



INDIAN SCHOOL AL WADI AL KABIR



CLASS: XI	DEPARTMENT OF SCIENCE: 2026- 2027 SUBJECT: BIOLOGY	DATE: 18/08/2026
WORKSHEET:7	Unit V: Human Physiology Ch- 17- Locomotion and movement	NOTE: A4 FILE FORMAT
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

I. MULTIPLE CHOICE QUESTIONS (1M)

- Which of the following types of movement is exhibited by macrophages and leucocytes in the human body?
 - Ciliary movement
 - Amoeboid movement
 - Flagellar movement
 - Gliding movement
- The functional unit of contraction in a skeletal muscle fibre, located between two successive 'Z' lines, is known as the:
 - Sarcolemma
 - Sarcoplasm
 - Sarcomere
 - Myofibril
- During muscle contraction, which of the following events occurs according to the Sliding Filament Theory?
 - The A-band shortens
 - The I-band retains its length
 - The H-zone disappears or reduces
 - Actin filaments shorten in length
- Which protein masks the active binding sites for myosin on the actin filaments in a resting state?
 - Troponin
 - Tropomyosin
 - Meromyosin
 - Actinin
- The globular head of meromyosin (heavy meromyosin) possesses binding sites for:
 - ATP and Troponin
 - Actin and Calcium ions
 - ATP and Actin
 - Tropomyosin and Potassium ions

Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

A. Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of

the Assertion (A).

- B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
C. Assertion (A) is true, Reason (R) is false.
D. Assertion (A) is false, Reason (R) is true.

6. **Assertion (A):** Myasthenia gravis is an autoimmune disorder that affects the neuromuscular junction.

Reason (R): It leads to fatigue, weakness, and paralysis of skeletal muscles due to the destruction of acetylcholine receptors.

7. **Assertion (A):** Osteoporosis is characterised by decreased bone mass and increased chances of fractures.

Reason (R): A common cause of osteoporosis in elderly women is the increased level of estrogen.

8. **Assertion (A):** Repeated activation of muscles can lead to the accumulation of lactic acid.

Reason (R): Lactic acid is formed due to the aerobic breakdown of glycogen in the muscles.

9. **Assertion (A):** Gout is the inflammation of joints.

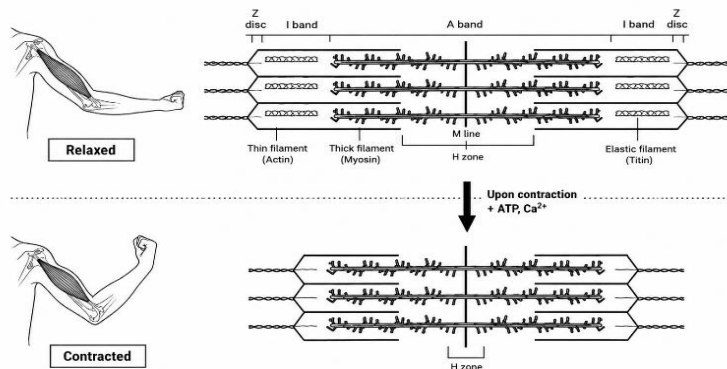
Reason (R): It is caused by the deposition of calcium carbonate crystals in the joints.

II. VERY SHORT ANSWER TYPE QUESTIONS (2M)

10. Differentiate between red muscle fibres and white muscle fibres based on their myoglobin content and mitochondrial density.
11. Explain the specific role of Calcium ions (Ca^{2+}) in the initiation of the muscle contraction cycle.
12. Describe the structure of the human pectoral girdle, naming the bones that constitute it.
13. What is the biological significance of the 'all-or-none' principle in muscle fibre contraction?
14. Distinguish between the axial skeleton and the appendicular skeleton in terms of their primary components.

