



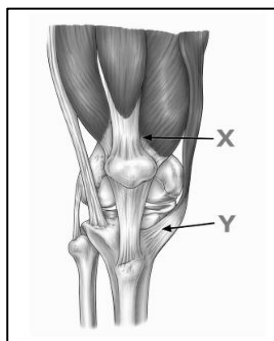
INDIAN SCHOOL AL WADI AL KABIR



Class: IX	DEPARTMENT OF SCIENCE:2026-27 SUBJECT: BIOLOGY	DATE: 15-10-2026
WORKSHEET NO:4 WITH ANSWERS	TOPIC: TISSUES IN ACTION- PART 2	A4 FILE FORMAT (PORTFOLIO)
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

I. OBJECTIVE TYPE QUESTIONS (1 Mark):

1. The diagram illustrates a human knee joint. Which of the following accurately describes the primary function of the connective tissues labeled 'X' and 'Y'?



- (A) 'X' limits joint movement to prevent dislocation, while 'Y' transmits force for movement.
- (B) 'X' transmits muscular force to the bone, while 'Y' provides stability and limits excessive movement.
- (C) 'X' cushions the ends of bones to absorb shock, while 'Y' attaches muscles to bones.
- (D) 'X' provides rigid structural support, while 'Y' produces red blood cells for the body.
2. Blood and bone are both classified as connective tissues, yet blood is fluid while bone is hard and rigid. This difference is mainly due to:
- (A) The number of cells present
- (B) The type of matrix present
- (C) The presence of nucleus in the cells
- (D) The location of the tissue in the body

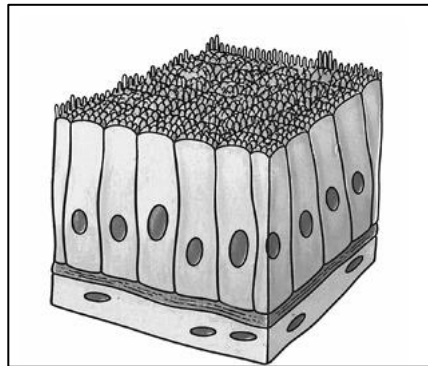
3. Which type of muscle is found in the walls of the stomach and intestines, and brings about slow, continuous, involuntary movements such as digestion?

- (A) Skeletal muscle
- (B) Smooth muscle
- (C) Cardiac muscle
- (D) Striated muscle

4. During an experiment, a student compares three types of muscle tissue and records the following observations. The muscle tissue obtained from the heart shows a pattern of contraction that continues regularly throughout life without conscious effort. Which observation is most likely associated with this tissue?

- (A) Long, cylindrical fibres that contract rapidly and are under voluntary control
- (B) Spindle-shaped fibres that contract slowly and are not under conscious control
- (C) Branched fibres that contract rhythmically and are not under conscious control
- (D) Long, cylindrical, multinucleate fibres with prominent striations that contract rapidly.

5. The illustrated tissue lines the inner surface of the small intestine. How does its pillar-like structure directly support its biological function?



- (A) It provides rigid mechanical support against friction during the passage of food.
- (B) It facilitates rapid diffusion of gases across a single thin layer of cells.
- (C) It ensures maximum surface area for the efficient absorption of digested nutrients.
- (D) It actively secretes hormones directly into the bloodstream for digestion.

6. Ramesh touched his forearm muscles and wiggled his fingers. He felt movement in the forearm even though the fingers were far away. Which connective tissue is responsible for bringing about this movement by connecting muscle to bone?

- (A) Ligament
- (B) Cartilage
- (C) Tendon
- (D) Bone

7. Arrange the following events in the correct sequence that leads to movement at a joint:

1. Tendon transmits the force to the bone
2. Nervous tissue signals the muscle
3. Muscle contracts
4. Movement occurs at the joint

- (A) 2, 3, 1, 4
(B) 1, 2, 3, 4
(C) 3, 1, 2, 4
(D) 2, 1, 3, 4

For the questions 8 to 12, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the options (i), (ii), (iii) and (iv) as given below:

- i. Both A and R are true, and R is the correct explanation of the assertion.**
- ii. Both A and R are true, but R is not the correct explanation of the assertion.**
- iii. A is true but R is false.**
- iv. A is false but R is true.**

8. **Assertion (A):** The epithelial tissue that protects the skin has many layers of tightly packed cells.

Reason (R): This multi-layered arrangement offers protection against mechanical injury, friction and entry of microbes.

9. **Assertion (A):** The matrix of cartilage is hard, solid and rigid.

Reason (R): Cartilage provides flexibility and cushions the ends of bones for shock absorption.

10. **Assertion (A):** The bones of the skull are joined by fixed joints.

