

YAKEEN NEET 2.0

21.08.2025

2026

LOCOMOTION AND MOVEMENT

ZOOLOGY

Lecture – 2

By- SAMAPTI MAM





Topics to be covered

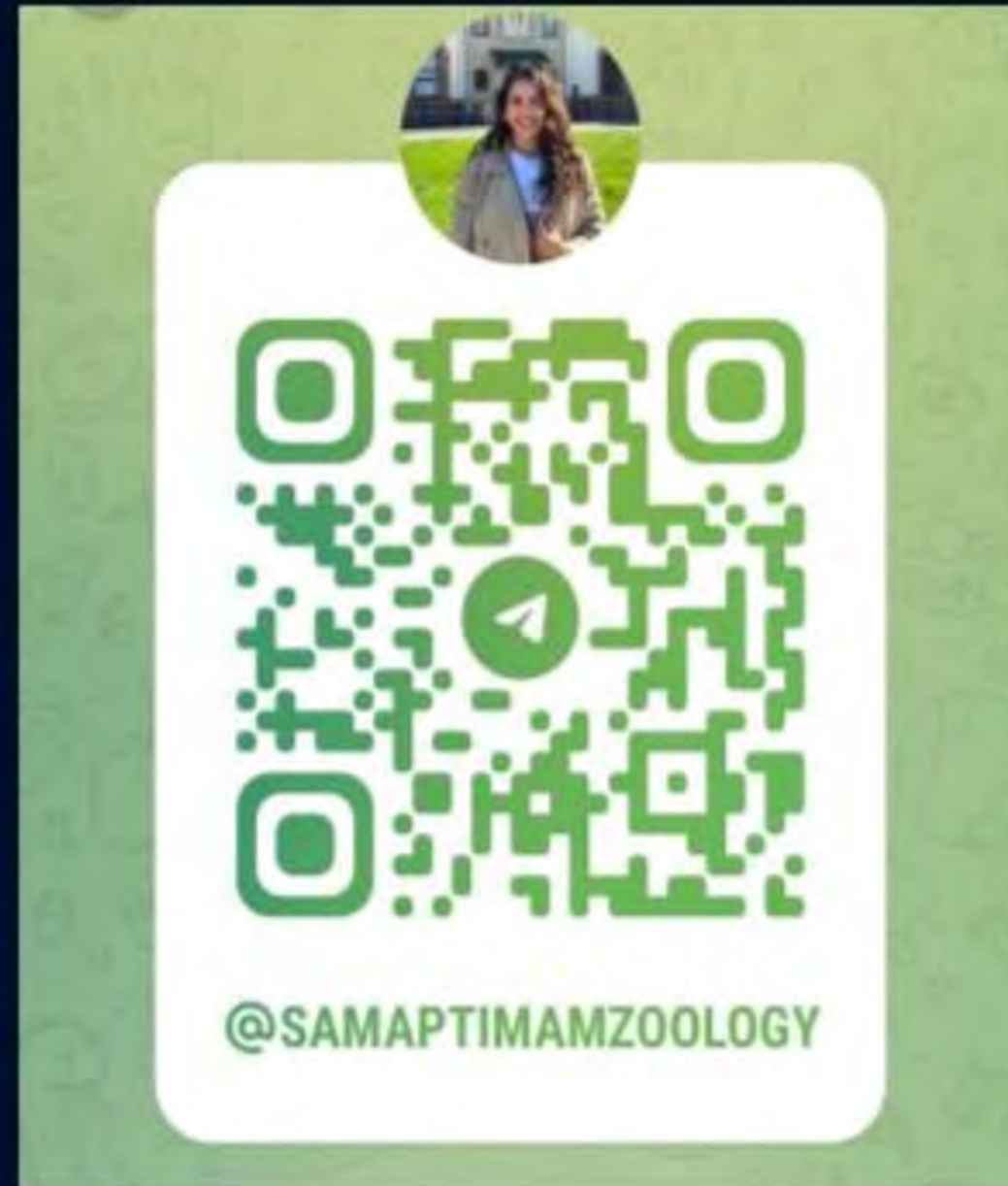
1

SARCOMERE, MYOFILAMENTS

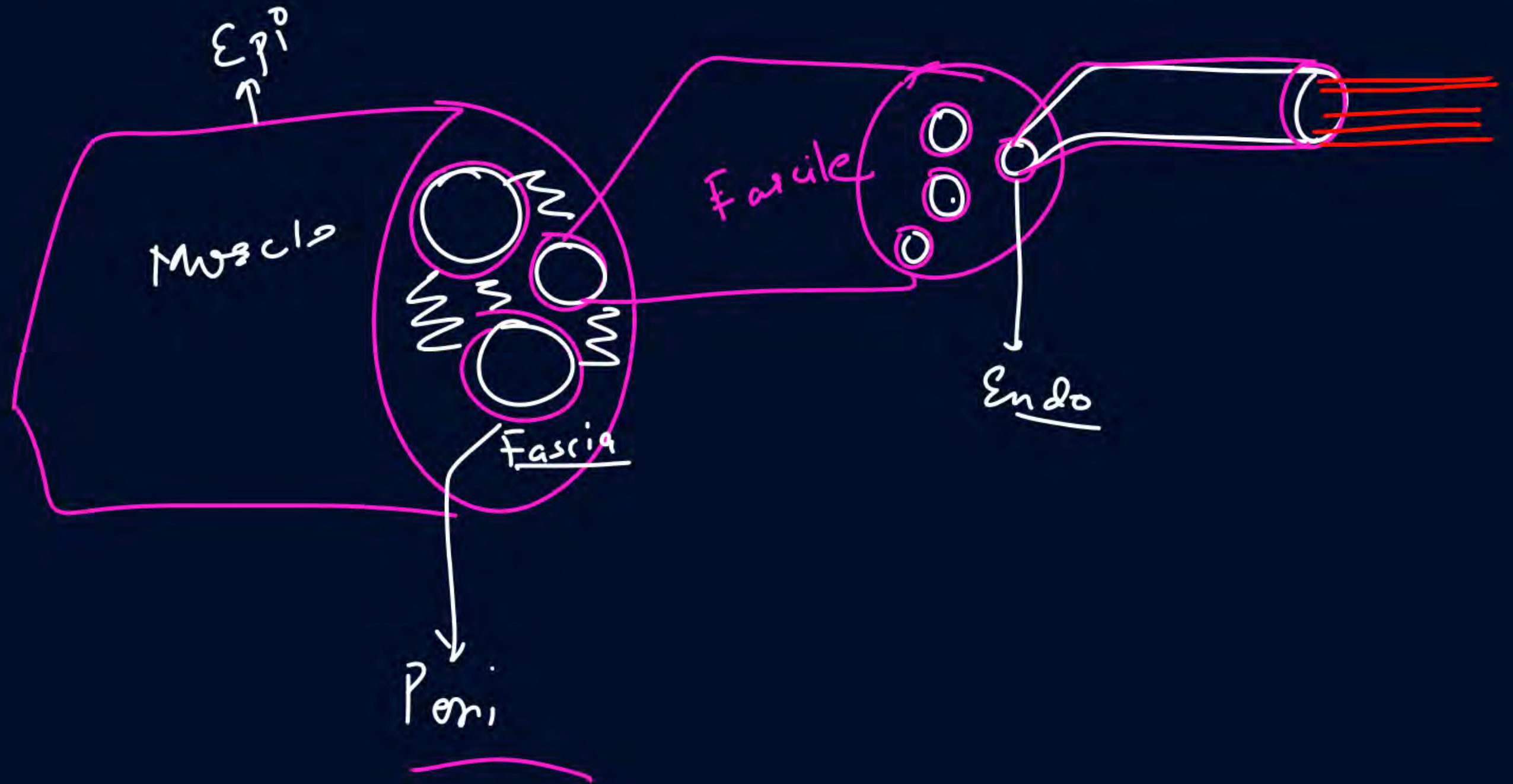
2

3

