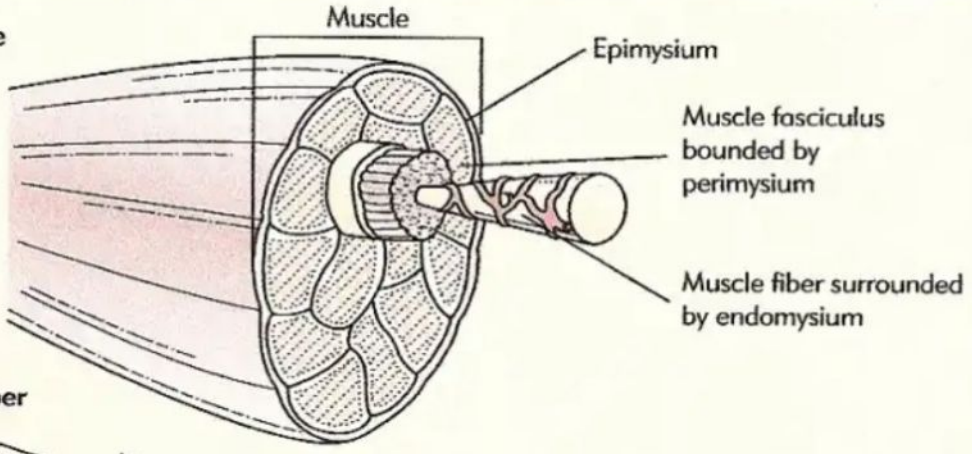
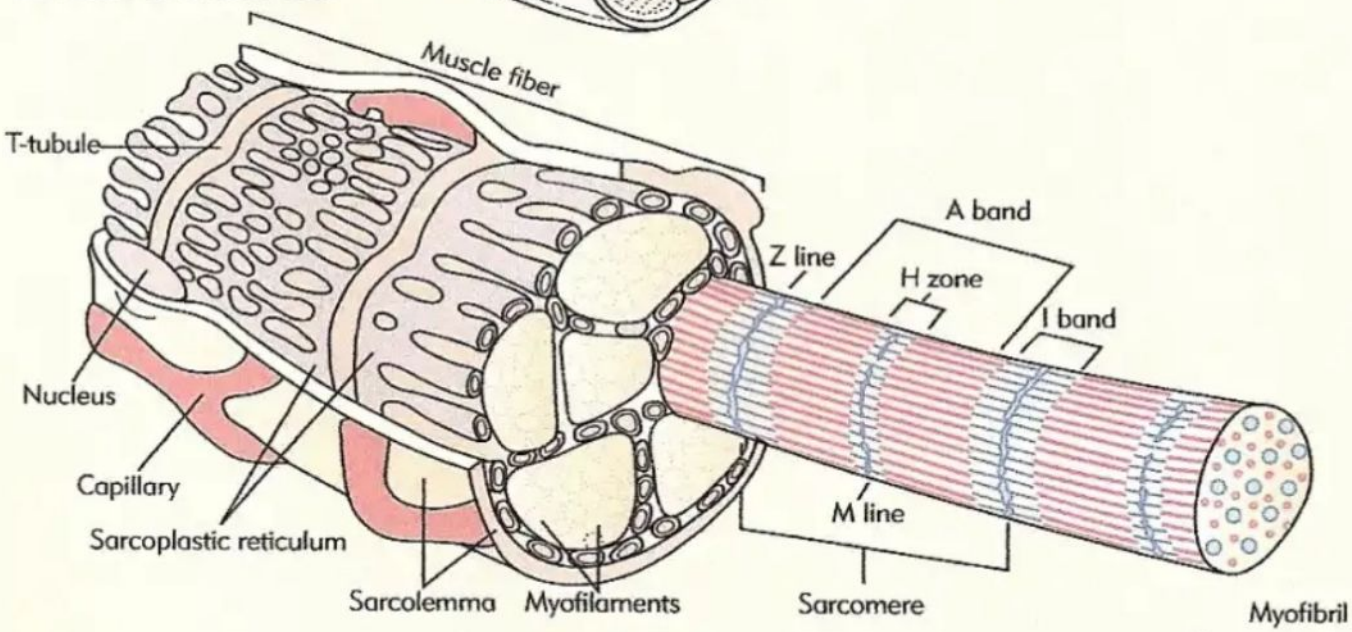
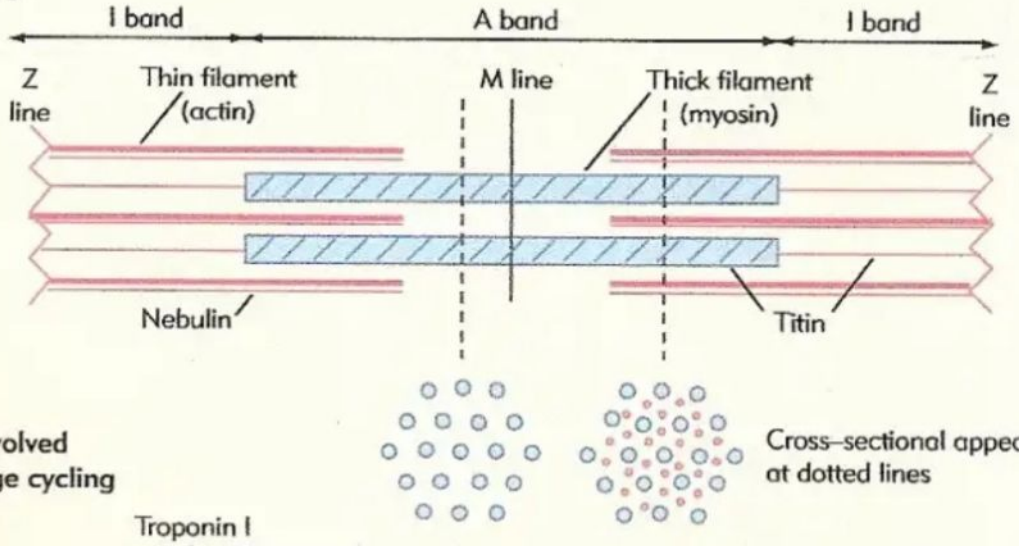
Gross muscle structure