Reason (R): This allows free movement of the skull bones to protect the brain.

11. **Assertion (A):** The ball and socket joint at the shoulder allows movement in many directions.

Reason (R): The rounded top of the upper arm bone fits into a shallow hollow of the shoulder bone.

12. **Assertion (A):** Voluntary movements like running and writing are carried out by skeletal muscles.

Reason (R): Skeletal muscle fibres are unbranched, multinucleate and striated.

II. SHORT ANSWER TYPE QUESTIONS (2 Marks):

13. (i) Differentiate between voluntary and involuntary movements, giving one example of each.

(ii) Name the type of muscle found only in the heart and mention one structural feature of its fibres.

14. What is a joint? Name the type of joint present in the elbow and describe the type of movement it allows.

15. Name the blood cells responsible for

(i) transporting oxygen, and

(ii) fighting infection. Also name the iron-rich protein responsible for the red colour of blood.

16. A student gently presses and folds their ear, and it returns to its original shape.

(i) Identify the connective tissue responsible for this property.

(ii) Mention one function of this tissue.

(iii) Name one location in the body where this tissue is found.

17. (i) Name the connective tissues that (a) connect muscle to bone, and (b) connect bone to bone.

(ii) State one difference in the function performed by each of them.

III. SHORT ANSWER TYPE QUESTIONS (3 Marks):

18. With the help of a labelled diagram, show the structure of a neuron. Name its three main parts and state one function of each.

19. Give the differences between the following:

(i) Bone and Cartilage

(ii) Skeletal muscle and Smooth muscle

20. List the different components of blood. State one function of each component.

21. Write the characteristics of epithelial tissue that make it suitable to form the protective outer covering of the body.

22. What is the musculoskeletal system? Name its components and explain the function of tendons in this system.

23. Name the three types of muscles found in our body. Mention one location and one characteristic feature of each.

24. Differentiate between a ball and socket joint and a hinge joint, giving one example of each.

25. Why does the rib cage need to move during breathing? Explain how this movement is made possible.

IV. LONG ANSWER TYPE QUESTIONS (5 Marks):

26. Write a short note on bone, cartilage, tendon and ligament, mentioning their structure, location and function.

27. Give reasons for the following:

(i) Cardiac muscle can work tirelessly throughout life without fatigue.

(ii) The epithelial tissue lining the small intestine has tall, pillar-like cells.

(iii) The skull bones do not move even though the rest of the body moves.

(iv) Bones alone cannot bring about movement at a joint.

(v) The elbow can only bend and straighten in one direction, unlike the shoulder.

28. Describe the different types of epithelial tissue found in the body on the basis of their function (exchange, protection, secretion, sensory and absorption). Mention the structure and one location for each type.

29. Explain, with the help of an example, how the nervous tissue, muscular tissue and skeletal system work together to bring about movement in the human body.

V. CASE STUDY-BASED QUESTIONS (4 Marks):

30. A student noted the following everyday observations:

(a) A small cut on the skin bleeds, and a clot forms after some time.

(b) A skin infection causes redness, swelling and sometimes fever.

(c) After running, breathing becomes faster and the face turns red.

Based on the above observations, answer the following:

- (i) Which blood component is responsible for clot formation?
- (ii) Which blood component collects at the infected area, causing swelling?
- (iii) Why does breathing become faster during exercise?
- (iv) Name the iron-rich protein responsible for the red colour of blood, and the blood cell in which it is found.

31. Riya performed a few actions and recorded her observations:

- Elbow: bends and straightens only in one direction.
- Shoulder: moves freely forward, backward, sideways and in a circular manner.
- Neck: turns side to side like a doorknob turning in its socket.
- Skull bones: do not move at all.

Based on the above observations, answer the following:

- (i) Identify the type of joint present in the elbow.
- (ii) Identify the type of joint present in the shoulder and justify your answer.
- (iii) Identify the type of joint that allows the neck to turn from side to side.
- (iv) Name the type of joint present in the skull. Why is it advantageous for the bones of the skull to be joined in this manner?

32. On an average, the adult human skeleton makes up about 12–15 per cent of body weight. Adult males have about 40–50 per cent muscle mass, while adult females have about 30–40 per cent muscle mass. An adult weighing 50 kg wants to estimate the weight contributed by bones and muscles in the body.

- (i) Calculate the approximate range of bone weight (in kg) for this student.
- (ii) If the person is a male, calculate the approximate range of muscle weight (in kg).
- (iii) Give one reason why bone and muscle mass differ between individuals.
- (iv) Name the system formed together by bones, muscles, joints, cartilage, tendons and ligaments.

