Anatomy of Flowering Plants

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. The meristem responsible for the increase in girth of the stem is the:

(a) intercalary meristem
(b) primary meristem only
(c) apical meristem
(d) lateral meristem (vascular cambium and cork cambium)

2. Sclereids are:

(a) short dead lignified cells found in nut shells and the pulp of guava
(b) dividing tissue at the root and shoot tips that makes the plant longer
(c) sclerenchyma of the phloem, used for jute and flax
(d) living phloem cells without a nucleus, joined by sieve plates

3. A section shows more than six radial xylem bundles (polyarch) and a large, well-developed pith. It is a section of a:

(a) monocot stem **(b)** dicot root **(c)** monocot root **(d)** monocot leaf

4. The trunk of a felled tree shows 48 annual rings (each a light band and a dark band). The tree was about:

(a) 48 years old **(b)** 24 years old **(c)** 58 years old **(d)** 96 years old

5. A root section shows 4 xylem bundles. This arrangement is called:

(a) polyarch **(b)** pentarch **(c)** hexarch **(d)** tetrarch

6. Where are bulliform cells found?

(a) Just inside the endodermis
(b) Around the vascular bundles of leaves
(c) The upper epidermis of grass leaves
(d) The epidermis of the root, in the root hair zone

7. Which is a feature of the dicot root?

(a) More than six radial xylem bundles (polyarch)
(b) No secondary growth
(c) A large, well-developed pith
(d) Little or no pith

8. Assertion (A): A tree trunk with 17 annual rings is about 34 years old.
Reason (R): Each year the cambium forms one band of spring wood and one of autumn wood, which together make one annual ring.

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

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

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

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

Section B — Short answer — 8 × 2 = 16 marks

9. What is the difference between an apical and an intercalary meristem?

10. Name the tissue: nucleated phloem cells that keep the sieve tubes working.

11. A tree cut down in 2025 had 88 annual rings and a trunk radius of 30 cm. About when did it start growing, and what was its average increase in radius per year?

12. A root section has 15 xylem bundles. Name the arrangement, and say whether it is likely to be a dicot or a monocot root.

13. Identify the section and give a reason: it has ground tissue not divided into cortex and pith and sclerenchymatous hypodermis.

14. Where are medullary rays found? Give its job.

15. Give one difference between open and closed vascular bundles.

16. What is the structure or job of vascular cambium?

Section C — Word problems — 4 × 4 = 16 marks

17. Compare the internal structure of a dicot root and a monocot root.

18. A tree felled in 2018 showed 18 annual rings and a radius of 40 cm. (a) How old was it? (b) About when did it start growing? (c) What was its average radial growth per year? (d) Why can the rings be seen?

19. Give the differences between a monocot root and a dicot root.

20. Three sections are labelled P, Q and R. P has bulliform cells in the upper epidermis (grasses); Q has dorsiventral; R has 2–4 radial xylem bundles (diarch to tetrarch). Identify each and give one more feature you would expect to see.

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Answer key

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Q	Answer	Working
1	**(d) lateral meristem (vascular cambium and cork cambium)**	—
2	**(a) short dead lignified cells found in nut shells and the pulp of guava**	—
3	**(c) monocot root**	—
4	**(a) 48 years old**	one annual ring is formed each year
5	**(d) tetrarch**	—
6	**(c) The upper epidermis of grass leaves**	—
7	**(d) Little or no pith**	—
8	**(d) A is false, but R is true.**	A is false: 17 rings, 17 years. R is true.
9	**An apical meristem is at the tips of roots and shoots and makes the plant longer. An intercalary meristem is between mature tissues, at the base of grass internodes, and helps regrow parts removed by grazers.**	—
10	**Companion cells**	—
11	**About 1937; 3.41 mm per year**	2025 − 88; 300 mm ÷ 88 rings (2 decimal places)
12	**Polyarch; a monocot root (more than six)**	dicot roots: 2–4 bundles; monocot roots: more than 6
13	**A monocot stem: ground tissue not divided into cortex and pith; sclerenchymatous hypodermis**	—
14	**Between the vascular bundles of a dicot stem; radial conduction of water and food**	—
15	**Open bundles have cambium (dicot stems); closed bundles have none (monocots)**	—
16	**Lateral meristem that forms secondary xylem and phloem**	—
17	**Dicot root: 2–4 xylem bundles (diarch to tetrarch), small or no pith, cambium forms later and secondary growth occurs. Monocot root: more than six xylem bundles (polyarch), large well-developed pith, no secondary growth. Both have epidermis with root hairs,**	—

Q	Answer	Working
	cortex, endodermis with Casparian strips, pericycle and radial exarch vascular bundles.	
18	**(a) about 18 years; (b) about 2000; (c) 22.22 mm per year; (d) each year's light, wide-celled spring wood and dark, dense autumn wood form a visible ring**	400 mm ÷ 18 (2 decimal places)
19	**Monocot root: more than six radial xylem bundles (polyarch); a large, well-developed pith; no secondary growth. Dicot root: 2–4 radial xylem bundles (diarch to tetrarch); little or no pith; secondary growth occurs.**	—
20	**P: monocot leaf (also undifferentiated mesophyll); Q: dicot leaf (also mesophyll divided into palisade and spongy parenchyma); R: dicot root (also exarch xylem)**	—