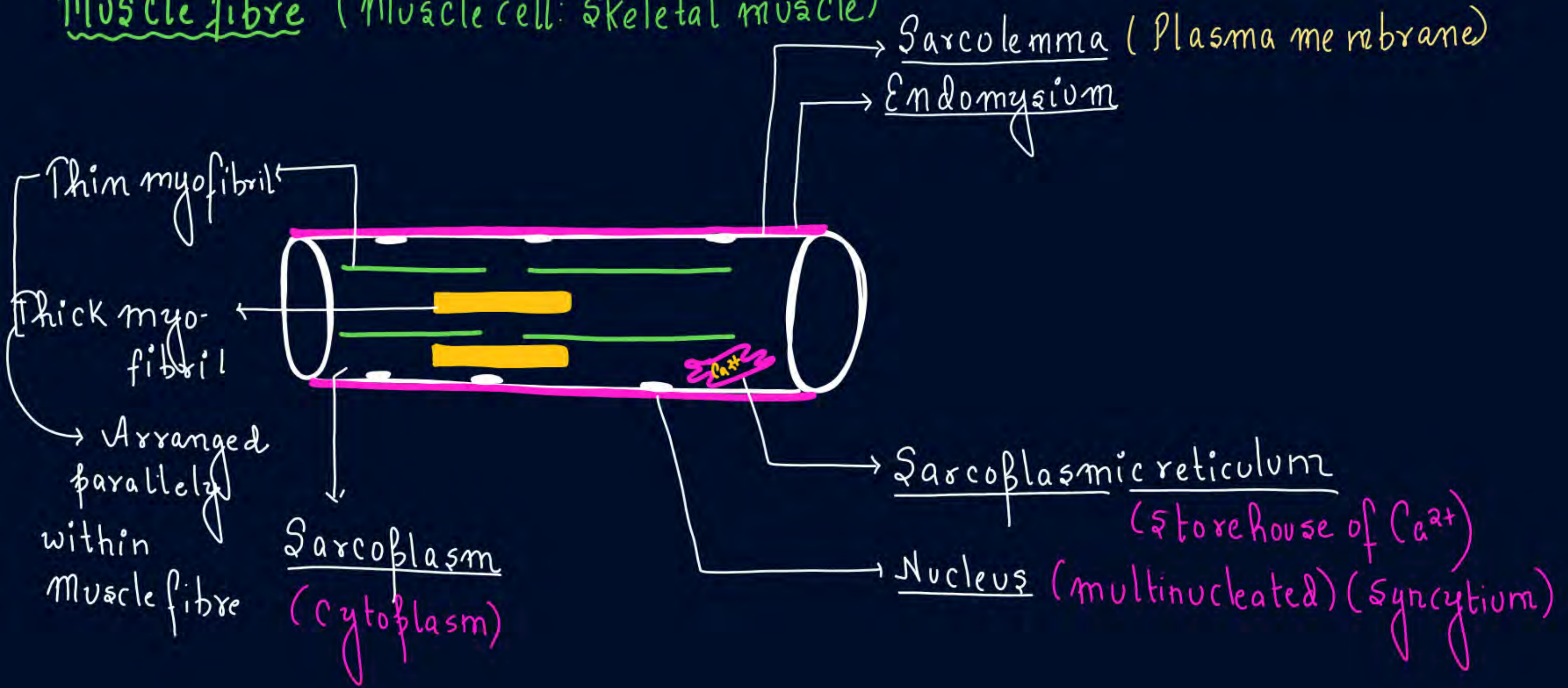
4



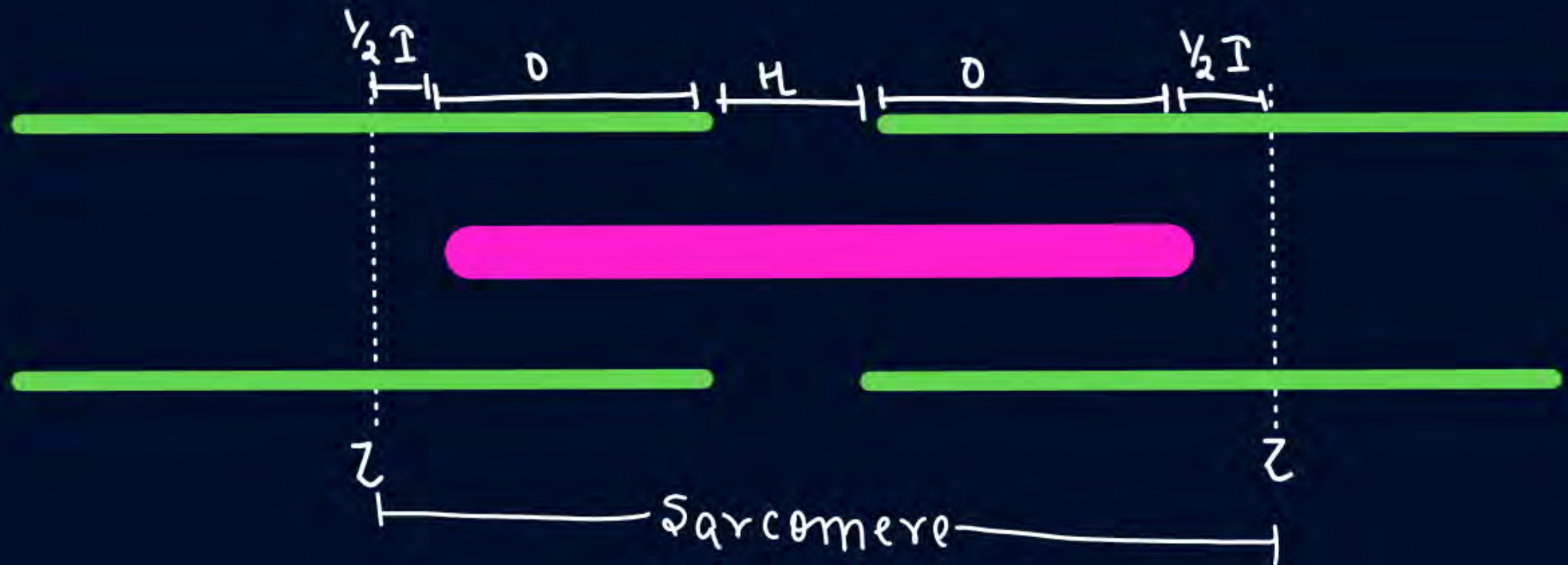
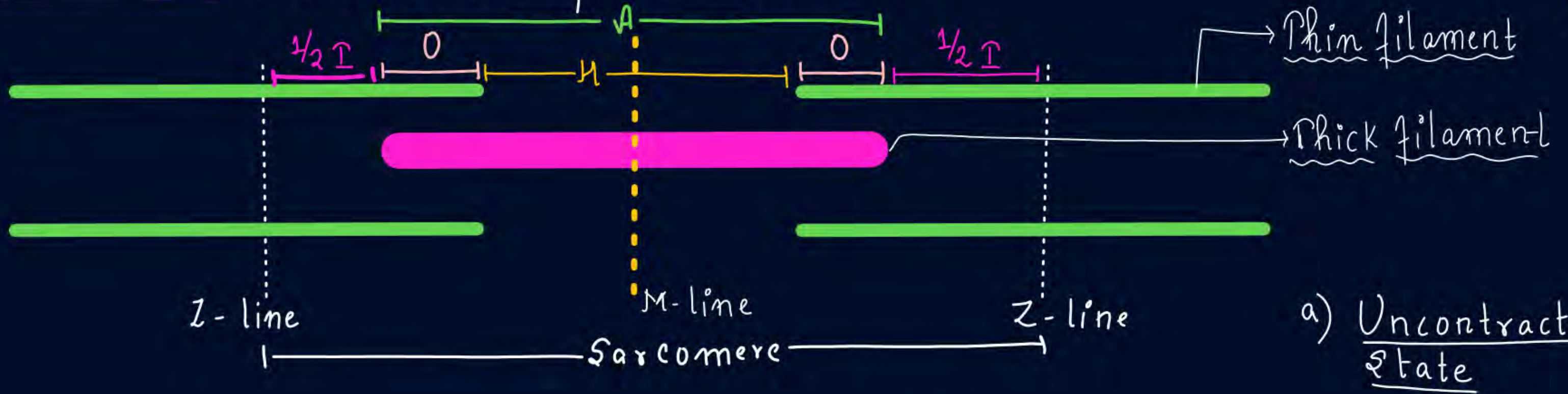
#2 amaptyexpress