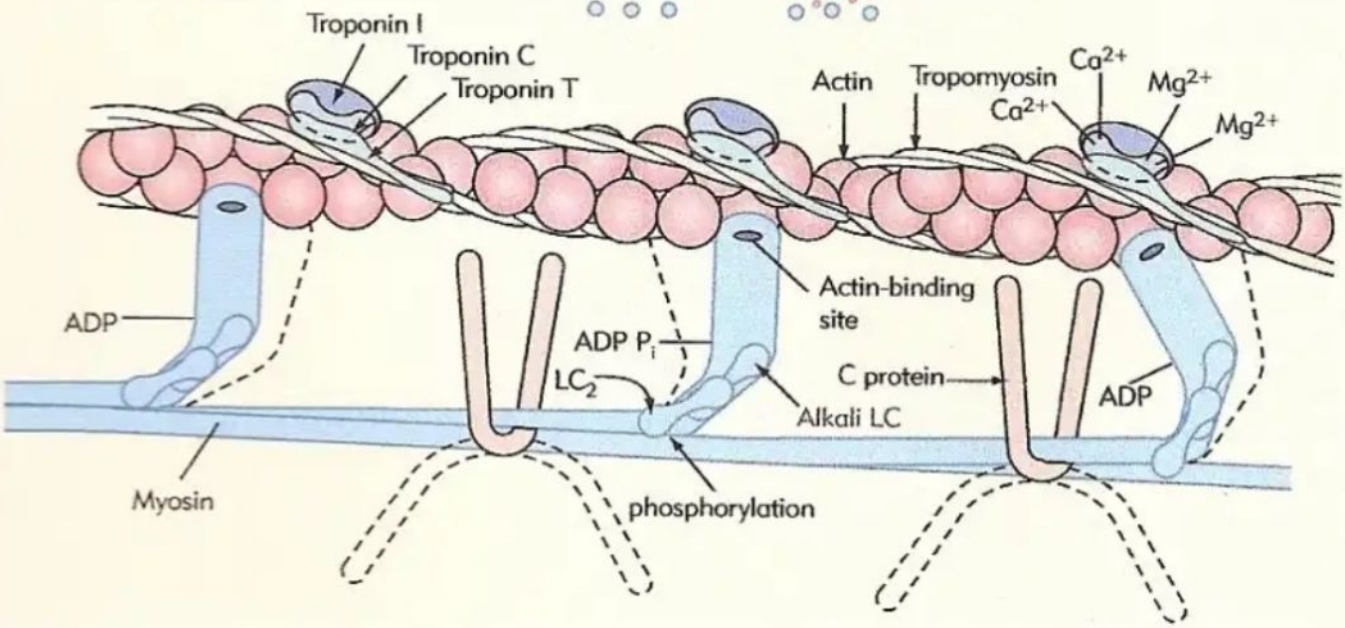
Structure of muscle fiber



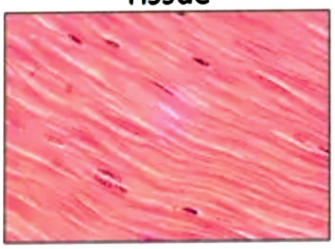
The sarcomere



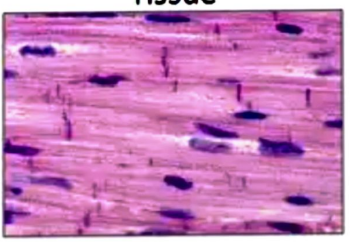
Structures involved in cross-bridge cycling



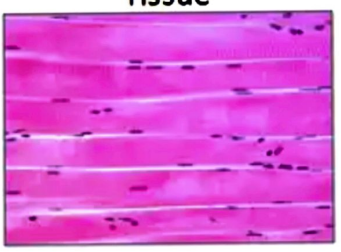
Smooth Muscle Tissue

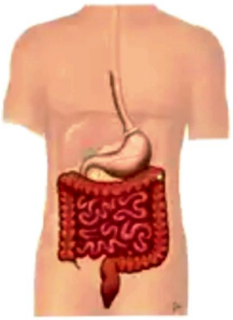


Cardiac Muscle Tissue

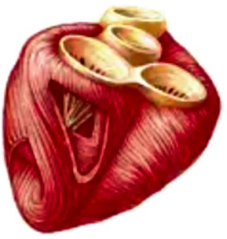


Skeletal Muscle Tissue





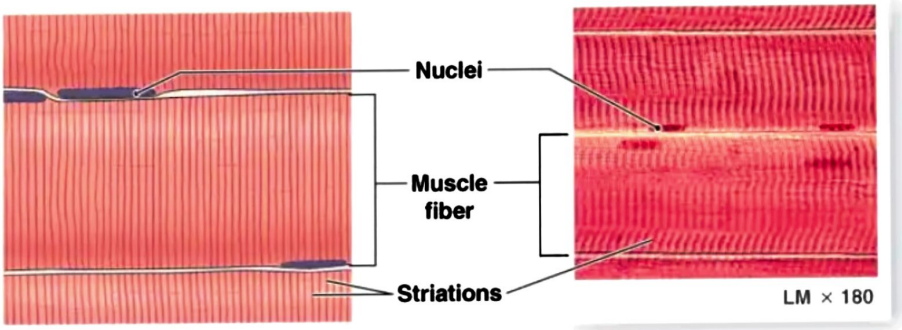
Involuntary Control



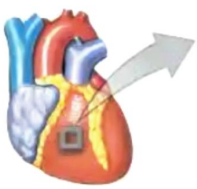
Involuntary Control

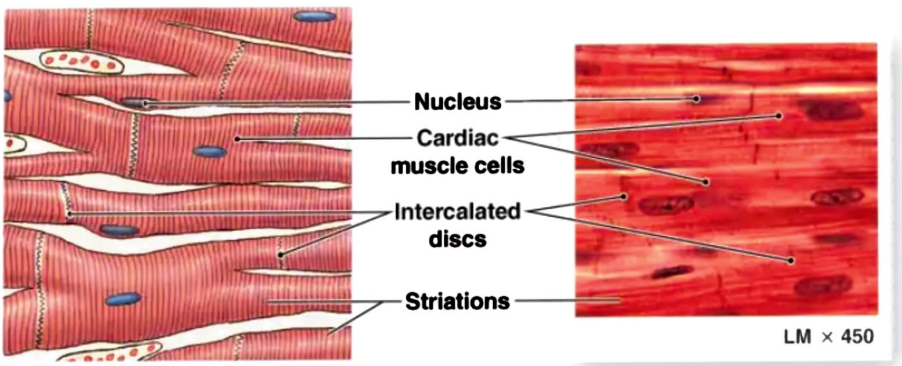
Voluntary Control

The structure and function of the three types of muscle tissue

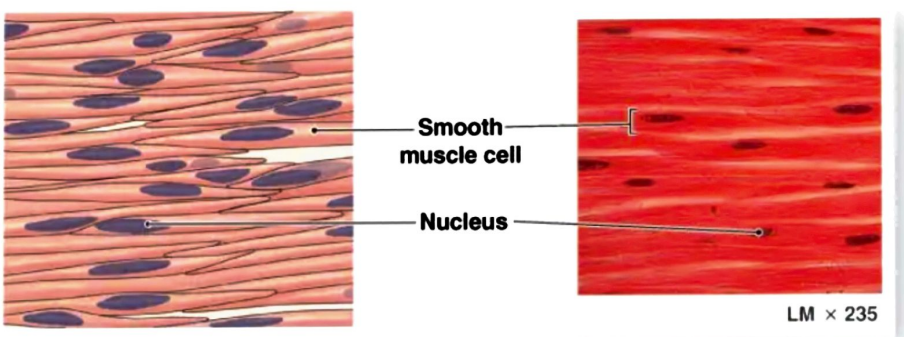


Skeletal muscles move or stabilize the position of the skeleton; guard entrances and exits to the digestive, respiratory, and urinary tracts; generate heat; and protect internal organs.

