SI Biology - Full Discipline Demo

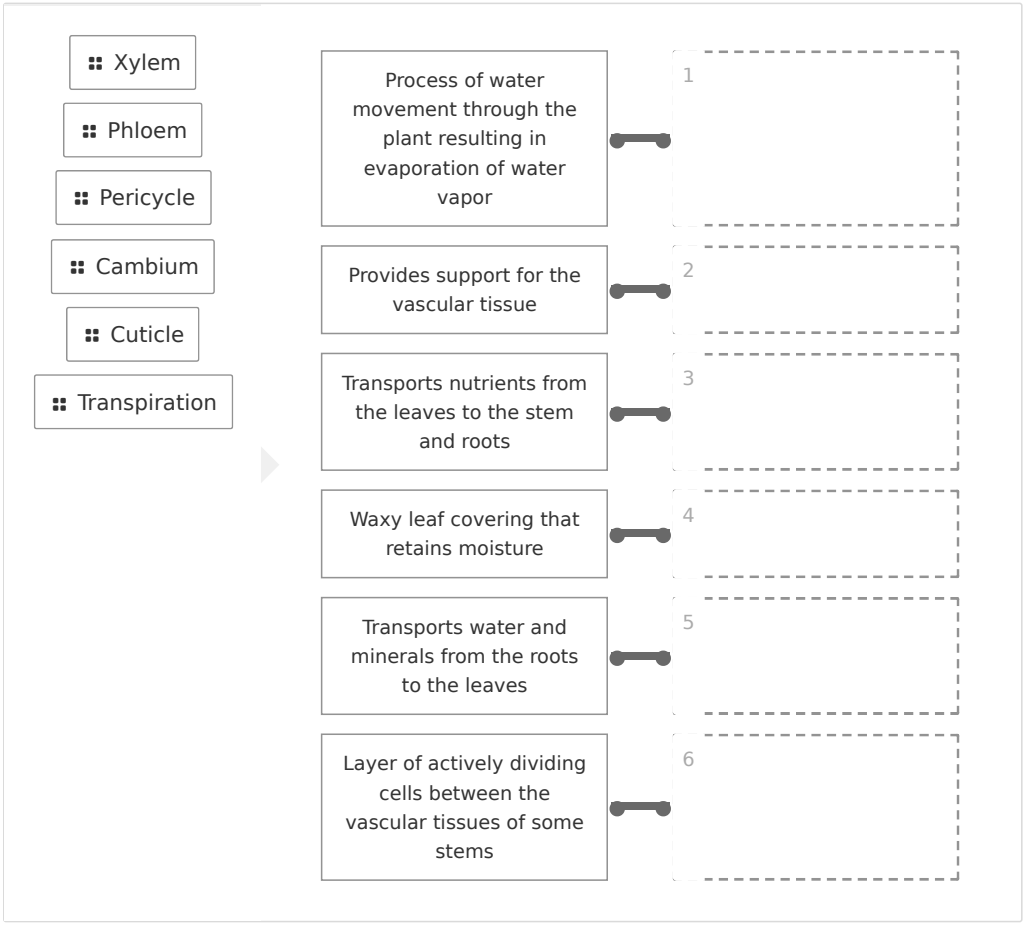
Angiosperms: Roots, Shoots, and Leaves

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Biology - Full Discipline Demo
Course	SI Biology - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Match each term with the best description.

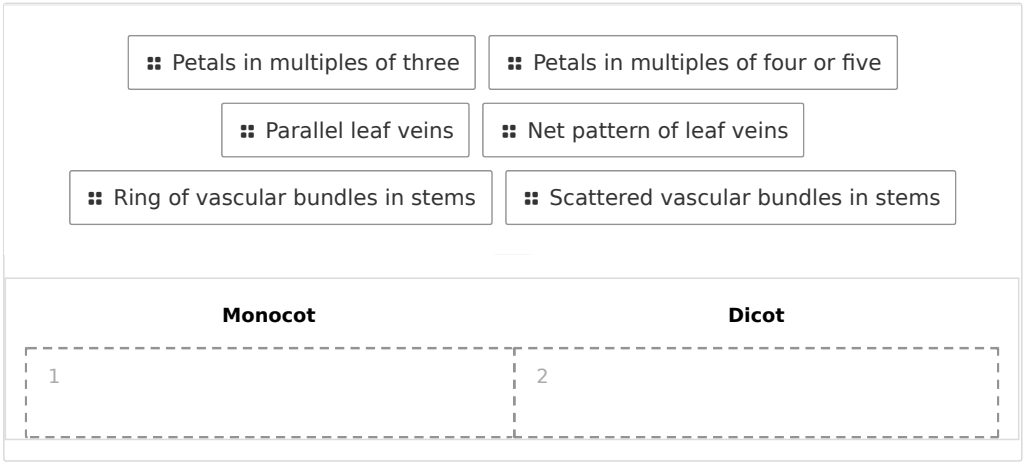


Correct answers:

1 Transpiration 2 Pericycle 3 Phloem 4 Cuticle 5 Xylem

6 Cambium

Differentiate between monocot and dicot characteristics.



Correct answers:

1 Petals in multiples of three Parallel leaf veins Scattered vascular bundles in stems

2 Petals in multiples of four or five Ring of vascular bundles in stems Net pattern of leaf veins

Exploration

Angiosperms are vascular plants that produce flowers and fruits.

- [x] True
- [ ] False

____ tissue forms endoderm, pericycle, and cortex of roots.

- [ ] Dermal
- [x] Ground
- [ ] Vascular
- [ ] Xylem

The cambium layer is present in the stems of _____.

- herbaceous monocots
- herbaceous dicots
- woody monocots
- woody dicots ✔

_____ is composed closely-spaced cells containing chloroplasts.

- Cuticle
- Epidermis
- Palisade mesophyll ✔
- Stoma

Gravity pulls water within the roots through the stem and into the leaves.

- True
- False ✔

Exercise 1

What differences were you able to observe between monocot and dicot root structures? Reference Photos 1-2 in your answer.

The xylem and phloem of the monocot root were arranged in a circular pattern and the monocot root contains a central area of pith as shown in Photo 1. The xylem and phloem of the dicot root were arranged in a star pattern and the dicot root lacked a central area of pith as shown in Photo 2.

What differences were you able to observe between monocot and dicot stem structures? Reference Photos 3-4 in your answer.

The vascular bundles of the monocot stem occurred throughout the ground tissue as shown in Photo 3. The vascular bundles of the dicot stem were arranged in a circle with the xylem and phloem being separated by a cambium layer as shown in Photo 4.

How do the palisade mesophyll and spongy mesophyll layers differ in appearance and function within leaf tissue? Reference Photo 5 in your explanation.

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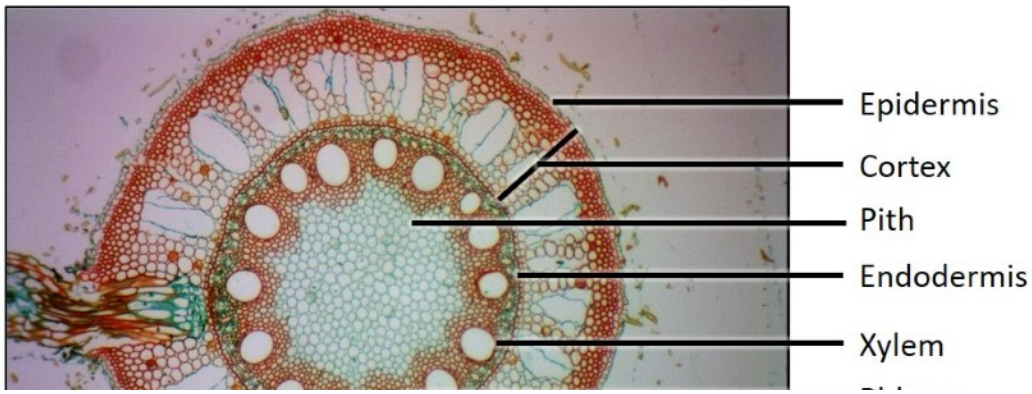
Data Table 1: Root and Stem Structures and Functions
(SAMPLE ANSWER BELOW)

Structure	Function
Epidermis	Single, outermost cell layer that functions for both protection and water absorption.
Cortex	multicellular layers that diffuses water and stores starch.
Pericycle	A single or double layer of cells that provides support for the vascular tissue.
Endodermis	A single layer of cells that regulates water movement out of the vascular tissues.
Xylem	Provides support to the plant and moves water and minerals from the roots to the leaves.
Phloem	Transports nutrients from the leaves to the stem and roots.

