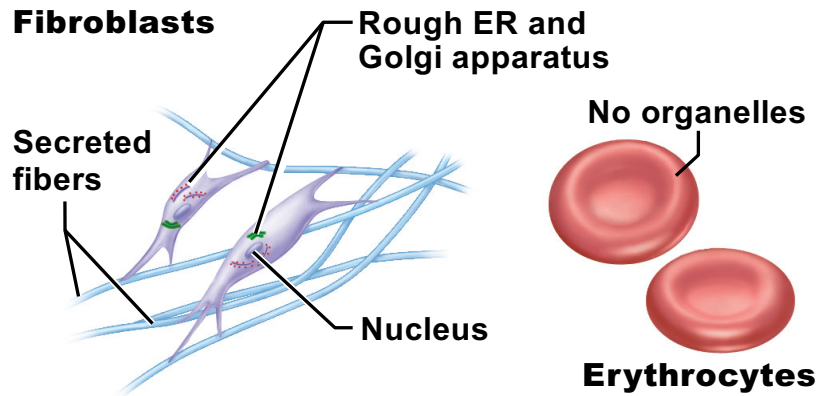


4

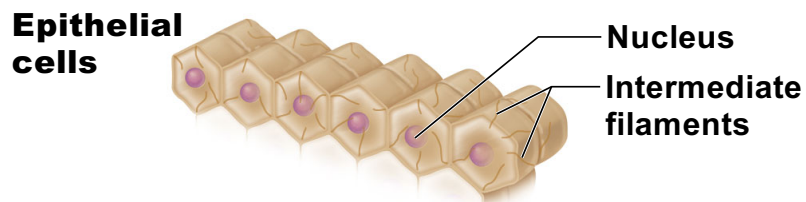




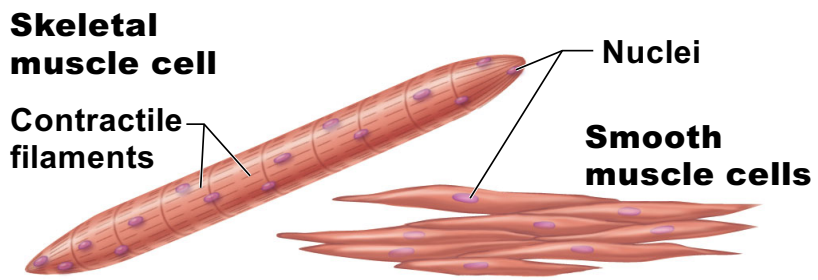
(a) Microfilaments	(b) Intermediate filaments	(c) Microtubules
<p><b>Actin subunit</b></p>  <p>7 nm</p>	<p><b>Fibrous subunits</b></p>  <p>10 nm</p>	<p><b>Tubulin subunits</b></p>  <p>25 nm</p>
 <p><b>Microfilaments form the blue batlike network.</b></p>	 <p><b>Intermediate filaments form the purple network surrounding the pink nucleus.</b></p>	 <p><b>Microtubules appear as gold networks surrounding the cells' pink nuclei.</b></p>



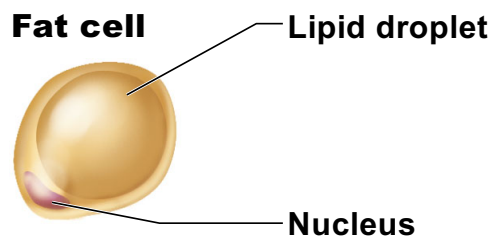
**(a) Cells that connect body parts**



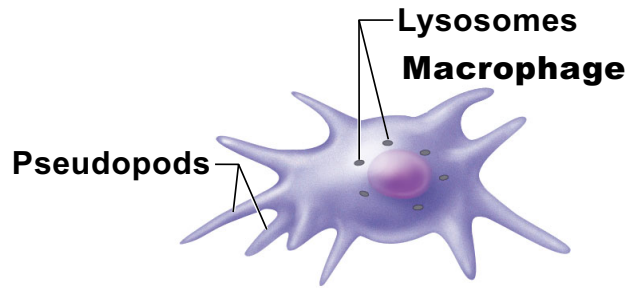
**(b) Cells that cover and line body organs**



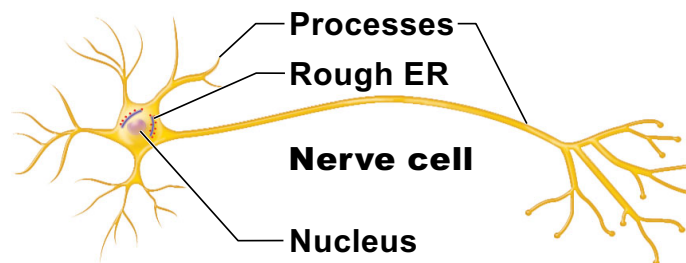
**(c) Cells that move organs and body parts**



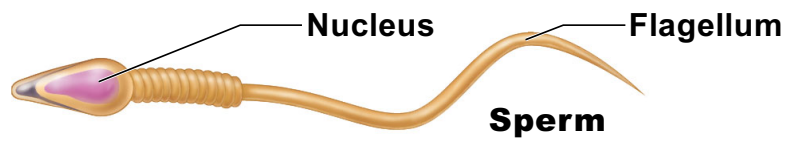
**(d) Cell that stores nutrients**



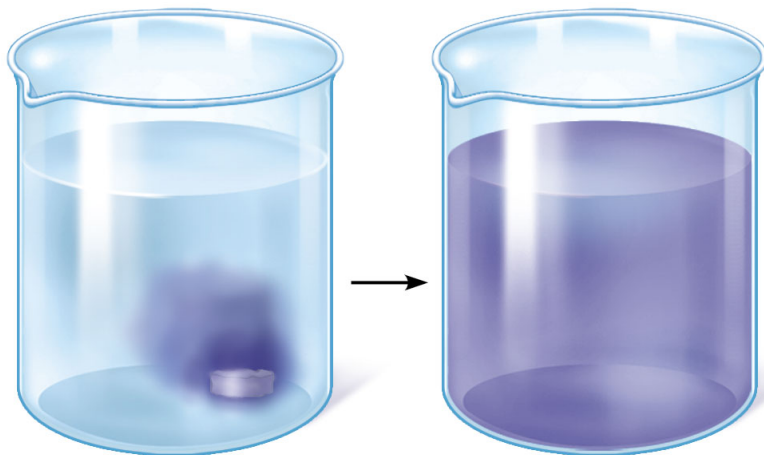
**(e) Cell that fights disease**



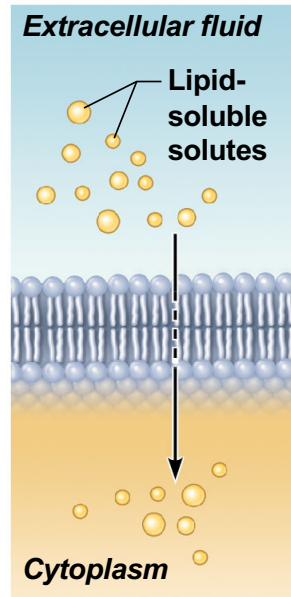
**(f) Cell that gathers information and controls body functions**