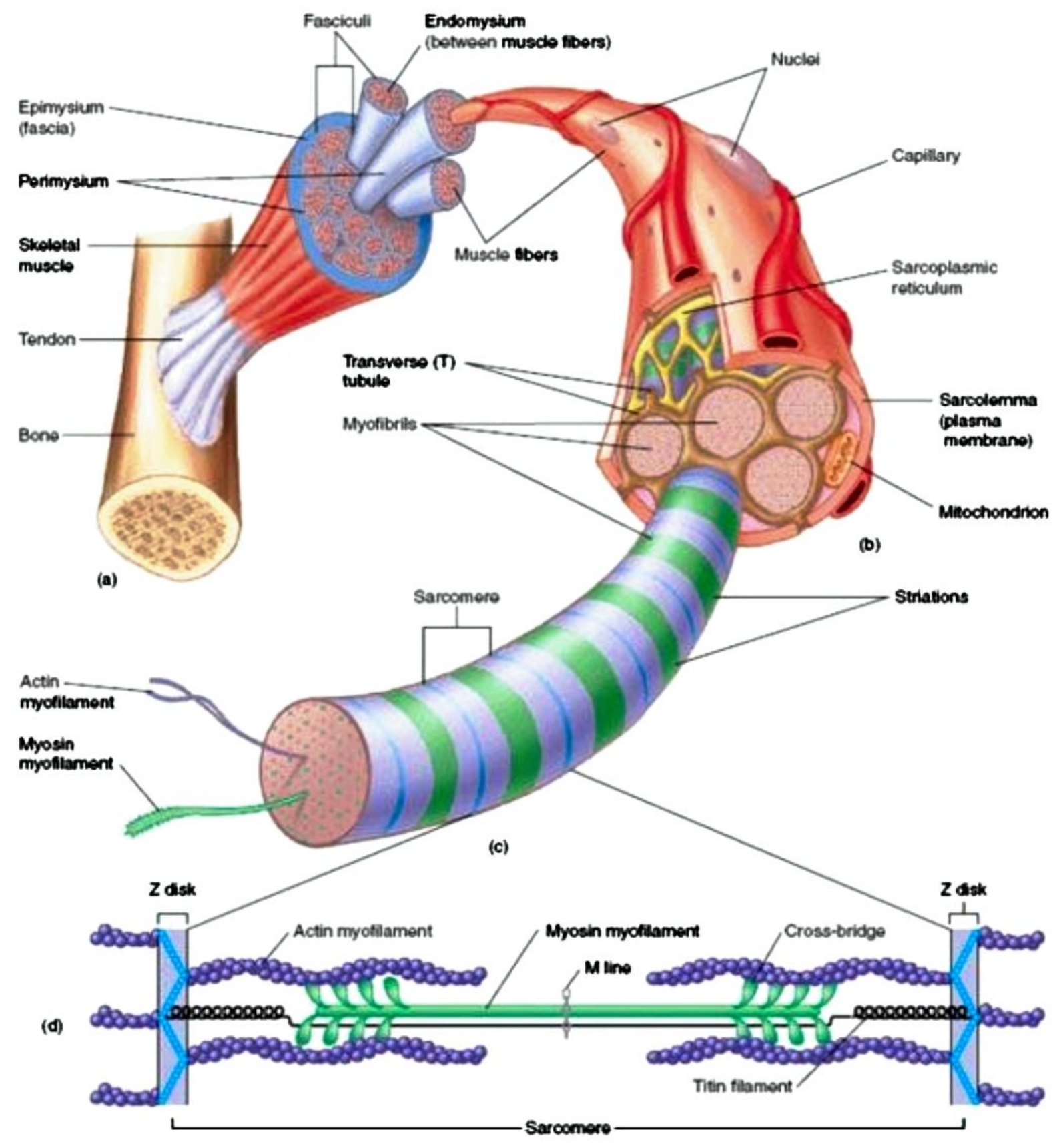


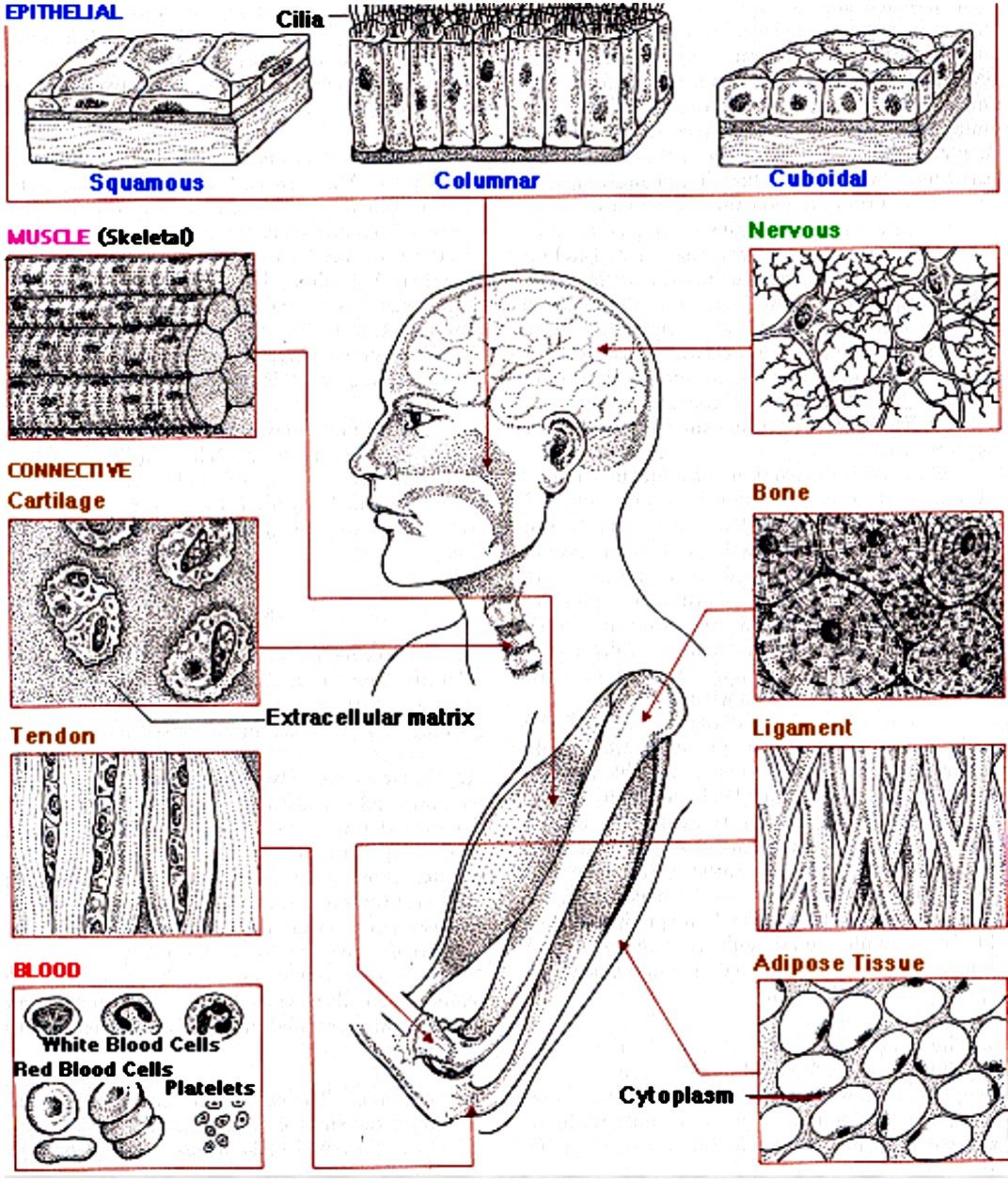


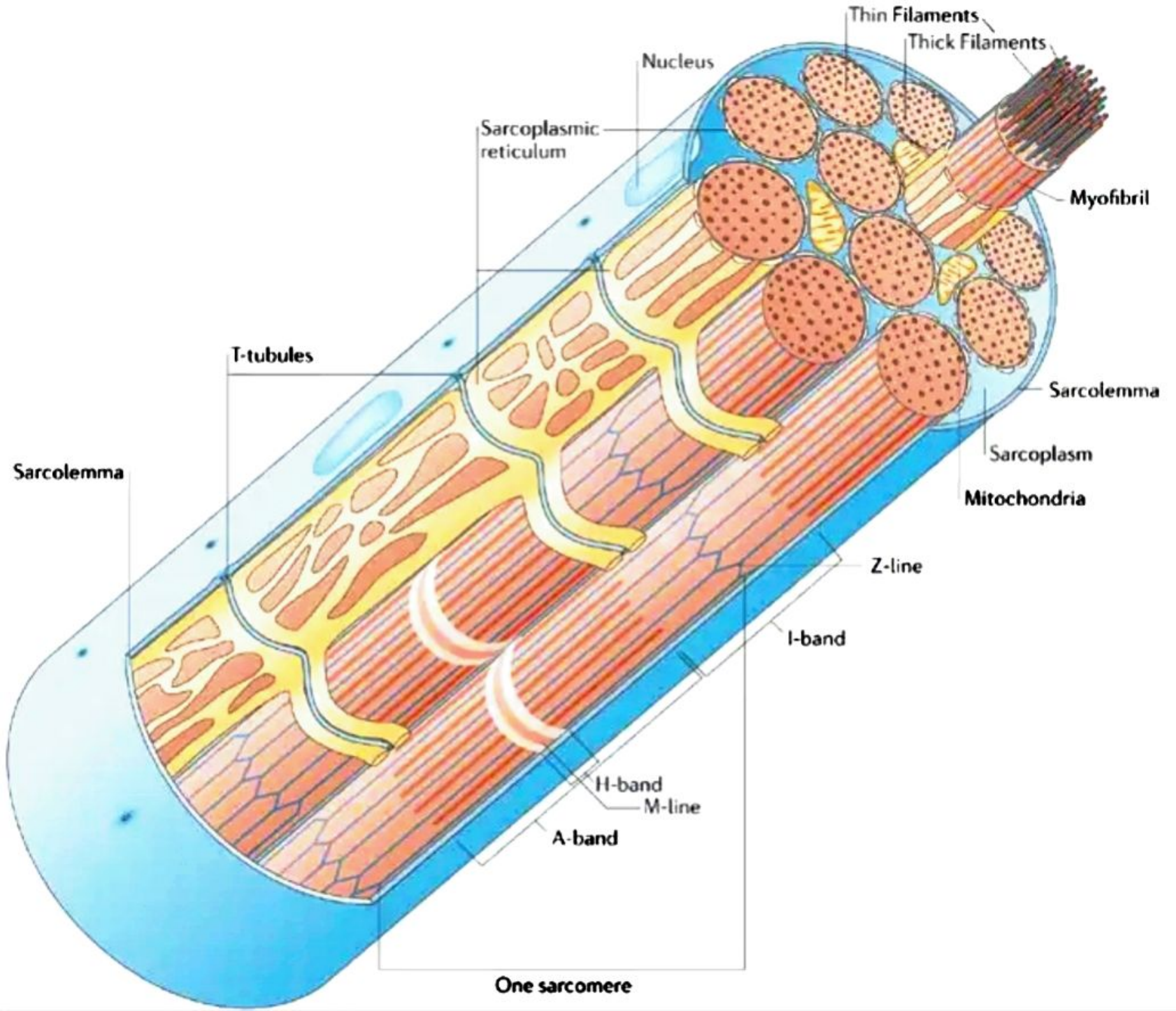
Cardiac muscle moves blood and maintains blood pressure.

