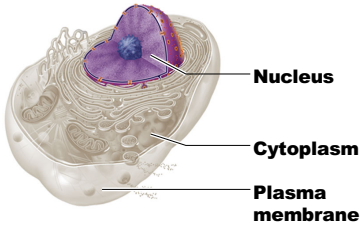

(a) Generalized animal cell

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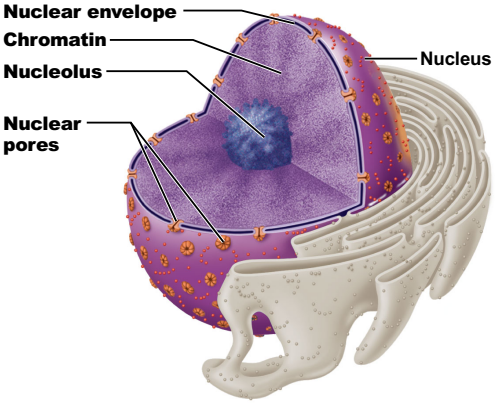
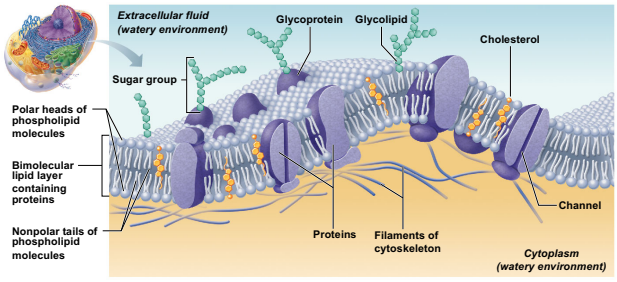
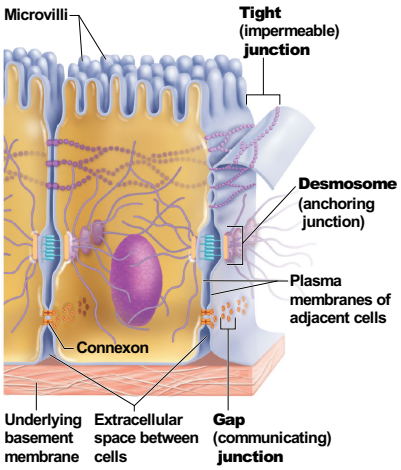
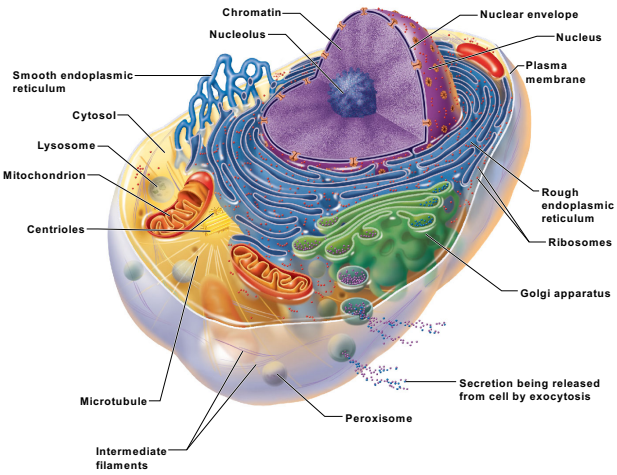
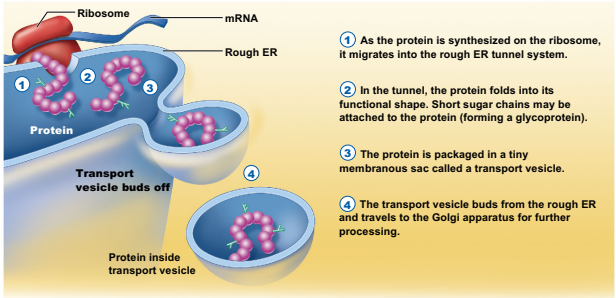


