

EPIDERMIS

CORTEX



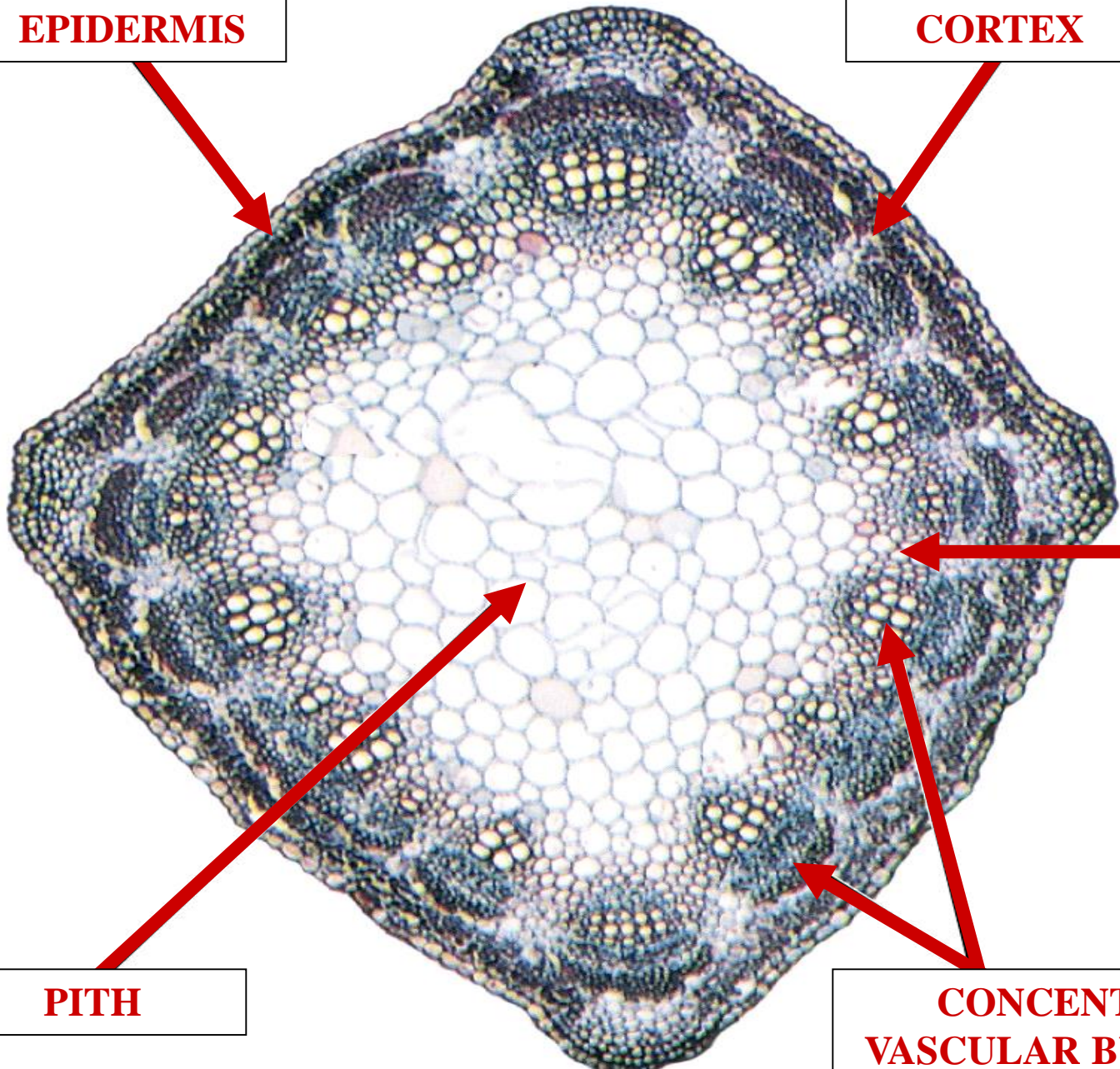
PITH RAY

STEM

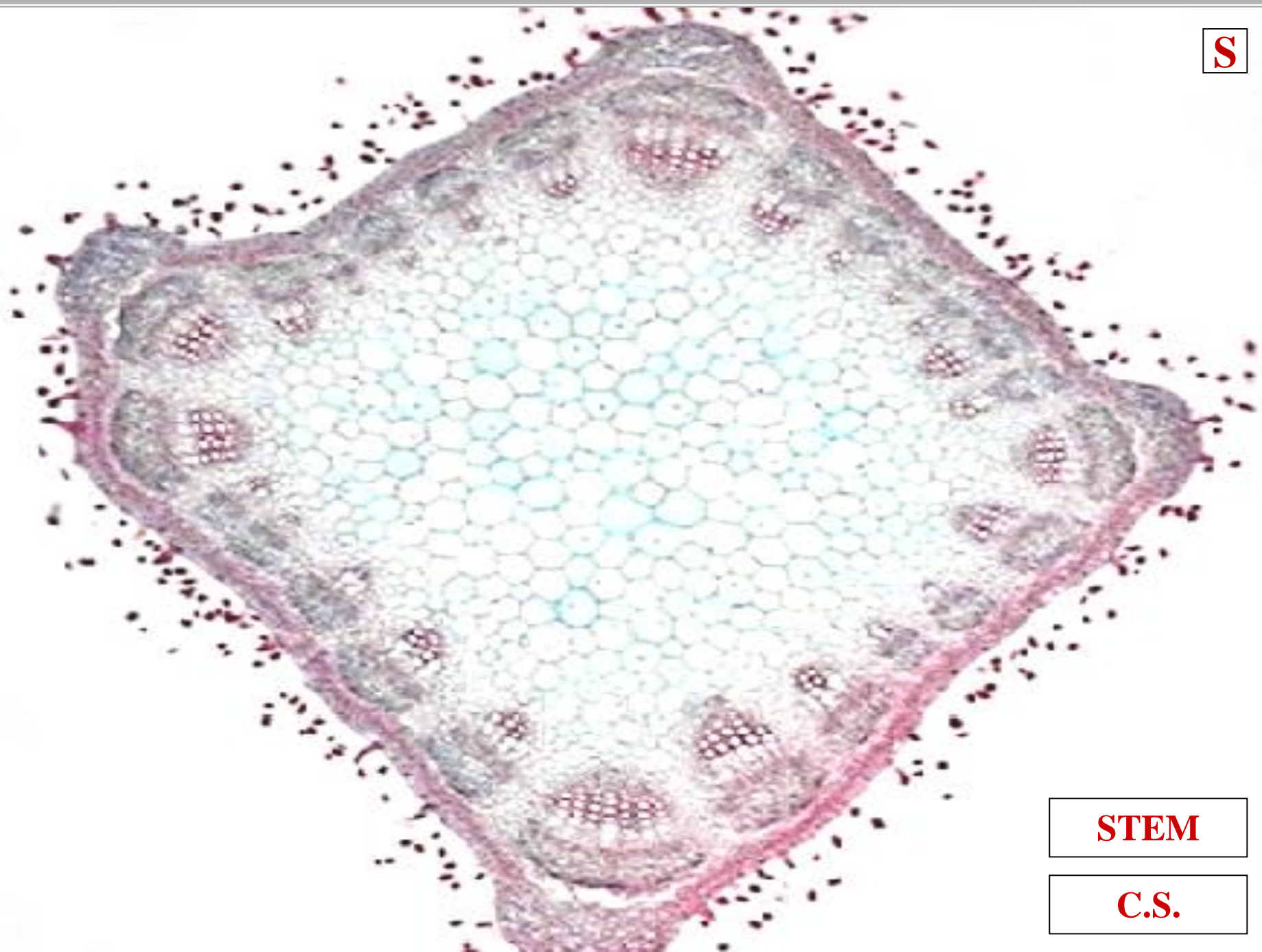
C.S.

