

Class – IX (Science)

Chapter – Tissues in Action

Back Exercise Solution

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.

Ans- Correct Option: (iii)

Meristematic cells are specially designed for rapid and continuous cell division.

They possess:

- Thin primary cell walls that allow easy division and expansion.
- Dense cytoplasm containing many organelles required for metabolism.
- A large prominent nucleus that actively controls cell division.
- Very small or absent vacuoles so that maximum space is available for cytoplasm and rapid metabolic activity.

Why other options are incorrect:

- (i) Thick walls restrict division.
- (ii) Large vacuoles are typical of mature permanent cells.
- (iv) Differentiated cells usually lose the ability to divide.

Conclusion:

Meristematic tissues act as the 'growth engine' of plants because their cells remain metabolically active and undifferentiated.

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



Ans-Correct Option: (ii) Phloem

Scientific Explanation:

Phloem transports prepared food (mainly sugars formed during photosynthesis) from leaves to all other parts of the plant. This movement is called translocation.

Why not others?

- Xylem transports water and minerals.
- Epidermis provides protection.
- Sclerenchyma gives mechanical strength.

Key Concept:

Xylem = water transport

Phloem = food transport

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.

Ans - Correct Option: (iii)

Detailed Explanation: Epithelial tissues lining organs such as lungs and intestine are very thin because materials like oxygen, carbon dioxide, nutrients, and water must diffuse rapidly across them.

Example:

- In lungs, oxygen diffuses quickly into blood.
- In intestine, nutrients are absorbed efficiently.

If the layer were thick, diffusion would become slow and inefficient.

Hence, thinness is an adaptation for efficient exchange of materials.



4. You can perform these two jumps (Fig. 3.21):



Fig. 3.21

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?

Ans - Observation:

- In a straight-leg jump, knees and ankles remain stiff.
- In a normal jump, knees and ankles bend naturally.

Scientific Analysis:

During a normal jump:

- Knee and ankle joints bend and absorb shock.
- Muscles and ligaments distribute body weight safely.
- Balance and flexibility improve.

In straight-leg jumps:

- Shock directly affects bones and joints.
- Greater strain is produced.
- Movement becomes rigid and less efficient.

Conclusion:

Flexible movement protects joints and improves locomotion efficiency.



5. Which type of joint is involved when you bend your knees and ankles?

(i) Ball and socket

(ii) Hinge

(iii) Pivot

Ans- Correct Option: (ii) Hinge Joint

Explanation:

Hinge joints allow movement mainly in one plane, just like a door hinge.

Examples:

- Elbow
- Knee
- Ankle

6. In each of the following cases (A, B, C and D), choose the correct option

as given below:

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

(ii) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

(iii) (A) is true, but (R) is false.

(iv) (A) is false, but (R) is 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.

Ans- Correct Option: (iii)

Explanation:

Lung epithelium is actually made of a single thin layer of flat cells (simple squamous epithelium), which allows rapid diffusion of gases.



B. Assertion: Cardiac muscle can contract continuously without fatigue.

Reason: Cardiac muscle cells have a high number of mitochondria and an abundant blood supply.

Ans- Correct Option: (i)

Explanation:

Cardiac muscles contain numerous mitochondria and receive rich blood supply. Therefore, they obtain continuous energy and resist fatigue, allowing the heart to beat throughout life.

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.

Ans- Correct Option: (iv)

Explanation:

- Tendons connect muscles to bones, not bone to bone.
- Ligaments connect bone 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.

Ans- Correct Option: (iii)

Explanation:

Hinge joints permit movement mainly in one direction. Bone ends are NOT shaped for movement in all directions; such movement occurs in ball-and-socket joints.

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 data given in the Table 3.7.

Table 3.7: Data related to the age of a teak tree, and corresponding increase in the diameter of stem and number of annual rings .



S. No.	Age of the teak tree (Years)	DBH (Diameter at Breast Height) of tree (cm)	Number of annual rings formed
1.	5	4	5
2.	10	8	10
3.	20	24	20
4.	25	28	25
5.	30	32	30
6.	40	40	40

(i) Analyse the graph in terms of the diameter of the stem over time and share the interpretation.

Ans - Interpretation: As the age of the teak tree increases, the diameter of the stem also increases steadily. This shows continuous secondary growth.

(ii) What is the relation between the diameter of the teak tree to the annual rings formed?

Ans- Relationship: The number of annual rings equals the approximate age of the tree. Thus, more annual rings indicate an older tree with greater girth.

(iii) Which specialised tissue is responsible for the girth of the stem and where is it located?

Ans - Responsible Tissue: The lateral meristem (cambium) is responsible for increase in girth.

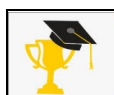
Location: It occurs along the sides/circumference of stems and roots.

8. In a forest, it was observed that one of the trees was severely debarked by an elephant to meet its food requirements, as the bark is a rich source of nutrients (Fig. 3.22).



Fig. 3.22

Based on your learning, answer the following:



(i) Which function(s) of the tree is/are hampered by debarking?

Ans - Hampered Functions:

- Protection of inner tissues
- Transport of food through phloem
- Prevention of water loss

(ii) Which plant tissue would be affected by further damage to the tree trunk even after debarking?

Ans - Tissue affected: Phloem and cambium beneath the bark.

(iii) Which function of the tree would be hampered if the tissues beneath the bark were severely damaged?

Ans- Function hampered: Food transport from leaves to roots would be severely disrupted.

