# 3 Tissues in Action

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

**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:**
(ii) Phloem

**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:**
(iii) To allow quick exchange of materials across them.

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**4. You can perform these two jumps (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:

| Body Part | Straight-Leg Jump | Normal Jump |
|---|---|---|
| **Ankle** | Stiff | Bent |
| **Knee** | Straight | Bent |
| **Hip** | Slight movement | Flexible bending |
| **Shock Absorption** | Very low | High |
| **Comfort** | Less | More |

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

**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.

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.

**Ans:**
A → (iii) True, False reason
B → (i) True, correct reason
C → (iv) False assertion, true reason
D → (iii) True, false reason

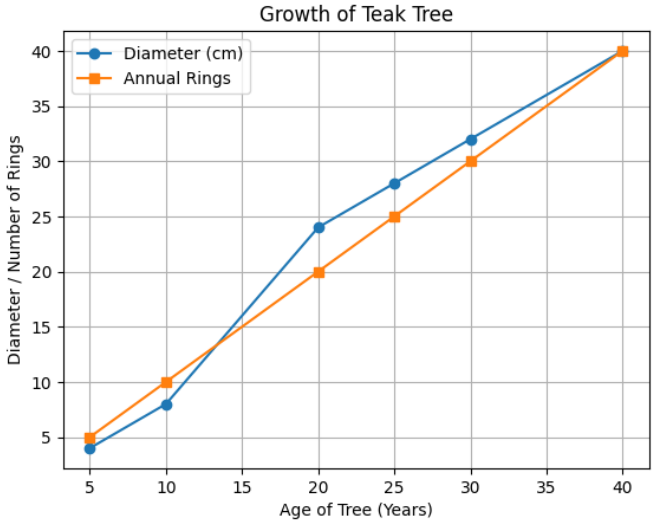
**7. Plot a graph between the age of a tree (in years) on the x-axis and the diameter of the tree (in cm) along with the number of annual rings formed over time on the y-axis, using the data given in the Table 3.7.**

| 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 |

**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**

(i) Analyse the graph in terms of the diameter of the stem over time and share the interpretation.
(ii) What is the relation between the diameter of the teak tree to the annual rings formed?
(iii) Which specialised tissue is responsible for the girth of the stem and where is it located?

**Ans:**

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(i) The graph shows that the diameter of the teak tree increases as its age increases. In the early years (5–10 years), the increase in diameter is relatively slow. However, after 10 years, the diameter increases more rapidly, showing active growth.

(ii) There is a direct relationship between the diameter of the tree and the number of annual rings. As the number of annual rings increases, the diameter of the tree also increases. Therefore, greater the number of rings, larger is the diameter of the stem.

(iii) The specialised tissue responsible for the increase in girth of the stem is the lateral meristem (cambium). It is located along the sides of the stem, forming a ring-like structure.

**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). Based on your learning, answer the following:**
(i) Which function(s) of the tree is/are hampered by debarking?
(ii) Which plant tissue would be affected by further damage to the tree trunk even after debarking?
(iii) Which function of the tree would be hampered if the tissues beneath the bark were severely damaged?
(iv) What assumptions are you making to answer the questions above? How would the answer change if your assumptions are also changed?
Ans:
(i) Transport of food affected
(ii) Phloem damaged
(iii) Nutrient transport stops
(iv) Assuming bark contains phloem

**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:**
- The flexibility in the young mango sapling's stem is due to collenchyma tissue.
- Sclerenchyma cells are dead with thick, lignified walls. They provide strength and rigidity, but no flexibility.
- The sapling would lose its ability to bend and will break in strong winds if replaced by sclerenchyma.

**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.**

(i) Why were the type 'B' cuttings able to grow as sugarcane but type 'A' could not?
(ii) What difference was present in type 'B' compared to type 'A'?
(iii) What observation or measurement was made to determine whether this change had an effect?
(iv) What parameters should be kept the same for both types of cuttings to ensure a fair comparison?
**Ans:**
(i) Type 'B' cuttings were able to grow because they contained nodes with buds (meristematic tissue). These buds have actively dividing cells that can develop into new shoots.

Type 'A' cuttings did not sprout because they likely lacked these buds or nodes. Without meristematic tissue, new growth cannot occur.

Therefore, the presence of active meristematic tissue is essential for regeneration.

(ii) The key difference is that type 'B' cuttings had nodes with buds, while type 'A' cuttings did not.

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(iii) The observation made was whether the cuttings sprouted and developed into new plants.

(iv) To ensure a fair experiment, all conditions except the type of cutting must be kept the same:
- Amount of water
- Exposure to sunlight
- Type and quality of soil
- Temperature and environmental conditions

**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 partially correct, but Rajiv's argument is more complete and accurate.

A tissue is generally defined as a group of cells working together to perform a specific function. However, this definition applies perfectly to simple tissues, but needs slight modification for complex tissues.
In case of Complex Tissues:
- Xylem → consists of tracheids, vessels, fibres, parenchyma
- Phloem → consists of sieve tubes, companion cells, fibres, parenchyma

Here, cells are not similar, but they cooperate to perform the same overall function (transport).

**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:
The tissue responsible for providing strength to coconut husk fibres is sclerenchyma.
- Sclerenchyma cells are dead cells with very thick, lignified cell walls.
- The presence of lignin makes the walls hard, rigid, and durable.

Why parenchyma cannot serve the same purpose:
- Parenchyma cells are living cells, soft and loosely packed, with thin cell walls.
- Their main functions are storage, photosynthesis, and healing, not strength.
- They lack lignin, so they cannot provide rigidity or toughness.

**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:
Vibha's statement is incorrect because meristematic tissues are not present only at the root and shoot apices.
- Meristematic tissues are found in three locations in plants:
- Apical meristem → at root and shoot tips (growth in length)
- Lateral meristem → along the sides of stems (growth in girth)
- Intercalary meristem → at nodes or base of internodes (regrowth in grasses, etc.)

To help Vibha understand, Neha can ask:
"If meristematic cells are only at the tips, then how does the stem increase in thickness or how does grass regrow after cutting?"

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**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 to answer the question above?**
Ans:
The plant cell will have a larger vacuole.

Reason:
- Plant cells typically contain a large central vacuole that occupies most of the cell.
- This vacuole stores water, nutrients, and wastes.
- It also maintains turgor pressure, which keeps the plant cell firm and helps the plant remain upright.

In contrast, animal cells either have small vacuoles or none at all, as they do not require turgor pressure for support.

**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:
The statement "Each plant tissue performs only one specific function" is not completely correct, because many plant tissues perform more than one function.

**To test this statement, you can ask:**

1. Do some plant tissues perform multiple functions instead of just one?
2. Can a tissue that mainly performs one function also assist in other functions?
3. Are there tissues that both support and store food?
4. Do tissues involved in transport also provide mechanical strength?
5. Can the same tissue behave differently depending on its location in the plant?

**Examples of tissues:**

1. Parenchyma
Main function → Storage of food
Other functions:
Photosynthesis (when chlorophyll is present → chlorenchyma)
Buoyancy in aquatic plants (aerenchyma)

2. Collenchyma
Main function → Support and flexibility
Also helps in growth of young parts

3. Sclerenchyma
Main function → Strength
Also provides protection (e.g., seed coat, nutshell)

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