Muscle fibre (Muscle cell: skeletal muscle)




Sarcomere: Functional unit of Contraction.



b) Muscle Contraction

Important Points:



- 1) Thin filaments are attached to an elastic membrane: **Z-line**
- 2) Z-line: passes through centre of  Thin fil.
I band
- 3) I-Band (Isotropic band) : Where only 'thin' filament seen
↳ Light Band: appears light under microscope
- 4) A-Band (Anisotropic) : $O + H + O$ (O: Overlapping, H- Hensen Zone)
↳ Dark Band: appears Dark under microscope.
- 5) M-Line: Thin fibrous membrane
↳ Holds the thick filament in the centre
↳ passes through centre of 'A' Band / H-zone / Thick filament.
- 6) Sarcomere = $\frac{1}{2} I + A + \frac{1}{2} I$ (distance b/w 2 successive Z-line)

1) Muscle contracts: I Band ↓
A Band same (O ↑, H ↓)
Sarcomere ↓

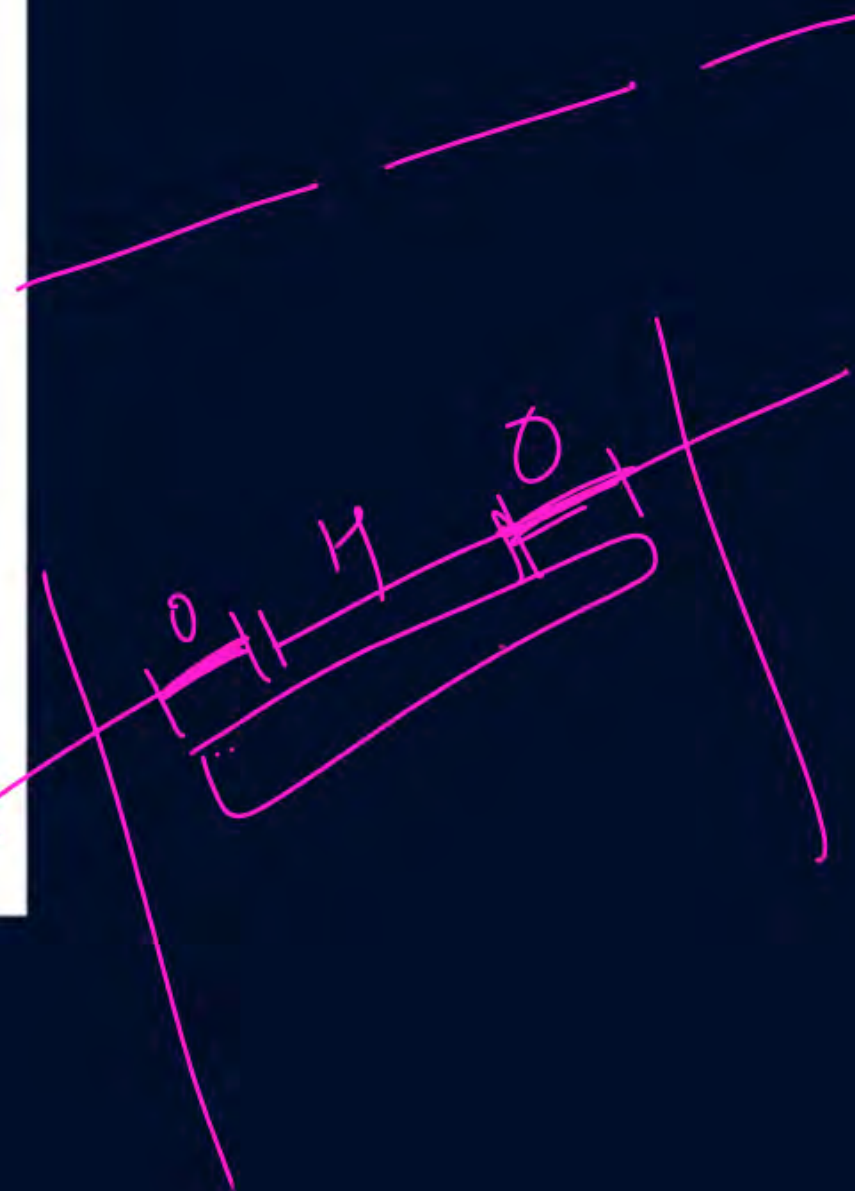
2) Max. contraction: H-Zone disappears