PITH

**CONCENTRIC
VASCULAR BUNDLES**

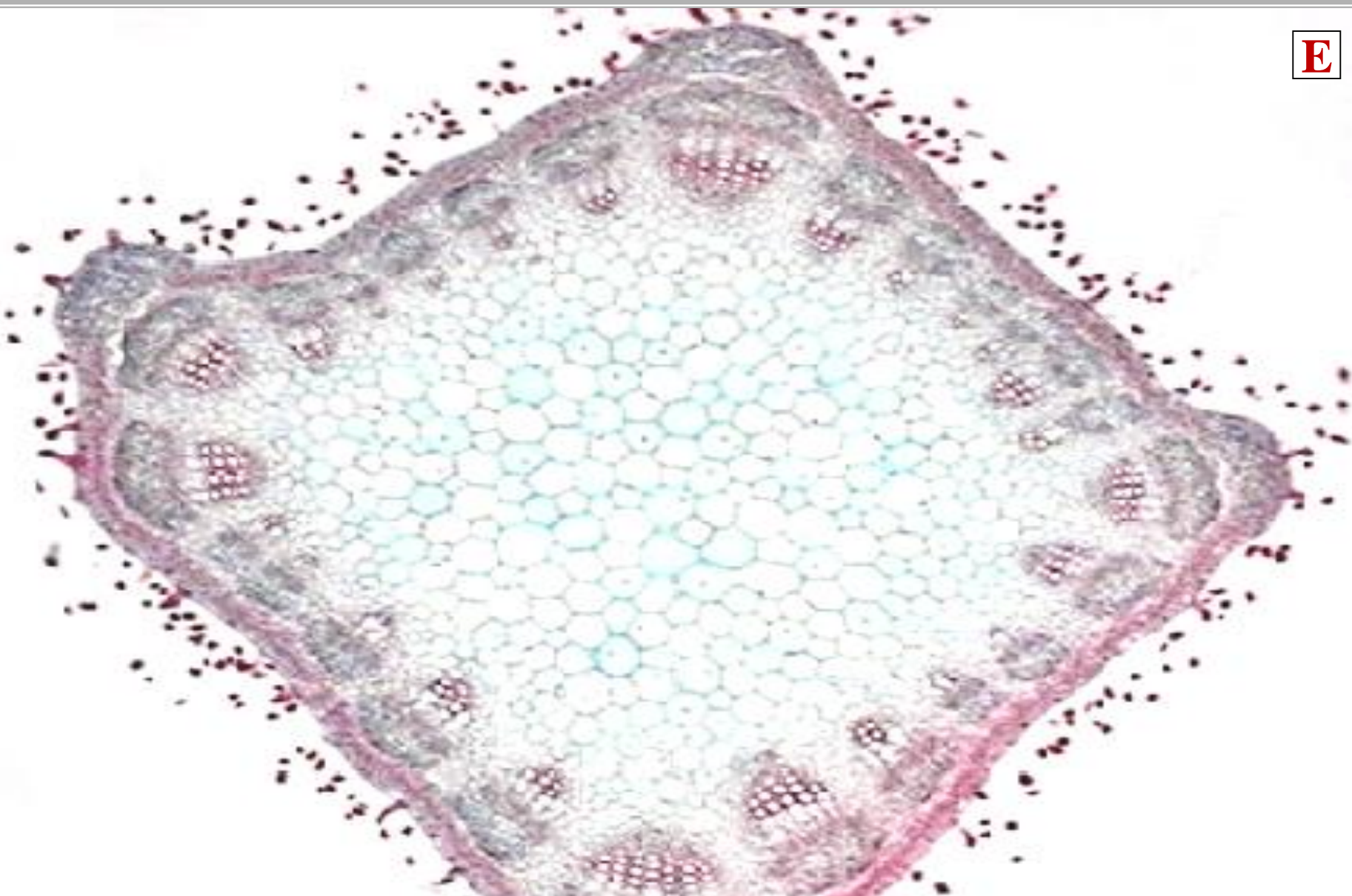


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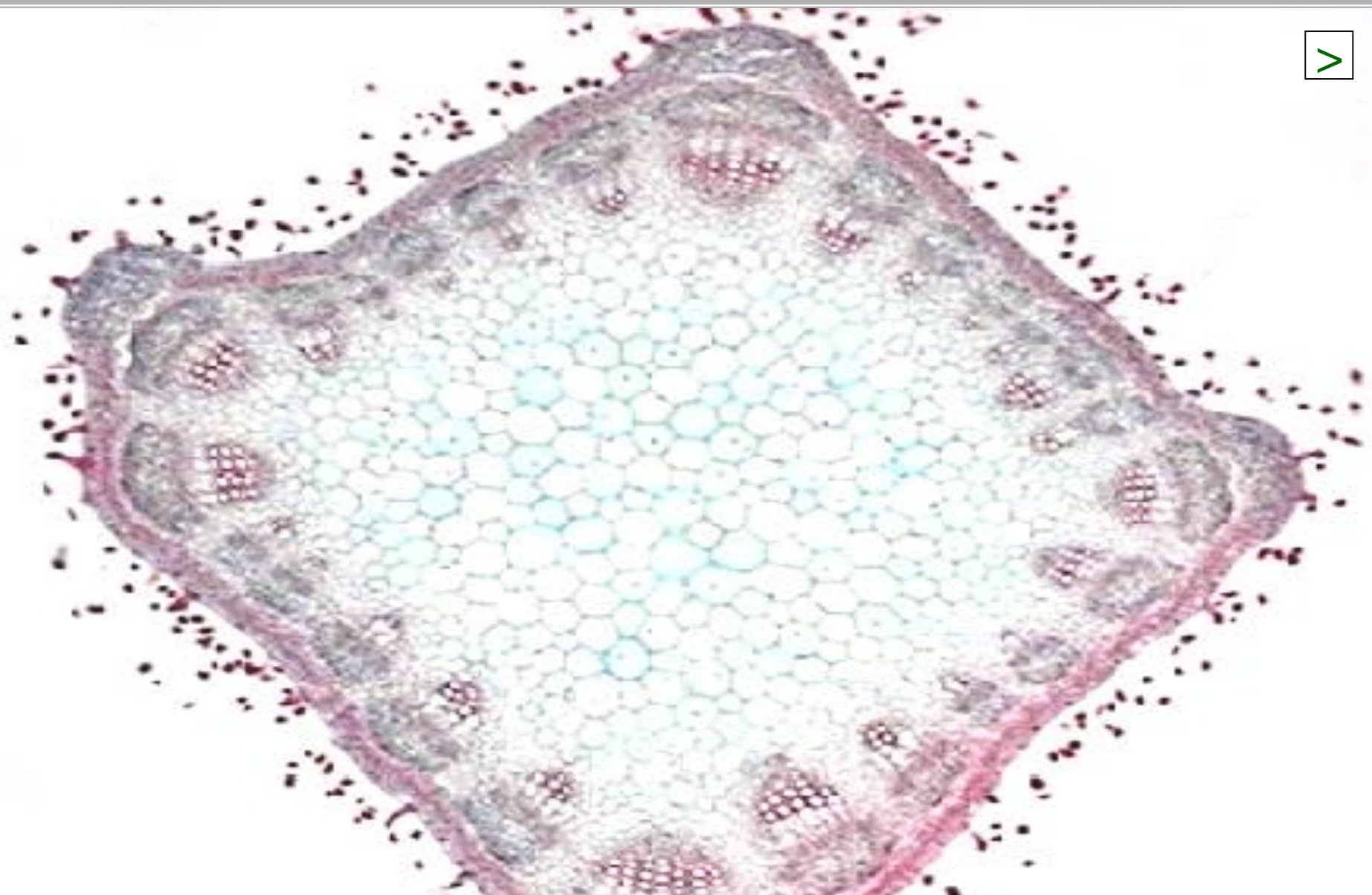


STEM

C.S.



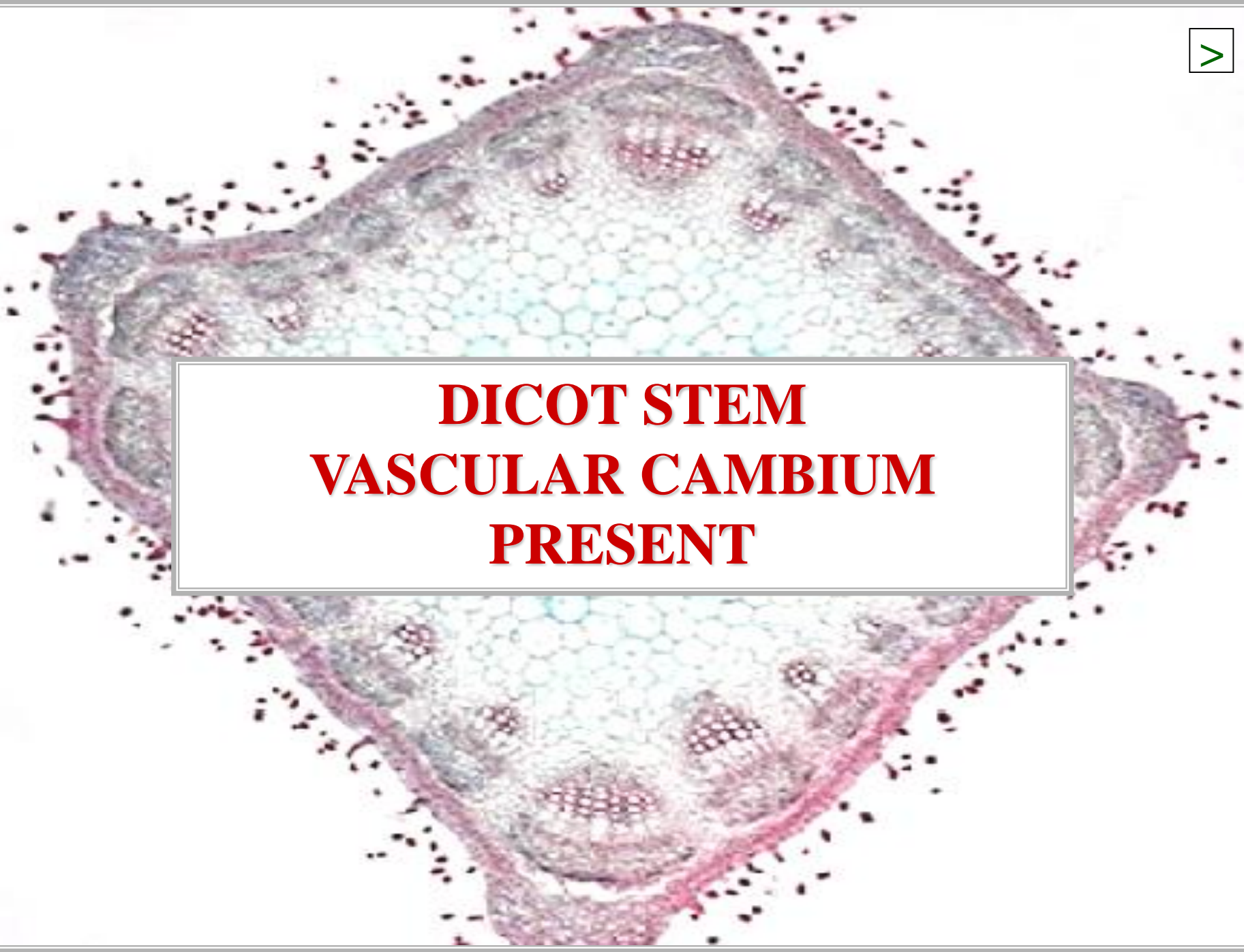
SIPHONOSTELE



SIPHONOSTELE / EUSTELE



**DICOT STEM
VASCULAR CAMBIUM
PRESENT**



A detailed micrograph of a dicot stem cross-section. The stem is roughly triangular in shape. The outermost layer is the cortex, followed by a thin layer of endodermis. Inside the endodermis is the vascular cambium, which is a dense, reddish-brown ring. The vascular cambium is producing secondary xylem (wood) towards the center and secondary phloem (cork) towards the periphery. The secondary xylem shows growth rings, and the secondary phloem is surrounded by a cork cambium that produces a thick, protective cork layer. The central pith is visible at the very center. The overall structure is symmetrical and shows clear evidence of secondary growth.

**DICOT STEM
SECONDARY GROWTH
PRESENT**



ATTENTION STUDENTS



BIOLOGY 463

PLANT TAXONOMY

DR. MENAPACE

SPRING 2023

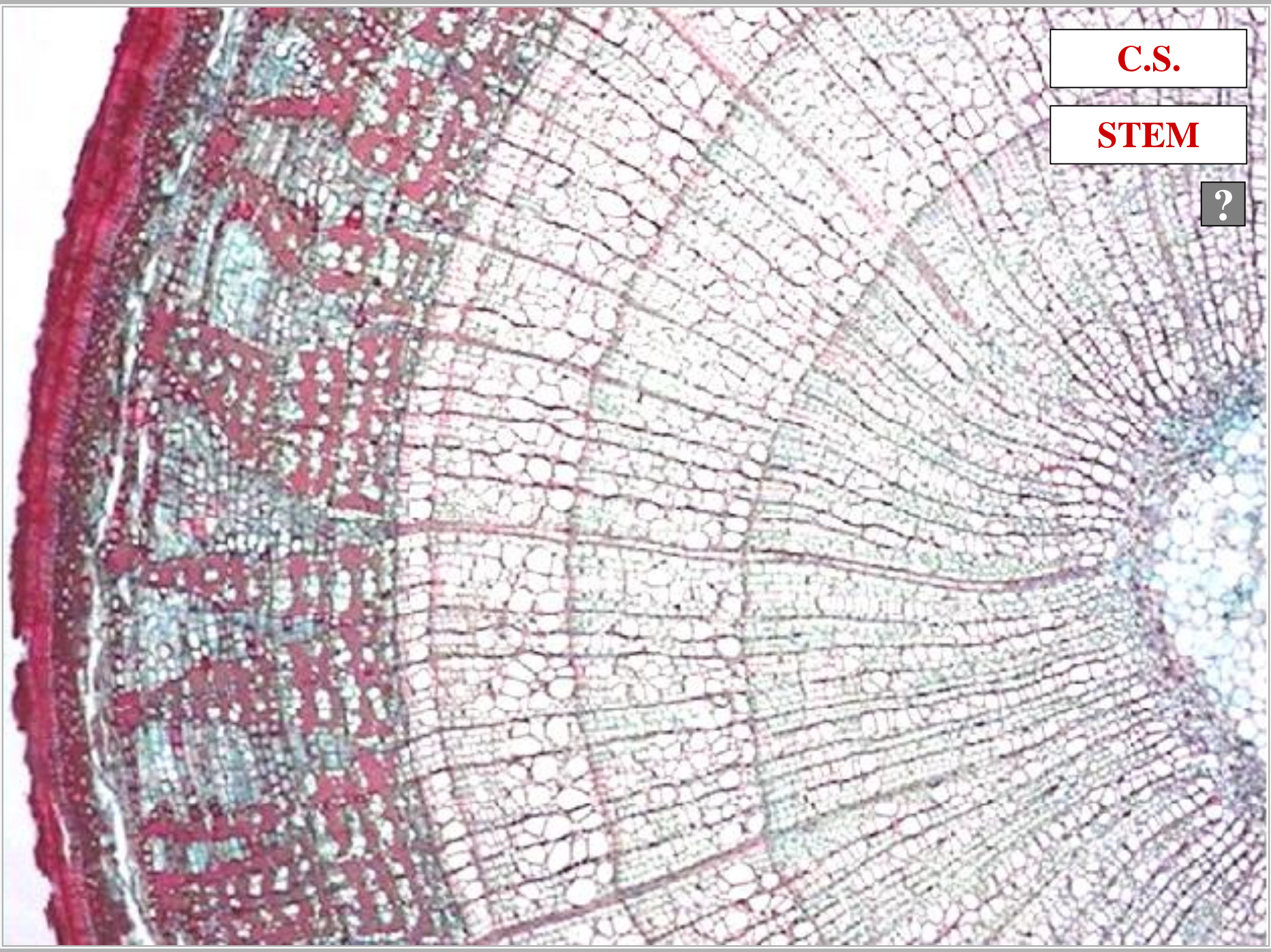


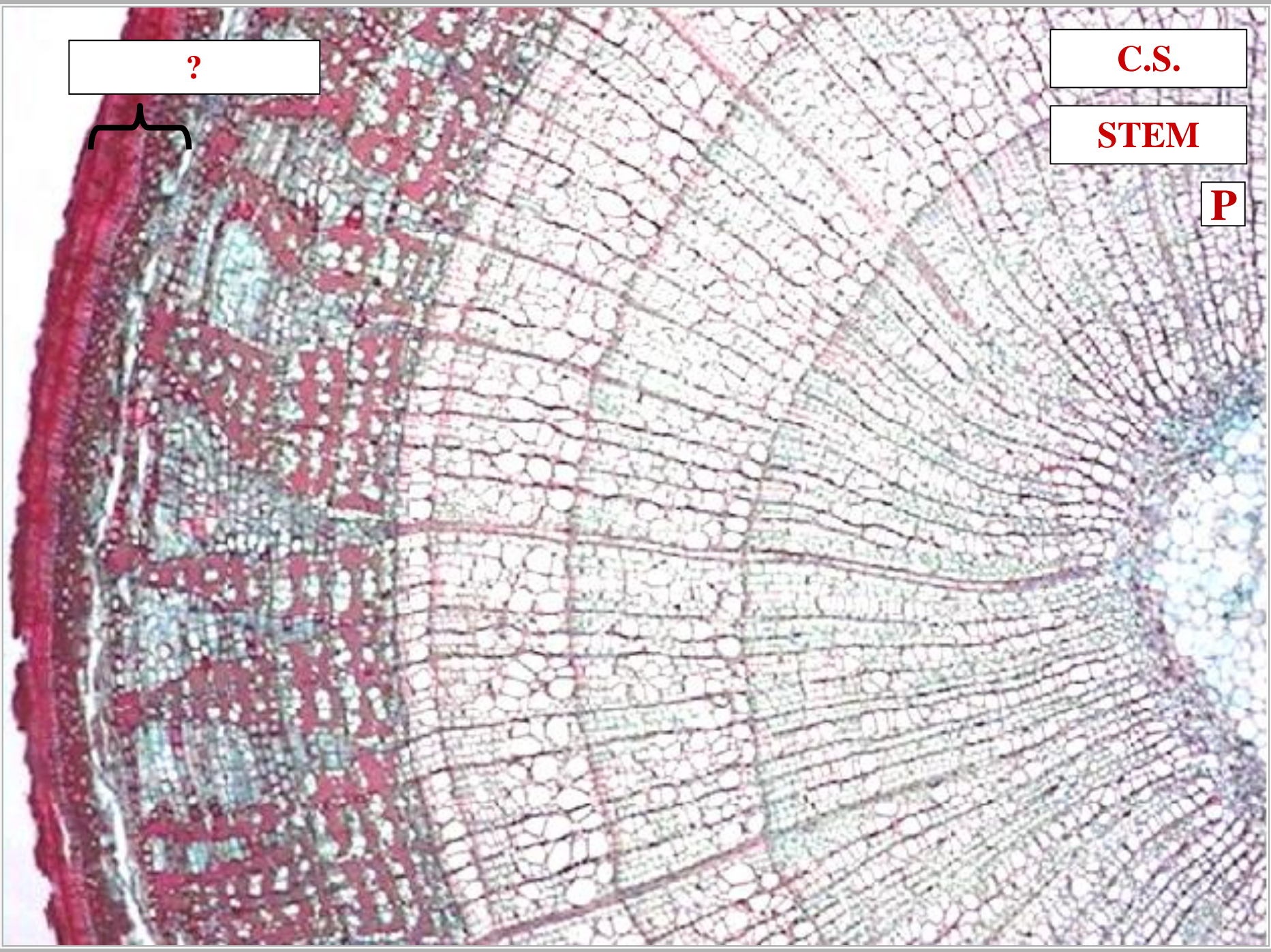
DICOT SECONDARY STEM ANATOMY

C.S.

