CLASS 9 SCIENCE

CHAPTER 3

TISSUES IN ACTION

NCERT QUESTIONS & ANSWERS

Chapter coverage: Plant and animal tissues; meristematic and permanent tissues; apical, lateral and intercalary meristems; epidermis; parenchyma, collenchyma and sclerenchyma; xylem and phloem; plant tissue systems; epithelial, connective, muscular and nervous tissues; musculoskeletal system; joints; skeletal system; totipotency and tissue culture.

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CHAPTER-END QUESTIONS & ANSWERS

Revise • Reflect • Refine — Chapter 3

1. Meristematic tissues divide repeatedly. What property of their cells allows them to do this?
(i) They have thick walls for protection. (ii) They contain large vacuoles that store nutrients. (iii) They have thin walls, dense cytoplasm and large prominent nucleus. (iv) They are functionally differentiated cells.

Answer: (iii). Meristematic cells are small, have thin cell walls, dense cytoplasm and a large prominent nucleus. Vacuoles are generally absent and the cells are tightly packed. These features support continuous cell division.

2. If a plant is unable to transport food from leaves to roots which tissue is malfunctioning?
(i) Xylem (ii) Phloem (iii) Epidermis (iv) Sclerenchyma

Answer: (ii) Phloem. Phloem transports food prepared in leaves to other parts of the plant.

3. Why are the epithelial tissues that line an animal's internal organs usually only one or a few cells thick?
(i) To store food efficiently. (ii) To provide maximum strength. (iii) To allow quick exchange of materials across them. (iv) To reduce friction.

Answer: (iii). Thin epithelial layers, such as those lining blood vessels and lungs, allow rapid diffusion and exchange of gases and liquids.

Exam Tip: Focus on the relationship between structure and function. Chapter 3 questions repeatedly test why a tissue's structure makes it suitable for its role.

4. You can perform these two jumps: straight-leg jump—keep knees and ankles stiff; normal jump—bend knees and ankles naturally. How did your ankle, knee and hip positions differ between the two jumps?

Answer: In the straight-leg jump, the knees and ankles remain relatively stiff, so movement at these joints is restricted. In the normal jump, the knees and ankles bend and the hip position also changes to help lower and then raise the body. Bending the joints allows the musculoskeletal system to absorb and generate movement more effectively.

5. Which type of joint is involved when you bend your knees and ankles?
(i) Ball and socket (ii) Hinge (iii) Pivot

Answer: (ii) Hinge. Hinge joints permit bending and straightening mainly in one direction. The chapter gives the knee and elbow as examples.

6. In each case choose: (i) Both A and R true, and R explains A; (ii) Both true, but R does not explain A; (iii) A true, R false; (iv) A false, R true.
A. Assertion: Epithelium is well-suited for gas exchange in the lungs. Reason: It consists of multiple layers of tall cells that slow down diffusion.
B. Assertion: Cardiac muscle can contract continuously without fatigue. Reason: Cardiac muscle cells have a high number of mitochondria and an abundant blood supply.
C. Assertion: Tendons connect bone to bone and allow joint movement. Reason: Tendons are made of tough connective tissue that transmits force from muscle to bone.
D. Assertion: In a hinge joint, movement occurs primarily in one plane. Reason: The bone ends are shaped to allow sliding in all directions.

Answer: A — (iii): the assertion is true, but the reason is false; lung epithelium is thin to facilitate diffusion. **B — (i)**: both are true and the reason explains sustained cardiac activity. **C — (iv)**: the assertion is false because tendons connect muscle to bone; the reason is true. **D — (iii)**: the assertion is true, but the reason is false because hinge joints do not allow sliding in all directions.

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7. Plot a graph between the age of a tree (in years) on the x-axis and the diameter of the tree (in cm) along with the number of annual rings formed over time on the y-axis, using the given data. (i) Analyse the graph in terms of diameter over time. (ii) What is the relation between diameter and annual rings? (iii) Which specialised tissue is responsible for girth and where is it located?

Answer: (i) The diameter generally increases as the tree ages, although the increase is not perfectly uniform. (ii) The number of annual rings corresponds to the tree's age in the supplied data, while diameter also increases with age. (iii) **Lateral meristem** is responsible for increase in girth. It is arranged in a ring along the circumference of the stem and produces cells that increase its diameter.

8. In a forest, one tree was severely debarked by an elephant. (i) Which function(s) are hampered by debarking? (ii) Which plant tissue would be affected by further damage to the trunk after debarking? (iii) Which function would be hampered if tissues beneath the bark were severely damaged? (iv) What assumptions are you making and how might the answer change?

