

Anatomy of Flowering Plants — NEET MCQs with Solutions

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Q1. Simple permanent tissues include

- (A) Parenchyma, collenchyma, and sclerenchyma
- (B) Xylem and phloem
- (C) Cambium and cork
- (D) Epidermis and cortex

Q2. The cell wall thickening in collenchyma occurs

- (A) Unevenly, predominantly at corners
- (B) Uniformly across the entire wall
- (C) Only at the middle lamella
- (D) Only on the inner tangential wall

Q3. Which of the following correctly explains why sclerenchyma cells are dead at maturity?

- (A) They undergo rapid cell division consuming all cellular energy
- (B) They store large amounts of starch that displaces the nucleus
- (C) Lignin deposition in secondary walls cuts off nutrient supply, leading to protoplasm death
- (D) They lack mitochondria from the earliest stage of differentiation

Q4. Position-based classification of meristem includes

- (A) Primary and secondary
- (B) Simple and complex
- (C) Xylem and phloem
- (D) Apical, intercalary, and lateral

Q5. A student observes a tissue with compactly arranged cells, no intercellular spaces, thin primary walls, dense cytoplasm, and a prominent nucleus. Which of the following is the MOST precise identification?

- (A) Collenchyma
- (B) Phloem parenchyma
- (C) Meristematic tissue
- (D) Sclerenchyma

Q6. Lateral meristem mainly contributes to

- (A) Leaf formation
- (B) Root cap protection
- (C) Bark formation
- (D) Increase in girth

Q7. Intercalary meristem is generally present at the

- (A) Root cap
- (B) Vascular bundles
- (C) Base of internodes
- (D) Endodermis

Q8. The shape of meristematic cells is generally described as

- (A) Polygonal with unequal axes
- (B) Isodiametric with equal dimensions
- (C) Elongated and tapering
- (D) Flattened and scale-like

Q9. The cortex of a dicot root is mainly composed of which type of cells?

- (A) Sclerenchyma
- (B) Collenchyma
- (C) Chlorenchyma
- (D) Parenchyma

Q10. Which of the following correctly describes the arrangement of vascular bundles in a dicot root?

- (A) Bicollateral — phloem on both sides of xylem
- (B) Radial — xylem and phloem on alternate radii
- (C) Conjoint — xylem and phloem in same bundle
- (D) Collateral — phloem on one side of xylem

Q11. Which of the following correctly explains why xylem in dicot root is described as exarch?

- (A) Metaxylem is peripheral because it develops before protoxylem
- (B) Xylem differentiates from the centre outward, with metaxylem innermost
- (C) Protoxylem is central and surrounded by metaxylem on all sides
- (D) Protoxylem is towards the periphery, having differentiated first in a centripetal direction

Q12. Lateral roots arise endogenously from which layer of the root?

- (A) Cortex
- (B) Epiblema
- (C) Pericycle
- (D) Endodermis

Q13. In a dicot root, the vascular cambium that initiates secondary growth originates from

- (A) Cortical parenchyma immediately outside the pericycle
- (B) Procambium of the apical meristem directly
- (C) Pericycle cells and conjunctive parenchyma between xylem and phloem
- (D) Endodermal cells alone

Q14. Which of the following correctly identifies the central region of a dicot stem?

- (A) Cortex
- (B) Endodermis
- (C) Pericycle
- (D) Pith

Q15. Vascular bundles in monocot stem are described as closed because

- (A) They are surrounded by a bundle sheath on all sides
- (B) Their xylem is completely encased by phloem
- (C) They do not allow lateral transport of water
- (D) They lack cambium between xylem and phloem

Q16. In a dicot stem, vascular bundles are arranged in

- (A) A radial pattern
- (B) Irregular patches
- (C) A ring
- (D) A scattered pattern

Q17. Vascular bundles in a dicot stem are correctly described as

- (A) Radial and open
- (B) Conjoint bicollateral and closed
- (C) Conjoint collateral and open
- (D) Conjoint collateral and closed

Q18. The innermost layer of cortex in a dicot stem is called

- (A) Endodermis
- (B) Pericycle
- (C) Pith
- (D) Epidermis

Q19. During secondary growth, the vascular cambium cuts off secondary xylem towards its

- (A) Outer side (cortex side)
- (B) Both sides equally
- (C) Lateral sides only
- (D) Inner side (pith side)

Q20. Spring wood (early wood) is characterised by

- (A) Wide vessels, thin walls, low density
- (B) Narrow vessels, thick walls, high density
- (C) Lignified fibres with no vessels
- (D) Absence of parenchyma and vessels

Q21. Lenticels present on the bark surface originate from the activity of

- (A) Phellogen (cork cambium)
- (B) Vascular cambium
- (C) Protoderm
- (D) Pericycle directly