(iv) What assumptions are you making to answer the questions above? How would the answer change if your assumptions are also changed?

Ans- Assumptions: We assume bark removal damaged the phloem but not xylem.

If xylem were also damaged:

- Water transport would stop.
- The tree might eventually die.

9. Aamrapali observed that a young mango sapling's stem bends flexibly during monsoon winds and does not break. Which tissue is responsible for this flexibility? Predict and provide your explanation of the impact if the existing tissue was replaced by sclerenchyma.

Ans- Responsible Tissue: Collenchyma

Reason: Collenchyma cells possess unevenly thickened walls containing pectin, giving flexibility and support.

If replaced by sclerenchyma:

- Stem would become rigid and brittle.
- It might break during strong winds.



- Flexibility required for survival would be lost.

Comparison:

Collenchyma = flexible support

Sclerenchyma = rigid mechanical strength

10. Sohan designed an experiment for the regeneration of sugarcane, where he used cuttings to grow sugarcane. He used two types of cuttings, type 'A' and type 'B' (Fig. 3.23). After a few weeks, type 'B' cuttings sprouted and developed into sugarcane plants, whereas the type 'A' cuttings did not sprout.

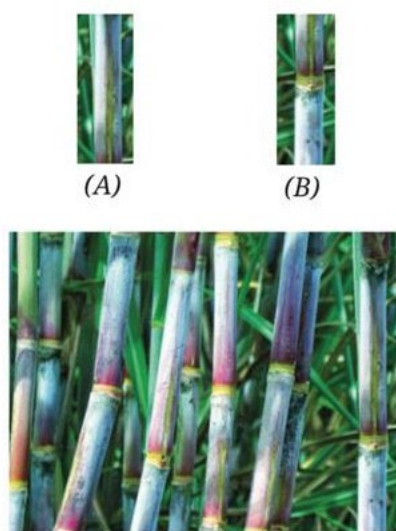


Fig. 3.23

(i) Why were the type 'B' cuttings able to grow as sugarcane but type 'A' could not?

Ans - Type B cuttings possessed nodes/intercalary meristem capable of division and regeneration.

(ii) What difference was present in type 'B' compared to type 'A'?

Ans - Type B contained living meristematic tissue; Type A lacked it.

(iii) What observation or measurement was made to determine whether this change had an effect?

Ans- Sprouting and development into new sugarcane plants.

(iv) What parameters should be kept the same for both types of cuttings to ensure a fair comparison?



Ans- Controlled Parameters:

- Same soil
- Same water supply
- Same sunlight
- Same temperature
- Same cutting size

11. During the discussion in class, Rohan gives a statement that, “A tissue is a group of similar cells performing similar functions”. But Rajiv counter argues that, “this is true in case of simple tissues but little different in case of complex tissues”. Provide your explanation in view of the discussion in class.

Ans- Rohan’s statement is correct only for simple tissues.

Rajiv’s argument is scientifically stronger because:

- Simple tissues contain one type of similar cells.
- Complex tissues contain different kinds of cells working together.

Example: Xylem contains:

- Vessels
- Tracheids
- Xylem fibres
- Xylem parenchyma

Thus, complex tissues perform a common function using different cell types.

12. Coconut husk fibres are used for mats which are tough and fibrous. Which tissue has structural features suitable for providing this strength? Explain why living parenchyma couldn’t serve the same purpose.

Ans- Tissue Responsible: Sclerenchyma

Structural Features:

- Thick lignified walls



- Dead cells
- High mechanical strength

Why parenchyma cannot perform this role:

Parenchyma cells are living, thin-walled and soft. They mainly store food and cannot provide the hardness and toughness needed for mats and ropes.

13. Vibha claims to her friend Neha that, “Meristematic cells are located only at the root and shoot apices”. What do you think about this statement? What question can Neha ask Vibha to help her understand further if the statement is incorrect?

Ans- The statement is incorrect.

Meristematic tissues occur in three regions:

1. Apical meristem – root and shoot tips
2. Lateral meristem – along stem circumference
3. Intercalary meristem – at nodes or internodes

Question Neha can ask:

“How does grass regrow after cutting if meristematic tissues exist only at root and shoot tips?”

This would help Vibha understand the role of intercalary meristem.

14. A plant cell and an animal cell are of the same size.

(i) Which cell will have a larger vacuole? Give reasons.

Ans-) Plant cells generally possess a much larger vacuole.

Reason:

- Plant vacuoles store water, salts, pigments and wastes.
- They maintain turgidity and structural support.

Animal cells usually contain small temporary vacuoles.

(ii) What assumptions are you making to answer the question above?



Ans-We assume:

- Both cells are mature cells.
- Cells are healthy and functional.
- Plant cell is not meristematic.

If the plant cell were meristematic, vacuoles would be very small or absent.

15. A textbook states, “Each plant tissue performs only one specific function”. What questions would you ask to critically examine the correctness of this statement? What examples of tissues would you take to find out the answers to these questions?

Ans- Questions to ask:

- Can one tissue perform multiple functions?
- Do tissues interact with each other?
- Are some tissues multifunctional?

Examples:

1. Parenchyma:

- Stores food
- Performs photosynthesis
- Helps in floating (aerenchyma)

2. Epidermis:

- Protection
- Reduces water loss
- Helps in gaseous exchange through stomata

3. Xylem:

- Conducts water
- Provides mechanical support



Conclusion:

The statement is oversimplified because many plant tissues perform multiple interconnected functions.

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Web: www.smartachievers.online
Phone: +91-7292077839 / 7292047839