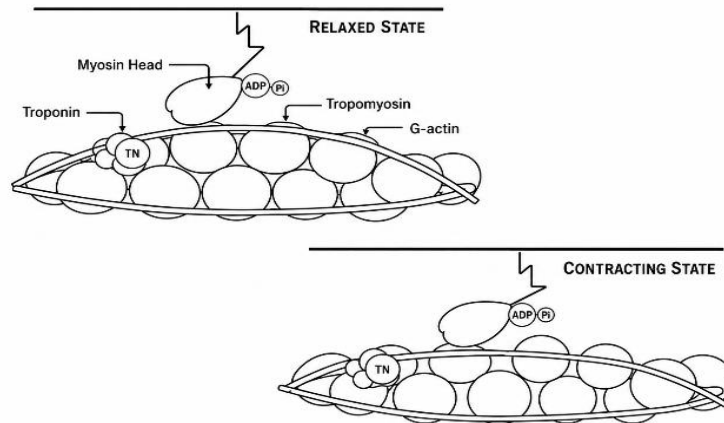
III. SHORT ANSWER TYPE QUESTIONS (3M)

15. What is osteoporosis? State its causes and mention one preventive measure.
16. What are the different types of joints in the human body? Give examples.
17. Study the diagram of the functional unit of contraction.



- a) Identify the 'Z-line' and the 'H-zone'.

- b) Explain what happens to the width of the 'I-band' during contraction.
18. Observe the structure of the actin and myosin filaments.

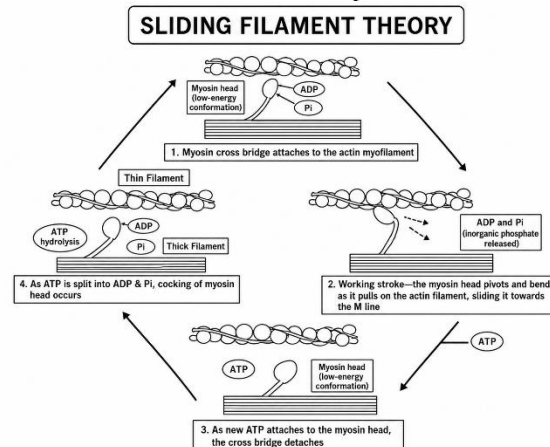


- a) Name the protein that masks the active binding sites on actin filaments.
- b) Identify the two important binding sites present on the globular head of myosin.

IV. CASE STUDY BASED QUESTIONS (4M)

19. Read the given passage & answer the following Questions:

The sliding filament theory is the most widely accepted mechanism for muscle contraction. It states that muscle fibre contraction occurs through the sliding of thin filaments over thick filaments. Contraction is initiated by a signal sent by the central nervous system (CNS) via a motor neuron. A motor neuron, along with the muscle fibres it innervates, constitutes a motor unit. The junction between a motor neuron and the sarcolemma of the muscle fibre is called the neuromuscular junction or motor-end plate. A neural signal reaching this junction releases a neurotransmitter (Acetylcholine), which generates an action potential in the sarcolemma. This spreads through the muscle fibre and causes the release of calcium ions into the sarcoplasm. An increase in Ca^{++} level leads to the binding of calcium with a subunit of troponin on actin filaments and thereby removes the masking of active sites for myosin. Utilising the energy from ATP hydrolysis, the myosin head now binds to the exposed active sites on actin to form a cross bridge.



- A. Which neurotransmitter is released at the neuromuscular junction to initiate an action potential?
- B. What is the specific role of Calcium ions (Ca^{++}) in the sarcoplasm during contraction?

- C. Explain how the hydrolysis of ATP facilitates the 'power stroke' and the subsequent detachment of the myosin head from the actin filament.

V. LONG ANSWER TYPE QUESTIONS (5M)

20. Describe the detailed mechanism of muscle contraction according to the sliding filament theory. Specifically highlight the role of ATP and the changes observed in the sarcomere (H-zone, I-band, and A-band) during contraction.
21. Describe the structure and functions of the human skeleton.
22. Explain the structure and function of joints in the human body.
23. Classify joints based on their mobility and the nature of the connecting tissue. Provide examples for Fibrous, Cartilaginous, and Synovial joints and explain their importance in human locomotion.