Photo 1: Monocot Root Labeled
(SAMPLE ANSWER BELOW)



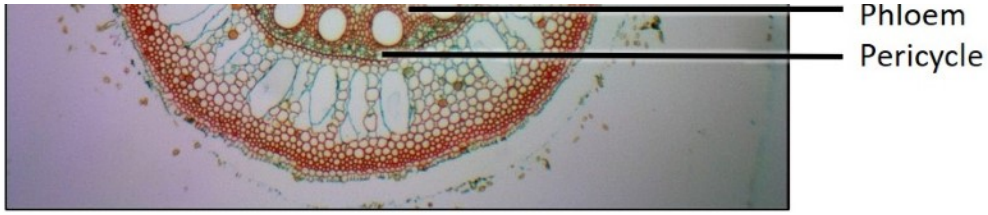
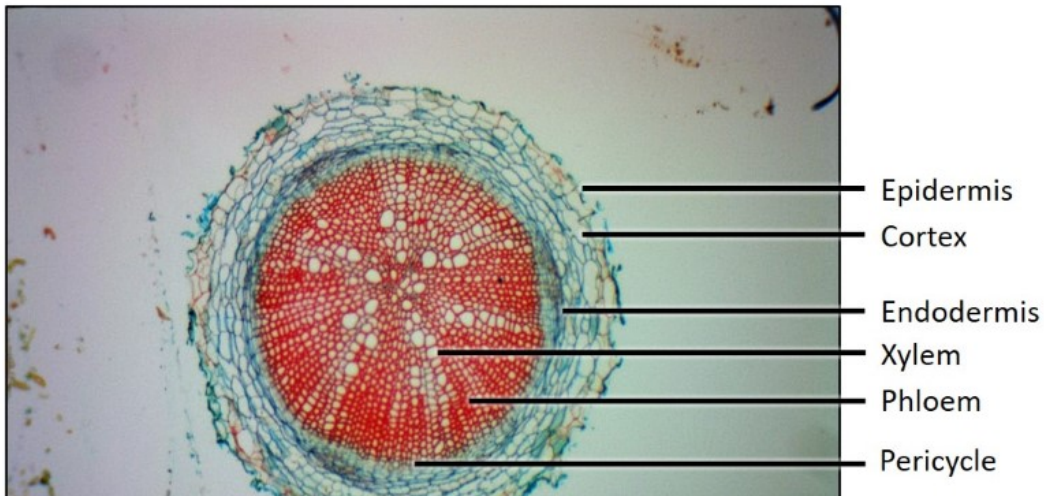
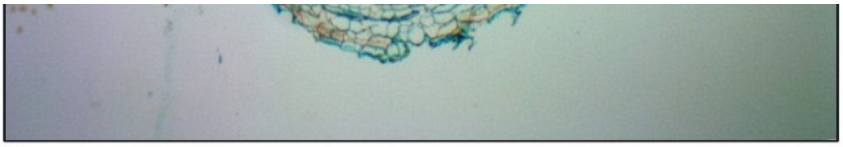


Photo 2: Dicot Root Labeled
(SAMPLE ANSWER BELOW)





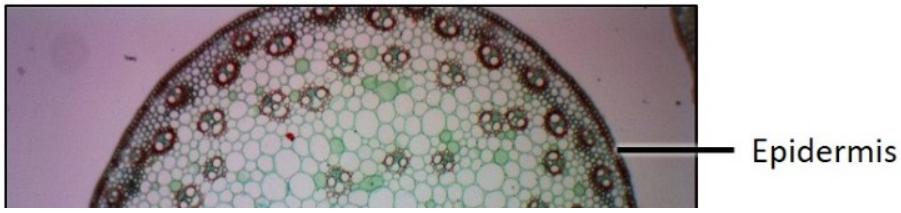
Data Table 2: Total Magnification of Roots & Stems

(SAMPLE ANSWER BELOW)

Structure	Magnification	Comments
Monocot Root	60x	Students should only provide answers in this section if they were unable to identify structures.
Dicot Root	60x	
Monocot Stem	60x	
Dicot Stem	60x	

Photo 3: Monocot Stem Labeled

(SAMPLE ANSWER BELOW)