Q22. Secondary phloem produced during secondary growth in dicot roots is deposited towards the

- (A) Outer side of vascular cambium
- (B) Inner side of vascular cambium
- (C) Pith region
- (D) Endodermis

Q23. During secondary growth in dicot roots, the fate of primary xylem is best described as

- (A) It becomes embedded at the centre, surrounded by secondary xylem
- (B) It gets pushed outward by secondary xylem pressure
- (C) It is converted into secondary phloem by dedifferentiation
- (D) It is obliterated and replaced entirely by secondary xylem

Q24. Lenticels in roots are

- (A) Present in both monocot and dicot roots at maturity
- (B) Absent in roots and found only in stems
- (C) Present only in woody roots after periderm replaces epidermis
- (D) Present in all dicot roots from early stages

Answer key and explanations

Q1. Answer: (A) Parenchyma, collenchyma, and sclerenchyma

Simple tissues are composed of only one type of cell — parenchyma, collenchyma, and sclerenchyma. Xylem and phloem are complex tissues (multiple cell types); cambium is meristematic; epidermis and cortex are anatomical regions, not tissue types.

Q2. Answer: (A) Unevenly, predominantly at corners

Collenchyma is defined by uneven thickening — deposits of pectin and cellulose accumulate at corners (angular collenchyma). Uniform thickening describes sclerenchyma; middle lamella thickening and tangential thickening are not features of collenchyma.

Q3. Answer: (C) Lignin deposition in secondary walls cuts off nutrient supply, leading to protoplasm death

Lignification of the secondary wall makes it impermeable — the protoplast cannot receive nutrients and dies. This is an adaptive trade-off: mechanical strength is gained at the cost of living cytoplasm.

Options A, B, and D are factually incorrect mechanisms.

Q4. Answer: (D) Apical, intercalary, and lateral

Based on position, meristems are apical (tips), intercalary (internodes/leaf bases), and lateral (sides of stem/root). Primary/secondary is a developmental classification; simple/complex and xylem/phloem classify permanent tissues.

Q5. Answer: (C) Meristematic tissue

All listed features — compact arrangement, no intercellular spaces, thin primary wall, dense cytoplasm, prominent nucleus — collectively and exclusively define meristematic tissue. Sclerenchyma has thick lignified walls; collenchyma has unevenly thickened walls; phloem parenchyma has vacuolate cytoplasm.

Q6. Answer: (D) Increase in girth

Lateral meristem (vascular cambium and cork cambium) increases stem and root thickness during secondary growth. Leaf formation occurs at shoot apex; bark is a product of cork cambium, not the function of all lateral meristems.

Q7. Answer: (C) Base of internodes

Intercalary meristem occurs at bases of internodes or leaf bases and is especially prominent in grasses. Root cap covers apical meristem; endodermis and vascular bundles are permanent tissues.

Q8. Answer: (B) Isodiametric with equal dimensions

Meristematic cells are isodiametric — equal in all dimensions — reflecting their undifferentiated state.

Elongated/tapering shapes characterize fibres; flattened cells are seen in epidermis; polygonal with unequal axes is a distractor conflating isodiametric with polyhedral.

Q9. Answer: (D) Parenchyma

Cortex in dicot root consists of multiple layers of loosely packed parenchymatous cells involved in storage and lateral conduction. Collenchyma is typical of dicot stems, not roots.

Q10. Answer: (B) Radial — xylem and phloem on alternate radii

In roots, vascular bundles are radial: xylem and phloem occur on different radii alternating with each other. Conjoint bundles (collateral or bicollateral) are characteristic of stems.

Q11. Answer: (D) Protoxylem is towards the periphery, having differentiated first in a centripetal direction

In exarch xylem, protoxylem differentiates first and is located towards the periphery (near endodermis); metaxylem differentiates later towards the centre. This centripetal maturation (outside to inside) is the defining feature of exarch condition. Option B reverses the sequence incorrectly.

Q12. Answer: (C) Pericycle

Lateral roots originate from pericycle cells, which divide and push through the cortex and epiblema to emerge — this endogenous origin is a key NEET trap. Endodermis is adjacent but does not generate lateral roots.

Q13. Answer: (C) Pericycle cells and conjunctive parenchyma between xylem and phloem

Vascular cambium in dicot root arises from two sources: conjunctive parenchyma (between xylem and phloem strands) and pericycle cells (opposite the protoxylem). Together they form a continuous wavy cambial ring. This dual origin is a high-difficulty NEET concept.

Q14. Answer: (D) Pith

Pith forms the large central region of dicot stem, composed of parenchymatous cells involved in storage. It is well-developed in dicot stem, unlike dicot root where pith is small or absent.