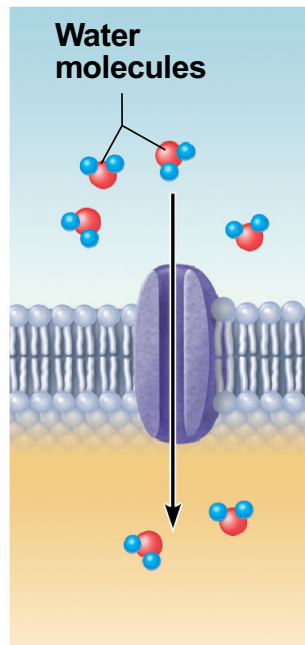
**(g) Cell of reproduction**



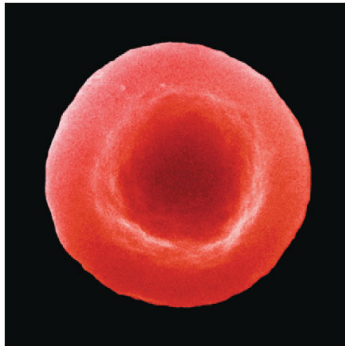




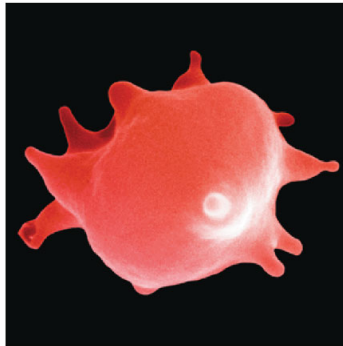
**(a) Simple diffusion**  
of lipid-soluble  
solutes directly  
through the  
phospholipid  
bilayer



**(b) Osmosis,**  
diffusion of water  
through a specific  
channel protein  
(aquaporin)



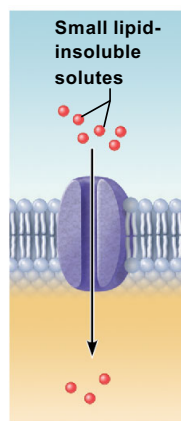
(a) RBC in isotonic solution



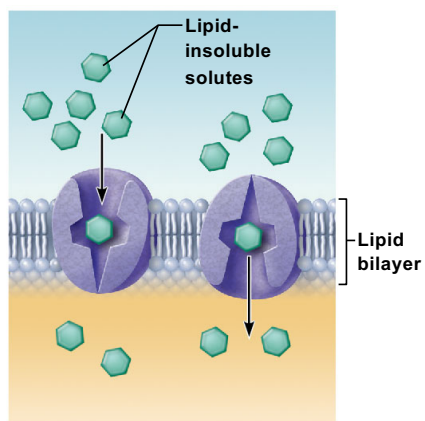
(b) RBC in hypertonic solution



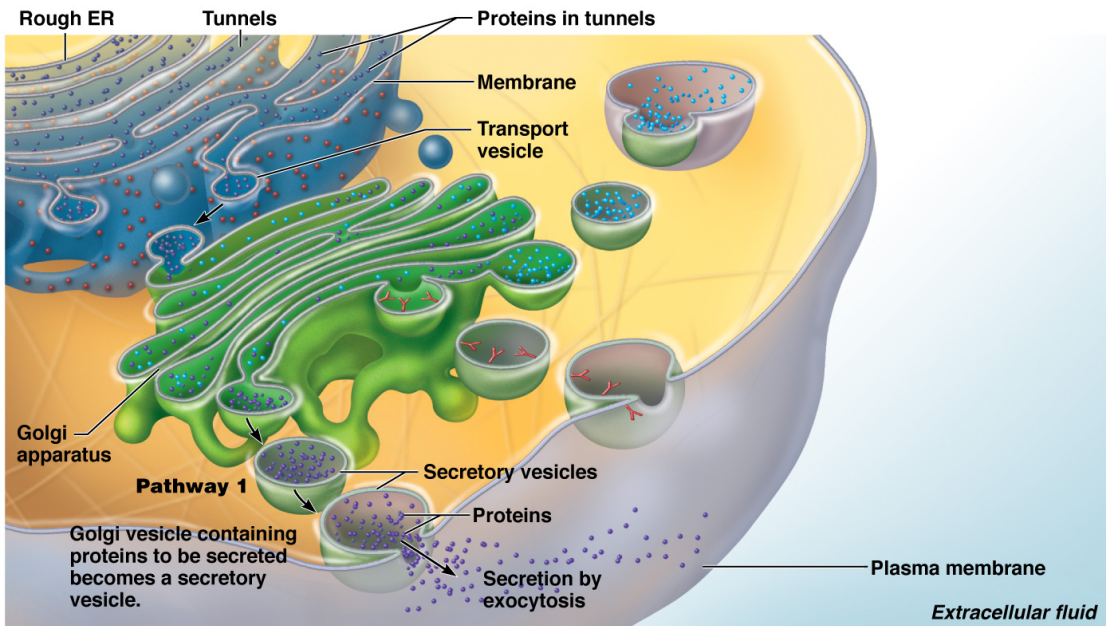
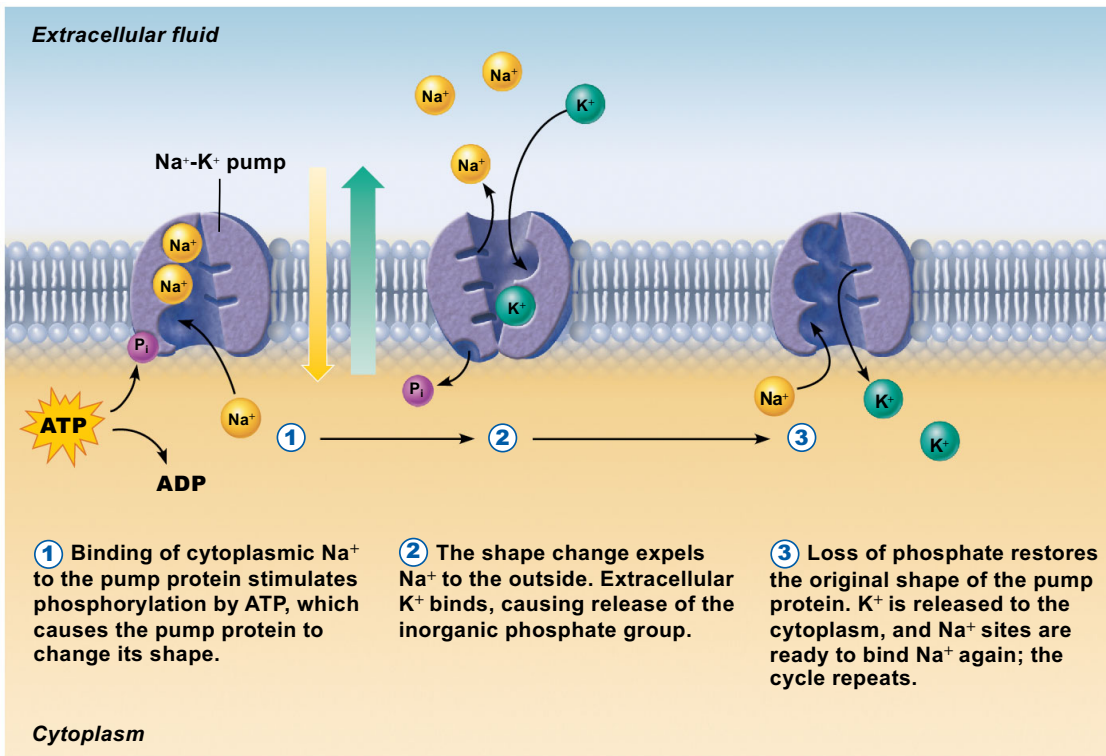
(c) RBC in hypotonic solution

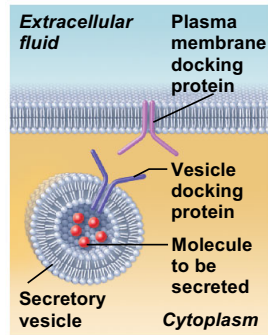


(c) **Facilitated diffusion** through a channel protein; mostly ions, selected on basis of size and charge

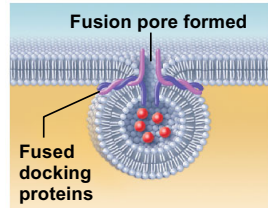


(d) **Facilitated diffusion** via protein carrier specific for one chemical; binding of substrate causes shape change in transport protein

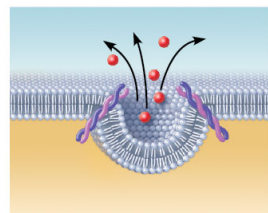




① The membrane-bound vesicle migrates to the plasma membrane.