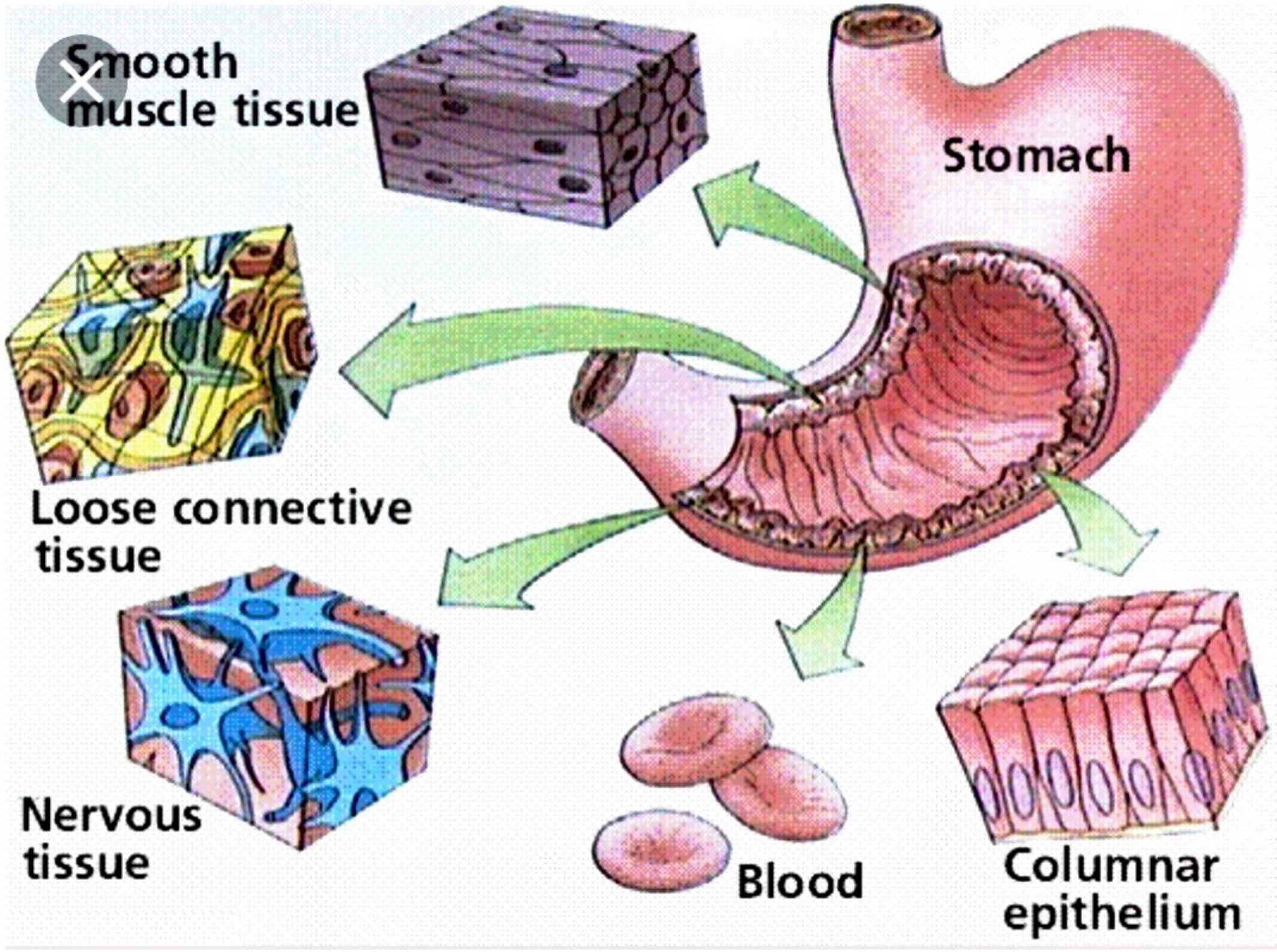


Smooth muscle moves food, urine, and reproductive tract secretions; controls diameter of respiratory passageways and regulates diameter of blood vessels.