STEM

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?

C.S.

STEM

P

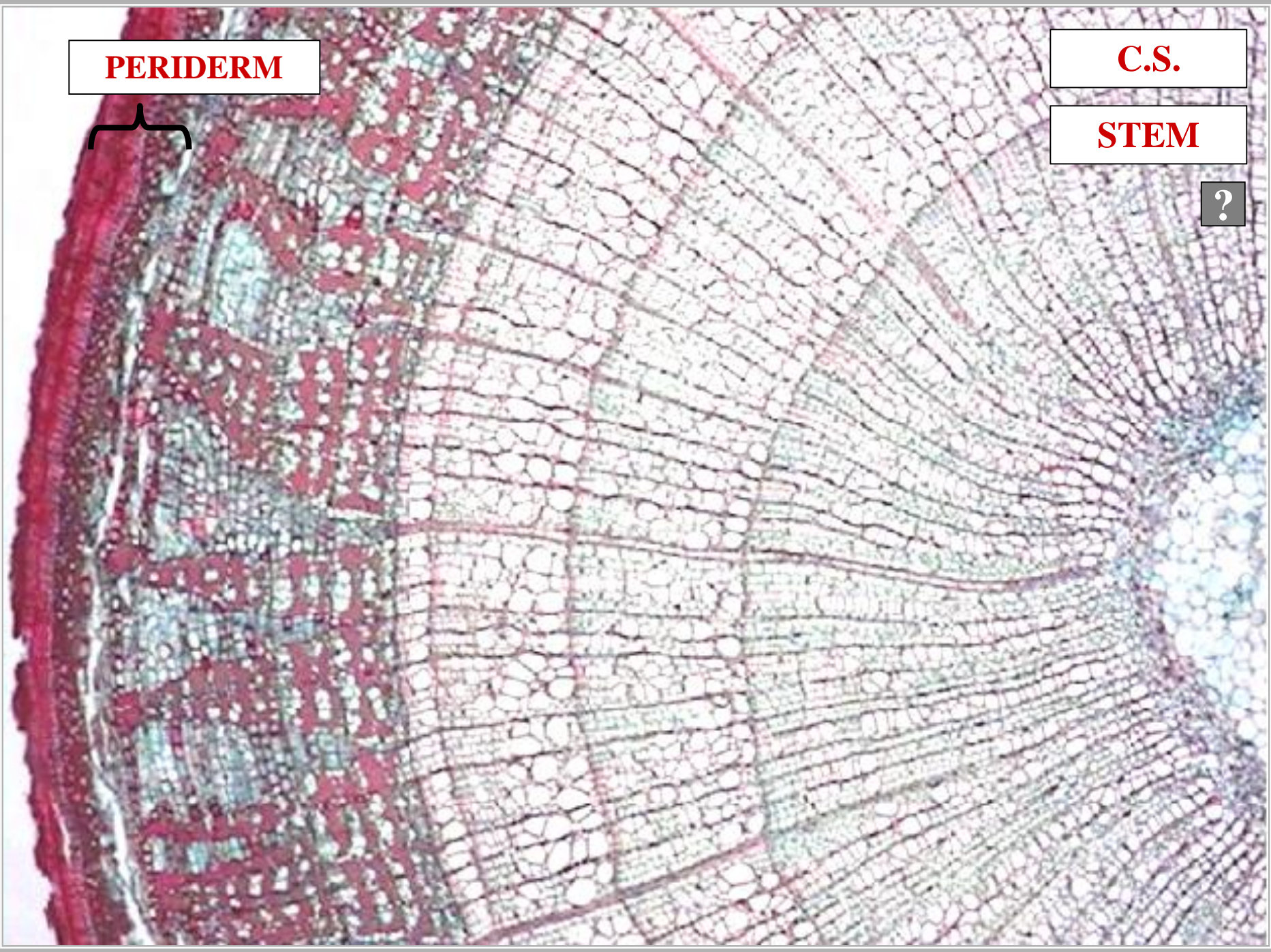
PERIDERM



C.S.

STEM

?



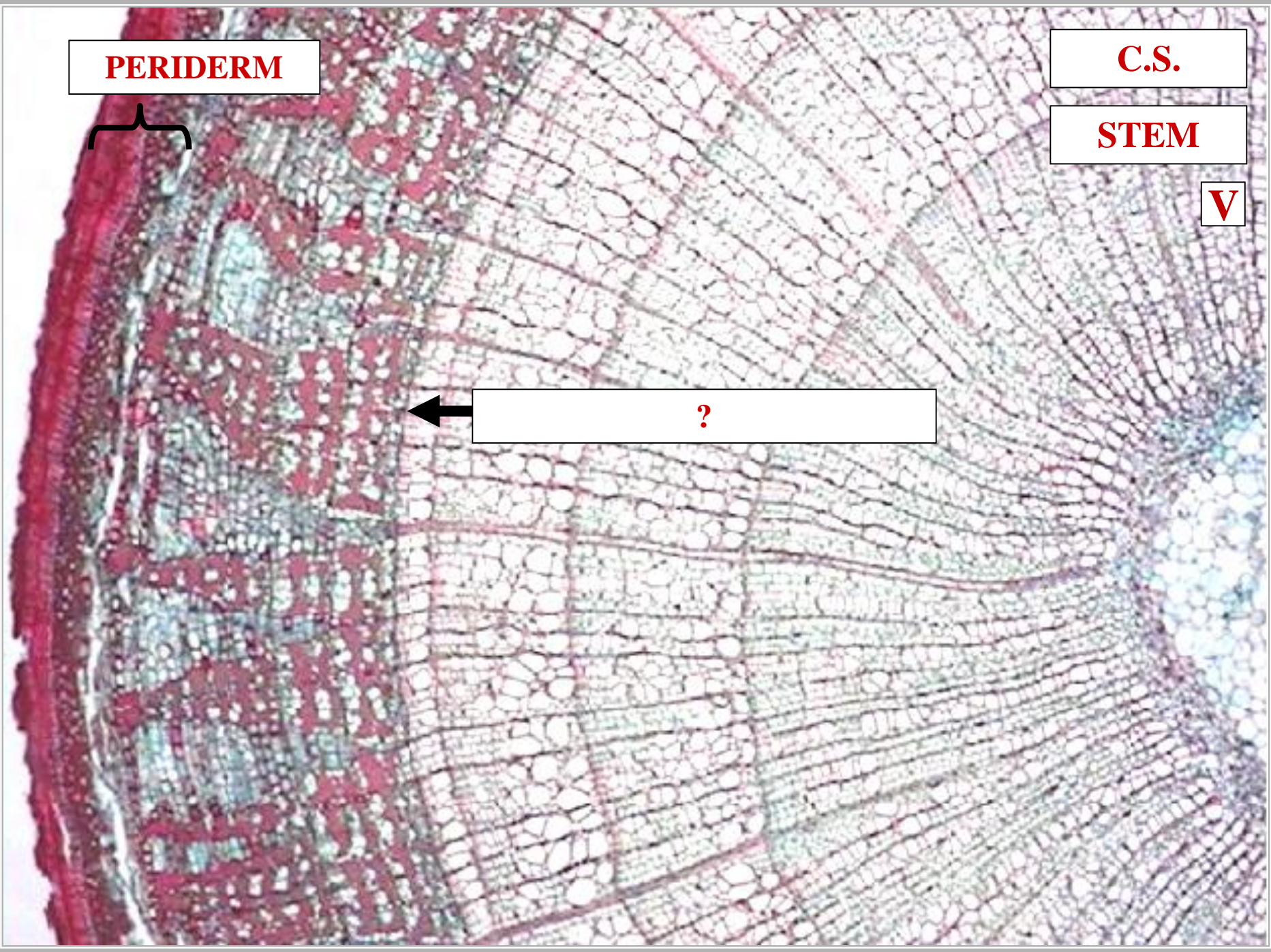
PERIDERM

C.S.

STEM

V

?



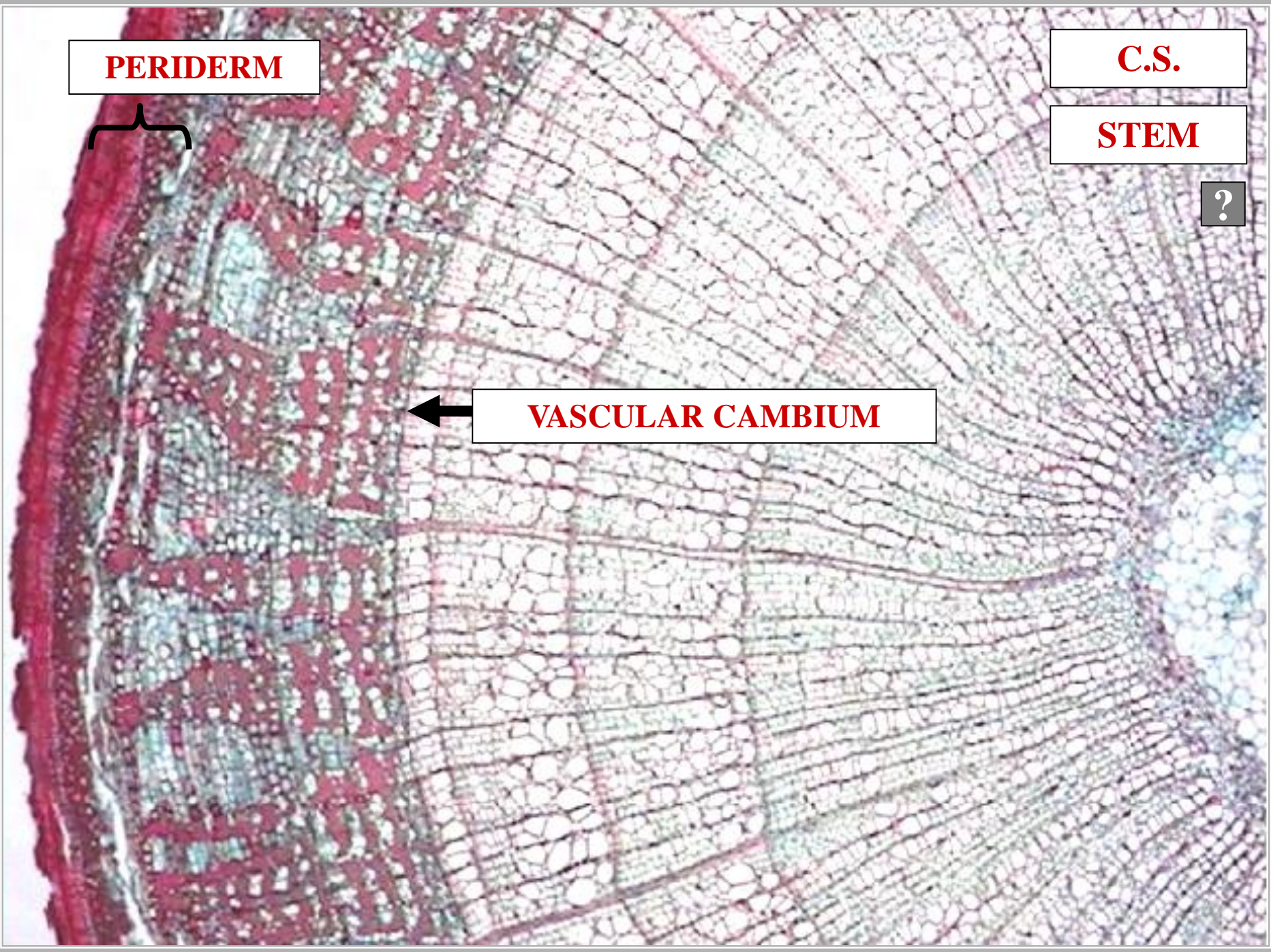
PERIDERM

C.S.

STEM

?