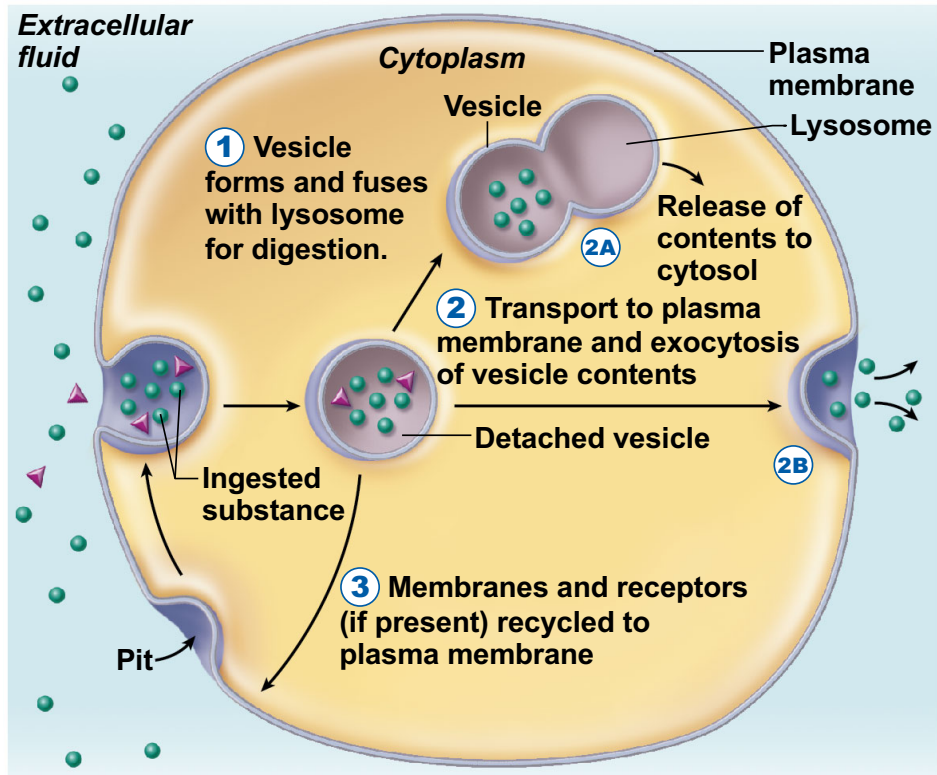


② There, docking proteins on the vesicle and plasma membrane bind, the vesicle and membrane fuse, and a pore opens up.

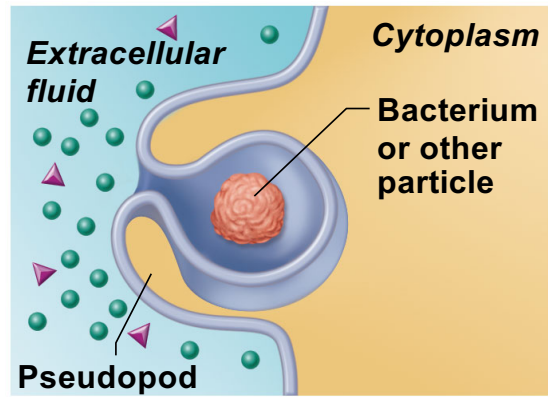


③ Vesicle contents are released to the cell exterior.

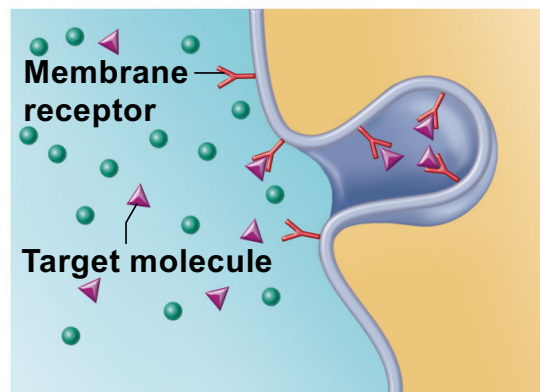
(a) The process of exocytosis



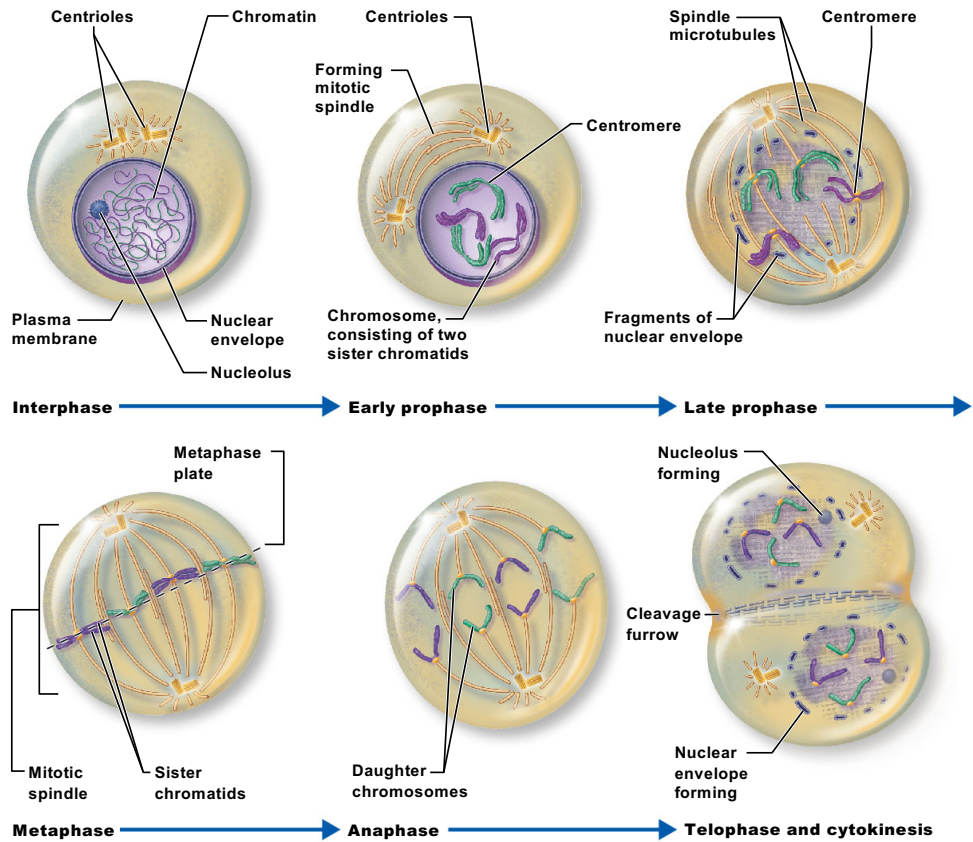
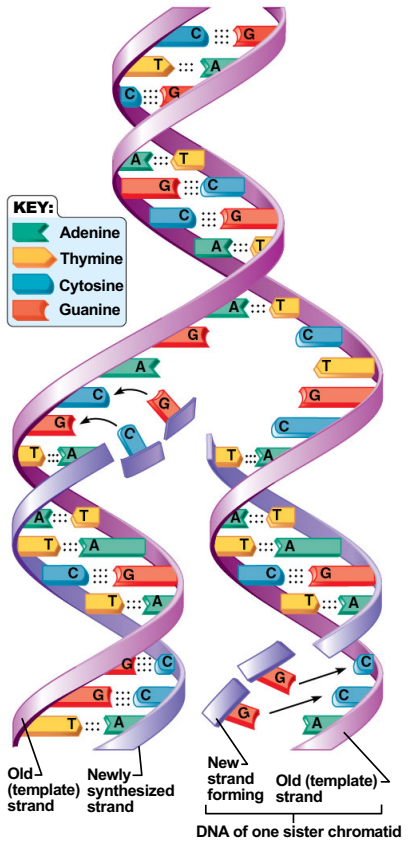
(a) Endocytosis (pinocytosis)

