

Muscular Tissues:-

Date: _____

- Many multicellular animals evolved specialized cells for contraction. i.e. Muscle Cells.
- Such contraction may result in the movement of whole body or a portion of it if skeleton is attached to a moveable part of muscle.
- If the muscle is located in the walls of hollow organs, its contraction may cause the contents of organ to move e.g.:- peristaltic movement of material through digestive tract.

Types:-

The vertebral ^{animals} possess three kinds of muscles

- Smooth
- Skeletal
- Cardiac.

Skeletal Muscle:-

Muscles attached to the skeleton & associated with the movement of bones.

- Features:-
- Regularly Striped
 - long > 35cm ^{Sartorius muscle (thigh)}
 - Multinucleated
 - Voluntary ^{conscious}
 - Slow to Rapid Speed of Contraction
 - Caused By Nervous System
 - Filamentous.
 - Peripheral Nucleus.
 - Unbranched
 - Contraction
 - ATP Amount ↑↑
 - Neuromuscular Junction
 - Stimulation

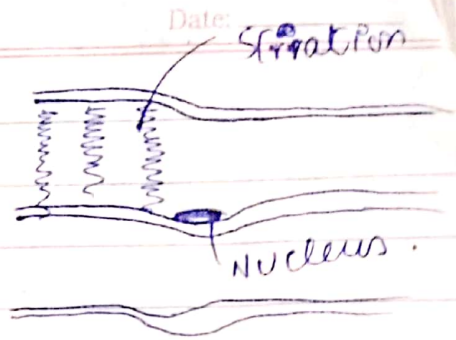
Functions:

- Heat Production
- Protection
- Major body muscle contraction involved in locomotion & facial expression

Location: All major muscles

Connective Tissue:

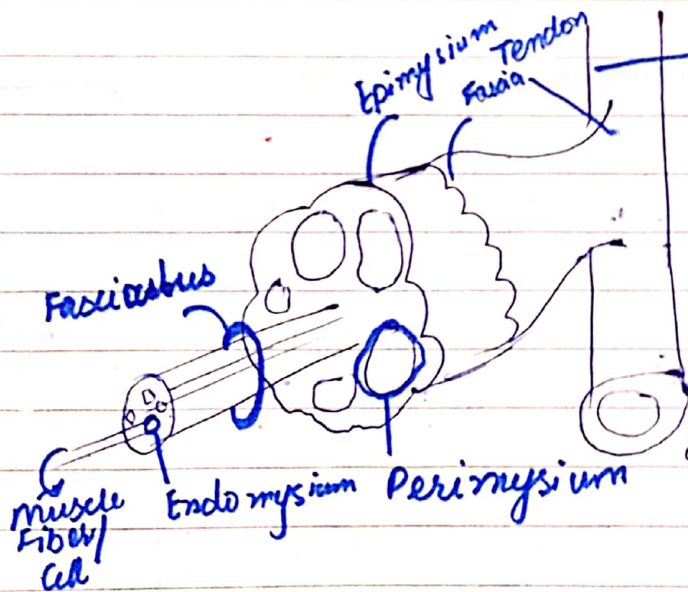
All An individual skeletal muscles may be made up of hundred or even thousands of muscle fibers bound/bundled together & wrapped in a connective tissue covering.



Epimysium: Each muscle is surrounded by a connective tissue sheath called

Fascia: Connective tissue outside the epimysium and separate the muscle.

Portion of epimysium project inward to divide the muscle into compartment



⇒ Each compartment contains a muscle bundle called a fasciculus & is surrounded by a layer of connective tissue called perimysium

Endomysium:

Within fasciculus, each individual cell called muscle fibers is surrounded by C.T called endomysium

Tendon & Aponeurosis:

Commonly, the epi, peri & endomysium extend beyond

Date _____

the fleshy part of muscle the belly or gaster to form a thick rope like tendon or broad flat sheet like Aponeurosis.

⇒ Tendon & Aponeurosis forms indirect attachment from muscle to the periosteum of bone or to the connective tissue of other muscle.

⇒ Typically, a muscle spans a joint and is attached to bone by tendon at both ends.

One of end remain fixed or stable while the other end moves as a result of muscle contraction.