VASCULAR CAMBIUM



PERIDERM

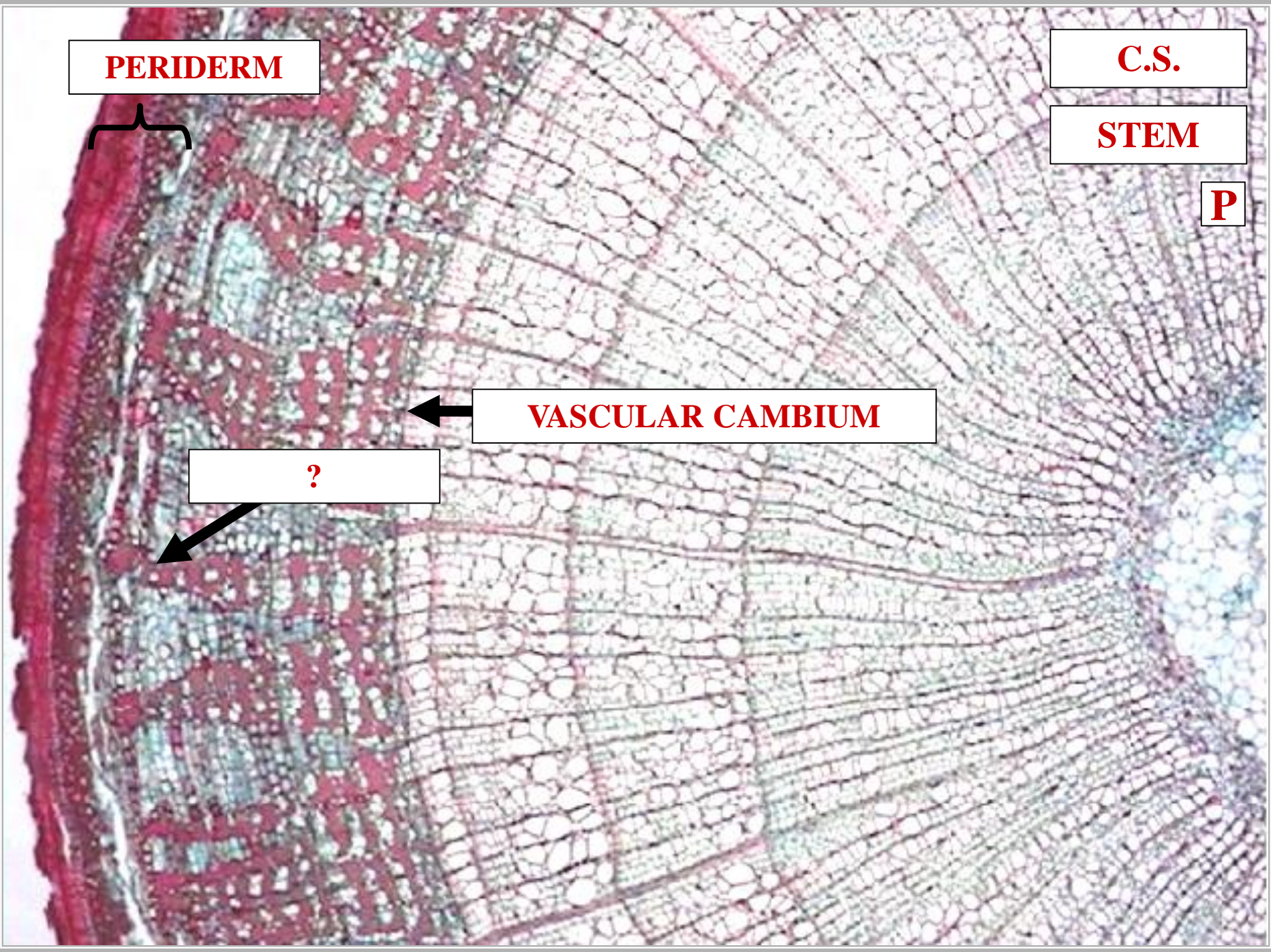
C.S.

STEM

P

VASCULAR CAMBIUM

?



PERIDERM

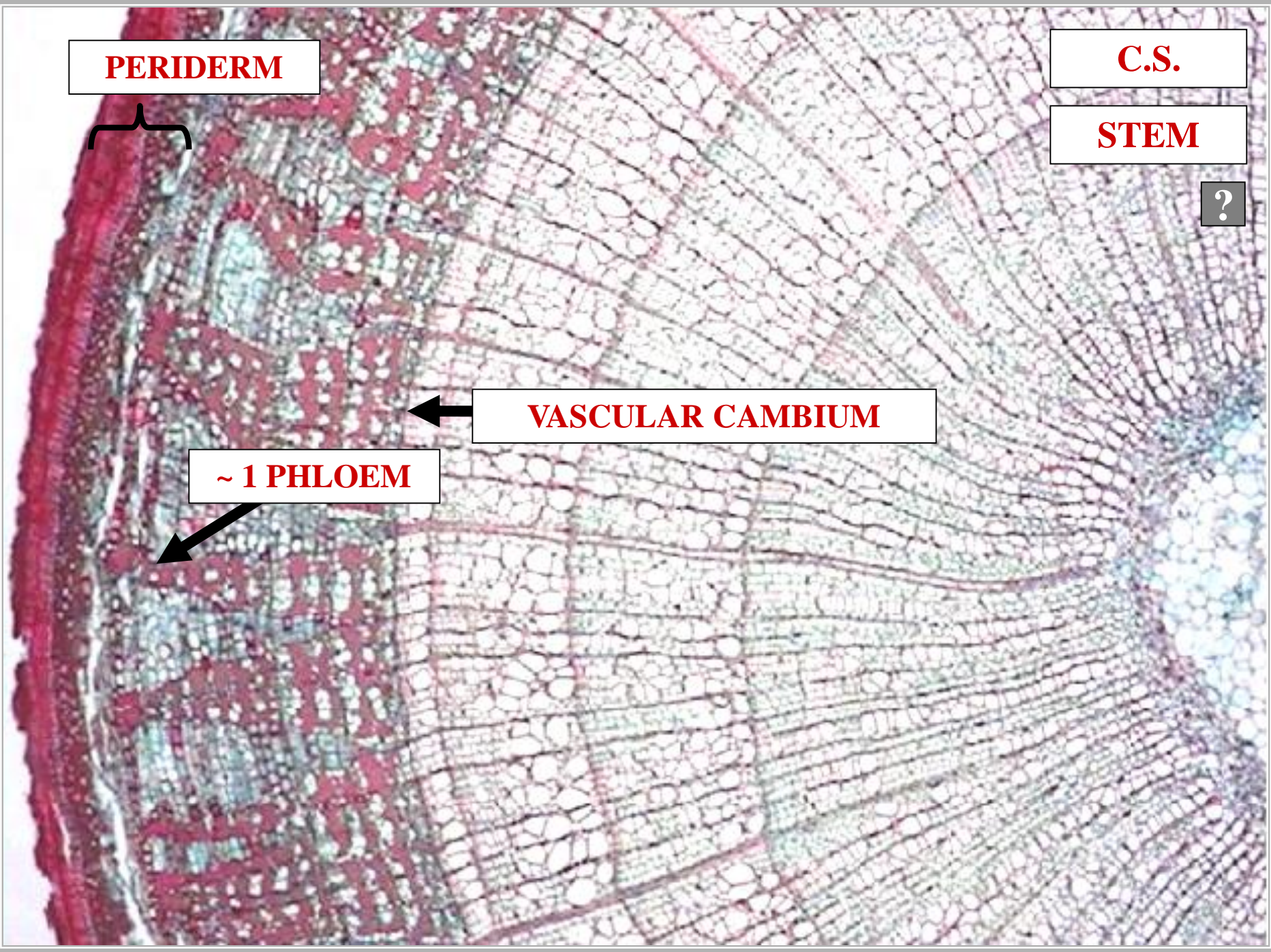
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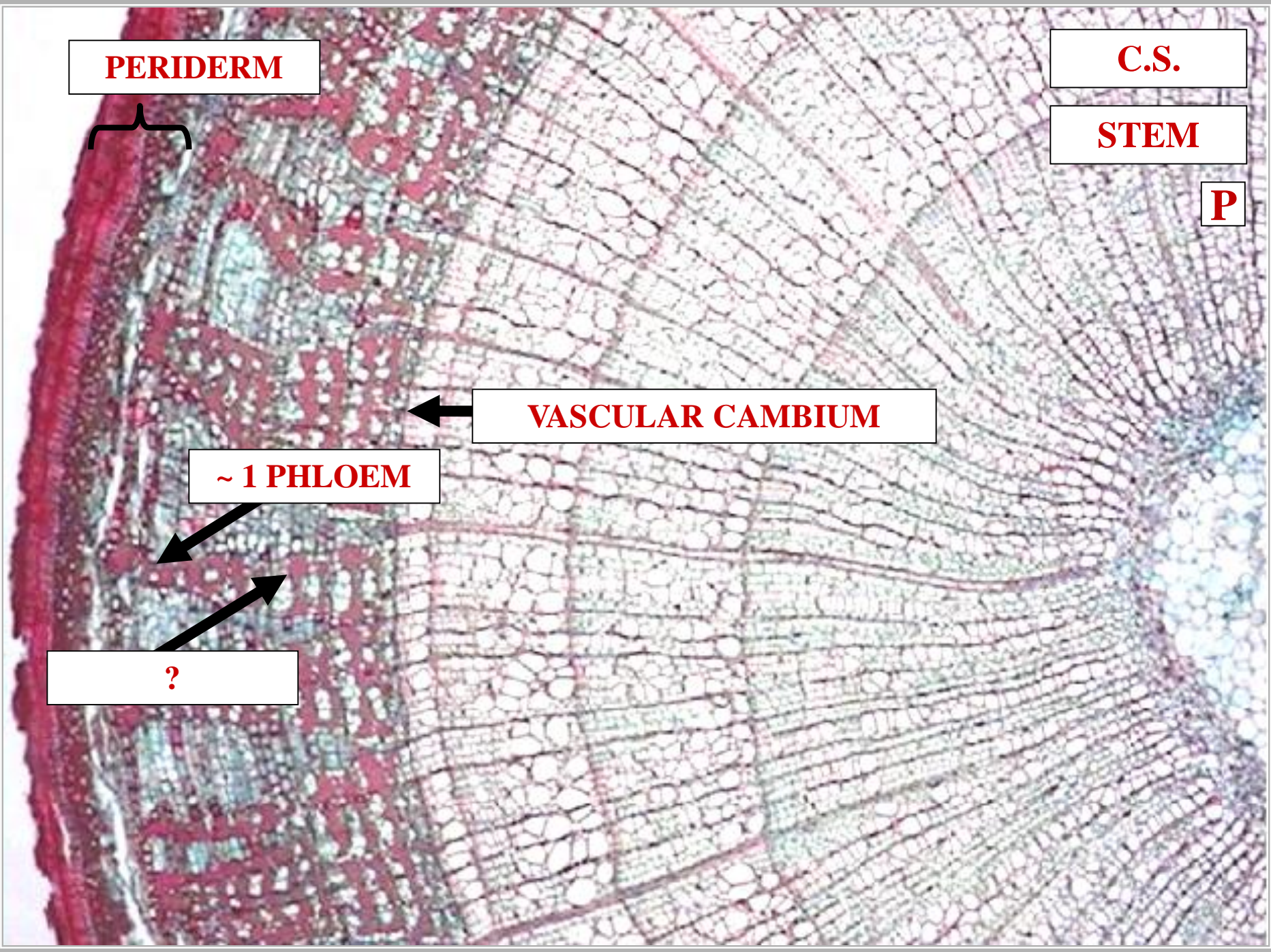
STEM

?

VASCULAR CAMBIUM

~ 1 PHLOEM





PERIDERM

C.S.

STEM

P

VASCULAR CAMBIUM

~ 1 PHLOEM

?

PERIDERM

C.S.