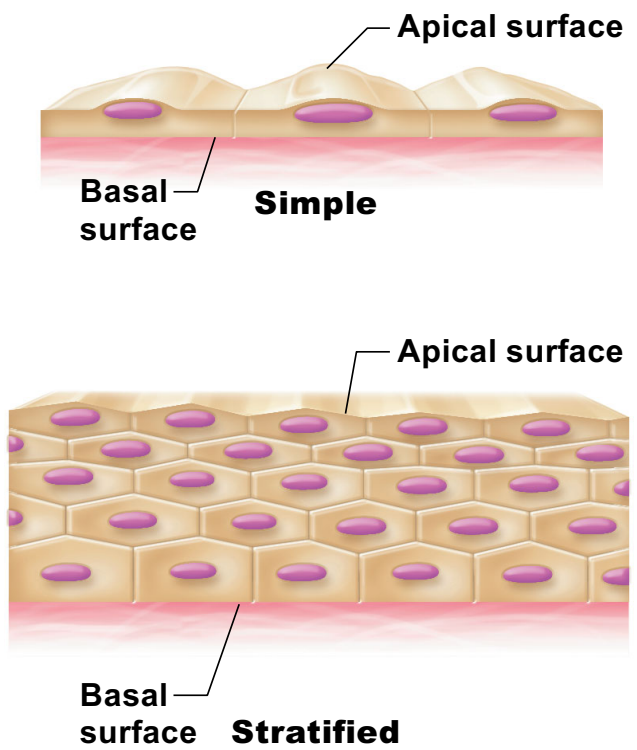
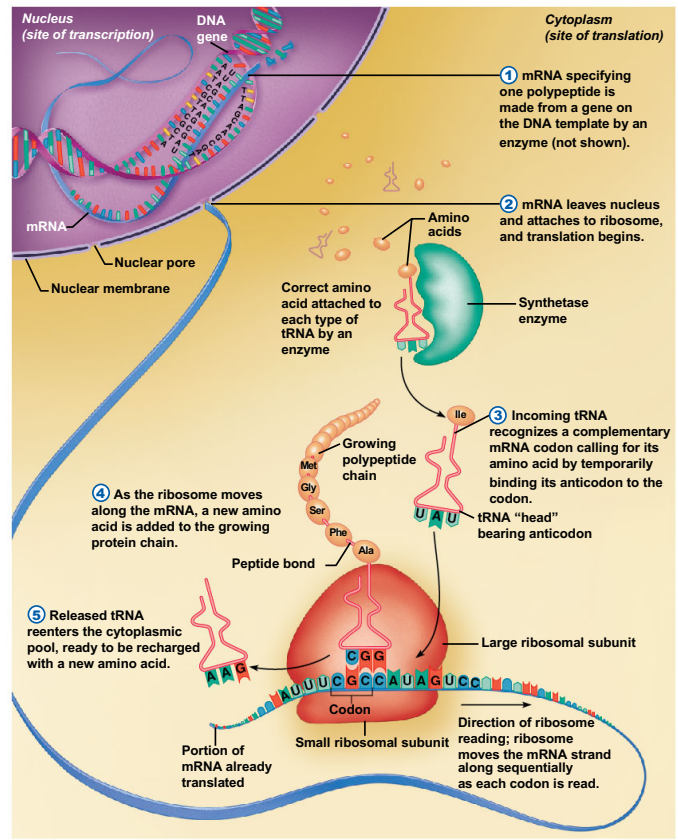


**(b) Phagocytosis**

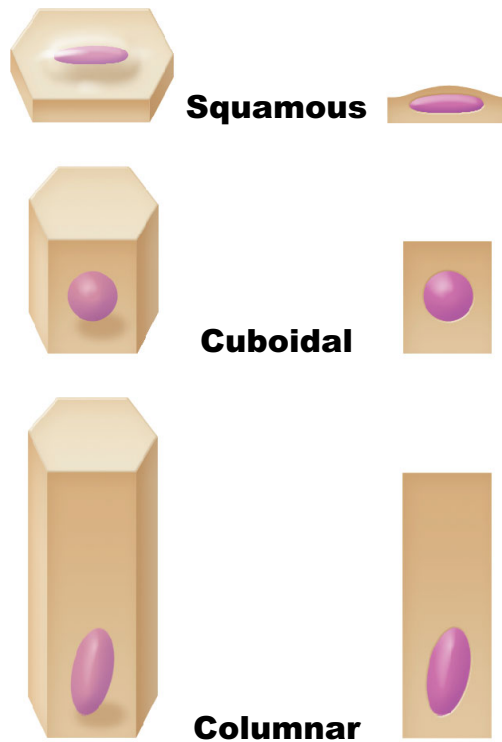


**(c) Receptor-mediated endocytosis**





**(a) Classification based on number of cell layers**

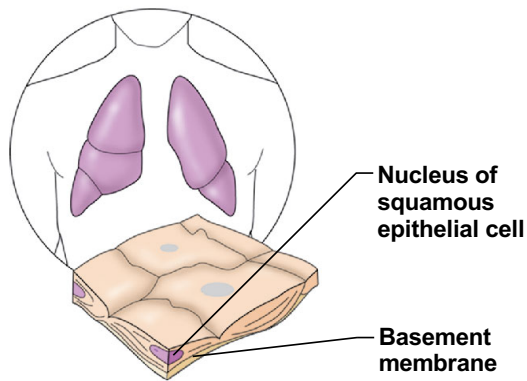


**(b) Classification based on cell shape**

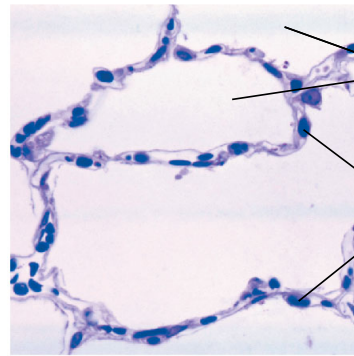
Cell shape	Number of layers	
	One layer: simple epithelial tissues	More than one layer: stratified epithelial tissues
<b>Squamous</b>	Diffusion and filtration Secretion in serous membranes	Protection
<b>Cuboidal</b>	Secretion and absorption; ciliated types propel mucus or reproductive cells	Protection; these tissue types are rare in humans
<b>Columnar</b>	Secretion and absorption; ciliated types propel mucus or reproductive cells	
<b>Transitional</b>	No simple transitional epithelium exists	Protection; stretching to accommodate distension of urinary structures