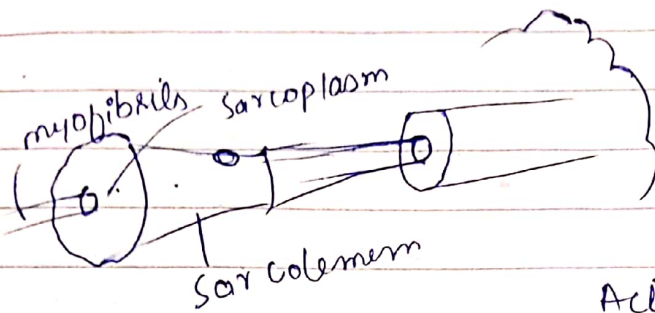
⇒ Anatomy of Muscle Fibers:

- myofibrils
- muscle → muscle Bundle →
 - Muscle Cell / Fibers → long cylindrical cell with multiple oval Nuclei just Beneath its Sarcolemma.
 - Huge Cell • 10-100 μm • Muscle Fibers contain large no. of cylinder structures called myofibrils (1-2 μm in diameter).
 - Sarcolemma: Each bundle of myofibrils are enclosed by muscle cell membrane.
 - Sarcoplasm: • Large Amount of stored (cytoplasm of muscle fiber) Glycogen.
 - Oxygen Binding Protein Myoglobin.
 - Mitochondria • ^{stored} Interacellular Ca^{+2}
 - T-tubules: Punctured by opening called T-tubules. Narrow tubules that extends into the sarcoplasm at right angle to the surface.
 - Filled with extracellular fluid.

Myofilaments

myofibrils are bundle of proteins filaments (myofilaments) Actin Filament / Myosin Filament

- when myofibrils shorten, muscles short (contracts)



Muscle Proteins

Contractile Protein

Regulatory Protein

Actin Thin fila

Myosin Thick

Troponin

Tropomyosin

Attachment Protein

Titin, Nebulin, dysotroponin
α-actinin

Each myofibrils is made up of array of parallel filaments.

Thick Filament

Diameter of About 15nm
Composed of Protein Myosin

Actin, Thin fila

- 3 major protein → Actin → →
- Two strands of fibrous actin form double helix extending the length of myofilament.

composed of G-actin monomers each of which has a myosin Binding site.

Actin site can bind myosin during muscle contraction.

Tropomyosin

two strands of elongated Protein winds along the groove of F actin double helix.

Thin Filament

Diameter of 5nm
Chiefly of protein actin along with 2 smaller proteins

Troponin / Tropomyosin.

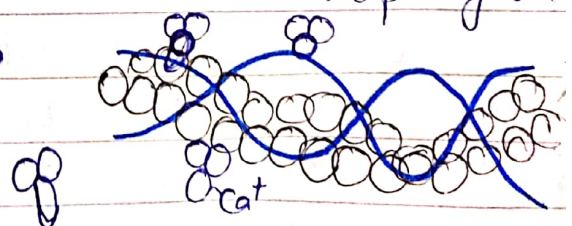
Troponin

Three Polypeptide Complex.

Tn-A → binds to actin

Tn-C → Ca^{2+}

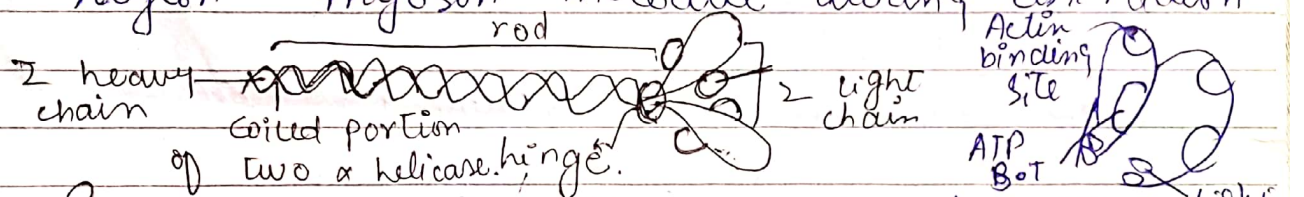
Tn-T → Tropomyosin



Myosins Many elongated myosin molecules shaped like golf clubs.