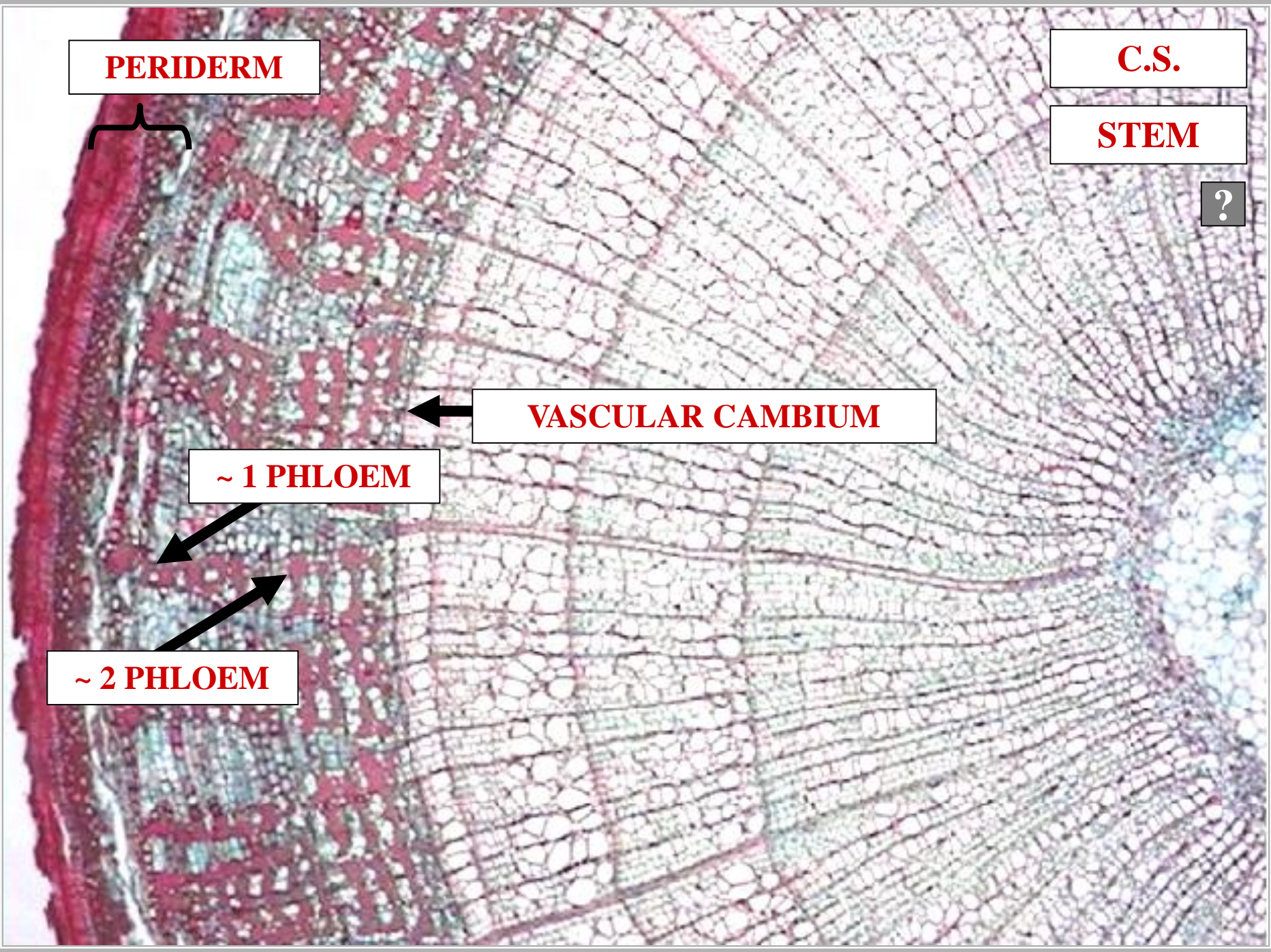
STEM

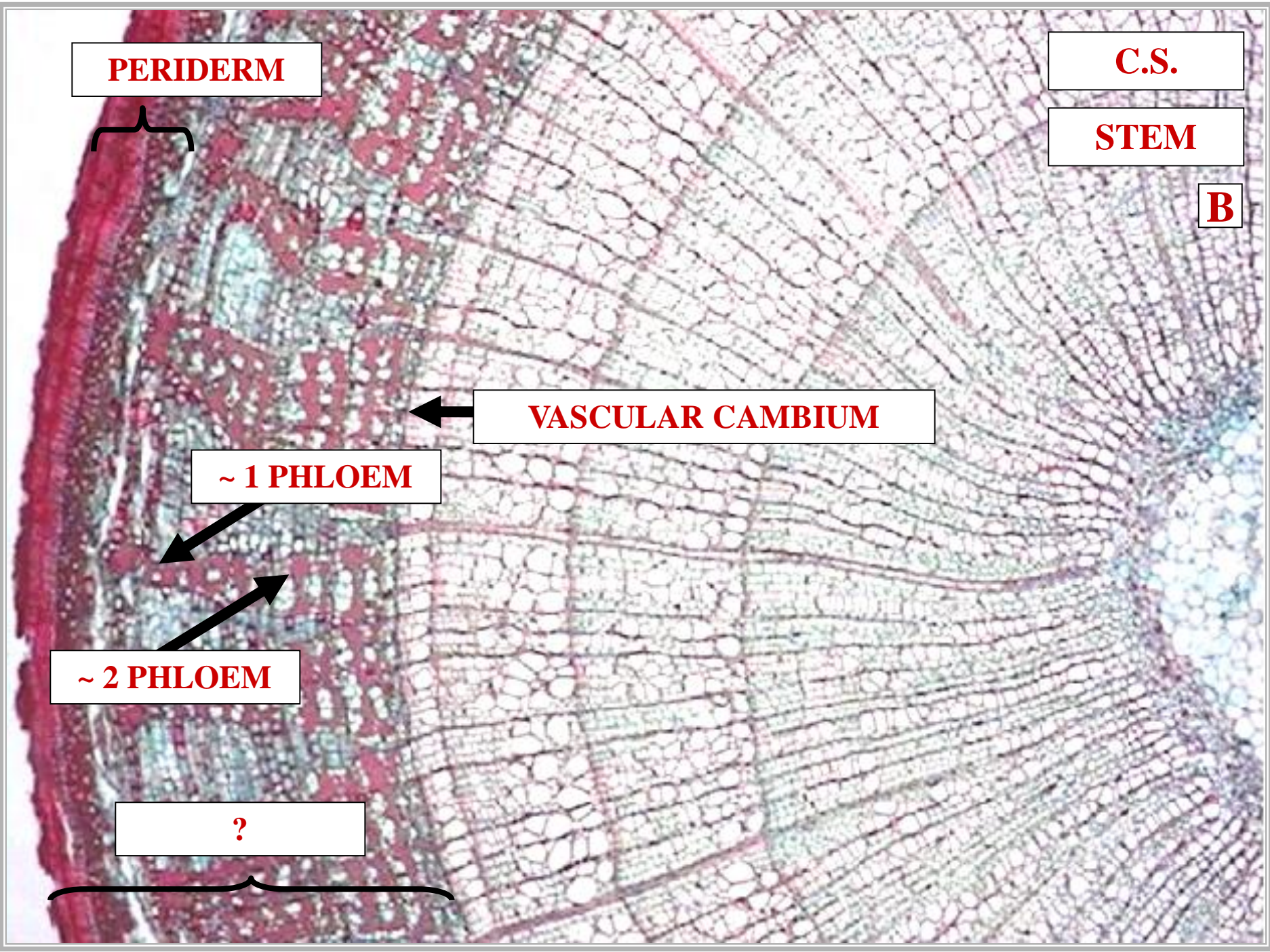
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VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM





PERIDERM

C.S.

STEM

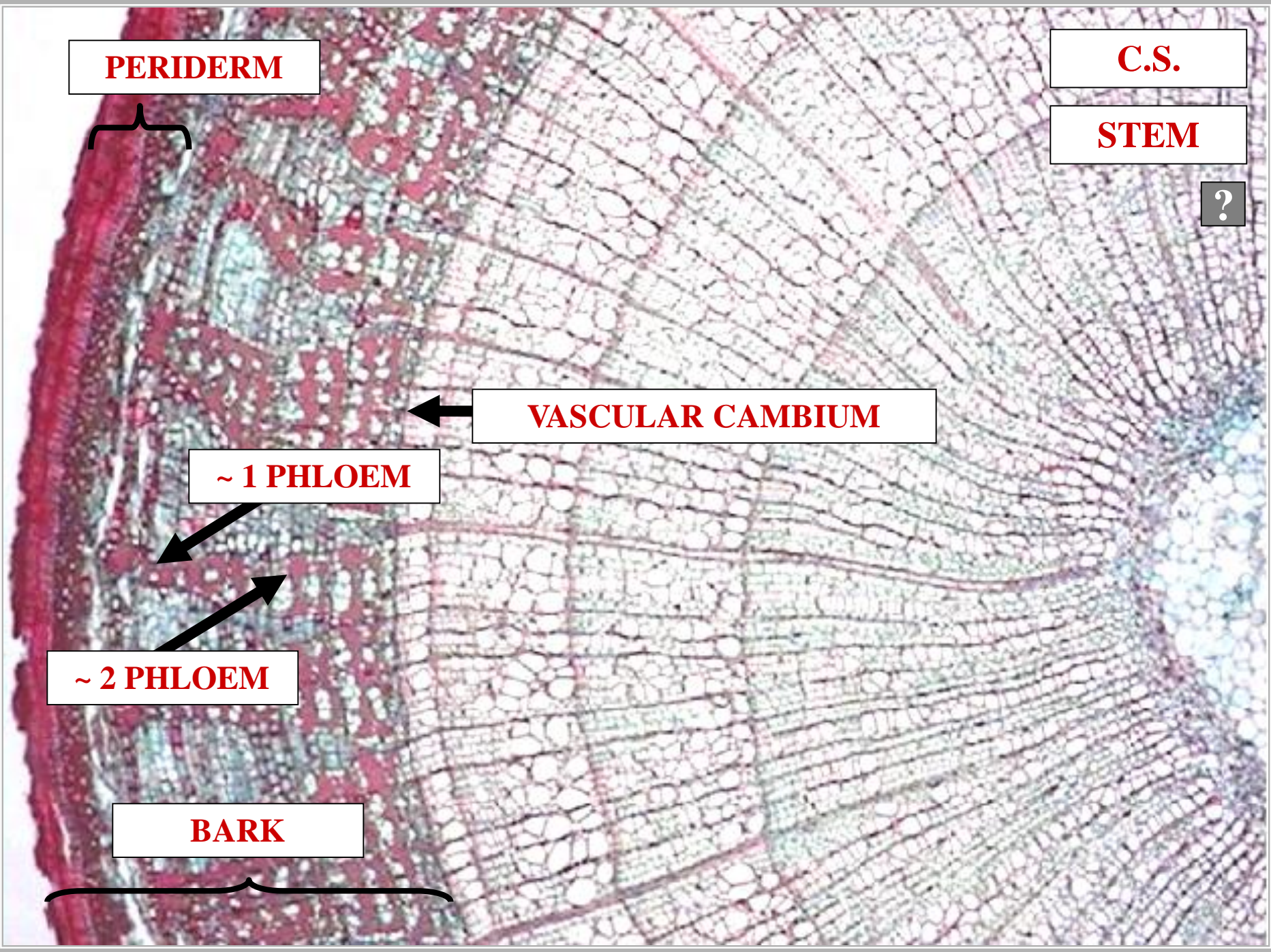
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VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM

?



PERIDERM

C.S.

STEM

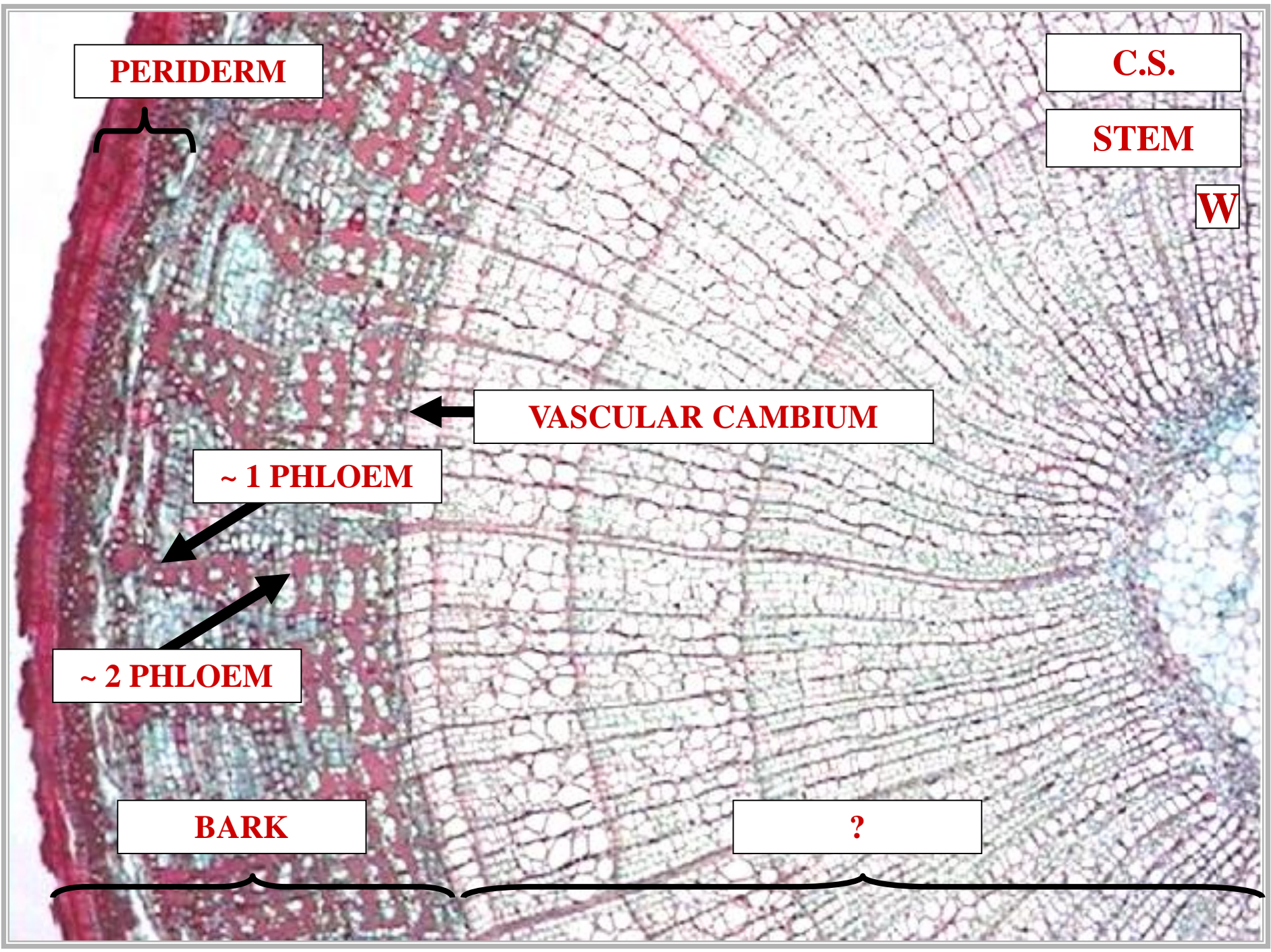
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VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM

BARK



PERIDERM

C.S.