**(c) Function of epithelial tissue related to tissue type**





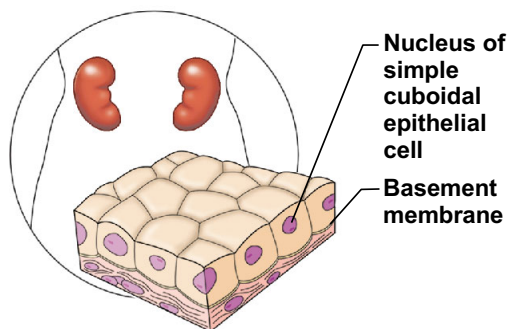
**(a) Diagram: Simple squamous**



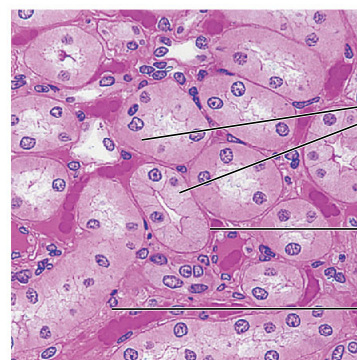
Air sacs of lungs

Nuclei of squamous epithelial cells

**Photomicrograph: Simple squamous epithelium forming part of the alveolar (air sac) walls (275 ×).**



**(b) Diagram: Simple cuboidal**

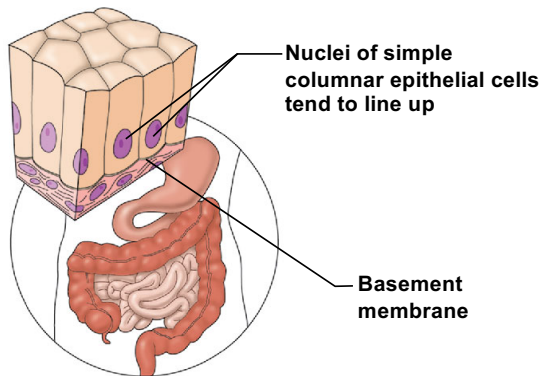


Simple cuboidal epithelial cells

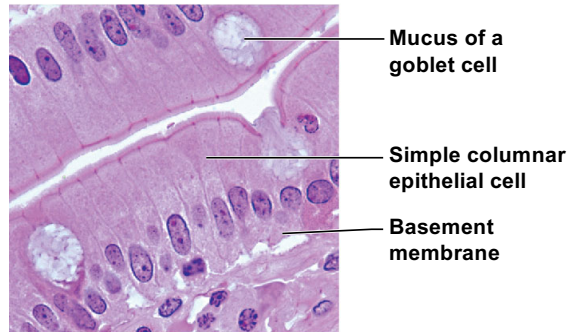
Basement membrane

Connective tissue

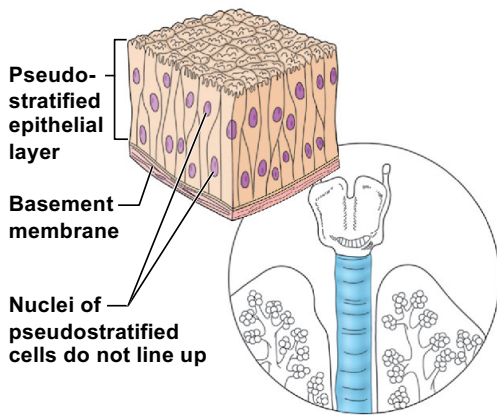
**Photomicrograph: Simple cuboidal epithelium in kidney tubules (250 ×).**



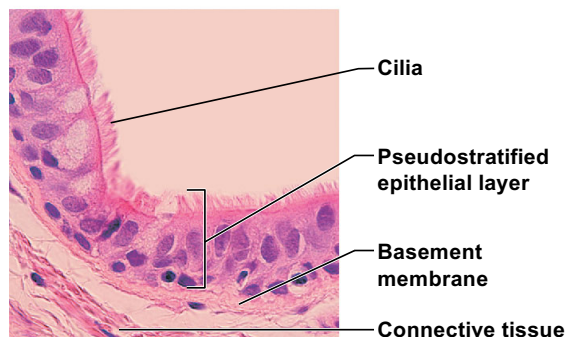
**(c) Diagram: Simple columnar**



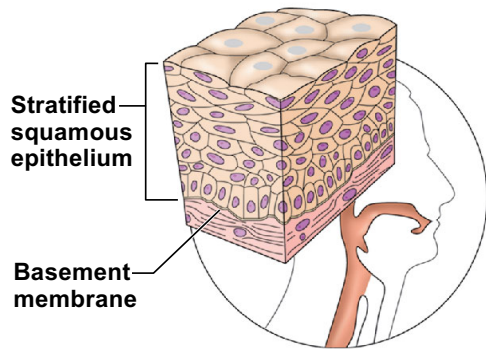
**Photomicrograph: Simple columnar epithelium of the small intestine (575 ×).**



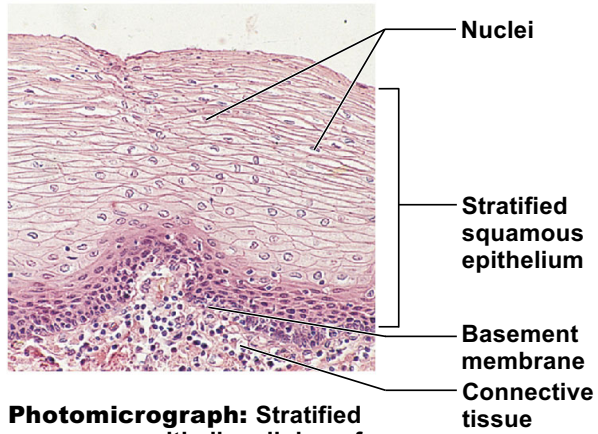
**(d) Diagram: Pseudostratified (ciliated) columnar**



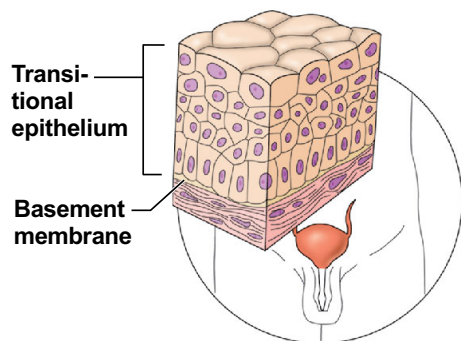
**Photomicrograph: Pseudostratified ciliated columnar epithelium lining the human trachea (560 ×).**



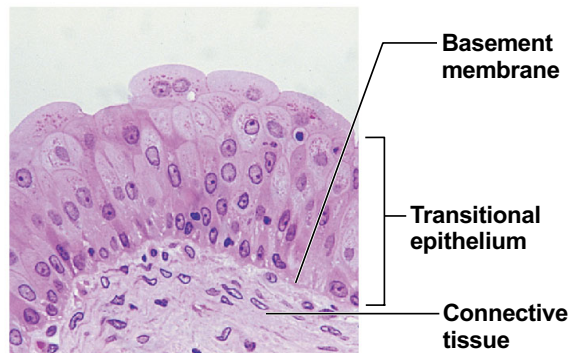
**(e) Diagram: Stratified squamous**



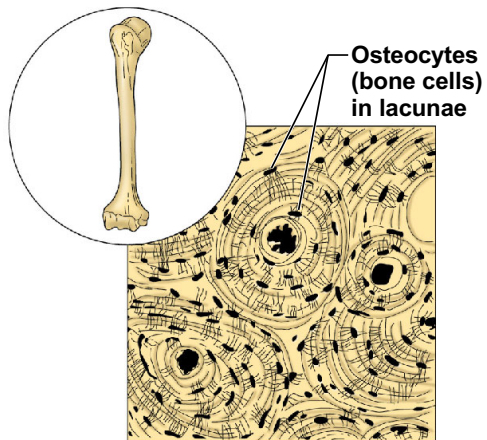
**Photomicrograph: Stratified squamous epithelium lining of the esophagus (140 ×).**