(b) Nucleus









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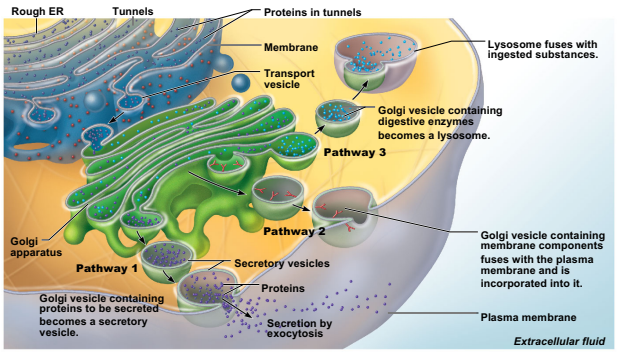

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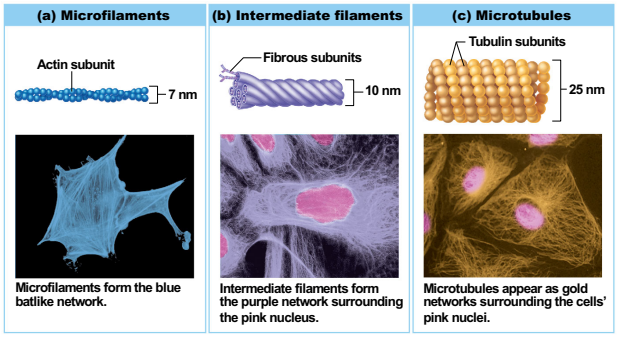

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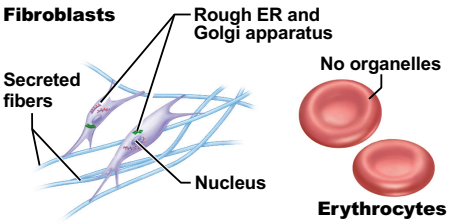

(a) Cells that connect body parts

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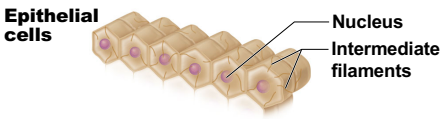

(b) Cells that cover and line body organs

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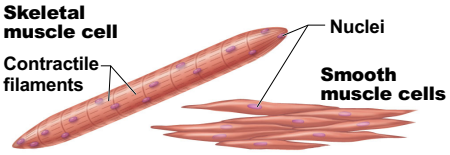

(c) Cells that move organs and body parts

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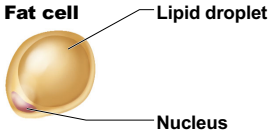

(d) Cell that stores nutrients

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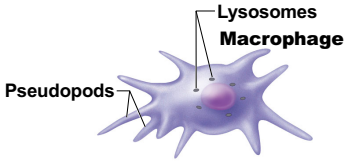

(e) Cell that fights disease

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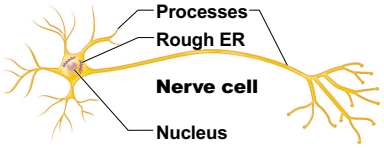

(f) Cell that gathers information and controls body functions

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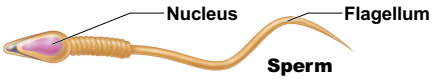

(g) Cell of reproduction

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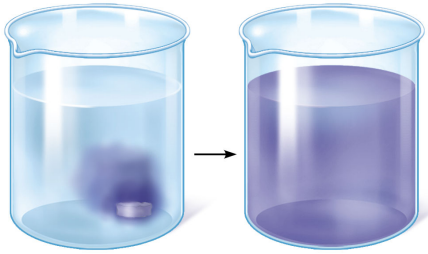

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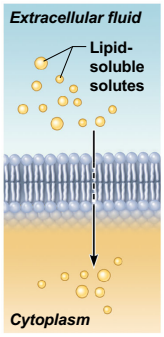