STEM

W

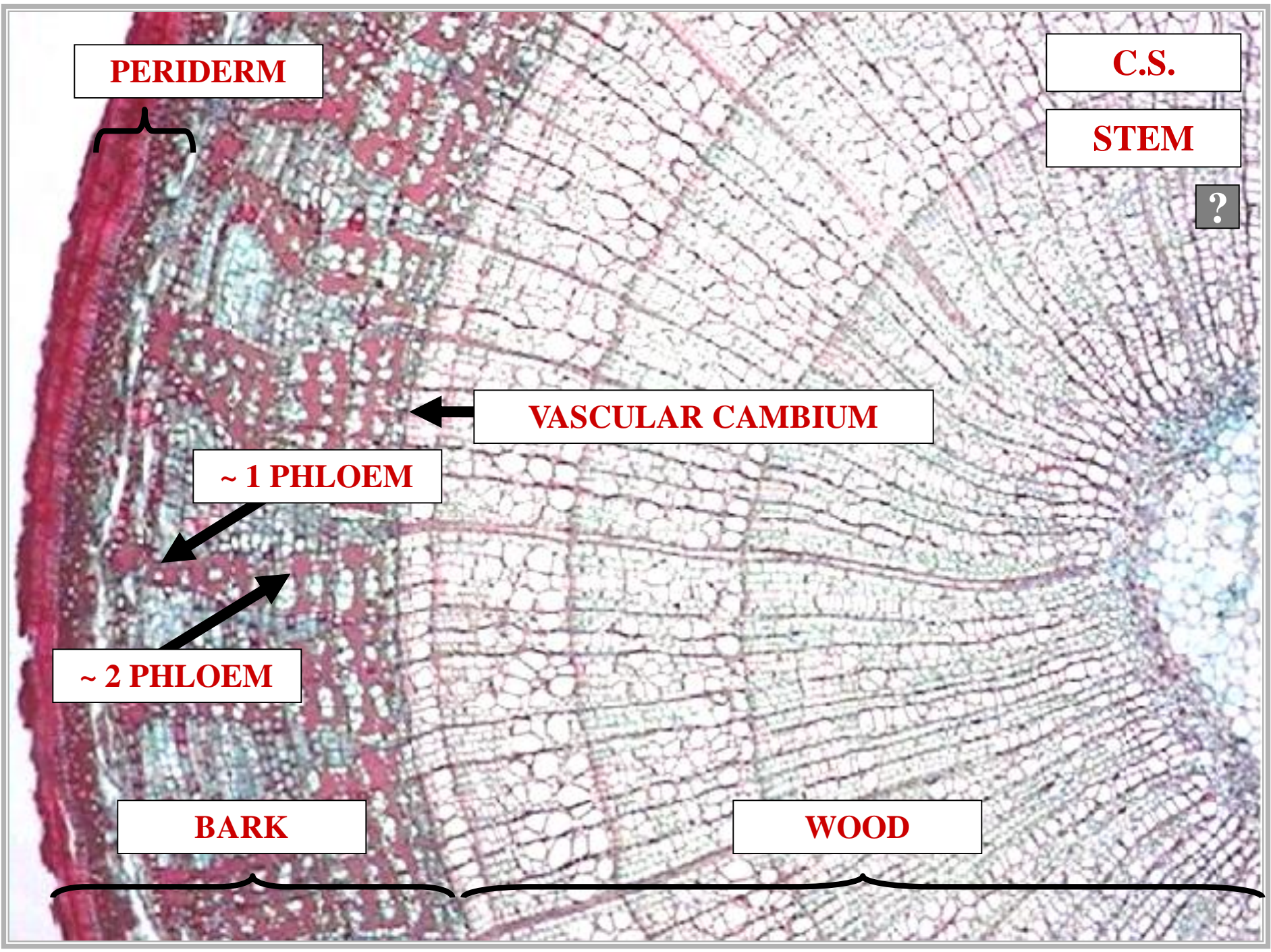
VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM

BARK

?



PERIDERM

C.S.

STEM

?

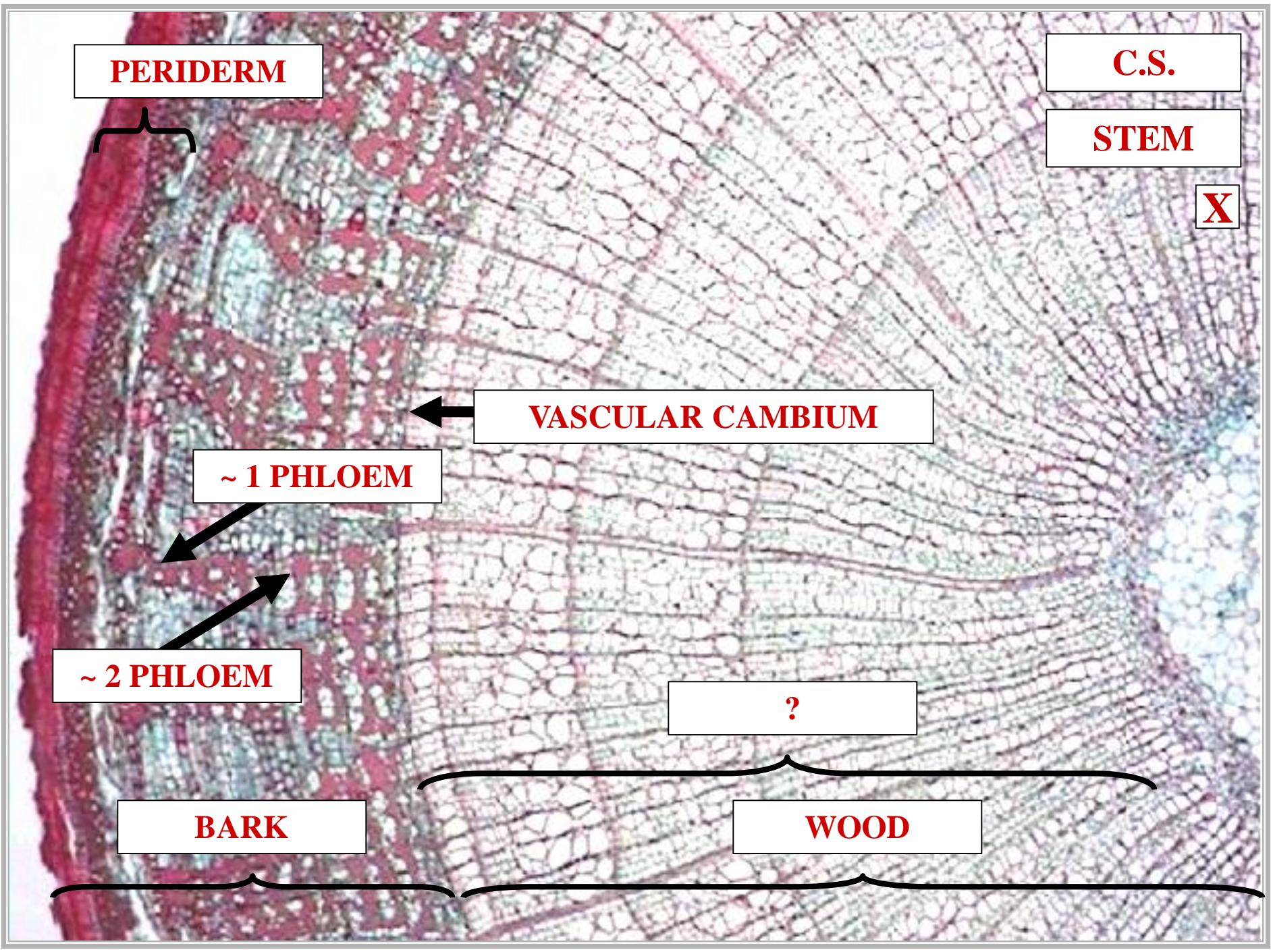
VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM

BARK

WOOD



PERIDERM

C.S.

STEM

X

VASCULAR CAMBIUM

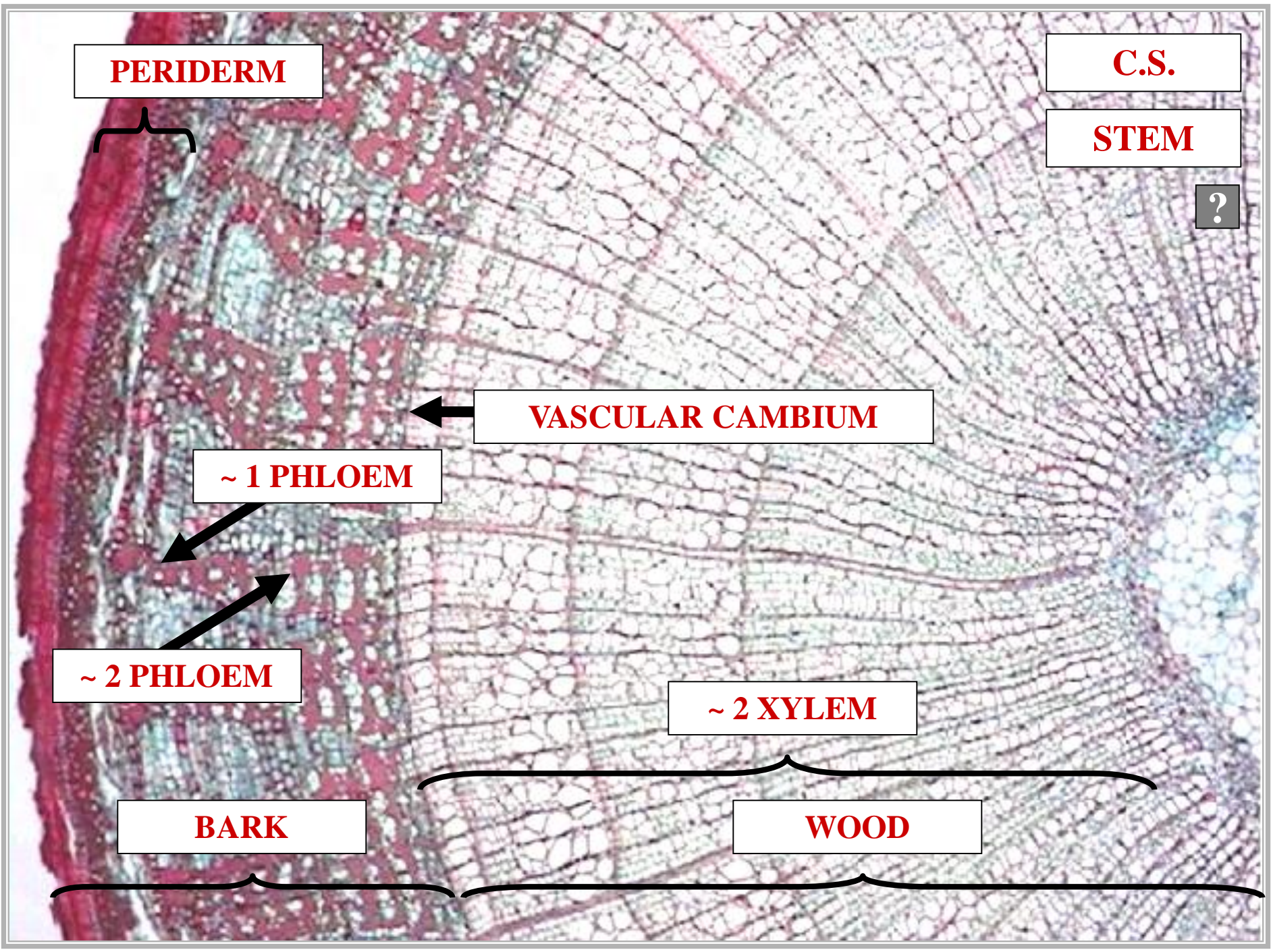
~ 1 PHLOEM

~ 2 PHLOEM

?

BARK

WOOD



PERIDERM

C.S.

STEM

?