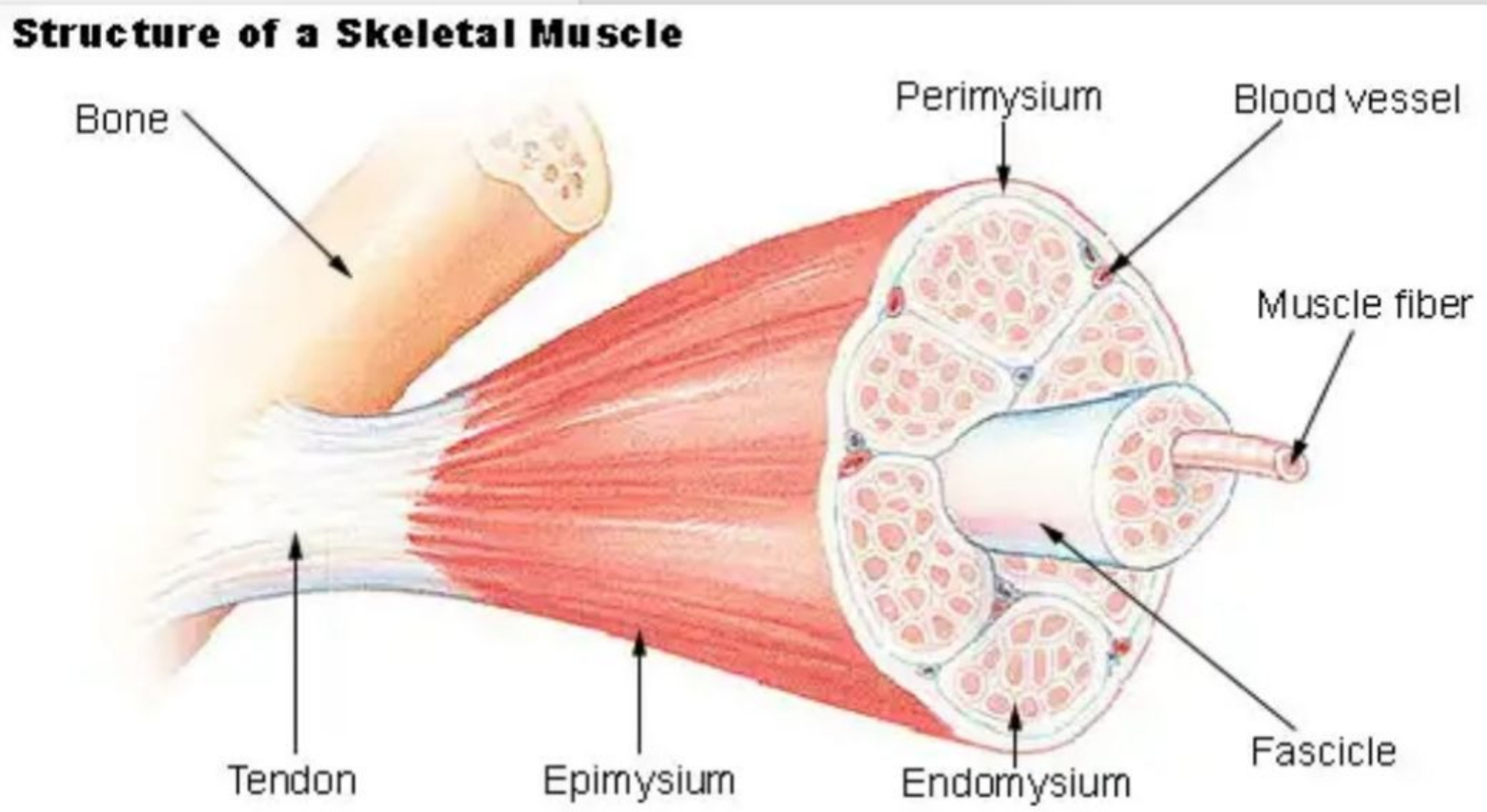

Fasciculi
Endomysium
(between muscle fibers)
Nuclei
Epimysium
(fascia)
Capillary
Perimysium
Skeletal
muscle
Muscle fibers
Sarcoplasmic
reticulum
Tendon
Transverse (T)
tubule
Sarcolemma
(plasma
membrane)
Myofibrils
Bone
Mitochondrion
(a)
(b)
Sarcomere
Striations
Actin
myofilament
Myosin
myofilament
(c)
Z disk
Z disk
Actin myofilament
Myosin myofilament
Cross-bridge
M line
(d)
Titin filament
Sarcomere

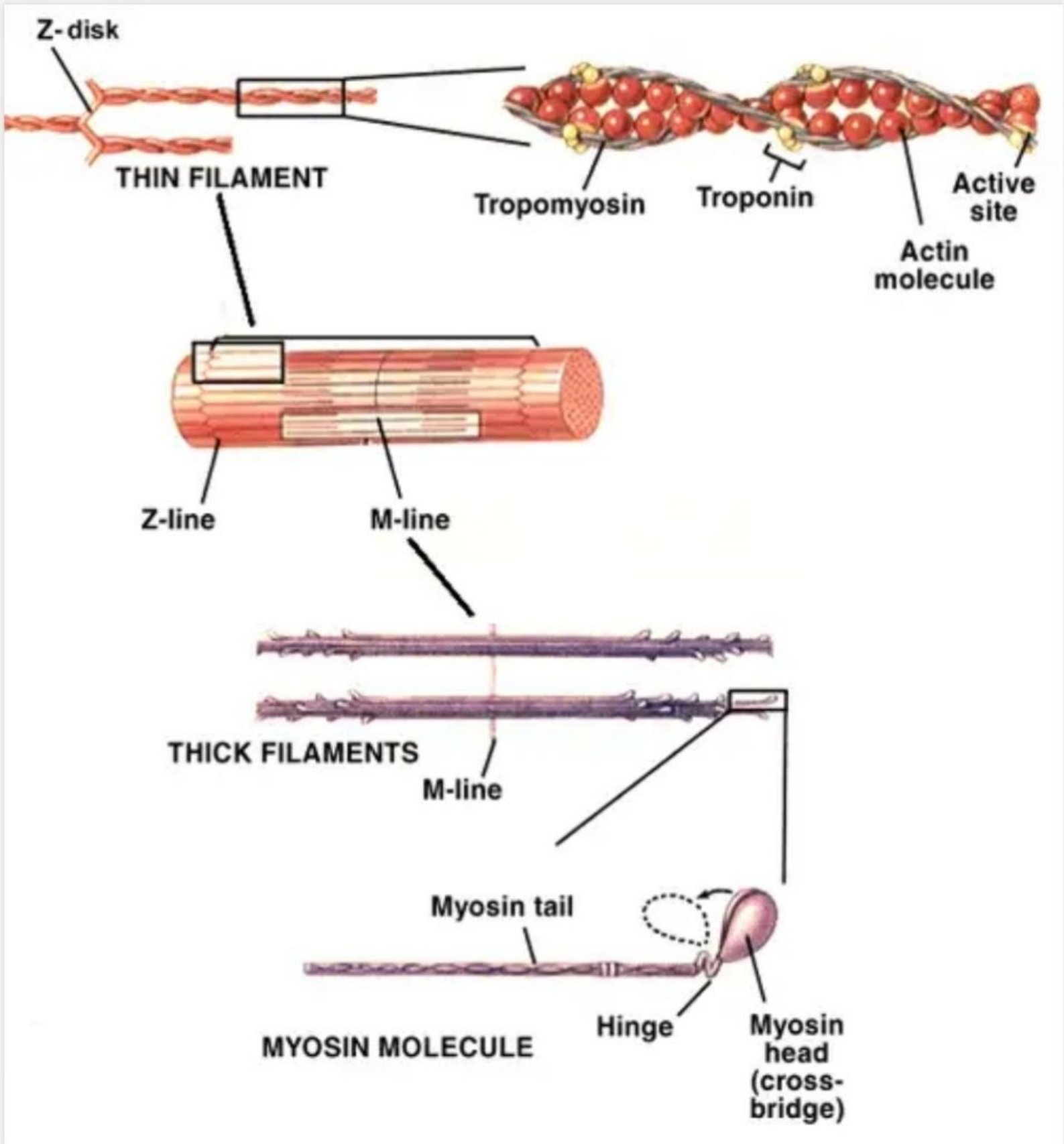

EPITHELIAL
Cilia
Squamous
Columnar
Cuboidal
MUSCLE (Skeletal)
Nervous
CONNECTIVE
Cartilage
Bone
Extracellular matrix
Tendon
Ligament
BLOOD
White Blood Cells
Red Blood Cells
Platelets
Adipose Tissue
Cytoplasm


Thin Filaments
Thick Filaments
Nucleus
Sarcoplasmic reticulum
Myofibril
T-tubules
Sarcolemma
Sarcolemma
Sarcoplasm
Mitochondria
Z-line
I-band
H-band
M-line
A-band
One sarcomere


Smooth muscle tissue
Stomach
Loose connective tissue
Nervous tissue
Blood
Columnar epithelium