(a) Simple diffusion of lipid-soluble solutes directly through the phospholipid bilayer

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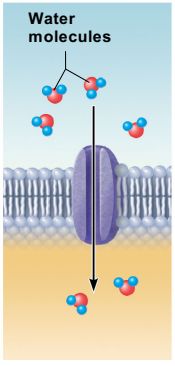

(b) Osmosis, diffusion of water through a specific channel protein (aquaporin)

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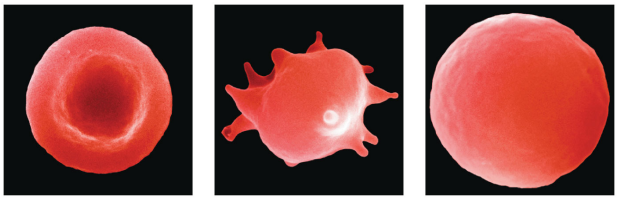

(a) RBC in isotonic solution (b) RBC in hypertonic solution (c) RBC in hypotonic solution

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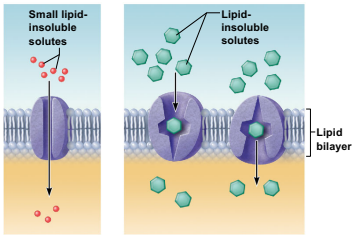

(c) **Facilitated diffusion** through a channel protein; mostly ions, selected on basis of size and charge

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

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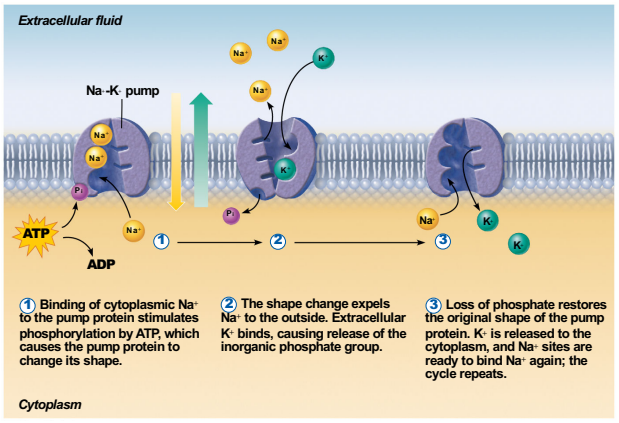

① Binding of cytoplasmic Na^+ to the pump protein stimulates phosphorylation by ATP, which causes the pump protein to change its shape.

② The shape change expels Na^+ to the outside. Extracellular K^+ binds, causing release of the inorganic phosphate group.

③ Loss of phosphate restores the original shape of the pump protein. K^+ is released to the cytoplasm, and Na^+ sites are ready to bind Na^+ again; the cycle repeats.

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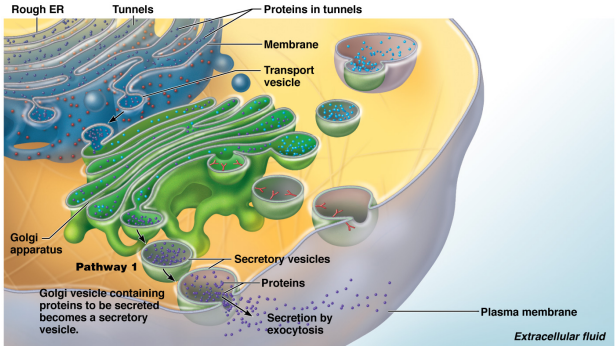
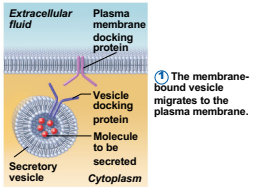
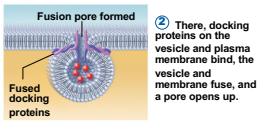
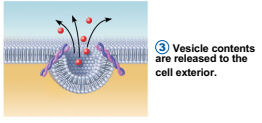




① The membrane-bound vesicle migrates to the plasma membrane.