VASCULAR CAMBIUM

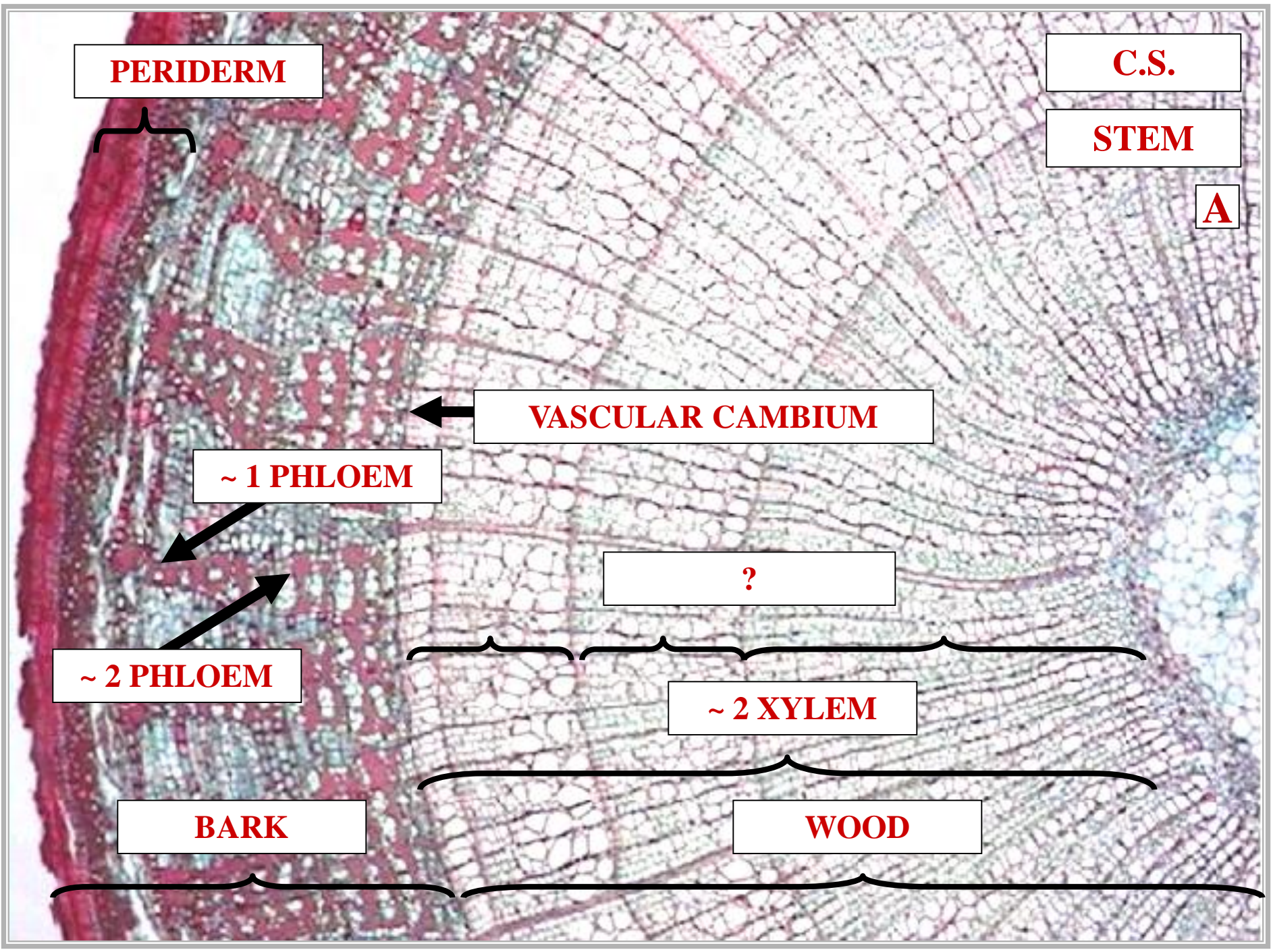
~ 1 PHLOEM

~ 2 PHLOEM

~ 2 XYLEM

BARK

WOOD



PERIDERM

C.S.

STEM

A

VASCULAR CAMBIUM

~ 1 PHLOEM

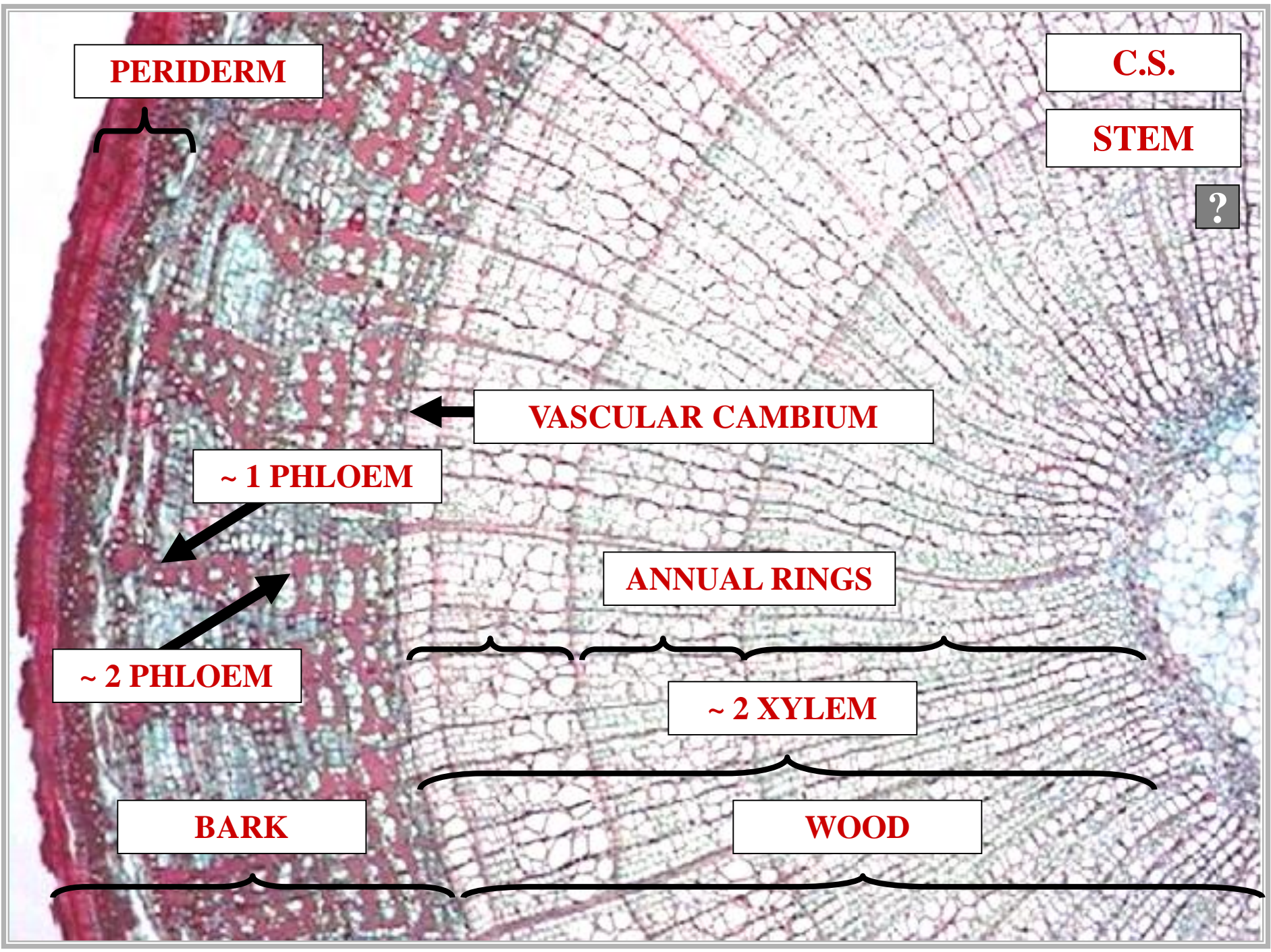
?

~ 2 PHLOEM

~ 2 XYLEM

BARK

WOOD



PERIDERM

C.S.

STEM

?

VASCULAR CAMBIUM

~ 1 PHLOEM

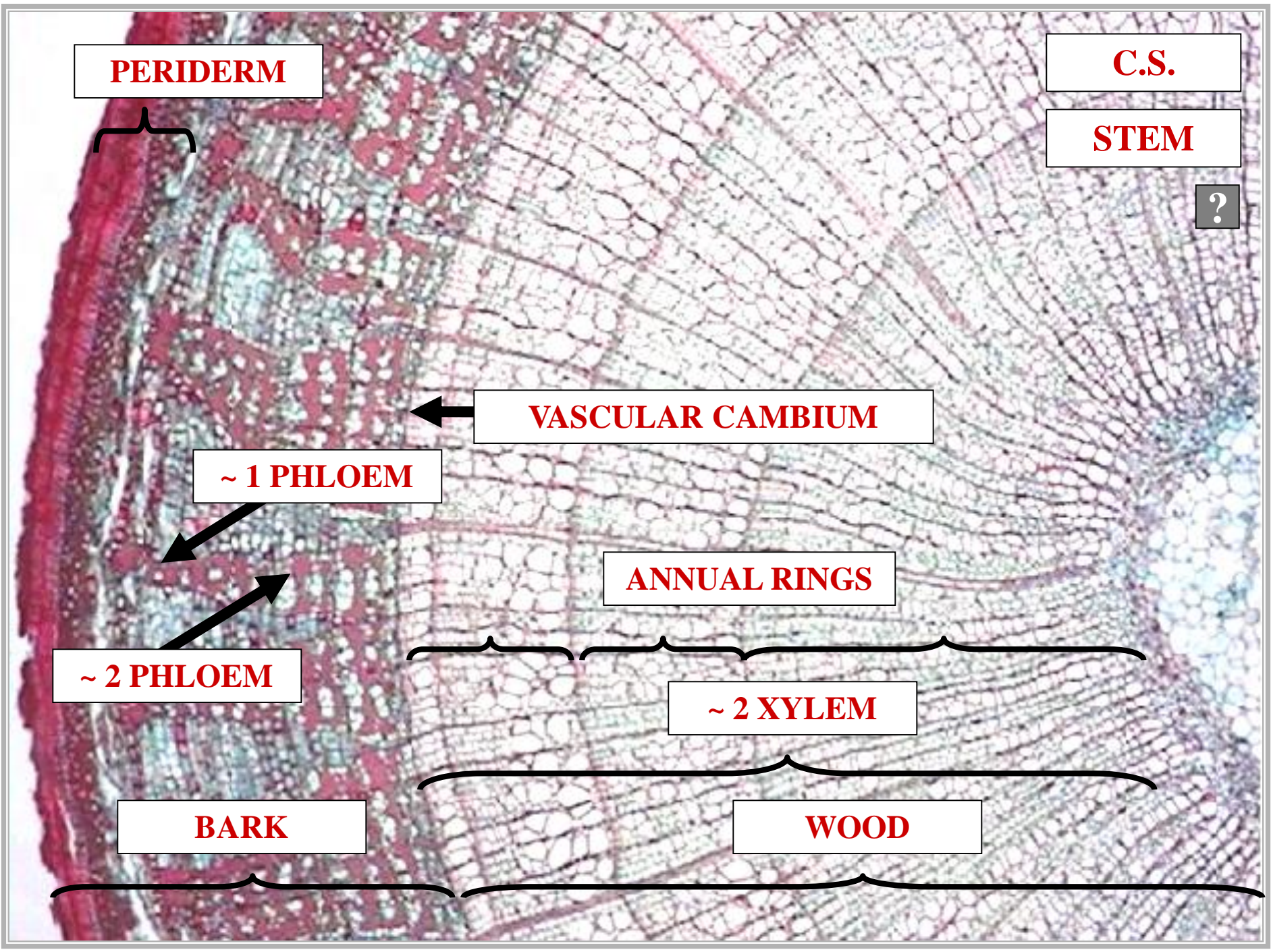
ANNUAL RINGS

~ 2 PHLOEM

~ 2 XYLEM

BARK

WOOD



PERIDERM

C.S.

STEM

?

VASCULAR CAMBIUM

~ 1 PHLOEM

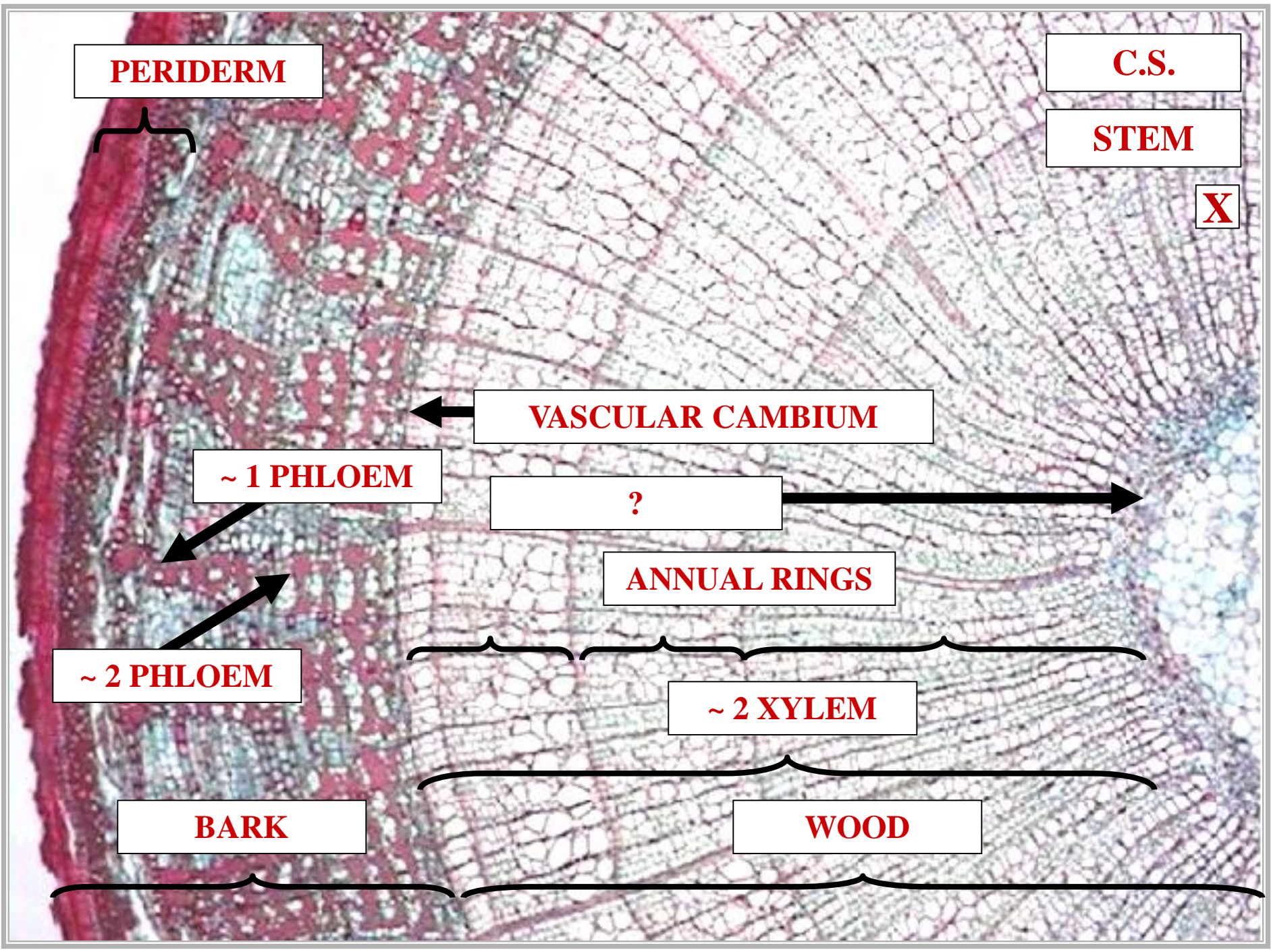
ANNUAL RINGS

~ 2 PHLOEM

~ 2 XYLEM

BARK

WOOD



PERIDERM

C.S.