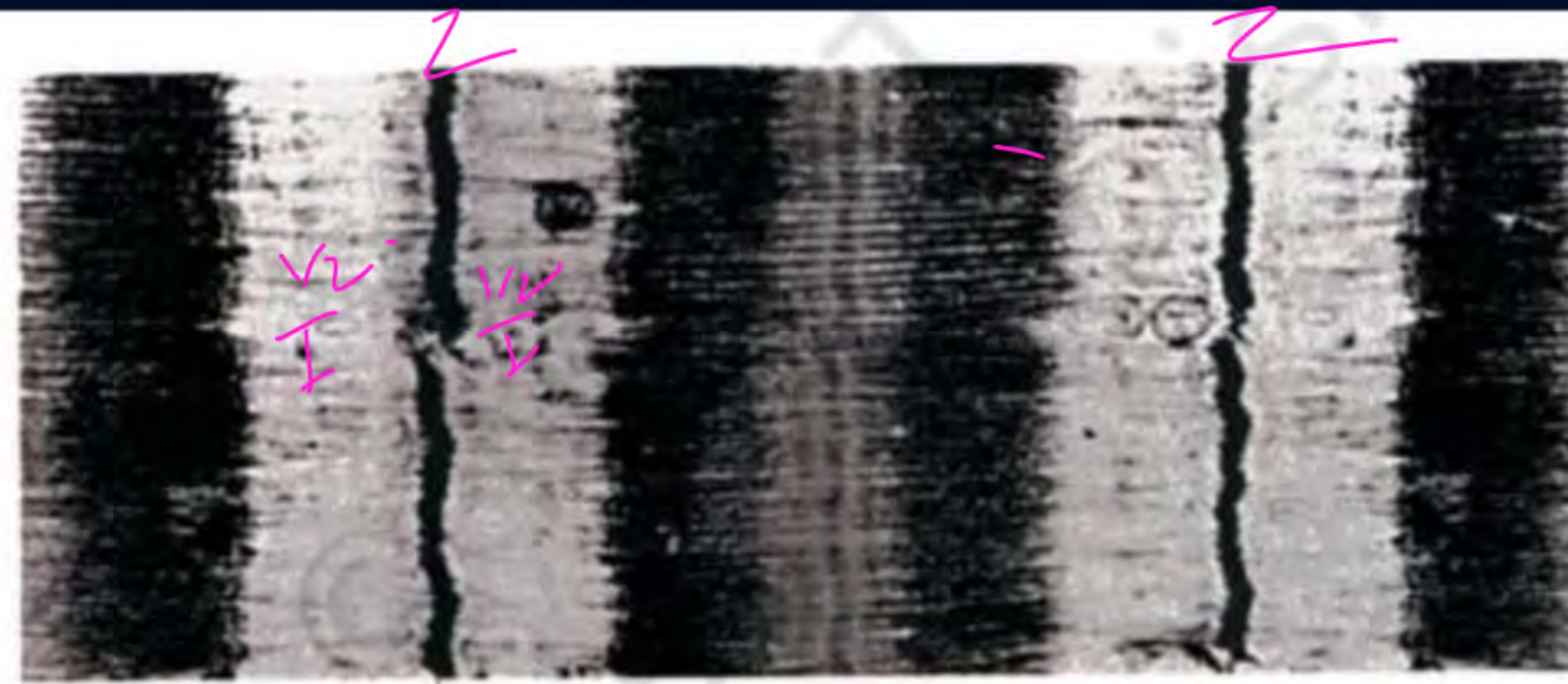


Max. Contraction

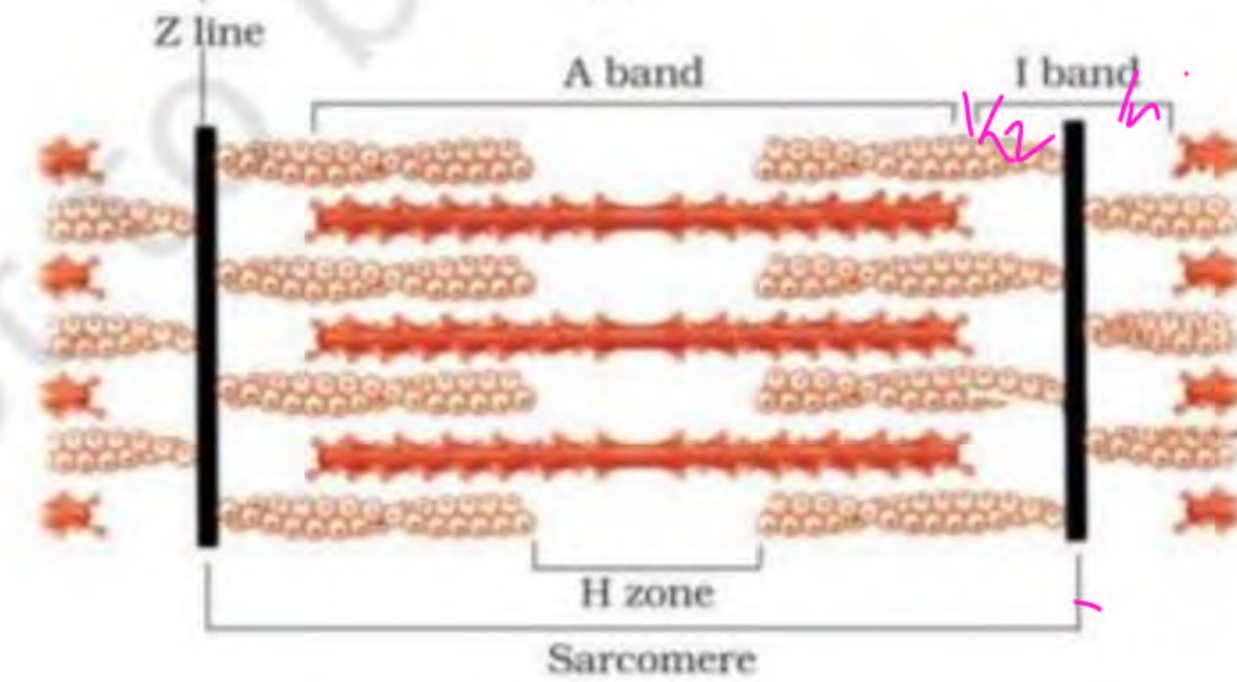
muscle fibre is lined by the plasma membrane called sarcolemma enclosing the sarcoplasm. Muscle fibre is a syncytium as the sarcoplasm contains many nuclei. The endoplasmic reticulum, i.e., sarcoplasmic reticulum of the muscle fibres is the store house of calcium ions. A characteristic feature of the muscle fibre is the presence of a large number of parallelly arranged filaments in the sarcoplasm called myofilaments or myofibrils. Each myofibril has alternate dark and light bands on it. A detailed study of the myofibril has established that the striated appearance is due to the distribution pattern of two important proteins – **Actin** and **Myosin**. The light bands contain actin and is called I-band or Isotropic band, whereas the dark band called 'A' or Anisotropic band contains

