Class 9 Science Chapter 3: Tissues in Action - Notes, Important Questions and MCQs (2026-27)

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These Class 9 Science Chapter 3 notes cover “Tissues in Action” from the new NCERT textbook Exploration (2026-27): plant tissues (meristematic and permanent), animal tissues (epithelial, connective, muscular, nervous), the musculoskeletal system, types of joints and the skeletal system – with comparison tables, Q&A, 10 MCQs and a free PDF.

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Chapter Overview

A tissue is a group of similar cells performing a specific function. Plants are mostly fixed in one place and need support, so many plant tissues are dead and provide strength, and growth happens only in certain regions. Animals move about, so most of their tissues are living and specialised for movement, protection and coordination.

The chapter then shows tissues “in action” in the musculoskeletal system – bones, muscles, joints, cartilage, tendons and ligaments working under the control of the nervous system.

Important Topics and Concepts

Meristematic Tissues (Growth in Plants)

- Cells have thin walls, dense cytoplasm and a large prominent nucleus; they divide repeatedly.
- Apical meristem: at tips of roots and shoots – increases length.
- Lateral meristem (cambium): increases girth of dicot stems; its yearly activity forms annual rings, used to estimate a tree's age.
- Intercalary meristem: at the base of leaves or internodes (e.g. grasses) – regrowth after grazing or mowing.

Permanent Tissues

- Formed when meristem cells lose the ability to divide and take up specific roles.
- Protective tissue – epidermis: single layer of tightly packed cells, covered with waxy cuticle; root hairs increase absorption; stomata allow gas exchange and transpiration.
- Simple permanent tissues: parenchyma (thin-walled, storage; may contain chloroplasts or air spaces to help aquatic plants float), collenchyma (thickened corners, flexibility – why a fresh twig bends), sclerenchyma (dead, thick lignified walls – hardness of seed coats, husk).
- Complex permanent tissues: xylem (carries water and minerals; tracheids, vessels, xylem parenchyma, fibres) and phloem (carries food; sieve tubes, companion cells, phloem parenchyma, fibres).

Epithelial and Connective Tissues

- Epithelial tissue covers the body and lines organs such as mouth, lungs, blood vessels and intestine; cells are closely packed, preventing germs and reducing water loss.
- Thin, single-layered epithelium in lungs and blood vessels allows quick exchange of gases and materials.
- Connective tissue connects and supports: blood (fluid matrix – plasma with RBCs, WBCs, platelets), bone (hard matrix), cartilage (flexible), tendons (muscle to bone) and ligaments (bone to bone).

Muscular and Nervous Tissues

- Skeletal (striated, voluntary) muscle: long, cylindrical, unbranched, multinucleate fibres attached to bones.
- Smooth (unstriated, involuntary) muscle: spindle-shaped, uninucleate; in stomach, intestine, blood vessels.
- Cardiac muscle: branched, striated, involuntary; contracts rhythmically without fatigue (many mitochondria and rich blood supply).
- Nervous tissue: neurons with cell body, dendrites and axon carry messages; the brain is the control centre.

Musculoskeletal System, Joints and Skeleton

- Made of bones, muscles, joints, cartilage, tendons and ligaments; muscles pull on bones to produce movement, under nervous control.
- Ball and socket joint: shoulder, hip – movement in all directions.
- Hinge joint: elbow, knee – movement in one plane; the kneecap protects the knee.
- Pivot joint: between skull and backbone – turning the head side to side.
- Fixed joints: skull bones – no movement, protect the brain.

- Skeleton: skull, vertebral column (vertebrae with cartilage discs for flexibility) and rib cage (12 pairs of ribs attached to spine and sternum, joined by cartilage so the cage can expand during breathing).

Plant Tissue Summary

Use this table for differences.

Tissue	Cells	Function
Apical meristem	Dividing	Growth in length
Lateral meristem	Dividing	Growth in girth
Intercalary meristem	Dividing	Regrowth at nodes/base of leaves
Parenchyma	Living, thin-walled	Storage, photosynthesis, buoyancy
Collenchyma	Living, corner thickening	Flexibility and support
Sclerenchyma	Dead, lignified	Strength and hardness
Xylem	Mostly dead	Water and minerals
Phloem	Mostly living	Food (sugars)

Types of Muscles

Feature	Skeletal	Smooth	Cardiac
Control	Voluntary	Involuntary	Involuntary
Shape	Long, cylindrical	Spindle	Branched
Nuclei	Many	One	One (or two)
Striations	Present	Absent	Present
Location	Limbs, attached to bones	Gut, blood vessels	Heart

Types of Joints at a Glance

Joint	Example	Movement
Ball and socket	Shoulder, hip	All directions
Hinge	Elbow, knee	One plane (bend and straighten)
Pivot	Skull on backbone	Side-to-side rotation
Fixed	Skull bones	None

Important Definitions and Terms

Term	Meaning
Tissue	Group of similar cells performing a specific function
Meristem	Dividing tissue responsible for plant growth
Annual rings	Rings in a tree trunk formed by yearly cambium activity

Term	Meaning
Cuticle	Waxy layer on the epidermis reducing water loss
Stomata	Pores in leaf epidermis for gas exchange and transpiration
Tendon	Tough connective tissue joining muscle to bone
Ligament	Connective tissue joining bone to bone
Neuron	Nerve cell that carries messages
Vertebrae	Small bones forming the backbone

Short Answer Questions

Q1. What property of meristematic cells allows them to divide repeatedly?

They have thin walls, dense cytoplasm and a large prominent nucleus.