Answer: (i) Debarking damages the protective outer tissues and can expose the plant to water loss, mechanical injury and pathogens. It can also interfere with transport if conducting tissues are damaged. (ii) Further damage can affect the vascular tissues, especially phloem and xylem, depending on depth. (iii) Damage to phloem can disrupt food transport from leaves; damage to xylem can disrupt water and mineral transport and support. (iv) The answer depends on how deeply the bark is removed and which tissues are damaged. If only the outer protective layer is affected, transport may continue; if vascular tissues are damaged, transport functions are seriously affected.

9. Aamrapali observed that a young mango sapling's stem bends flexibly during monsoon winds and does not break. Which tissue is responsible? Predict the impact if it were replaced by sclerenchyma.

Answer: Collenchyma provides flexible support. Its cells have unevenly thickened corners due to pectin deposition, allowing plant parts to bend without breaking. If replaced by sclerenchyma, the tissue would become much harder and less flexible because sclerenchyma cells have thick lignified walls; the young stem would be more rigid and less able to bend.

10. Sohan designed an experiment for regeneration of sugarcane using cuttings. Type B sprouted and type A did not. (i) Why did B grow? (ii) What difference was present? (iii) What observation/measurement determined the effect? (iv) What parameters should remain the same for a fair comparison?

Answer: (i) Type B likely contained a suitable node/bud with meristematic tissue capable of producing new growth. (ii) The key difference would be the presence of a viable node/bud in B compared with A. (iii) Sprouting, number of shoots, root formation or growth in length could be recorded. (iv) Cutting size, variety/age of cane, soil or growth medium, moisture, temperature, light, planting depth, time and other environmental conditions should be kept the same.

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11. Rohan says, "A tissue is a group of similar cells performing similar functions." Rajiv says this is true for simple tissues but different for complex tissues. Explain.

Answer: Rajiv's statement is more complete. Simple permanent tissues such as parenchyma, collenchyma and sclerenchyma are mainly made of one type of cell. Complex tissues contain more than one type of cell working together. Xylem and phloem are examples: different cell types cooperate to transport water/minerals or food and perform supporting and regulatory roles.

12. Coconut husk fibres are used for tough mats. Which tissue provides this strength? Why could living parenchyma not serve the same purpose?

Answer: Sclerenchyma provides the required strength. Its cells have thick, lignified walls and most are dead at maturity, making the tissue hard and strong. Parenchyma has thin-walled living cells with relatively loose packing and is mainly involved in storage and, in green parts, photosynthesis, so it is not suited for the same mechanical strength.

13. Vibha says, "Meristematic cells are located only at the root and shoot apices." Is this correct? What question could Neha ask to help her understand?

Answer: The statement is incomplete. Apical meristems occur at root and shoot tips, but **lateral meristems** increase stem girth and **intercalary meristems** occur at the base of internodes or near nodes in certain plants and help regeneration after cutting. Neha could ask: "If meristematic tissue occurs only at the tips, how do grass and cut hedges grow again after being cut?"

14. A plant cell and an animal cell are of the same size. (i) Which cell will have a larger vacuole? Give reasons. (ii) What assumptions are you making?

Answer: (i) The **plant cell** will generally have the larger central vacuole. Plant cells commonly possess a large vacuole that stores water and other substances and helps maintain rigidity. (ii) This assumes the two cells are typical mature plant and animal cells of comparable size and are being compared under ordinary conditions. Cell type and developmental stage can affect vacuole size.

15. A textbook states, "Each plant tissue performs only one specific function." What questions would you ask to critically examine this statement? What examples would you use?

Answer: Ask: "Does each tissue perform only one function?" and "Can a tissue have additional roles?" Examples show that many tissues have more than one function. Parenchyma can store food and perform photosynthesis in green parts; epidermis protects, helps in gaseous exchange and transpiration; xylem transports water and also provides strength; phloem transports food and includes cells involved in storage and support. Therefore, the statement is an oversimplification.

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QUICK REVISION — CHAPTER 3

High-priority concepts for exams

Plant tissues: Meristematic tissue • apical meristem — length • lateral meristem — girth • intercalary meristem — regeneration after cutting • differentiation • permanent tissues.

Simple permanent tissues: Parenchyma — storage/photosynthesis/air spaces • Collenchyma — flexible support • Sclerenchyma — strong, lignified support.

Complex tissues: Xylem — water and minerals plus support • Phloem — food transport. Plant tissue systems: dermal, ground and vascular.

Animal tissues: Epithelial • connective • muscular • nervous. Connective tissues include blood, bone, cartilage, tendon and ligament.

Movement: Skeletal, smooth and cardiac muscles • neuron • musculoskeletal system • ball-and-socket, hinge, pivot and fixed joints • skeletal system and rib cage.

Important diagrams to practise: Onion-root meristem experiment • plant tissue types • xylem/phloem • epithelial tissues • blood components • muscle types • neuron • musculoskeletal system • joint types • skeletal system • carrot-cell totipotency.