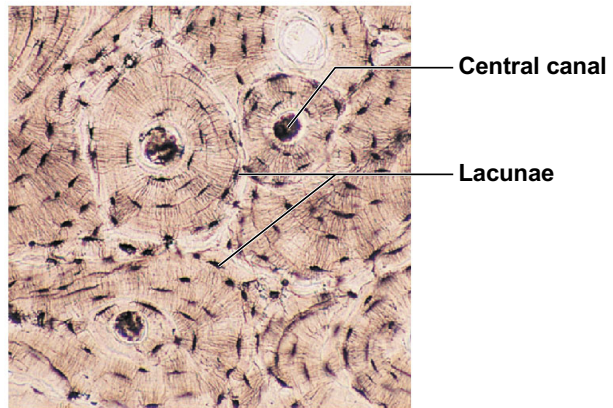
**(f) Diagram: Transitional**



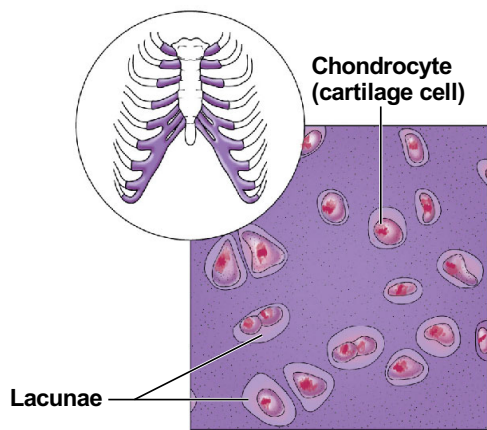
**Photomicrograph: Transitional epithelium lining of the bladder, relaxed state (270 ×); surface rounded cells flatten and elongate when the bladder fills with urine.**



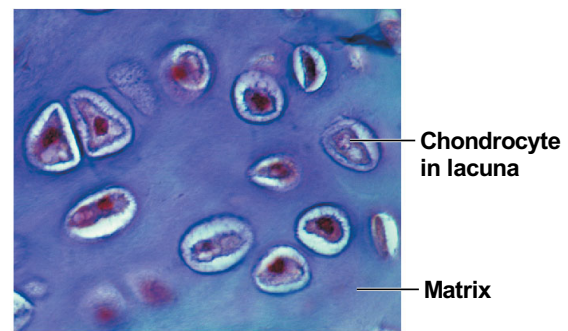
**(a) Diagram: Bone**



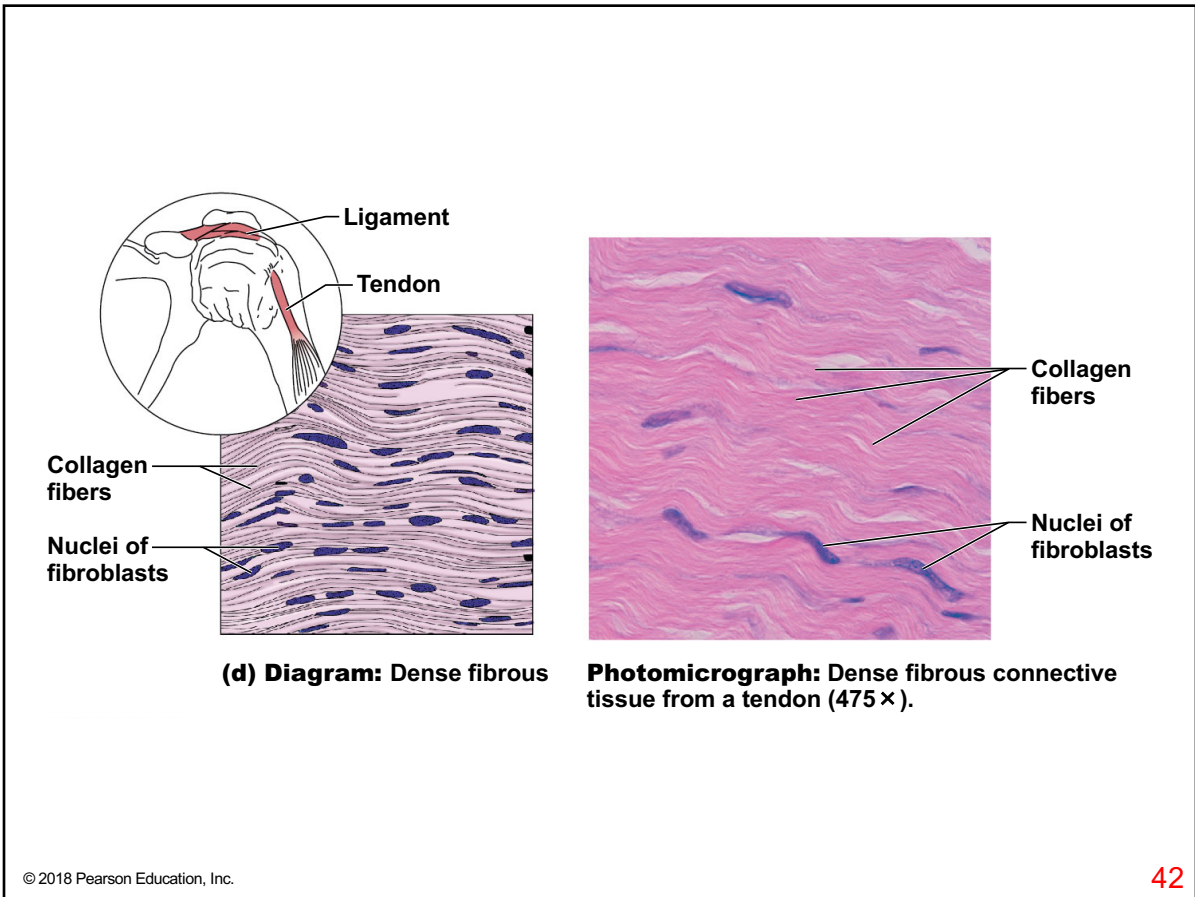
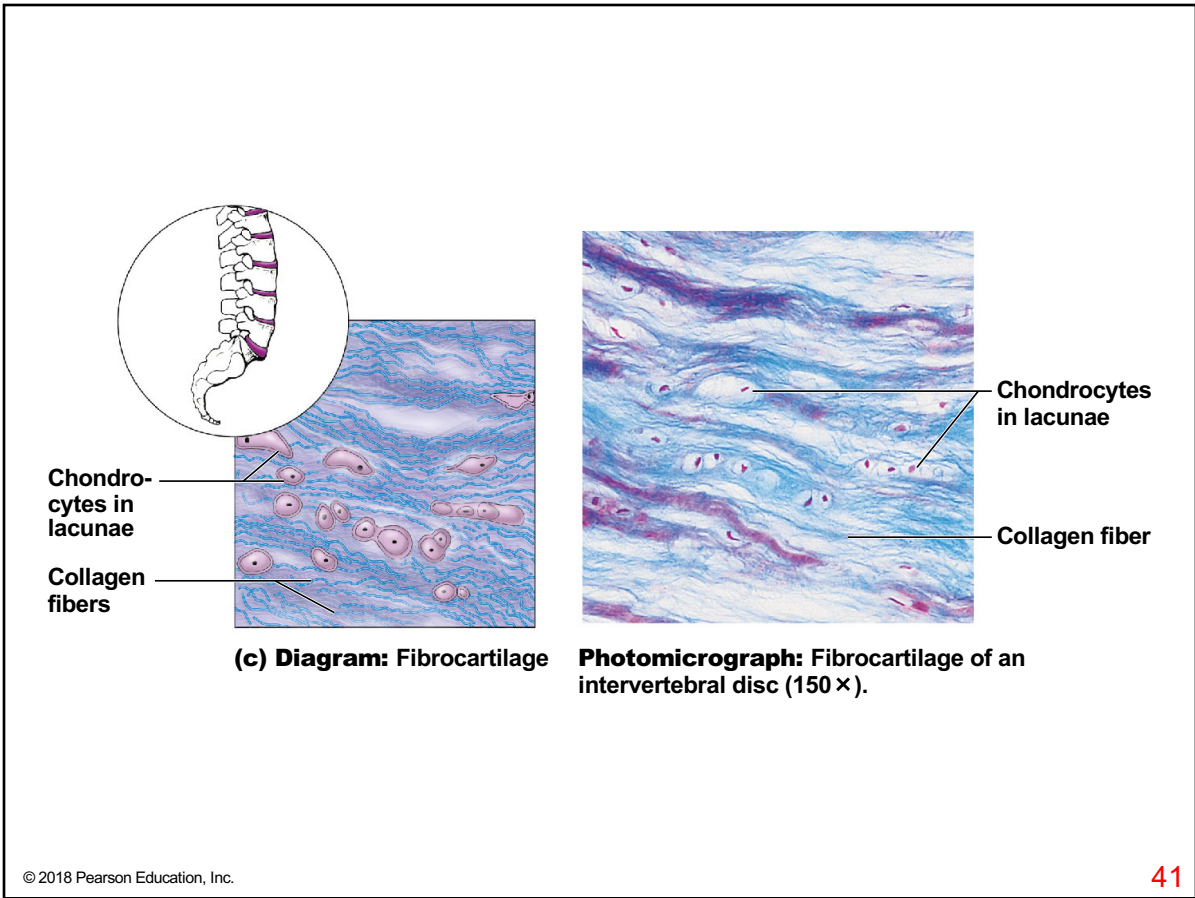
**Photomicrograph: Cross-sectional view of bone (165 ×).**