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

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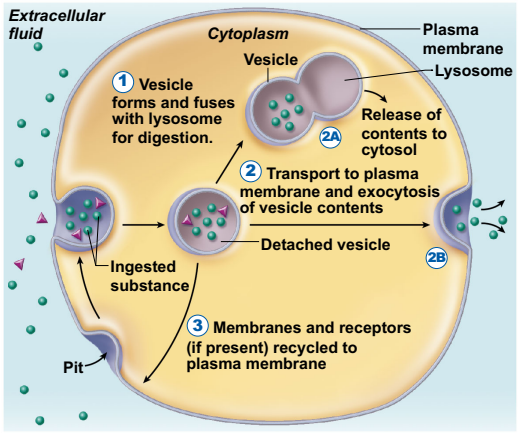

(a) Endocytosis (pinocytosis)

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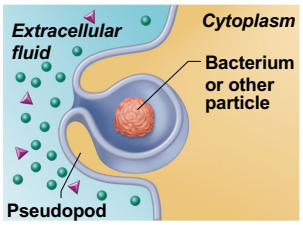

(b) Phagocytosis

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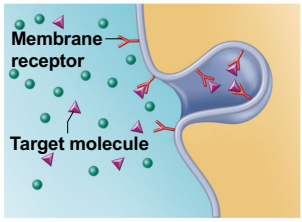

(c) Receptor-mediated endocytosis

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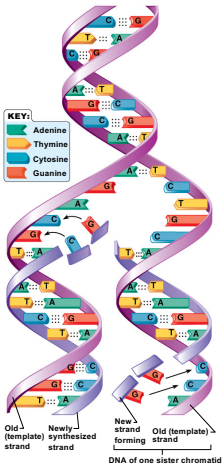

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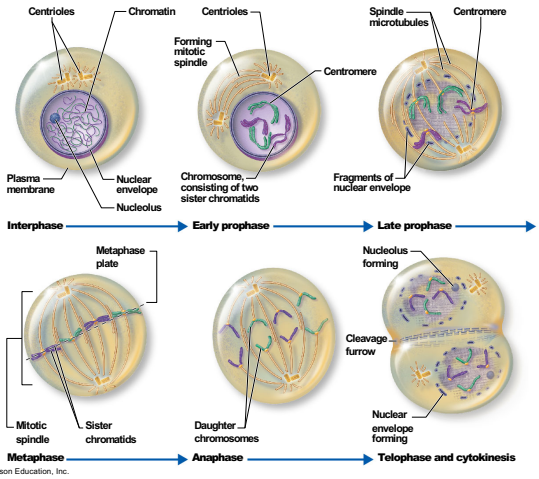

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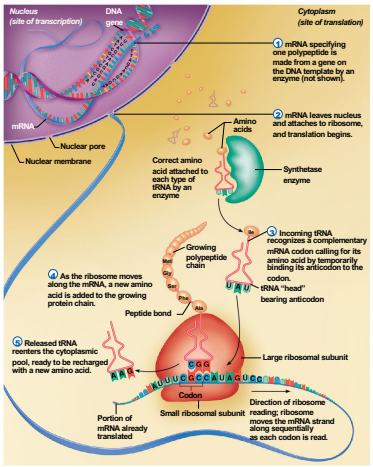

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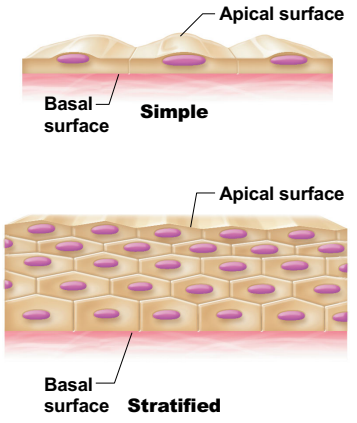