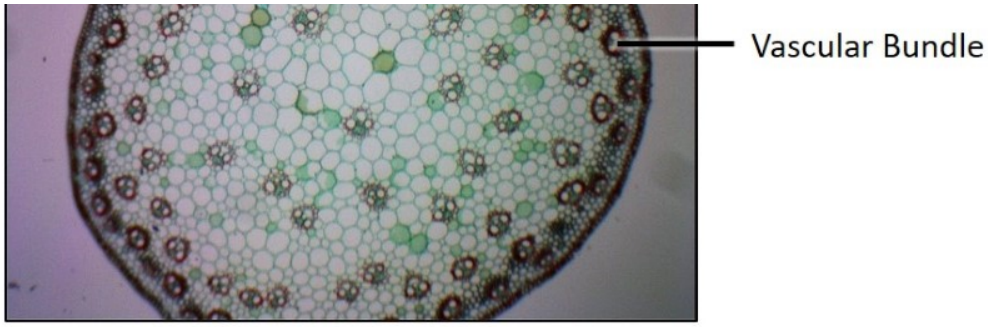
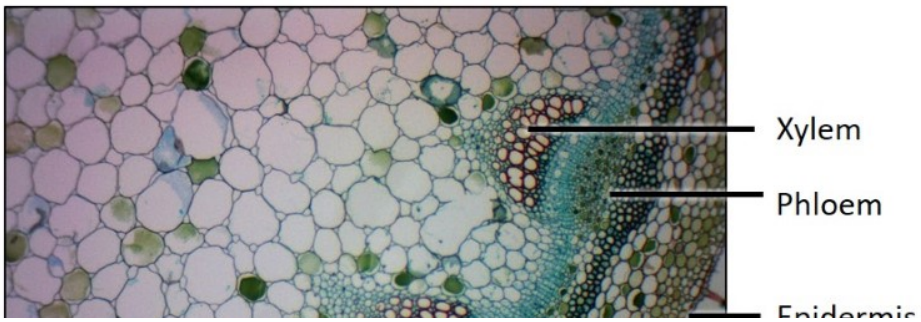
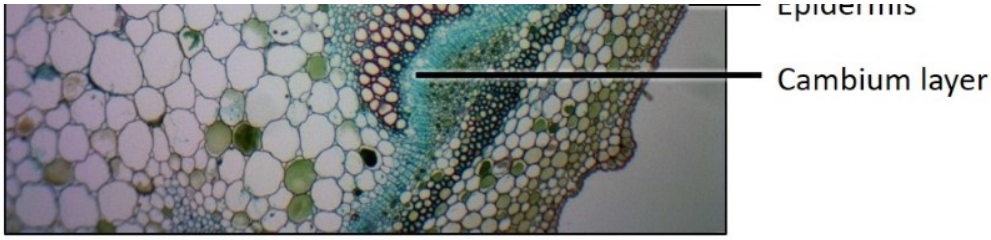


Photo 4: Dicot Stem Labeled
(SAMPLE ANSWER BELOW)





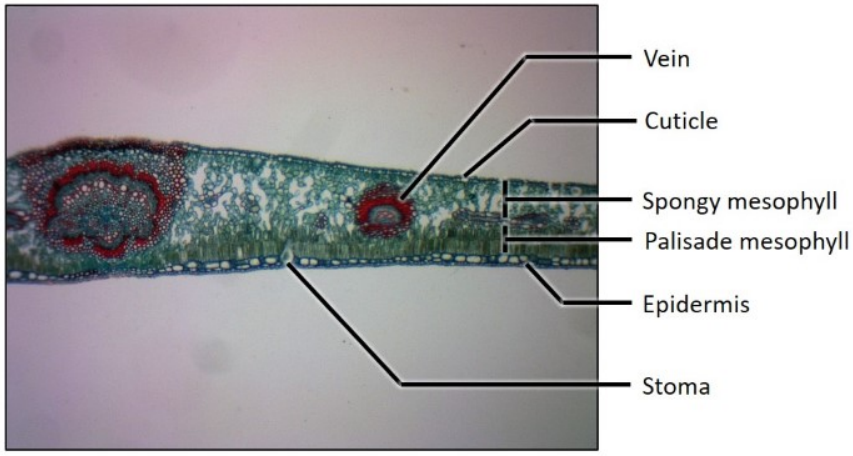
Data Table 3: Leaf Structures and Functions

(SAMPLE ANSWER BELOW)

Structure	Function
Cuticle	Waxy coating of plant; protects tissues and prevents water loss
Epidermis	Outermost layer of cells; protects underlying tissues; secretes the cuticle
Palisade mesophyll	Cells house chloroplasts and function for photosynthesis.
Spongy mesophyll	Loosely spaced cells that function for gas and liquid exchange.
Vein	Surround vascular tissue and provide support for leaf.
Stoma	Openings in leaf surface that control gas and water movement into and out of the leaf.