myosin. Both the proteins are arranged as rod-like structures, parallel to each other and also to the longitudinal axis of the myofibrils. Actin filaments are thinner as compared to the myosin filaments, hence are commonly called thin and thick filaments respectively. In the centre of each 'T' band is an elastic fibre called 'Z' line which bisects it. The thin filaments are firmly attached to the 'Z' line. The thick filaments in the 'A' band are also held together in the middle of this band by a thin fibrous membrane called 'M' line. The 'A' and 'T' bands are arranged alternately throughout the length of the myofibrils. The portion of the myofibril between two successive 'Z' lines is considered as the functional unit of contraction and is called a sarcomere (Figure 17.2). In a resting state, the edges of thin filaments on either side of the thick filaments partially overlap the free ends of the thick filaments leaving the central part of the thick filaments. This central part of thick filament, not overlapped by thin filaments is called the 'H' zone.





(a)



(b)

Figure 17.2 Diagrammatic representation of (a) anatomy of a muscle fibre showing a sarcomere (b) a sarcomere

Structure of Contractile Proteins:

• Contractile Proteins {
→ Actin
→ Myosin

• Regulatory Proteins {
→ Troponin
→ Tropomyosin

1) Thin myofilament {
→ Actin
→ Tropomyosin
→ Troponin

1) (ACTIN)