Q15. Answer: (D) They lack cambium between xylem and phloem

Closed vascular bundles lack vascular cambium, so they cannot undergo secondary growth. Bundle sheath surrounds them externally but is not what makes them "closed." Option B is a strong distractor as bundle sheath is present but irrelevant to the open/closed distinction.

Q16. Answer: (C) A ring

Vascular bundles in dicot stem are arranged in a definite ring, separating the cortex (outside) from the pith (inside). Scattered arrangement belongs to monocot stem — a consistently tested NEET distinction.

Q17. Answer: (C) Conjoint collateral and open

Dicot stem bundles are conjoint (xylem + phloem together), collateral (phloem outside xylem), and open (cambium present between xylem and phloem). Closed bundles lack cambium and are found in monocot stem.

Q18. Answer: (A) Endodermis

Endodermis is the innermost layer of cortex in dicot stem; it is also called starch sheath due to presence of starch grains. It is distinct from the well-defined, Casparian-strip-bearing endodermis of roots.

Q19. Answer: (D) Inner side (pith side)

Vascular cambium is bifacial — it produces secondary xylem (wood) toward the inner pith side and secondary phloem toward the outer cortex side. Far more secondary xylem is produced than phloem, which is why wood accumulates. This asymmetry is a common NEET trap.

Q20. Answer: (A) Wide vessels, thin walls, low density

Spring wood forms when cambium is highly active in favourable conditions, producing large-diameter, thin-walled vessels and tracheids — resulting in lighter, less dense wood. Autumn wood is the opposite. Students often confuse spring wood with being structurally stronger, which it is not.

Q21. Answer: (A) Phellogen (cork cambium)

Lenticels are loosely arranged pore-like structures in the periderm that allow gaseous exchange. They are formed by the phellogen (cork cambium), which produces loosely packed complementary cells in these regions instead of compact suberised cork. Vascular cambium produces only secondary vascular tissue, not periderm structures.

Q22. Answer: (A) Outer side of vascular cambium

Secondary phloem is cut off by the vascular cambium on its outer (cortex) side, while secondary xylem is deposited inward. As secondary phloem accumulates, it pushes outward and the older primary phloem gets crushed. This pressure-based obliteration of primary phloem is a conceptually important NEET point.

Q23. Answer: (A) It becomes embedded at the centre, surrounded by secondary xylem

Primary xylem (exarch, with protoxylem outermost in roots) remains at the centre of the root after secondary growth — it is NOT destroyed but becomes surrounded by the accumulating secondary xylem. Option C (conversion to phloem) is anatomically impossible and serves as the obvious discard. Option D (obliteration) is the tempting wrong choice.

Q24. Answer: (C) Present only in woody roots after periderm replaces epidermis

Lenticels form only after periderm development — which itself occurs only during secondary growth in woody dicot roots. They are absent in young, non-woody roots that still have an intact epidermis. Monocot roots never develop periderm and therefore never form lenticels. This multi-condition logic makes it a strong HARD question.

Tissues and anatomy at a glance

Term	What to remember
Apical meristem	Root and shoot tips; increases length
Intercalary meristem	At the base of leaves or internodes, e.g. grasses; regenerates parts removed by grazers

Lateral meristem	Vascular cambium and cork cambium; increases girth
Parenchyma	Thin cellulose walls; photosynthesis, storage, secretion
Collenchyma	Thickened at the corners with cellulose, hemicellulose and pectin; below the epidermis in dicots, absent in monocots
Sclerenchyma	Thick lignified walls; dead at maturity — fibres and sclereids
Xylem	Tracheids, vessels, xylem fibres, xylem parenchyma; endarch in stems, exarch in roots
Phloem	Sieve tube elements, companion cells, phloem parenchyma, phloem fibres; gymnosperms have albuminous cells and sieve cells
Radial vascular bundles	Xylem and phloem on different radii — roots
Conjoint, collateral, open	Dicot stems (cambium present)
Conjoint, closed	Monocot stems (no cambium)
Casparian strips	Suberin on the walls of root endodermis
Dicot vs monocot root	Dicot: 2–4 xylem bundles; monocot: more than 6 (polyarch)
Dicot stem	Collenchymatous hypodermis; vascular bundles in a ring; endodermis as starch sheath
Monocot stem	Sclerenchymatous hypodermis; scattered vascular bundles with bundle sheath; no distinct pith
Spring wood vs autumn wood	Spring: wide vessels, lighter; autumn: narrow vessels, denser
Heartwood vs sapwood	Heartwood (duramen): dark, dead, non-conducting; sapwood (alburnum): light, conducts water
Periderm	Phellem (cork) + phellogen (cork cambium) + phelloderm; lenticels allow gas exchange