Photo 5: Leaf Cross Section Labeled

(SAMPLE ANSWER BELOW)



Data Table 4: Total Magnification of Leaf Cross Section

(SAMPLE ANSWER BELOW)

Structure	Magnification	Comments
Leaf cross section	60x	Students should only answer if structures could not be identified.

Exercise 2

Describe the flow of water through the celery stems and leaves used in this exercise.

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Which experimental setup resulted in the highest rate of transpiration? Reference Data Table 6 and Graph 1 in your explanation.

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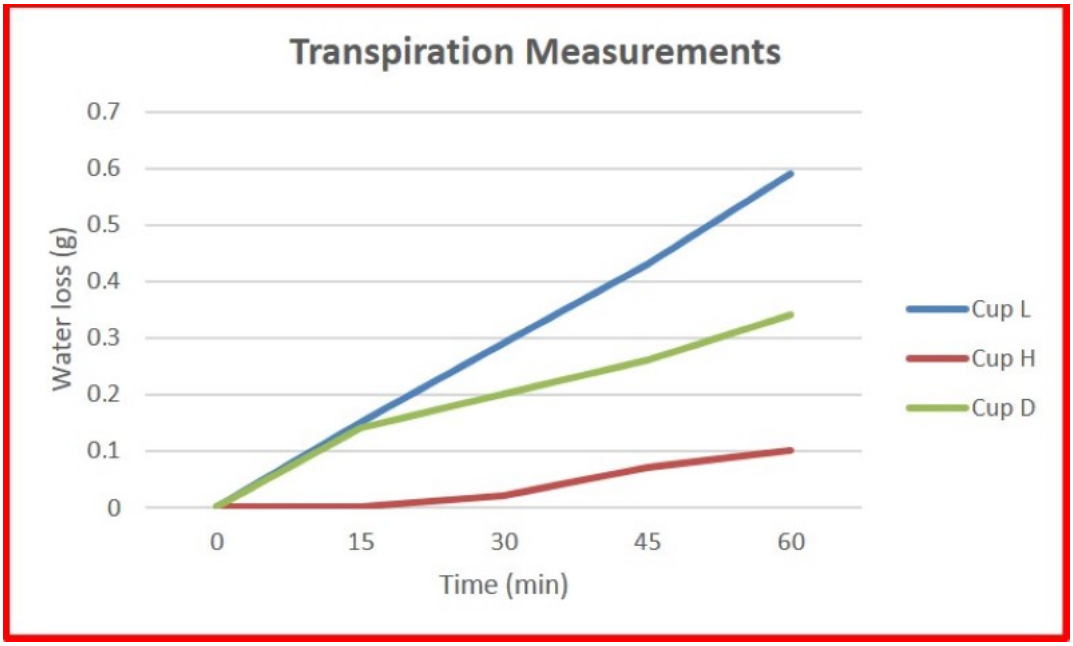
Data Table 5: Transpiration Cup Masses
(SAMPLE ANSWER BELOW)

Time (min)	Cup L mass (g)	Cup H mass (g)	Cup D mass (g)
0	27.44	25.71	25.9
15	27.29	25.71	25.76
30	27.15	25.69	25.7
45	27.01	25.64	25.64
60	26.85	25.61	25.56

Data Table 6: Water Loss Calculations
(SAMPLE ANSWER BELOW)

Time (min)	Cup L water loss (g)	Cup H water loss (g)	Cup D water loss (g)
0	0	0	0
15	0.15	0	0.14
30	0.29	0.02	0.20
45	0.43	0.07	0.26
60	0.59	0.1	0.34

Graph 1: Transpiration Measurements
(SAMPLE ANSWER BELOW)



Competency Review

Monocots are angiosperms with _____ vascular bundles in the stem.

- scattered ✔
- ringed
- square
- three or fewer

Vascular tissue in angiosperm roots forms _____.

- cortex and pith
- epidermis
- endodermis and pericycle
- phloem and xylem ✔

Pith is present in the center of monocot stems.