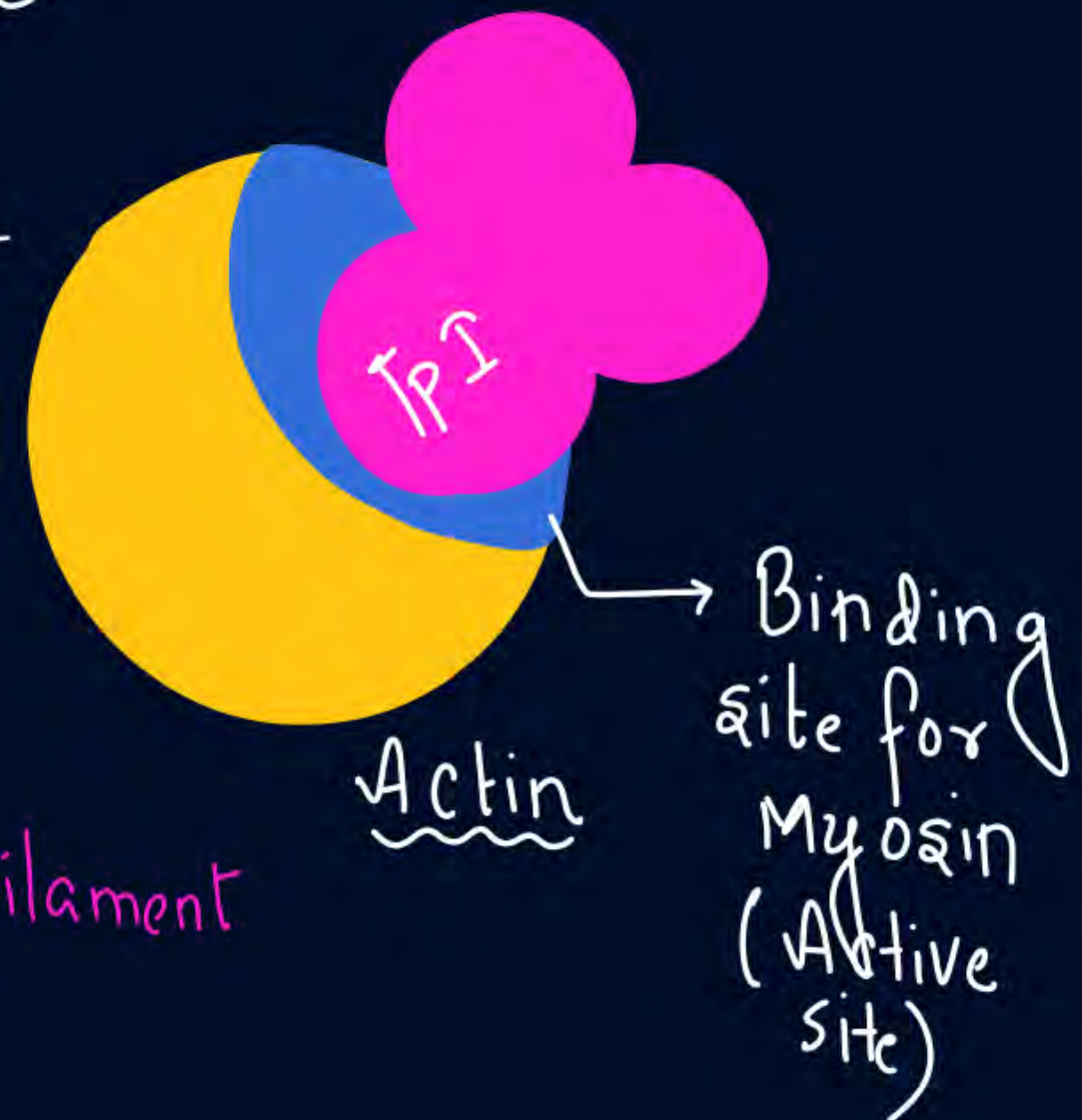
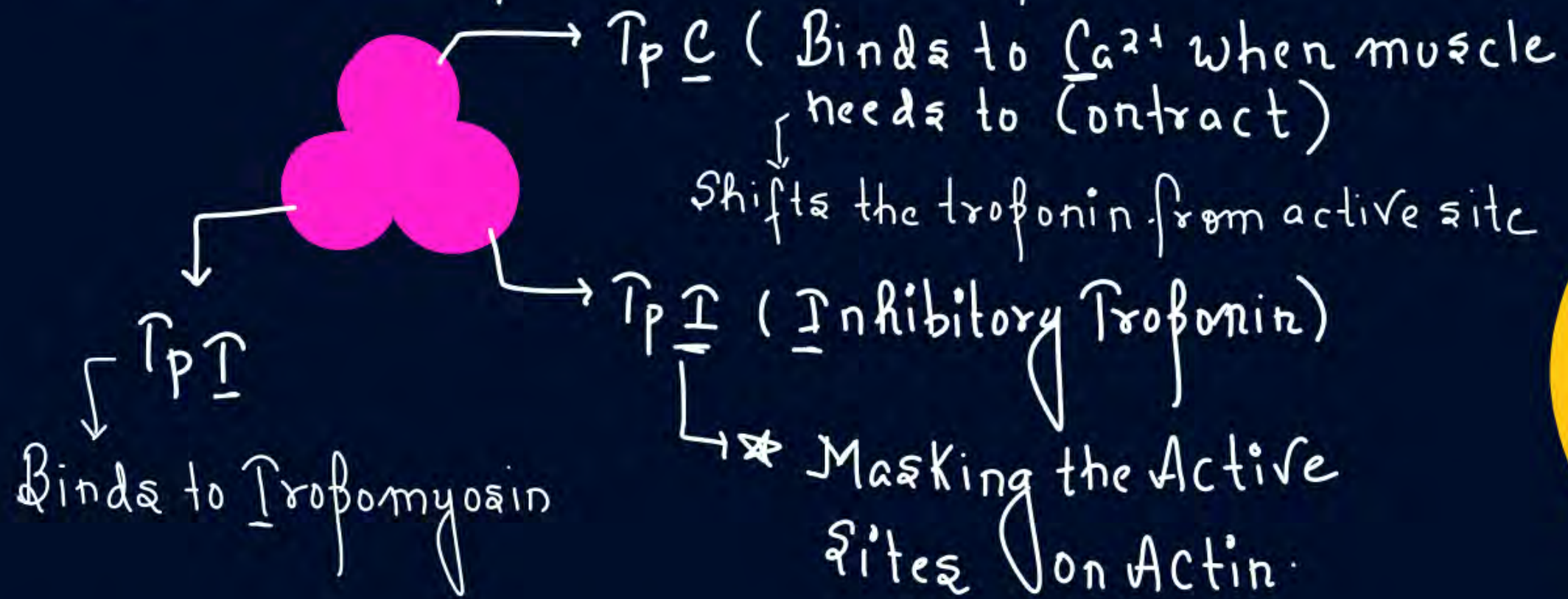
G-Actin
(Globular-Actin)
(Monomer)

f-actin (filamentous Actin)
(polymerise)

2) Troponin: 2 filamentous structure present along γ -actin.



3) Troponin: Complex TRIMERIC protein



• Troponin distributed at regular interval: Thin myofilament

17.2.1 Structure of Contractile Proteins

Each actin (thin) filament is made of two 'F' (filamentous) actins helically wound to each other. Each 'F' actin is a polymer of monomeric 'G' (Globular) actins. Two filaments of another protein, tropomyosin also run close to the 'F' actins throughout its length. A complex protein Troponin is distributed at regular intervals on the tropomyosin. In the resting state a subunit of troponin masks the active binding sites for myosin on the actin filaments (Figure 17.3a).

Each myosin (thick) filament is also a polymerised protein. Many monomeric proteins called Meromyosins (Figure 17.3b) constitute one thick filament. Each meromyosin has two important parts, a globular head with a short arm and a tail, the former being called the heavy meromyosin (HMM) and the latter, the light meromyosin (LMM). The HMM component, i.e.; the head and short arm projects outwards at regular distance and angle from each other from the surface of a polymerised myosin filament and is known as cross arm. The globular head is an active ATPase enzyme and has binding sites for ATP and active sites for actin.