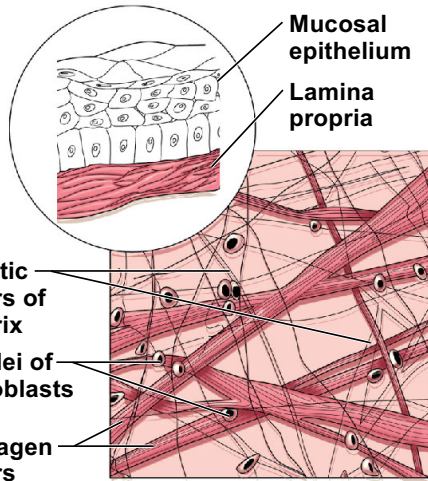


**(b) Diagram: Hyaline cartilage**

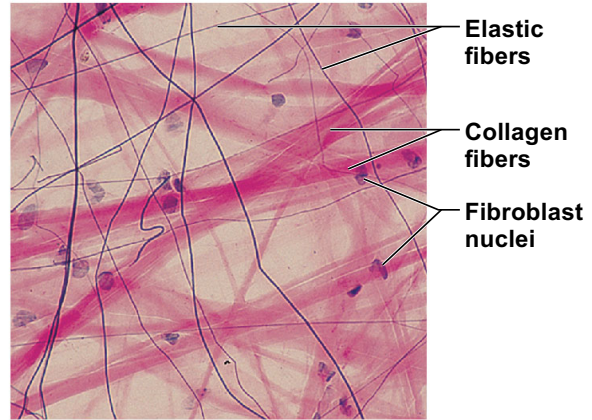


**Photomicrograph: Hyaline cartilage from the trachea (400 ×).**

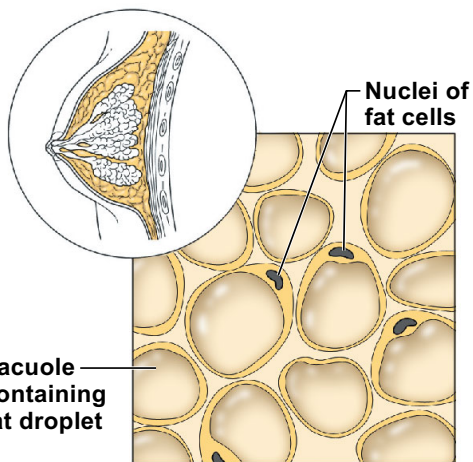




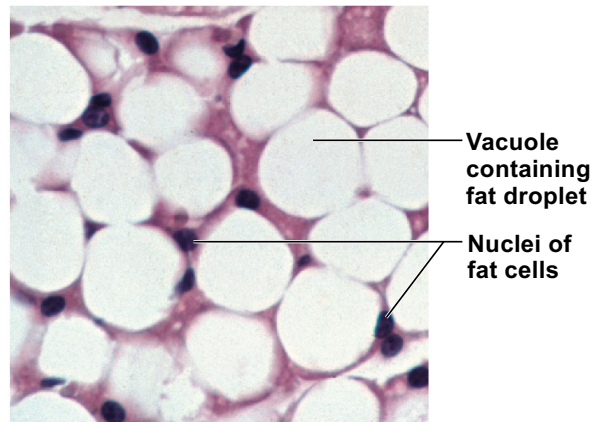
**(e) Diagram: Areolar**



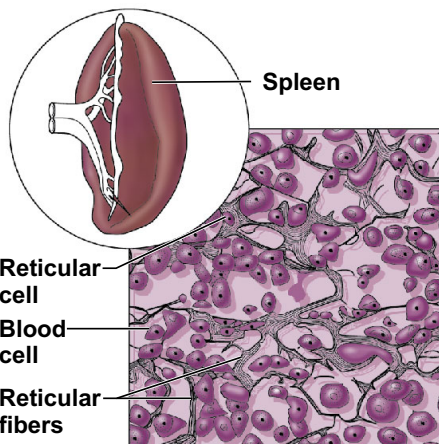
**Photomicrograph: Areolar connective tissue, a soft packaging tissue of the body (270 ×).**