(a) Classification based on number of cell layers

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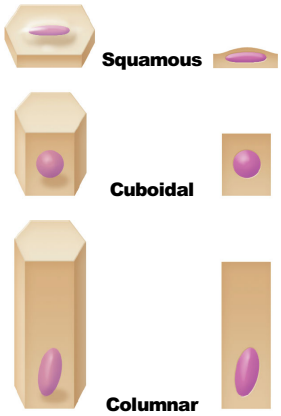

(b) Classification based on cell shape

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

(c) Function of epithelial tissue related to tissue type

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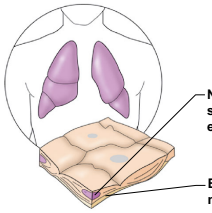
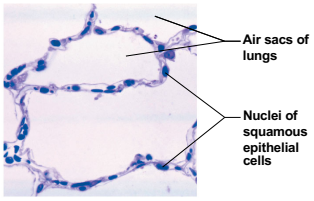


(a) Diagram: Simple squamous



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

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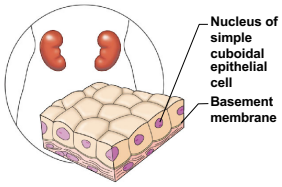
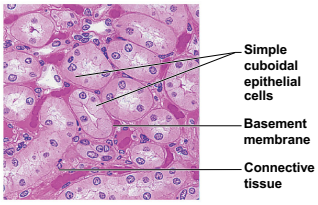


(b) Diagram: Simple cuboidal



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

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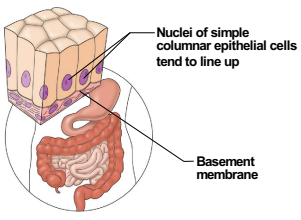
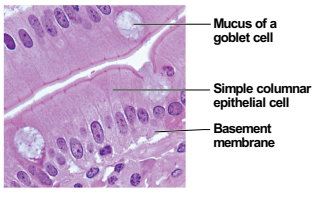


(c) Diagram: Simple columnar



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

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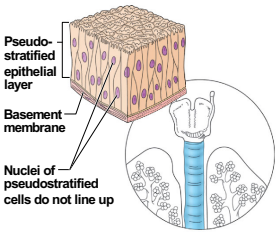
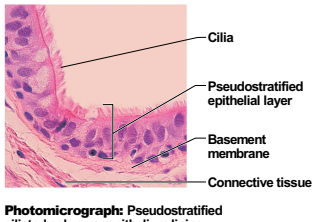


(d) Diagram: Pseudostratified (ciliated) columnar



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

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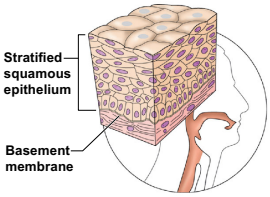
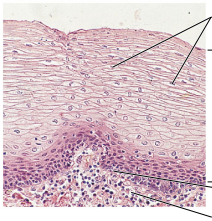


(e) Diagram: Stratified squamous



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

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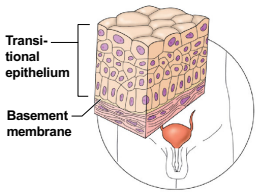
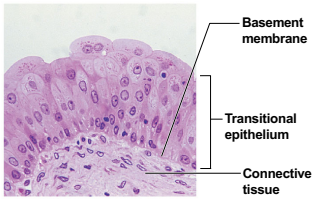


(f) Diagram: Transitional



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

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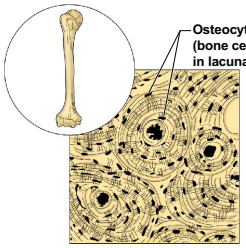
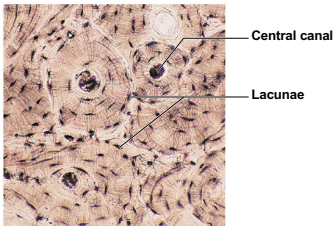