Date: _____

- Single filament contain 300 myosin molecules
- Each myosin molecule has a tail terminating at two globular head.
- Tail consists of two P.P chain.
- Myosin heads: Bind to Active Site on the Actin molecule to form Cross Bridges.
- Attached to the rod portion by a hinge region that can bend & straighten during contraction.
- Have ATPase activity: activity that breaks down ATP releasing energy. Part of the energy is used to bend the hinge region myosin molecule during contraction



Sarcomere: Repeatedly functional unit of a myofibril.

- About 10,000 sarcomere per myofibril, end to end
- About 2 μm long.
- In each sarcomere, a series of dark & light is evident across the length of each myofibrils.

A band: Dark

I band light

full length of thick myofilament

Isotropic

Anisotropic

from Z disks to ends of thick

M line: Proteins to which myosin attach. H-zone is bisected by a dark line called M-line

H-zones: Each A-band has lighter strip in its mid-section. Thick No Thin fil

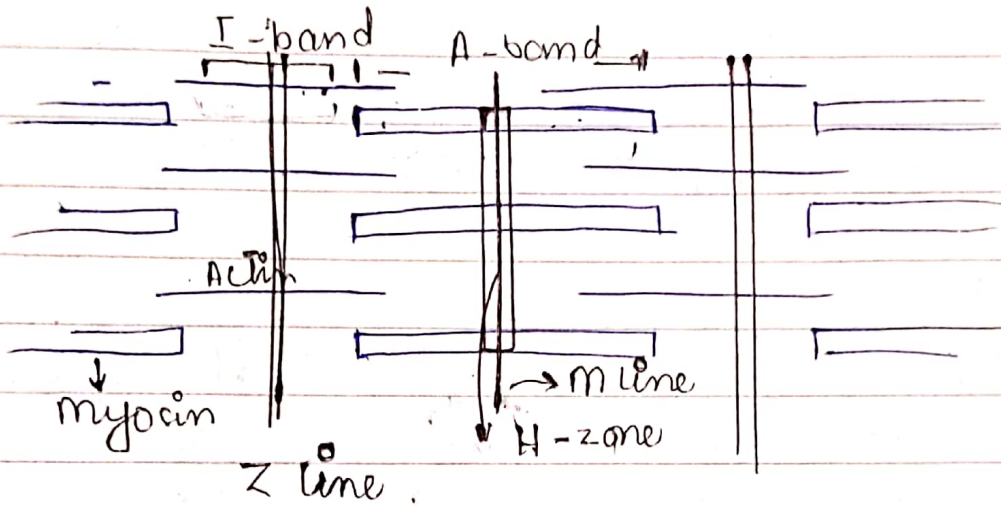
Z-disk: Serves as a attachment for actin myofilaments. mid line of I-band.

Myosin fil - 6 actin filament

Date: _____

Titin filaments: Elastic Chains of A.A & keep actin^{thin} & thick filament in proper alignment.

Array of thick & thin filament b/w Z-line is called Sarcomere.



During Contraction:

Thin filament slide past the Thick One.

Z-line Brought closer

- I band shortens
- H-zone disappears

Contraction requires a blood supply for sufficient O_2 , nutrient to remove waste product.

Maximum Marks: 50

Time Allowed: 3 Hours

Note: **Attempt any five questions. All questions carry equal marks.**

- Q.1.** a) With the help of diagram, elaborate the anatomy and histology of stomach. (5)
b) Differentiate large and small intestine on anatomical basis. (5)
- Q.2.** a) Draw the structure of nephron, label it and also discuss its various types. (5)
b) Define the following terms: (5)
i) Vasa vasorum ii) Hilus iii) Hilum iv) Adam's apple v) Mediastinum
- Q.3.** a) Differentiate between skeletal muscles, smooth muscle, and cardiac muscle (at least two points in each). (5)
b) Define coronary circulation. Discuss the different types of coronary arteries. (5)
- Q.4.** Differentiate the following terms anatomically. (5)
a) Diagrammatically differentiate Artery vs Vein. (5)
b) Parasympathetic system vs Sympathetic nervous system. (5)
- Q.5.** a) Briefly explain first six cranial nerves with origination and functions. (5)
b) Draw the structure of brain and label its various parts. (5)
- Q.6.** a) Explain the prostate gland. Mention at least one disease related to prostate gland. (5)
b) Draw the structure of adrenal gland, label it and mention its location. (5)
- Q.7.** a) Explain the structural anatomy of female reproductive system. (5)
b) Mention briefly the different male and female reproductive hormones. (5)