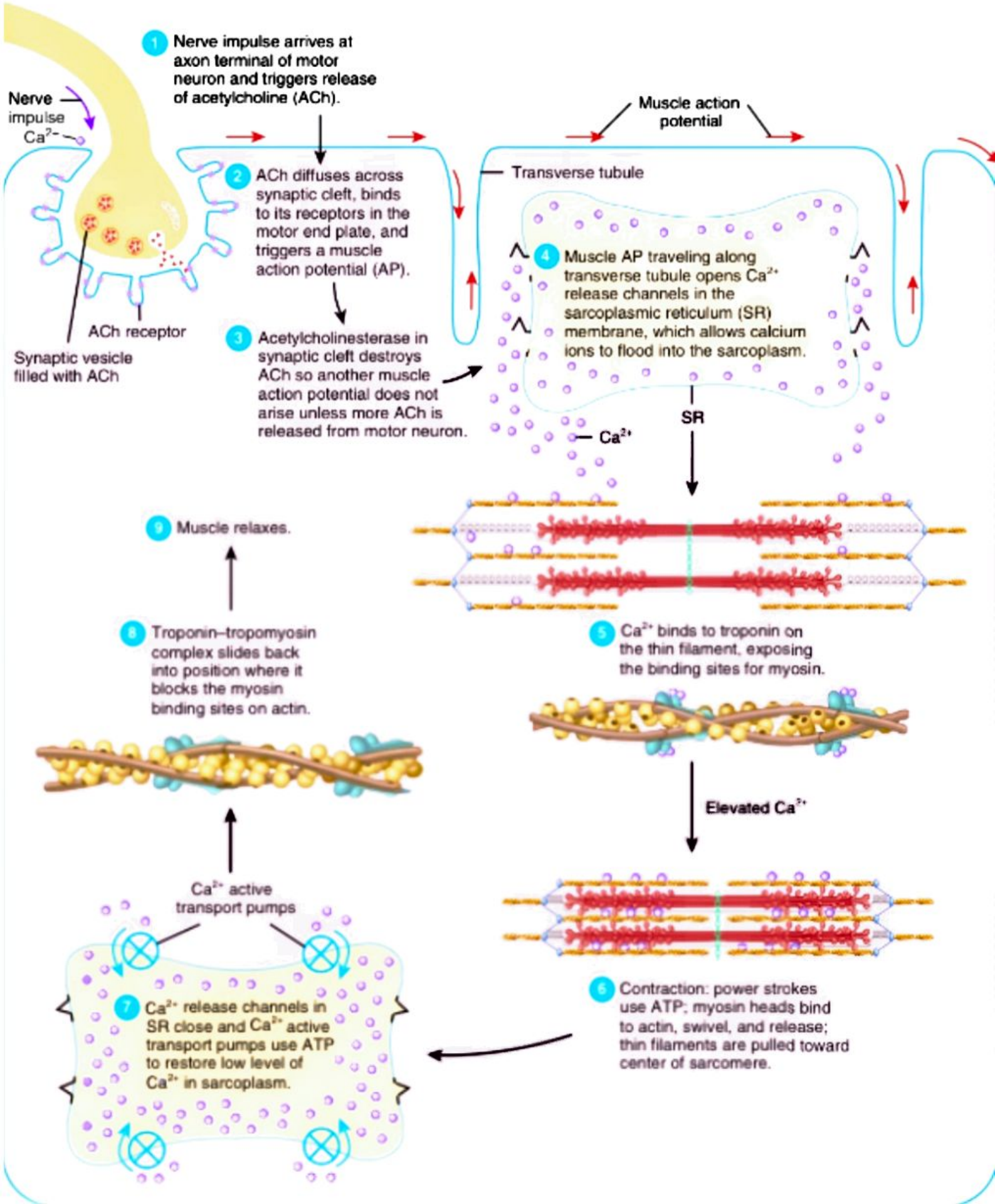
Structure of a Skeletal Muscle

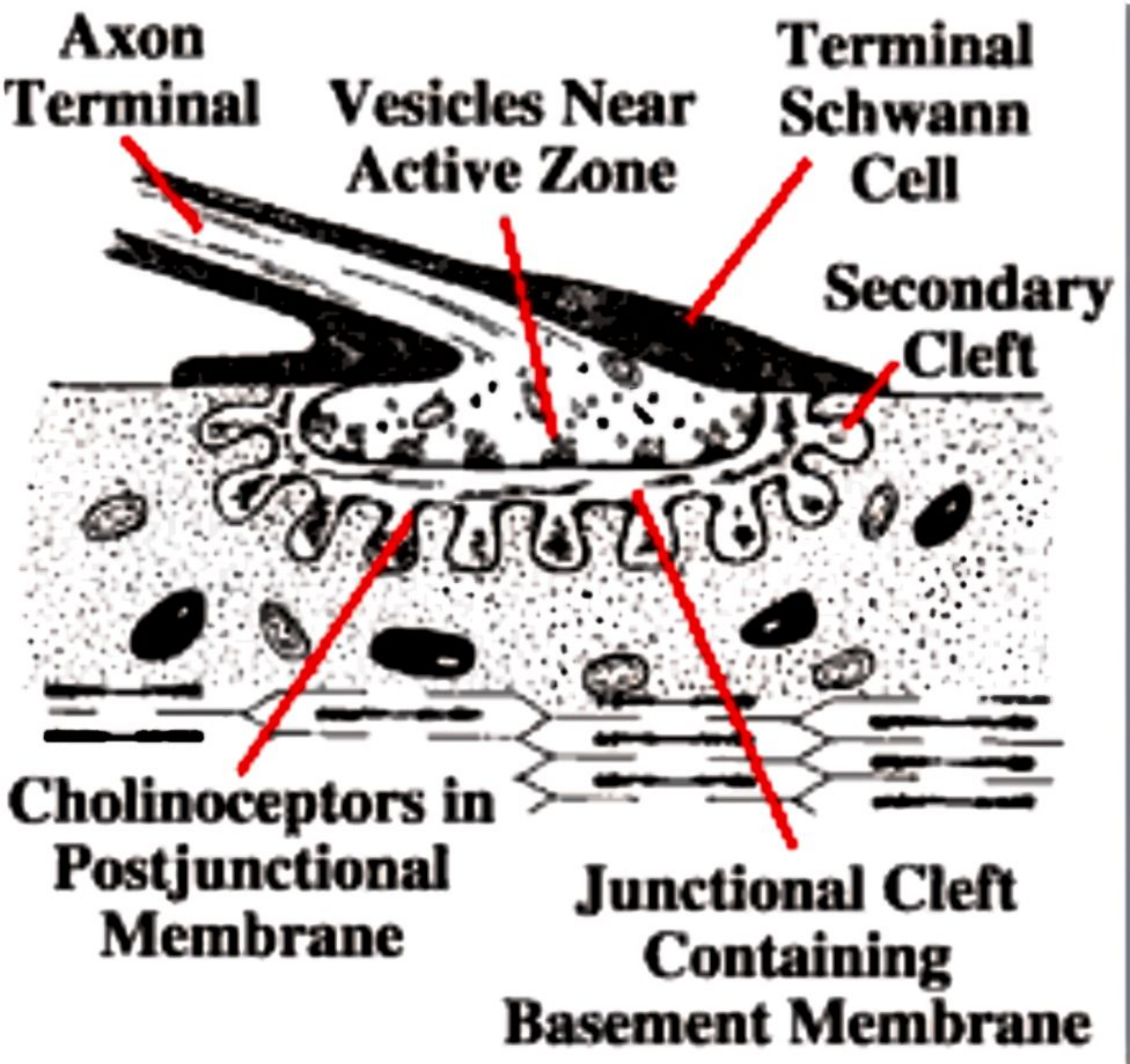



Z-disk
THIN FILAMENT
Tropomyosin
Troponin
Active site
Actin molecule
Z-line
M-line
THICK FILAMENTS
M-line
Myosin tail
Hinge
Myosin head (cross-bridge)
MYOSIN MOLECULE

Summary of the events of contraction and relaxation in a skeletal muscle fiber.

Acetylcholine released at the neuromuscular junction triggers a muscle action potential, which leads to muscle

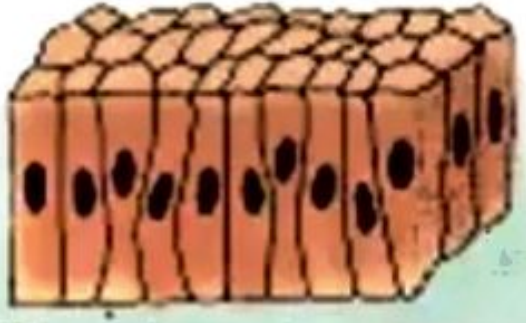



Axon Terminal
Vesicles Near Active Zone
Terminal Schwann Cell
Secondary Cleft
Cholinoceptors in Postjunctional Membrane
Junctional Cleft Containing Basement Membrane

Types of Epithelium

Simple squamous

Simple cuboidal

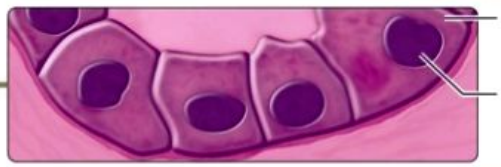
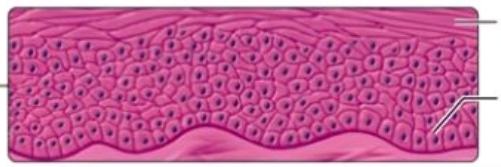
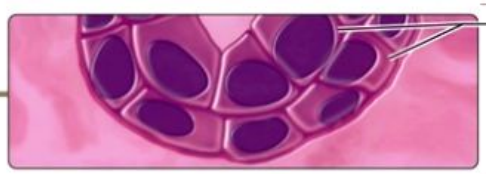
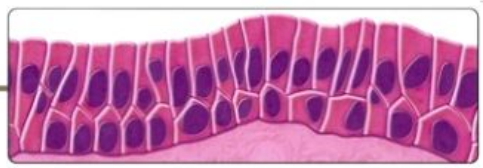
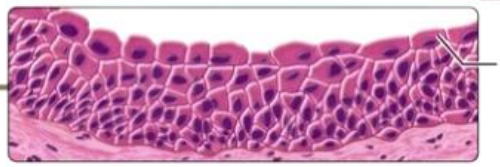