(a) Diagram: Bone



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

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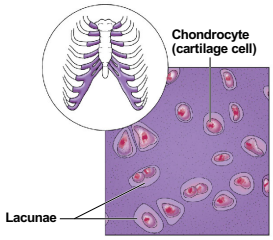
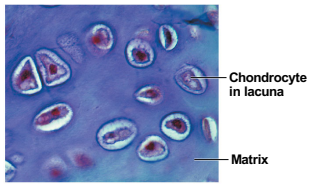


(b) Diagram: Hyaline cartilage



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

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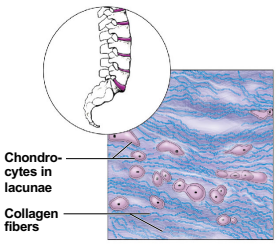
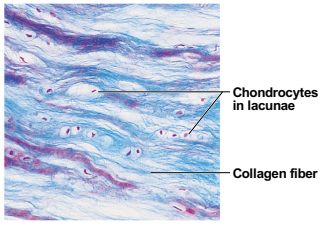


(c) Diagram: Fibrocartilage



Photomicrograph: Fibrocartilage of an intervertebral disc (150×).

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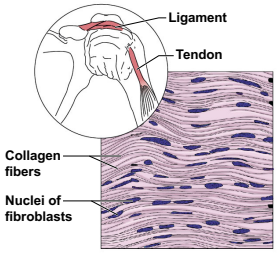
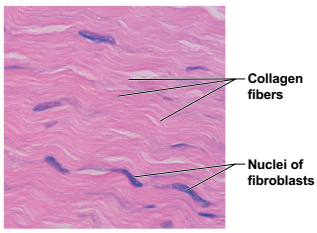


(d) Diagram: Dense fibrous



Photomicrograph: Dense fibrous connective tissue from a tendon (475×).

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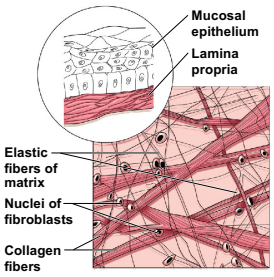
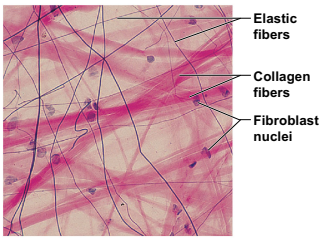


(e) Diagram: Areolar



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

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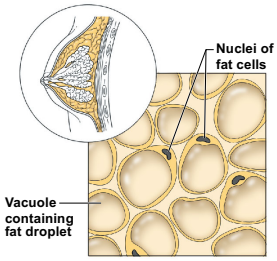
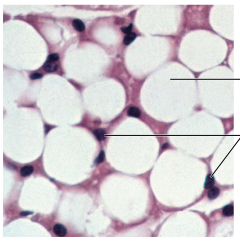


(f) Diagram: Adipose



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

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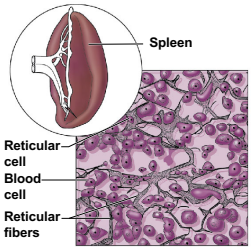
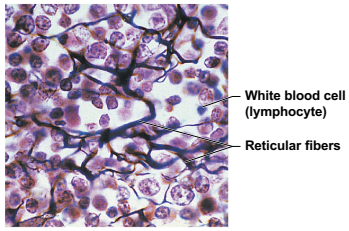


(g) Diagram: Reticular



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

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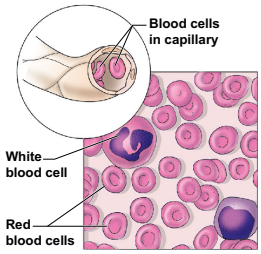
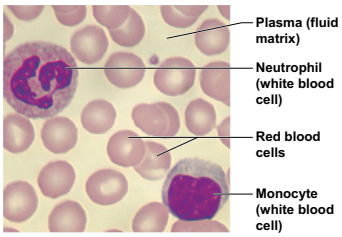