ANSWERS

I. OBJECTIVE TYPE QUESTIONS (1 MARK)	
1	(B) 'X' transmits muscular force to the bone, while 'Y' provides stability and limits excessive movement.
2	(B) The type of matrix present
3	(B) Smooth muscle
4	(C) Branched fibres that contract rhythmically and are not under conscious control
5	(C) It ensures maximum surface area for the efficient absorption of digested nutrients.
6	(C) Tendon
7	(A) 2, 3, 1, 4 (Nervous tissue signals the muscle → Muscle contracts → Tendon transmits force to the bone → Movement occurs at the joint)
8	(i) Both A and R are true, and R is the correct explanation of A.
9	(iv) A is false, but R is true. (The matrix of cartilage is soft and jelly-like, not hard; however, cartilage does provide flexibility and cushioning.)
10	(iii) A is true, but R is false. (Fixed joints keep the skull bones from moving, which keeps the brain safe.)
11	(i) Both A and R are true, and R is the correct explanation of A.
12	(ii) Both A and R are true, but R is not the correct explanation of A.

II. SHORT ANSWER TYPE QUESTIONS (2 MARKS)	
13	(i) Voluntary movements are under conscious control, e.g., running, writing or lifting objects. Involuntary movements occur automatically without conscious control, e.g., movement of food in the intestine and the beating of the heart. (ii) Cardiac muscle is found only in the heart; its fibres are cylindrical and branched, with a single nucleus and faint striations.
14	A joint is a junction between two or more bones. The elbow has a hinge joint, which allows movement (bending and straightening) in one direction only, like a door hinge.
15	(i) Red Blood Cells (RBCs) transport oxygen. (ii) White Blood Cells (WBCs) fight infection. Haemoglobin, an iron-rich protein present in RBCs, is responsible for the red colour of blood.
16	(i) Cartilage. (ii) It provides flexibility and cushions the ends of bones for shock absorption.

	(iii) Cartilage is found in the nose, external ear, at the ends of bones at joints, and between adjacent vertebrae.
17	(i) (a) Tendons connect muscle to bone. (b) Ligaments connect bone to bone. (ii) Tendons bring about movement by transmitting the force of muscle contraction to the bone, while ligaments provide stability, limit movement and help prevent dislocation at joints.

III. SHORT ANSWER TYPE QUESTIONS (3 MARKS)

18	A neuron has three main parts: (i) Cell body – contains the nucleus and controls cell activities; (ii) Dendrites – receive signals from other neurons; (iii) Axon – a long fibre that carries messages from the cell body and ends at axon terminals, which transmit the messages to other cells. (Diagram should show and label: cell body, nucleus, dendrites, axon and axon terminals.)
19	(i) Bone has a hard, solid and rigid matrix (containing calcium and phosphorus compounds) that gives strength, support and protection. Cartilage has a soft, jelly-like matrix that provides flexibility and cushions the ends of bones for shock absorption. (ii) Skeletal muscle is attached to the skeleton, is under voluntary control, and its fibres are unbranched, multinucleate and striated. Smooth muscle is found in organs like the stomach and intestines, is involuntary, and its cells are spindle-shaped with a single nucleus and no striations.
20	Blood has a fluid part, plasma (55% of the volume), and formed elements (45%). Plasma: the fluid part of blood, which transports nutrients, gases and hormones. RBCs: contain haemoglobin and carry oxygen. WBCs: collect at infected areas, causing pus formation and inflammation, and fight infection. Platelets: help in blood clotting at the site of injury.
21	Epithelial tissue suits the outer covering of the body for these reasons: • It is made of closely packed cells with very little space between them. • In the skin it has many layers, and the outer cells are flat and tightly packed. • This prevents the entry of germs, reduces water loss, and protects against mechanical injury and friction.
22	The musculoskeletal system is made up of bones, muscles, joints, cartilage, tendons and ligaments. It helps us stand upright, move, maintain posture and protect delicate organs, and functions under the control of the nervous system. Tendons are strong, flexible bands that attach muscles to bones; when a muscle contracts, the tendon transmits this force to the bone, resulting in movement at a joint.
23	Skeletal muscle – attached to the skeleton; brings about voluntary movement; fibres are unbranched, multinucleate and striated. Smooth muscle – found in organs like the stomach and intestines; brings about involuntary movement; cells are spindle-shaped with a single nucleus and lack striations. Cardiac muscle – found only in the heart; involuntary; fibres are cylindrical, branched, with a single nucleus and faint striations; works tirelessly and rhythmically.

24	In a ball and socket joint, the rounded end of one bone fits into a shallow hollow of another bone, allowing movement in many directions (forward, backward, sideways and circular), e.g., the shoulder joint. In a hinge joint, movement occurs in one direction only, like a door hinge, e.g., the elbow (and knee) joint.
25	The ribs are attached to the spine at the back and to the breast bone (sternum) in the front, joined by flexible cartilage. This flexibility allows the rib cage to expand and contract during breathing, which increases and decreases the space in the chest, allowing air to move in and out of the lungs.