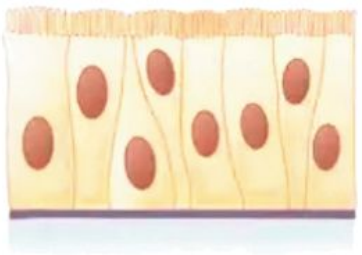
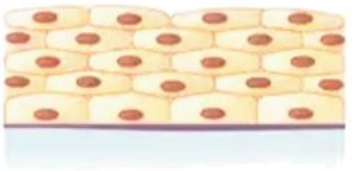
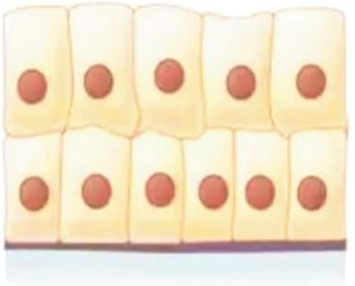
Simple columnar

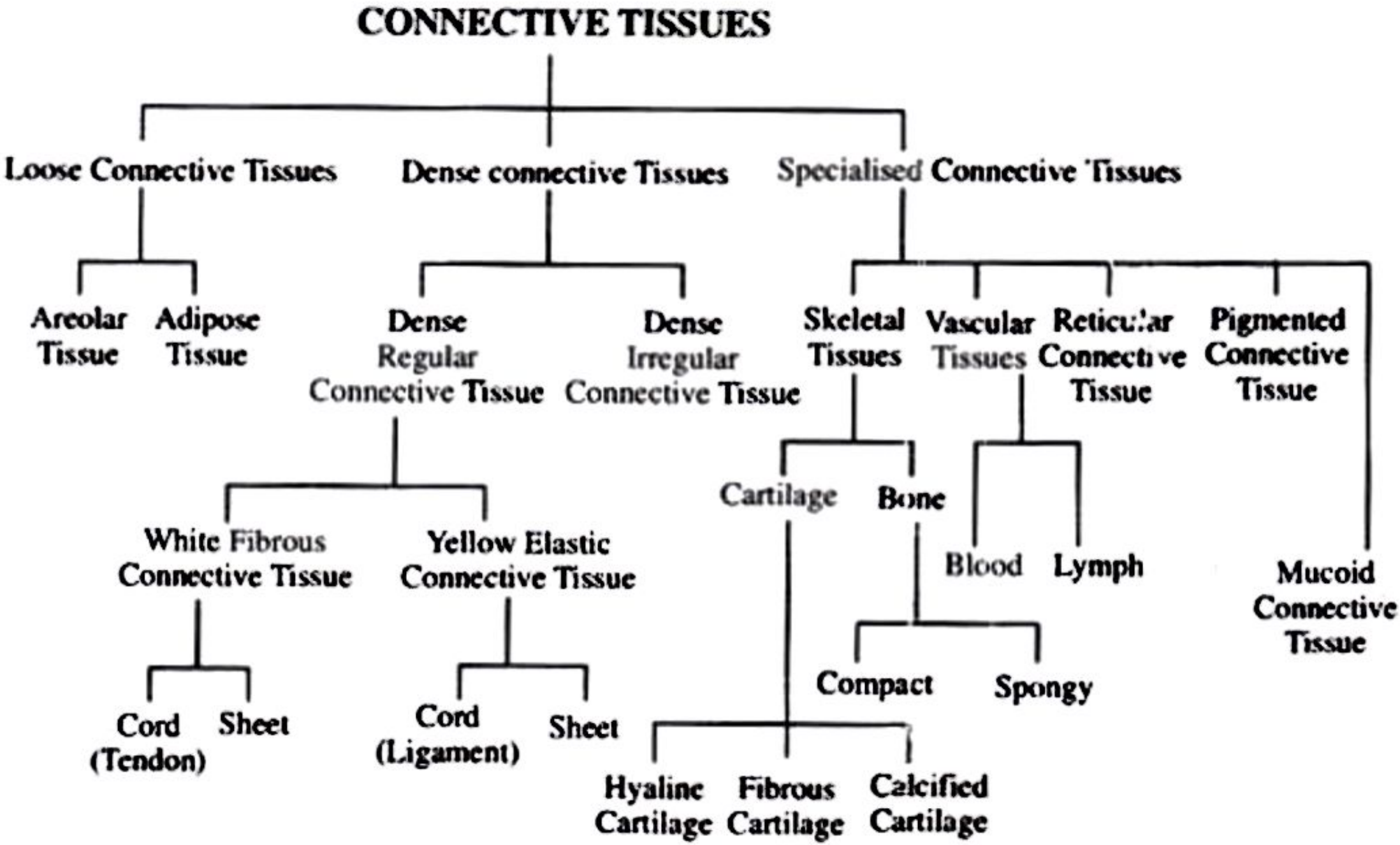
Stratified squamous

Stratified cuboidal

Pseudostratified columnar

SIMPLE EPITHELIA: CONSIST OF ONE LAYER OF CELLS		COMPONENTS	FUNCTION	LOCATION
Simple squamous epithelium		Single layer of flat cells Flattened, central nuclei	• Provides a barrier through which gases and fluids can be exchanged • Produces serous fluid	• Air sacs of lungs • Inner lining of ventral body cavities and blood vessels • Certain parts of kidney
Simple cuboidal epithelium		Single layer of cube-shaped cells Round, central nuclei	• Absorption • Secretion of mucus and other substances	• Kidney tubules • Lower respiratory passages • Thyroid, salivary, and mammary glands
Simple columnar epithelium		Single layer of rectangular cells Ovoid, basal nuclei	• Absorption • Secretion of mucus and other substances • Propulsion of egg through uterine tube	• Digestive tract from stomach to anus • Uterine tube • Gallbladder • Certain kidney tubules
Pseudostratified columnar epithelium		Single layer of columnar cells of different heights, giving a stratified appearance Cilia	• Secretes mucus and propels it with ciliary motion	• Nasal cavity • Parts of male urethra • Upper respiratory passages
STRATIFIED EPITHELIA: CONSIST OF MORE THAN ONE LAYER OF CELLS				
Stratified squamous epithelium		Multiple layers of squamous cells:	• Protection from mechanical stresses and microorganisms • Prevents most water loss through skin	• Epidermis
Keratinized epithelium		Apical cells dead, flaky, and filled with keratin Cuboidal to squamous-shaped basal cells		
Nonkeratinized epithelium		Apical cells living and very flat Cells more cuboidal toward basal layers	• Protection from mechanical stresses and microorganisms	• Mouth, pharynx, superior larynx, esophagus • Vagina • Anal canal
Stratified cuboidal epithelium		Two or more layers of cuboidal cells	• Some absorption and secretion	• Ducts of sweat glands
Stratified columnar epithelium		Two or more layers of columnar cells	• Protection • Some absorption and secretion	• Ducts of certain glands • Cornea • Parts of male urethra
Transitional epithelium		Multiple layers of cells Apical cells dome-shaped when relaxed and flattened when stretched	• Protection • Gives tissues added distensibility	• Urin[illegible] • Uret[illegible] • Uret[illegible]