- True
- False ✔

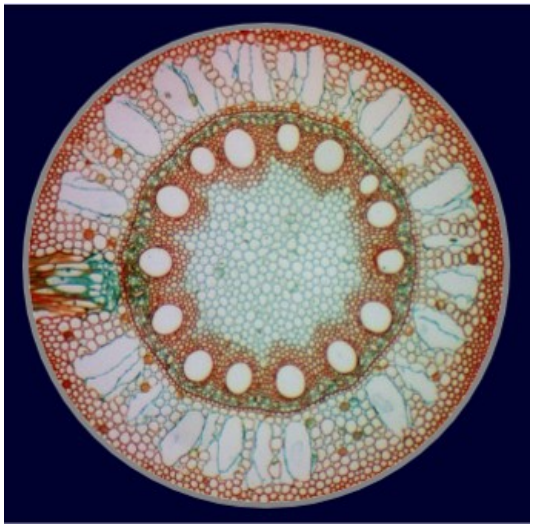
Xylem and phloem tissue is found within the _____ inside leaves.

- stomata
- palisade mesophyll
- veins ✔
- cambium

Environmental factors affect the rates of transpiration in plants.

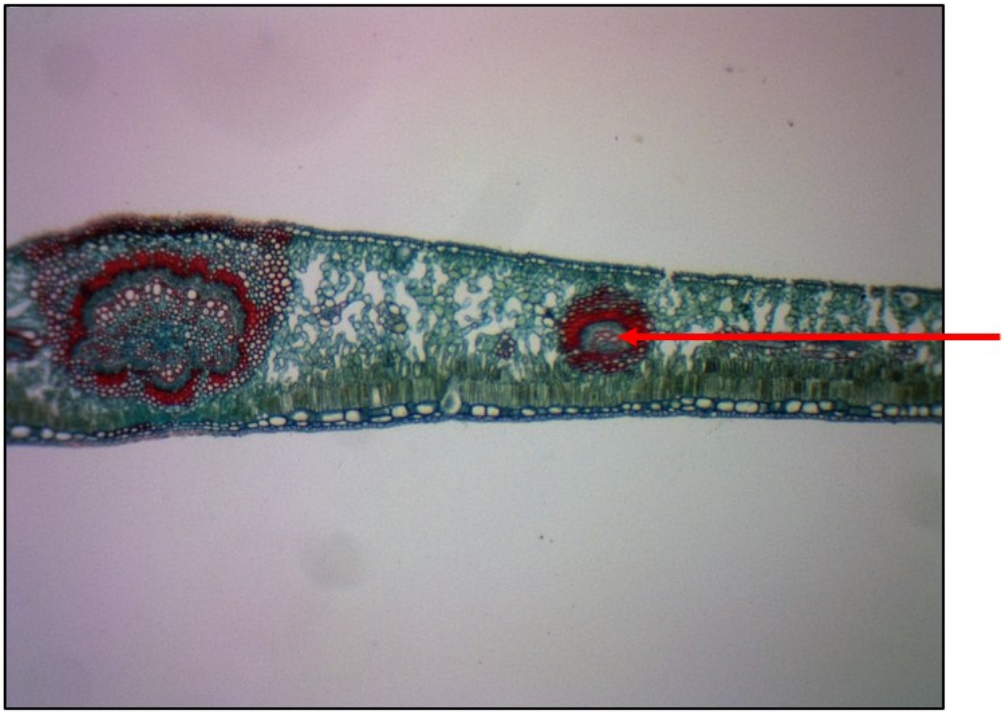
- True ✔
- False

A _____ cross section is pictured in the image below.



- monocot root ✔
- monocot stem
- dicot root
- dicot stem

The leaf tissue indicated by the arrow in the image below functions in ____ .



- photosynthesis
- transport ✔
- gas diffusion
- wax secretion

A leafy celery stem will lose more water when placed in bright light than when placed in a dark location.

- True ✔
- False

Extension Questions

Cacti are a group of dicot angiosperms that possess numerous adaptions for living in arid environments. Most notably, the leaves of these plants no longer function for photosynthesis, but rather form spines that both protect the plants from herbivores and provide shading from the desert sun. Apply your knowledge of dicot structures to predict adaptations present in the stems of cacti. (SAMPLE ANSWER BELOW)

The stems of cacti should contain mesophyll tissue with chloroplasts to perform photosynthesis since spines have replaced traditional leaves. Likewise, the stems should contain the stoma and cuticle normally associated with leaves. The stoma should be limited in number to prevent excessive water loss and the cuticle should be well developed. The cortex and pith normally found in dicot stems would be expected to be enlarged for water storage.