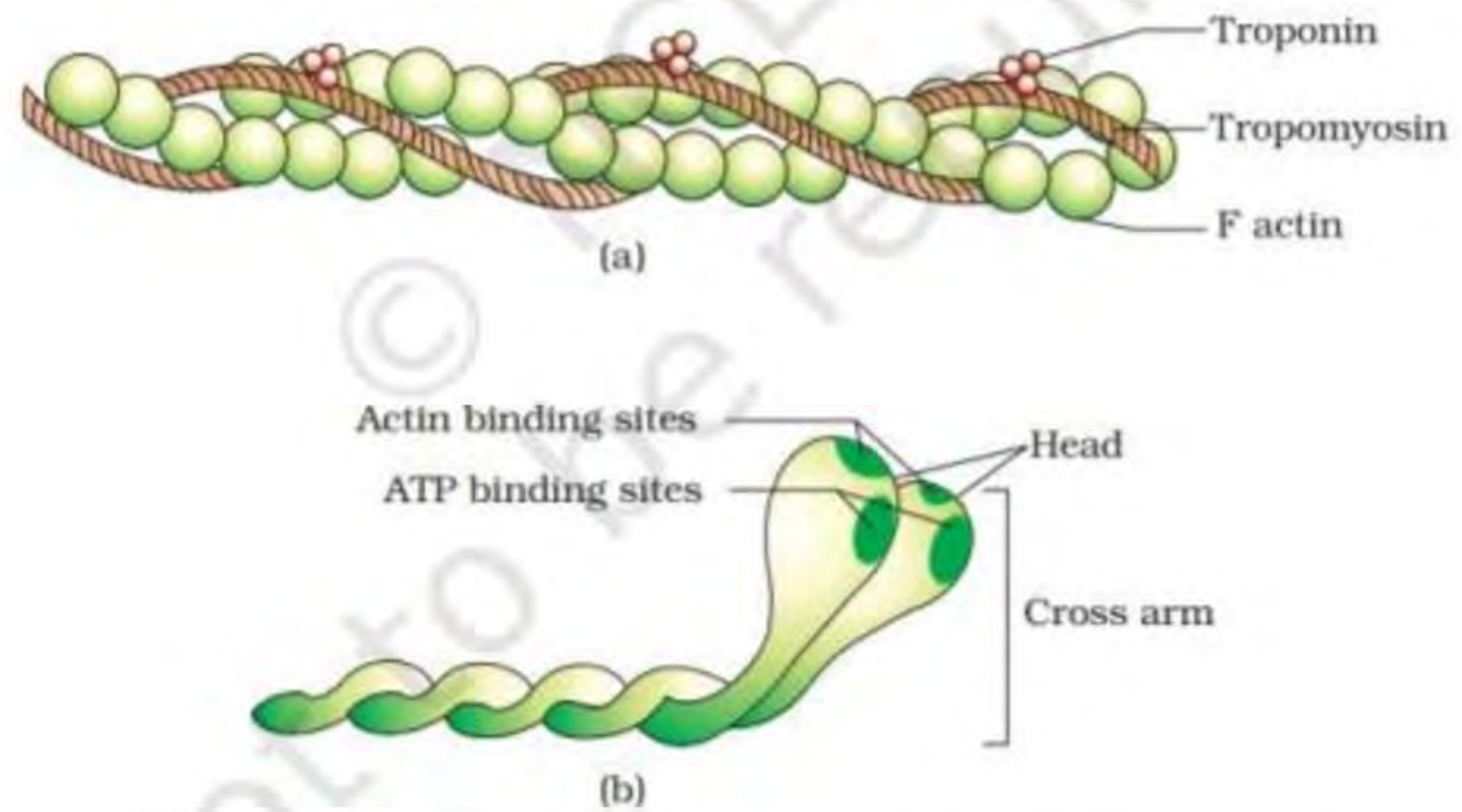


Figure 17.3 (a) An actin (thin) filament (b) Myosin monomer (Meromyosin)

QUESTION

The functional unit of the contractile system in the striped muscle is:

- A** I-band.
- B** A-band.
- C** myofibril.
- D** sarcomere.

Q-1
4

QUESTION

Name the connective tissue layer that holds muscle bundles together in skeletal muscles.

- A** Sarcolemma
- B** Fascia
- C** Fascicles
- D** Sarcoplasmic reticulum

fascicle

Q-2

2

QUESTION

Match List-I with List-II.

Choose the correct answer from the options given below:

Q-3
2

A A-I, B-II, C-III, D-IV

B A-II, B-III, C-IV, D-I

C A-II, B-III, C-I, D-IV

D A-I, B-IV, C-III, D-II

	List-I		List-II
(A)	<i>Paramoecium</i>	(I)	Streaming of protoplasm
(B)	<i>Hydra</i>	(II)	Cilia
(C)	Mammals	(III)	Tentacles
(D)	<i>Amoeba</i>	(IV)	Limbs

QUESTION

Which of the following statements is correct?

- A** Actin filaments are thicker than myosin filaments. X
- B** Troponin is distributed at irregular intervals on the myosin filament. X
- C** Actin filaments are firmly attached to the 'Z' line.
- D** Myoglobin is a pink colour oxygen storing pigment.

Q4

3

QUESTION

_____structure holds the thick filaments together in the middle of the 'A' band.

Choose the option which fills the blank correctly.

- A** Z line
- B** M line
- C** H zone
- D** I band

Q-5
B

QUESTION

How many filaments of tropomyosin run close to the F actins throughout its length?

- A** Ten
- B** Two
- C** Six
- D** Eight

Q-6

Samapti Sinha Mahapatra

PW Zoology Med Easy For NEET and Board Exams 2024-25 | Flowcharts, Schematic Diagrams Samapti Sinha Mahapatra Handwritten Notes

20 May 2024

ISBN-11: 978-9360345068 ISBN-10: 9360345067

#1 Best Seller in AIIMS & NEET Exams

14% off





Homework

- REVISE CLAASNOTES / ZOOLOGY MED EASY

THANK
YOU