(h) Diagram: Blood



Photomicrograph: Smear of human blood (1290×)

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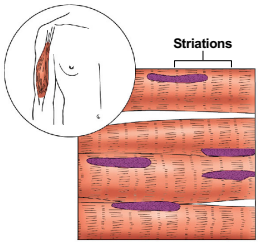
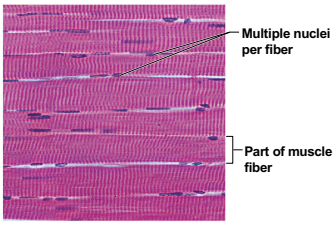


(a) Diagram: Skeletal muscle



Photomicrograph: Skeletal muscle (195×).

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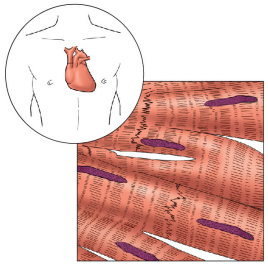
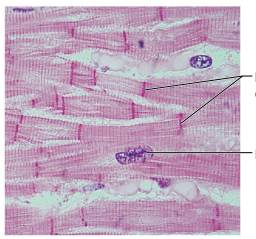


(b) Diagram: Cardiac muscle



Photomicrograph: Cardiac muscle (475×).

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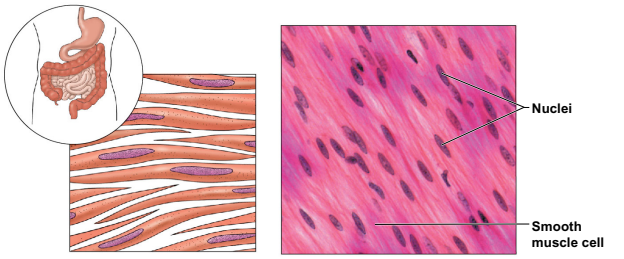

(c) Diagram: Smooth muscle **Photomicrograph:** Sheet of smooth muscle (360×).

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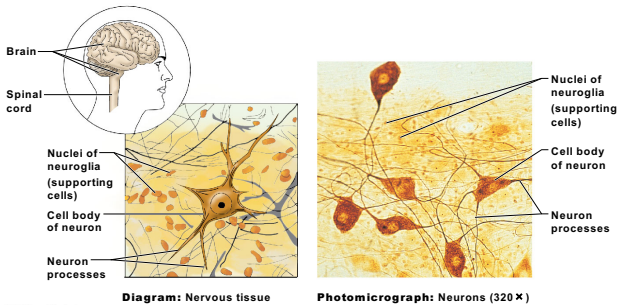

Diagram: Nervous tissue **Photomicrograph:** Neurons (320×)

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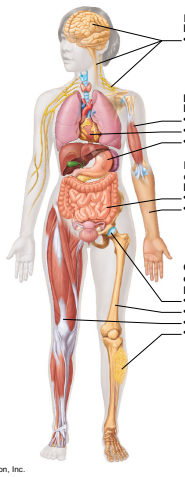

Nervous tissue: Internal communication and control
Hallmarks: irritable, conductive
- Brain, spinal cord, and nerves

Muscle tissue: Contracts to cause movement
Hallmarks: irritable, contractile
- Muscles attached to bones (skeletal)
- Muscles of heart wall (cardiac)
- Muscles of walls of hollow organs (smooth)

Epithelial tissue: Forms boundaries between different environments, protects, secretes, absorbs, filters
Hallmarks: one free (apical) surface, avascular
- Lining of GI tract and other hollow organs
- Skin surface (epidermis)

Connective tissue: Supports, protects, binds other tissues together
Hallmarks: extracellular matrix, varying vascularity
- Cartilage
- Bones
- Tendons
- Fat and other soft padding tissue

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