IV. LONG ANSWER TYPE QUESTIONS (5 MARKS)

26	Bone – Structure: hard, solid, rigid matrix containing calcium and phosphorus compounds. Location: e.g., collar bone, long bone, kneecap. Function: gives strength, support and protection. Cartilage – Structure: soft, jelly-like matrix. Location: e.g., nose, ear, joints such as the knee, between vertebrae. Function: provides flexibility and cushions the ends of bones for shock absorption. Tendon – Structure: tough, fibrous connective tissue. Location: joins muscle to bone at joints (e.g., forearm, ankle). Function: connects muscle to bone and brings about movement by transmitting the force of muscle contraction to the bone. Ligament – Structure: tough, fibrous connective tissue. Location: joins bone to bone at joints (e.g., knee). Function: connects bone to bone, provides stability, limits movement and helps prevent dislocation.
27	(i) Cardiac muscle cells have a high number of mitochondria, which give a continuous energy supply, and an abundant blood supply, which brings oxygen. So the heart contracts rhythmically throughout life without fatigue. (ii) The epithelial lining of the small intestine has tall, pillar-like cells, often with a hair-like structure, to allow efficient absorption of nutrients and water. (iii) The skull bones are joined by fixed joints, which do not allow movement; this keeps the brain safe even when the body moves. (iv) Joints allow movement but cannot move the bones on their own; it is the muscles, by contracting and pulling on bones through tendons, that bring about movement at a joint. (v) The elbow has a hinge joint, which allows movement in one direction only, like a door hinge; the shoulder has a ball and socket joint, which allows forward, backward, sideways and circular movement.
28	Exchange: single layer of thin, flat cells; found lining the blood vessels and lungs; helps in rapid diffusion of liquids and gases. Protection: many layers of cells with the outer cells flat and tightly packed; found in the skin, mouth and oesophagus; protects underlying tissues from mechanical injury, friction and entry of microbes. Secretion: cells specialised for producing and releasing substances, may be cuboidal or columnar; found in salivary glands, sweat glands and stomach lining; produces and secretes mucus, enzymes, hormones and sweat/saliva. Sensory functions: specialised receptor cells with hair-like cilia; found in the nostrils, taste buds and inner ear; responsible for smell, taste, sound and balance.

IV. LONG ANSWER TYPE QUESTIONS (5 MARKS)	
	Absorption: single layer of tall, pillar-like cells, often with a hair-like structure; found lining the small intestine; allows efficient uptake of nutrients and water.
29	Nervous tissue, muscular tissue and the skeletal system work together as a coordinated unit. Nervous tissue forms the body's control and coordination network, with the brain acting as the control centre. Muscles, whether voluntary (skeletal) or involuntary (smooth/cardiac), cannot function independently — they receive instructions from the nervous tissue. For example, during exercise, the brain signals the heart (cardiac muscle) to beat faster to meet the body's increased oxygen demand. Similarly, for voluntary movement, the nervous system signals skeletal muscles to contract; the muscles pull on bones through tendons, and movement occurs at the joint. Thus, division of labour among nervous, muscular and skeletal tissues, working under nervous control, brings about coordinated movement in the body.

V. CASE STUDY-BASED QUESTIONS (4 MARKS)	
30	(i) Platelets are responsible for clot formation at the site of injury. (ii) White Blood Cells (WBCs) collect at the infected area, causing pus formation and inflammation (redness and swelling). (iii) During exercise, muscles need more oxygen, so breathing becomes faster and blood flow increases (the face appears red). (iv) Haemoglobin is the iron-rich protein responsible for the red colour of blood; it is found in the Red Blood Cells (RBCs).
31	(i) Hinge joint. (ii) Ball and socket joint — because the rounded top of the upper arm bone fits into a shallow hollow of the shoulder bone, allowing forward, backward, sideways and circular movements. (iii) Pivot joint. (iv) Fixed joint. It is advantageous because it keeps the bones of the skull immovable, keeping the brain safe even when the rest of the body moves.
32	(i) 12% of $50\text{ kg} = 6\text{ kg}$; 15% of $50\text{ kg} = 7.5\text{ kg}$. So, bone weight is approximately 6 kg to 7.5 kg. (ii) 40% of $50\text{ kg} = 20\text{ kg}$; 50% of $50\text{ kg} = 25\text{ kg}$. So, muscle weight is approximately 20 kg to 25 kg. (iii) Bone and muscle mass differ between individuals due to age, gender and body composition. (iv) Musculoskeletal system.

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