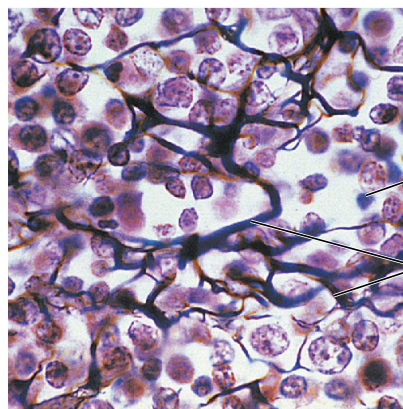
**(f) Diagram: Adipose**



**Photomicrograph: Adipose tissue from the subcutaneous layer beneath the skin (570 ×).**

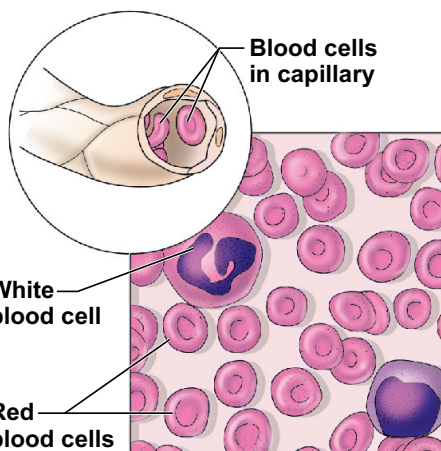


**(g) Diagram: Reticular**

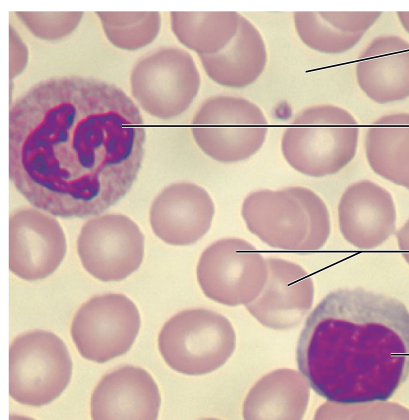


White blood cell (lymphocyte)  
Reticular fibers

**Photomicrograph: Dark-staining network of reticular connective tissue (400 ×).**

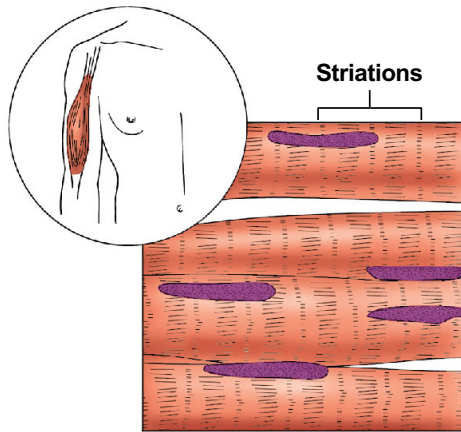


**(h) Diagram: Blood**

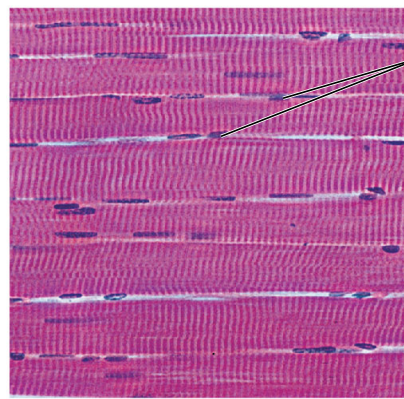


Plasma (fluid matrix)  
Neutrophil (white blood cell)  
Red blood cells  
Monocyte (white blood cell)

**Photomicrograph: Smear of human blood (1290 ×)**



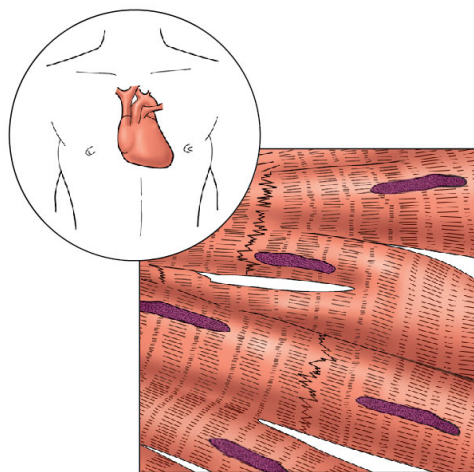
**(a) Diagram: Skeletal muscle**



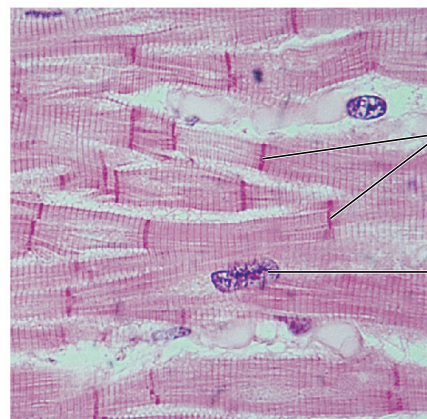
**Photomicrograph: Skeletal muscle (195 ×).**

Multiple nuclei per fiber

Part of muscle fiber



**(b) Diagram: Cardiac muscle**

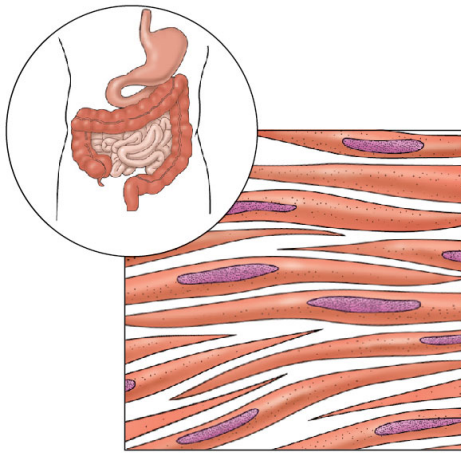


**Photomicrograph: Cardiac muscle (475 ×).**

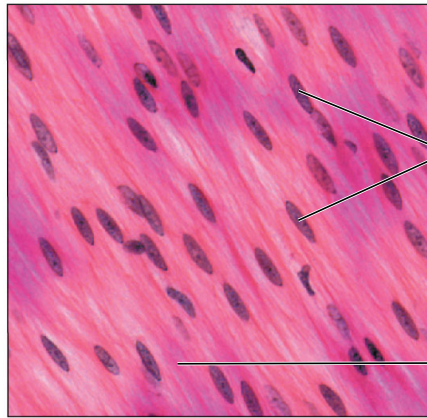
Intercalated discs

Nucleus





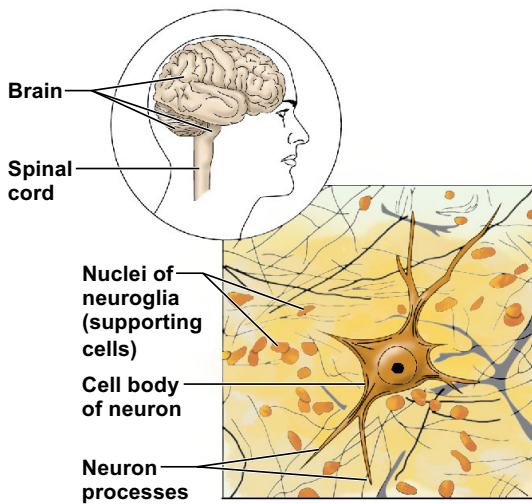
**(c) Diagram: Smooth muscle**



**Nuclei**

**Smooth muscle cell**

**Photomicrograph: Sheet of smooth muscle (360 ×).**



**Brain**

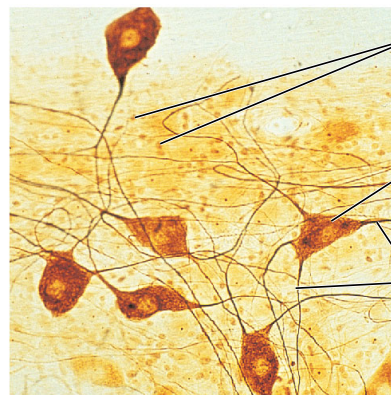
**Spinal cord**

**Nuclei of neuroglia (supporting cells)**

**Cell body of neuron**

**Neuron processes**

**Diagram: Nervous tissue**



**Nuclei of neuroglia (supporting cells)**

**Cell body of neuron**

**Neuron processes**

**Photomicrograph: Neurons (320 ×)**