Q2. If a plant cannot transport food from leaves to roots, which tissue is malfunctioning?

Phloem.

Q3. Why are epithelial tissues lining internal organs only one or a few cells thick?

To allow quick exchange of materials (such as gases) across them.

Q4. Why does a fresh twig bend but a dry twig break?

A fresh twig has living collenchyma that gives flexibility; a dry twig is brittle due to dead, hard tissues and loss of water.

Q5. How does grass grow again after being mowed?

Intercalary meristem at the base of the leaves keeps dividing, so the grass regrows.

Q6. Distinguish between tendons and ligaments.

Tendons join muscles to bones; ligaments join bones to bones.

Q7. Why can cardiac muscle contract continuously without fatigue?

Its cells have many mitochondria and an abundant blood supply.

Q8. How does the rib cage move during breathing?

Ribs are joined to the sternum by flexible cartilage, so the cage can expand and contract, changing the space in the chest.

Long Answer Questions

Q1. Describe the three types of meristematic tissues with their location and function.

Apical meristem: at tips of roots and shoots; increases length.

Lateral meristem (cambium): along the sides of dicot stems and roots; increases girth and forms annual rings.

Intercalary meristem: at the base of leaves or internodes, especially in grasses; allows regrowth after cutting.

All have actively dividing cells with thin walls and prominent nuclei.

Q2. Explain the structure and functions of the epidermis in plants.

Outermost layer of the plant body, usually one cell thick with tightly packed cells.

Covered by a waxy cuticle that reduces water loss and protects against injury and parasites.

Root hairs increase surface area for absorbing water and minerals.

Stomata in leaves allow gas exchange and transpiration.

Transpiration creates a pull that helps transport water in xylem and removes wastes.

Q3. Describe the four types of joints with examples.

Ball and socket (shoulder, hip): rounded end in a hollow – movement in all directions.

Hinge (elbow, knee): movement in one plane like a door hinge.

Pivot (skull on backbone): rotation side to side.

Fixed (skull): bones cannot move – protect the brain.

Joints together with muscles, tendons and ligaments let the body move safely.

MCQs with Answers

1. Growth in girth of a dicot stem is due to(a) apical meristem (b) lateral meristem (c) intercalary meristem (d) parenchymaAnswer: (b) lateral meristem

2. Food is transported in plants by(a) xylem (b) phloem (c) epidermis (d) sclerenchymaAnswer: (b) phloem

3. Hard seed coats are due to(a) parenchyma (b) collenchyma (c) sclerenchyma (d) xylemAnswer: (c) sclerenchyma

4. Muscle that is branched and involuntary is(a) skeletal (b) smooth (c) cardiac (d) striated voluntaryAnswer: (c) cardiac

5. A tendon connects(a) bone to bone (b) muscle to bone (c) muscle to muscle (d) nerve to muscleAnswer: (b) muscle to bone

6. The knee is an example of a(a) ball and socket joint (b) hinge joint (c) pivot joint (d) fixed jointAnswer: (b) hinge joint

7. Bones of the skull are joined by(a) hinge joints (b) fixed joints (c) pivot joints (d) ball and socket jointsAnswer: (b) fixed joints

8. How many pairs of ribs do humans have?(a) 10 (b) 11 (c) 12 (d) 14Answer: (c) 12

9. Blood is a(a) epithelial tissue (b) connective tissue (c) muscle tissue (d) nervous tissueAnswer: (b) connective tissue

10. Pores in the leaf epidermis are called(a) lenticels (b) stomata (c) root hairs (d) vesselsAnswer: (b) stomata

Quick Revision Points

- Meristems: apical (length), lateral (girth, annual rings), intercalary (regrowth).
- Permanent: epidermis; parenchyma, collenchyma, sclerenchyma; xylem, phloem.

- Animal tissues: epithelial, connective, muscular, nervous.
- Muscles: skeletal, smooth, cardiac.
- Joints: ball and socket, hinge, pivot, fixed.
- Skeleton: skull, vertebral column, 12 pairs of ribs.

Chapter Summary

Plant tissues are meristematic (dividing – apical, lateral, intercalary) or permanent (epidermis, parenchyma, collenchyma, sclerenchyma, xylem and phloem). Animal tissues are epithelial, connective, muscular and nervous, each suited to its function.

In the musculoskeletal system, muscles pull on bones across joints – ball and socket, hinge, pivot or fixed – under the control of the nervous system, while the skull, vertebral column and rib cage support and protect the body.

Exam Tips and PYQ Pattern

- Tables of tissue types and functions are very useful for 2–3 mark answers.
- Practise assertion–reason questions on tissues and joints.
- Learn examples of each joint and muscle type.
- Expect graph/data questions on annual rings and tree age.
- Label diagrams of tissues and joints neatly.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the new NCERT Class 9 Science textbook “Exploration” (first edition 2026), prescribed for the 2026-27 session.

Can I download these notes as a PDF?

Yes. Use the free PDF link at the top of this page – no signup needed.

What are the types of meristematic tissue?

Apical, lateral and intercalary meristem.

What are the four types of joints in Class 9?

Ball and socket, hinge, pivot and fixed joints.

Conclusion

Tissues in Action links cells to whole-body function. Learn the tissue and joint tables, practise the Q&A here and save the free PDF for revision.

More Notes: Class 9 Science Chapter 2: Cell: The Building Block of Life notes | Class 9 Science Chapter 4: Describing Motion Around Us notes | All Class 9 Science notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE science educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 9 Science textbook, Exploration (First