ANSWERS

I	MCQ
1	B) Amoeboid movement
2	C) Sarcomere
3	C) The H-zone disappears or reduces
4	A) Troponin
5	C) ATP and Actin
	Assertion and Reason Questions
6	A. Both A and R are true, and R explains the mechanism of the autoimmune attack
7	C. A is true, but R is false.
8	C. A is true, but R is false
9	A. Both A and R are true, and R explains the mechanism of the autoimmune attack
II.	VERY SHORT ANSWER TYPE QUESTIONS(2M)
10	Red Fibres: High myoglobin content (reddish appearance), high mitochondrial density, aerobic respiration. White Fibres: Low myoglobin, fewer mitochondria, depend on anaerobic process for energy.
11	Action potential causes release from sarcoplasmic reticulum. Ca^{2+} binds to Troponin, causing a conformational change that unmask the myosin-binding sites on actin.
12	Pectoral Girdles – Composed of two bones: clavicle and scapula. Provide support to the arms with a ball-and-socket joint through the glenoid cavity. Pelvic Girdles – Composed of three bones: ilium, ischium and pubis. Provide support to the limb with a ball-and-socket joint through the acetabulum.
13	A muscle fibre contracts maximally or not at all in response to a stimulus. Common error: Students often think this applies to the whole muscle; it applies to individual motor units/fibers.
14	Axial: Skull, vertebral column, ribs, and sternum (80 bones). Appendicular: Limbs (arms/legs) and girdles (pectoral/pelvic).
III.	SHORT ANSWER TYPE QUESTIONS (3M)

15	Osteoporosis is a condition in which the bones become weak, porous and prone to fractures due to reduced bone mass. It may occur due to decreased estrogen levels, inadequate calcium intake, vitamin D deficiency, or ageing. It can be prevented by adequate calcium and vitamin D intake along with regular weight-bearing exercise.
16	Fibrous joints: Immovable (e.g., sutures in the skull). Cartilaginous joints: Slightly movable (e.g., intervertebral discs). Synovial joints: Freely movable. Examples: Ball and socket: Shoulder. Hinge: Elbow. Pivot: Atlas/axis. Saddle: Thumb.
17	a) Z-line: The membrane/line anchoring actin; H-zone: The central part of thick filament not overlapped by thin filaments. b) The I-band shortens as actin filaments slide toward the M-line.
18	a) Troponin (specifically the tropomyosin-troponin complex). b) Actin-binding site and ATP-binding site.
IV	CASE STUDY BASED QUESTIONS (4M)
19.	Acetylcholine (ACh).
a)	
b)	Binding to Troponin: It removes the masking of active sites on actin filaments.
c)	Analytical Answer: ATP hydrolysis (to ADP and Pi) provides energy for the myosin head to bind to actin and tilt (power stroke), pulling actin toward the M-line. A new ATP molecule must bind to the myosin head to break the cross-bridge and cause detachment.
V.	LONG ANSWER TYPE QUESTIONS (5M)
20	Mechanism: Neural signal → ACh release → Action potential in sarcolemma → release → Troponin binding → Cross-bridge formation → Sliding (Power stroke) → Detachment. Sarcomere Changes: I-band shortens, H-zone reduces/disappears, A-band length remains constant.
21	• The human skeleton consists of 206 bones divided into: • Axial Skeleton: Skull, vertebral column, ribs, and sternum. • Appendicular Skeleton: Limbs, pectoral girdle, and pelvic girdle. • Functions: • Provides support and shape to the body. • Protects internal organs (e.g., skull protects the brain). • Facilitates movement by providing attachment points for muscles. • Stores minerals like calcium and phosphate. • Produces blood cells in bone marrow.

22	Joints are connections between bones that allow movement and flexibility. Types include: - Fibrous joints: No movement; bones are tightly joined (e.g., cranial sutures). - Cartilaginous joints: Limited movement; bones are connected by cartilage (e.g., intervertebral discs). - Synovial joints: Free movement; bones are separated by a synovial cavity and lubricated with synovial fluid. Examples: Ball and socket: Shoulder. Hinge: Knee. Pivot: Neck.
23	Joints: Fibrous: Immovable (Skull sutures). Cartilaginous: Limited movement (Intervertebral discs). Synovial: Freely movable; characterised by a fluid-filled synovial cavity (Ball and socket, Hinge, Pivot). Disorders: Myasthenia gravis: Autoimmune, NMJ affected. Muscular dystrophy: Genetic progressive degeneration. Tetany: Low calcium causing spasms. Arthritis: Inflammation of joints. Osteoporosis: Age-related, low bone mass, low estrogen. Gout: Uric acid crystal deposition.

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