Cells	Location	Function
Simple squamous epithelium 	Air sacs of lungs and the lining of the heart, blood vessels, and lymphatic vessels	Allows materials to pass through by diffusion and filtration, and secretes lubricating substance
Simple cuboidal epithelium 	In ducts and secretory portions of small glands and in kidney tubules	Secretes and absorbs
Simple columnar epithelium 	Ciliated tissues are in bronchi, uterine tubes, and uterus; smooth (nonciliated tissues) are in the digestive tract, bladder	Absorbs; it also secretes mucous and enzymes
Pseudostratified columnar epithelium 	Ciliated tissue lines the trachea and much of the upper respiratory tract	Secretes mucus; ciliated tissue moves mucus
Stratified squamous epithelium 	Lines the esophagus, mouth, and vagina	Protects against abrasion
Stratified cuboidal epithelium 	Sweat glands, salivary glands, and the mammary glands	Protective tissue
Stratified columnar epithelium 	The male urethra and the ducts of some glands	Secretes and protects
Transitional epithelium 	Lines the bladder, uretha, and the ureters	Allows the urinary organs to expand and stretch

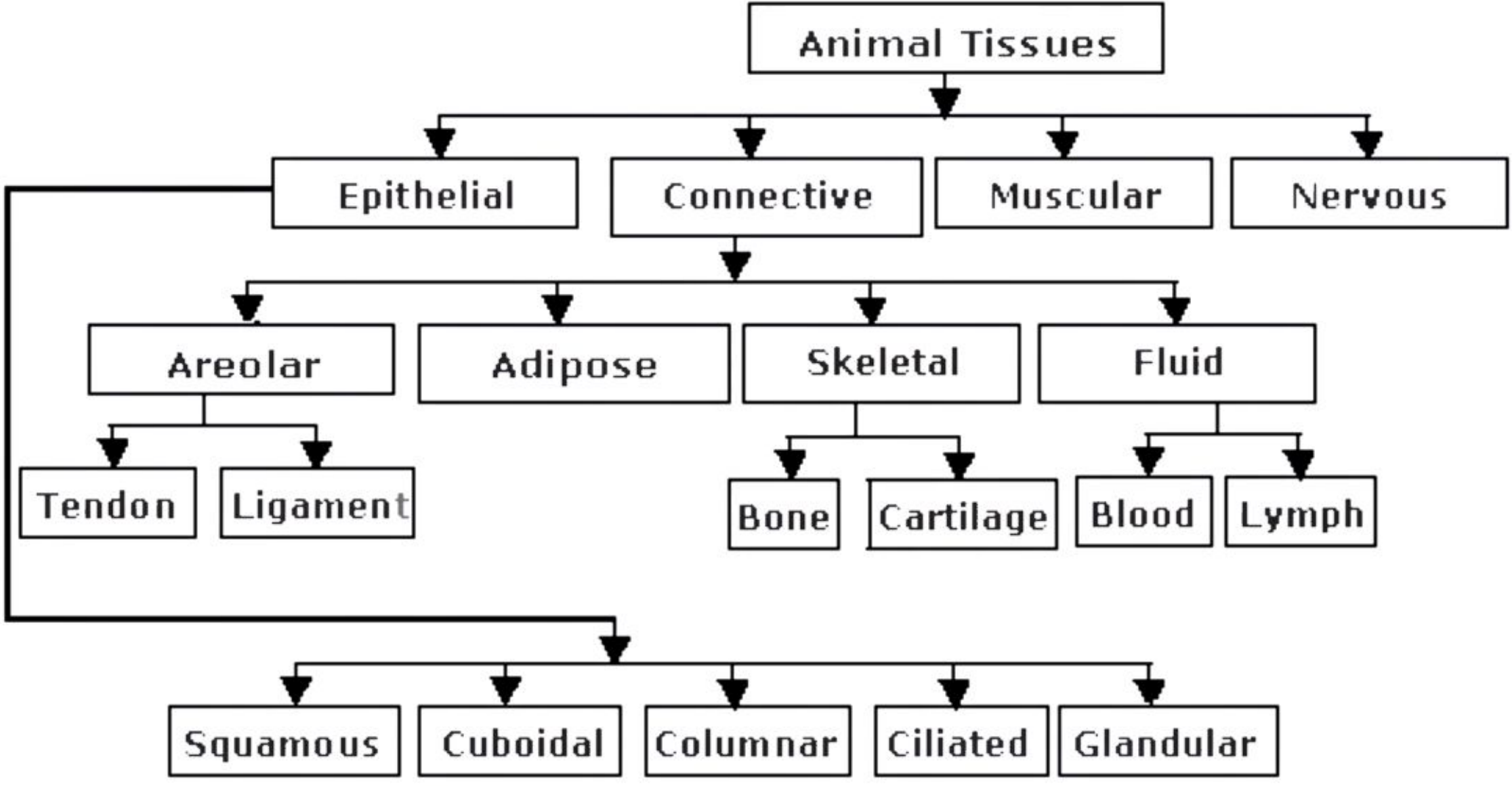

CONNECTIVE TISSUES
Loose Connective Tissues
Dense connective Tissues
Specialised Connective Tissues
Areolar Tissue
Adipose Tissue
Dense Regular Connective Tissue
Dense Irregular Connective Tissue
Skeletal Tissues
Vascular Tissues
Reticular Connective Tissue
Pigmented Connective Tissue
White Fibrous Connective Tissue
Yellow Elastic Connective Tissue
Cartilage
Bone
Blood
Lymph
Mucoid Connective Tissue
Cord (Tendon)
Sheet
Cord (Ligament)
Sheet
Compact
Spongy
Hyaline Cartilage
Fibrous Cartilage
Calcified Cartilage

CARDIAC MUSCLES vs SKELETAL MUSCLES vs SMOOTH MUSCLES

CARDIAC MUSCLES	SKELETAL MUSCLES	SMOOTH MUSCLES
Cardiac muscles are found only in the heart	Skeletal muscles are found attached to bones and skin	Smooth muscle cells line walls of the internal organs
Perform involuntary muscular movements	Perform voluntary muscular movements	Perform involuntary muscular movements
Responsible for pumping blood throughout the body	Power the joints, aiding physical movements	Move internal organs to facilitate their functions
Comprise branching chains of cells, connected by porous intercalated discs with a single nucleus	Comprise very long, cylindrical, multinucleated cells	Comprise single, tapering, single nucleated cells
Striated with many myofibrils in orderly arrangements	Striated with orderly arranged myofibrils	Not striated, fewer myofibrils are found in varying length
Self-stimulating	Not self-stimulating	Self-stimulating
Under the regulation of the nervous system, endocrine system, and various chemicals	Under the regulation of the nervous system	Under regulation of the nervous system, endocrine system, various chemicals, and stretching
Have an intermediate energy requirement	Have a high energy requirement	Have a low energy requirement
Have an intermediate speed of contraction	Have a high speed of contraction	Have a low speed of contraction
Exhibit rhythmic contractions	Do not exhibit rhythmic contractions	Exhibit rhythmic contractions
Strength increases with stretching	Strength increases with stretching	Exhibit a stress-releasing response
Do not fatigue	Easily fatigue	Do not fatigue

Table 39.1 Types of Skeletal Muscle Fibers

	Slow Oxidative	Fast Oxidative	Fast Glycolytic
Contraction speed	Slow	Fast	Fast
Major ATP source	Aerobic respiration	Aerobic respiration	Glycolysis
Rate of fatigue	Slow	Intermediate	Fast
Mitochondria	Many	Many	Few
Myoglobin content	High (red muscle)	High (red muscle)	Low (white muscle)


Animal Tissues
Epithelial
Connective
Muscular
Nervous
Areolar
Adipose
Skeletal
Fluid
Tendon
Ligament
Bone
Cartilage
Blood
Lymph
Squamous
Cuboidal
Columnar
Ciliated
Glandular

Character	***Striated Muscles***	***Unstriated Muscles***	***Cardiac Muscles***
1. Shape	Cells are long, cylindrical, non-tapering and are unbranched.	Cells are long with tapering ends and are unbranched.	Cells are non-tapering and cylindrical in shape and are branched.
2. Location in body	In hands, legs and skeletal muscles.	The wall of stomach, intestine, ureter and bronchi, etc.	In the heart.
3. Light and dark bands	Present.	Absent.	Present but less prominent.