STEM

X

VASCULAR CAMBIUM

~ 1 PHLOEM

?

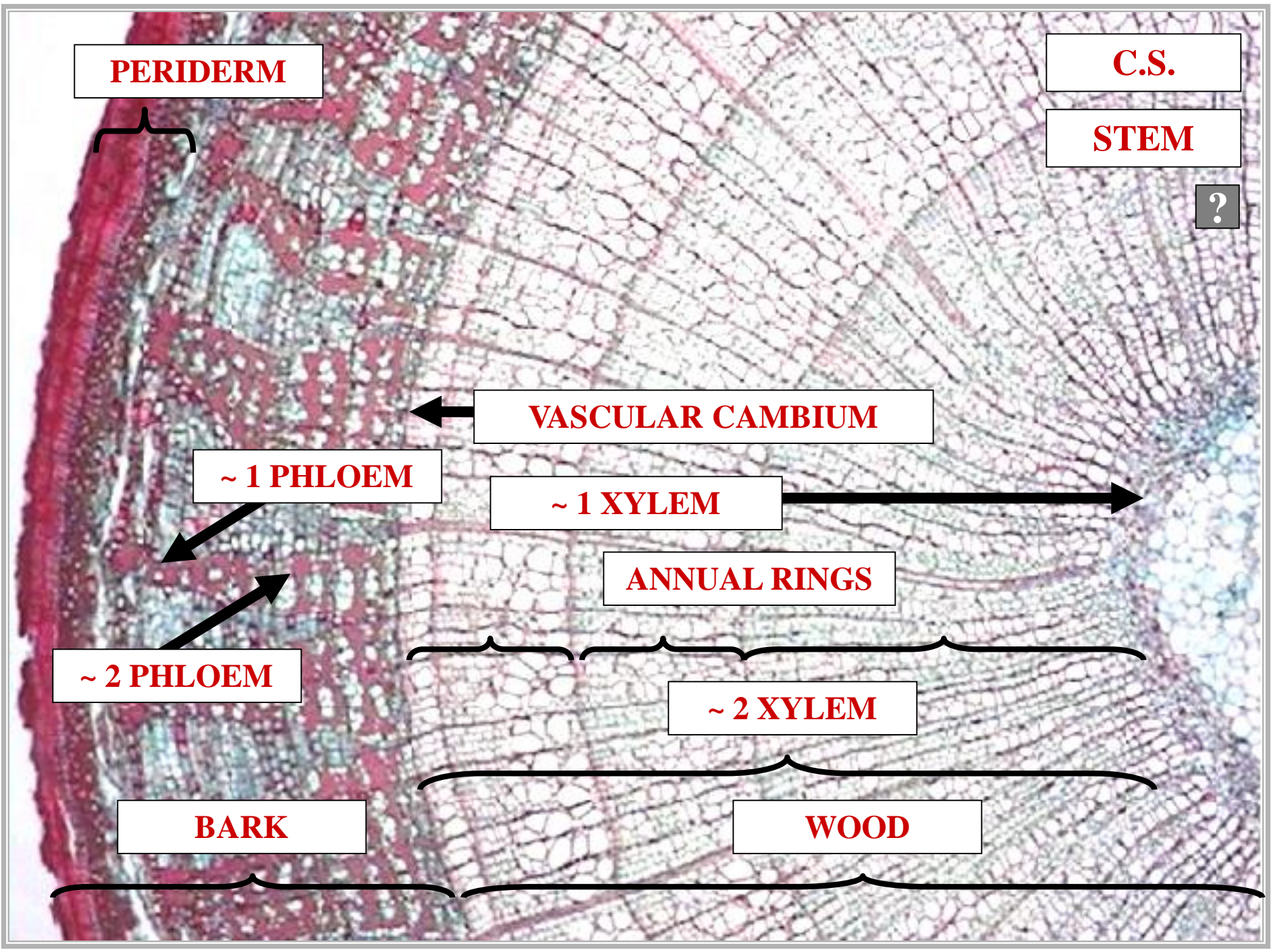
ANNUAL RINGS

~ 2 PHLOEM

~ 2 XYLEM

BARK

WOOD



PERIDERM

C.S.

STEM

?

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 1 XYLEM

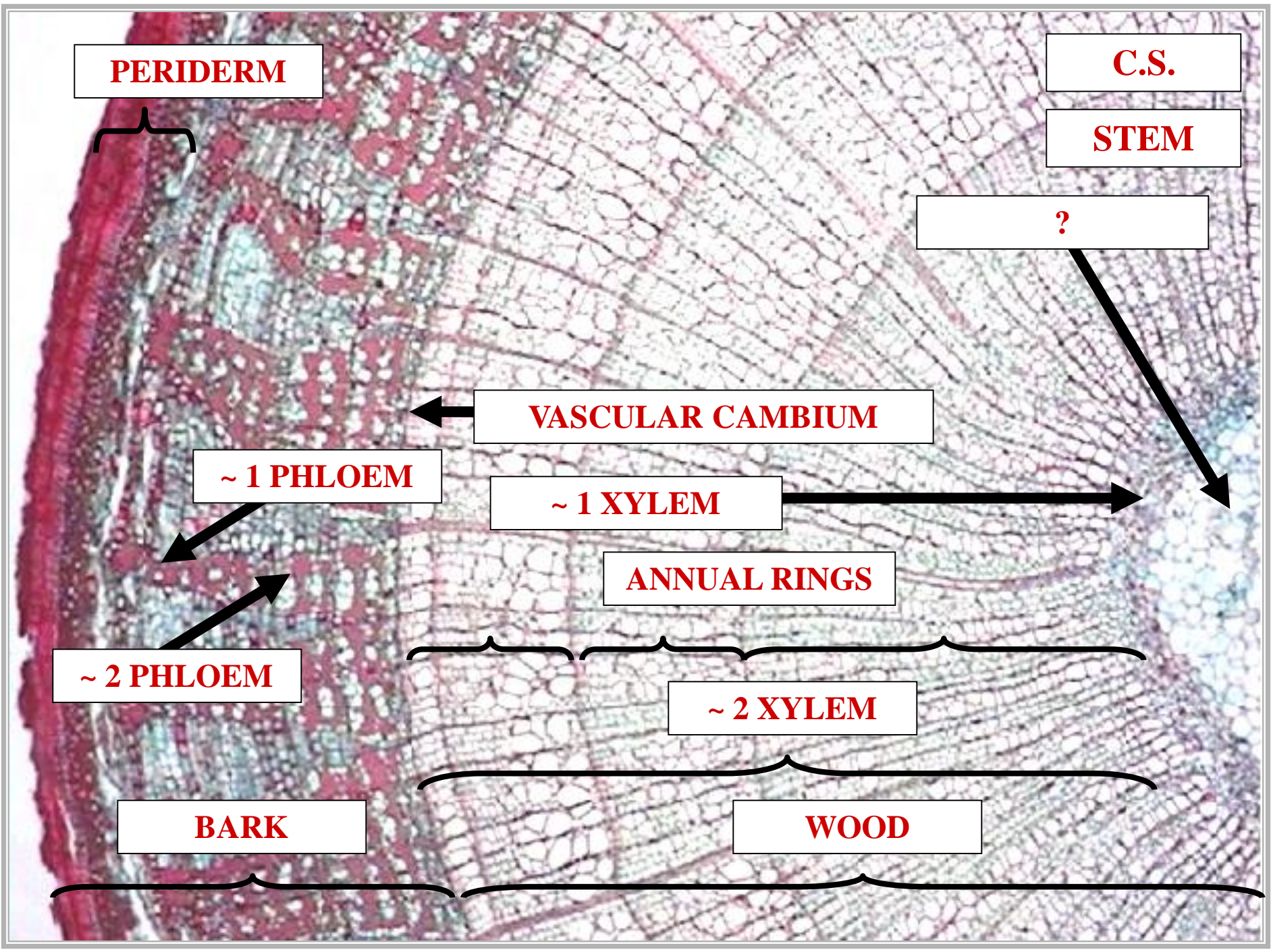
ANNUAL RINGS

~ 2 PHLOEM

~ 2 XYLEM

BARK

WOOD



PERIDERM

C.S.

STEM

?

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 1 XYLEM

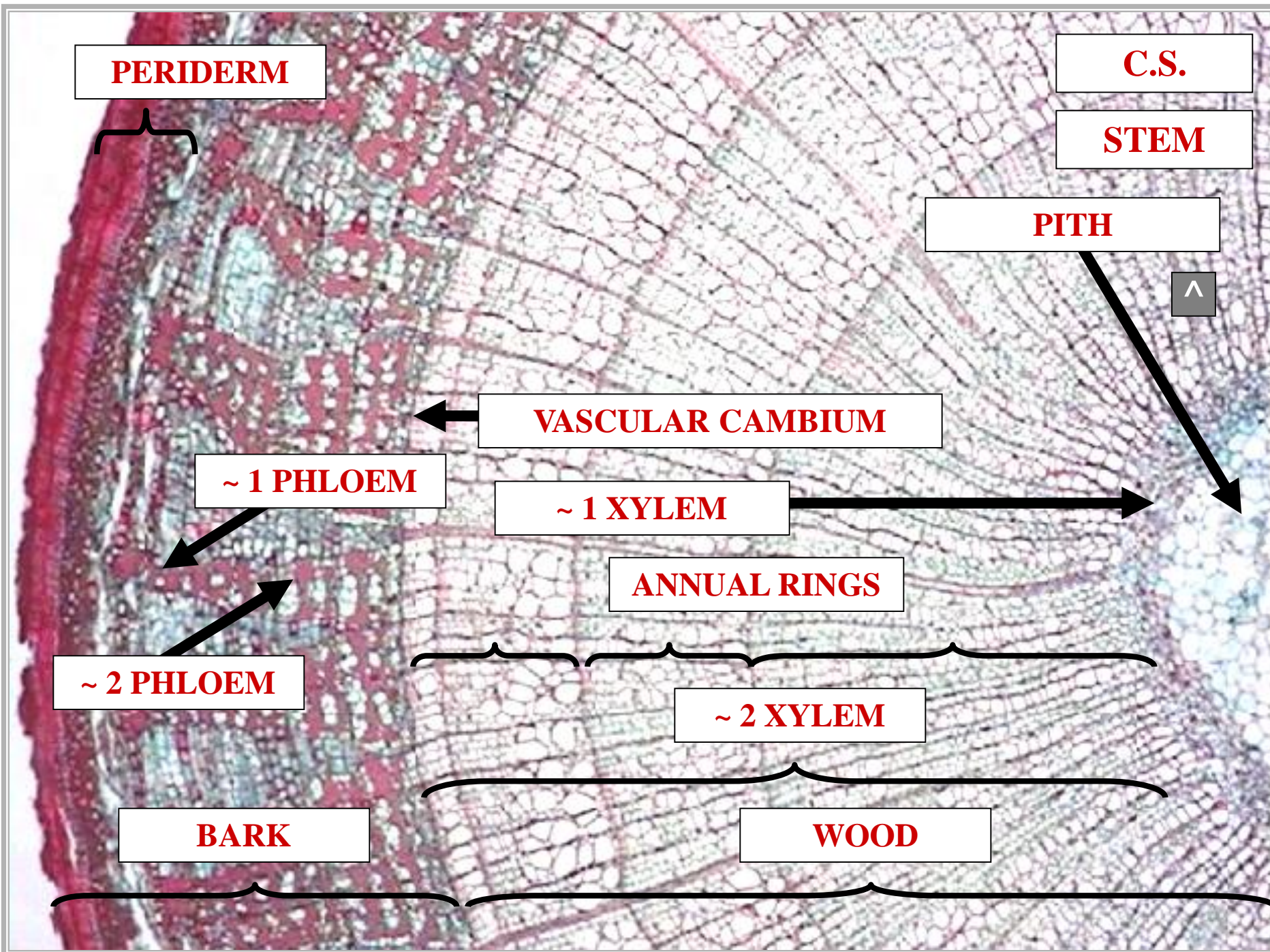
ANNUAL RINGS

~ 2 PHLOEM

~ 2 XYLEM

BARK

WOOD



PERIDERM

C.S.

STEM

PITH



VASCULAR CAMBIUM

~ 1 PHLOEM

~ 1 XYLEM

ANNUAL RINGS

~ 2 PHLOEM

~ 2 XYLEM

BARK

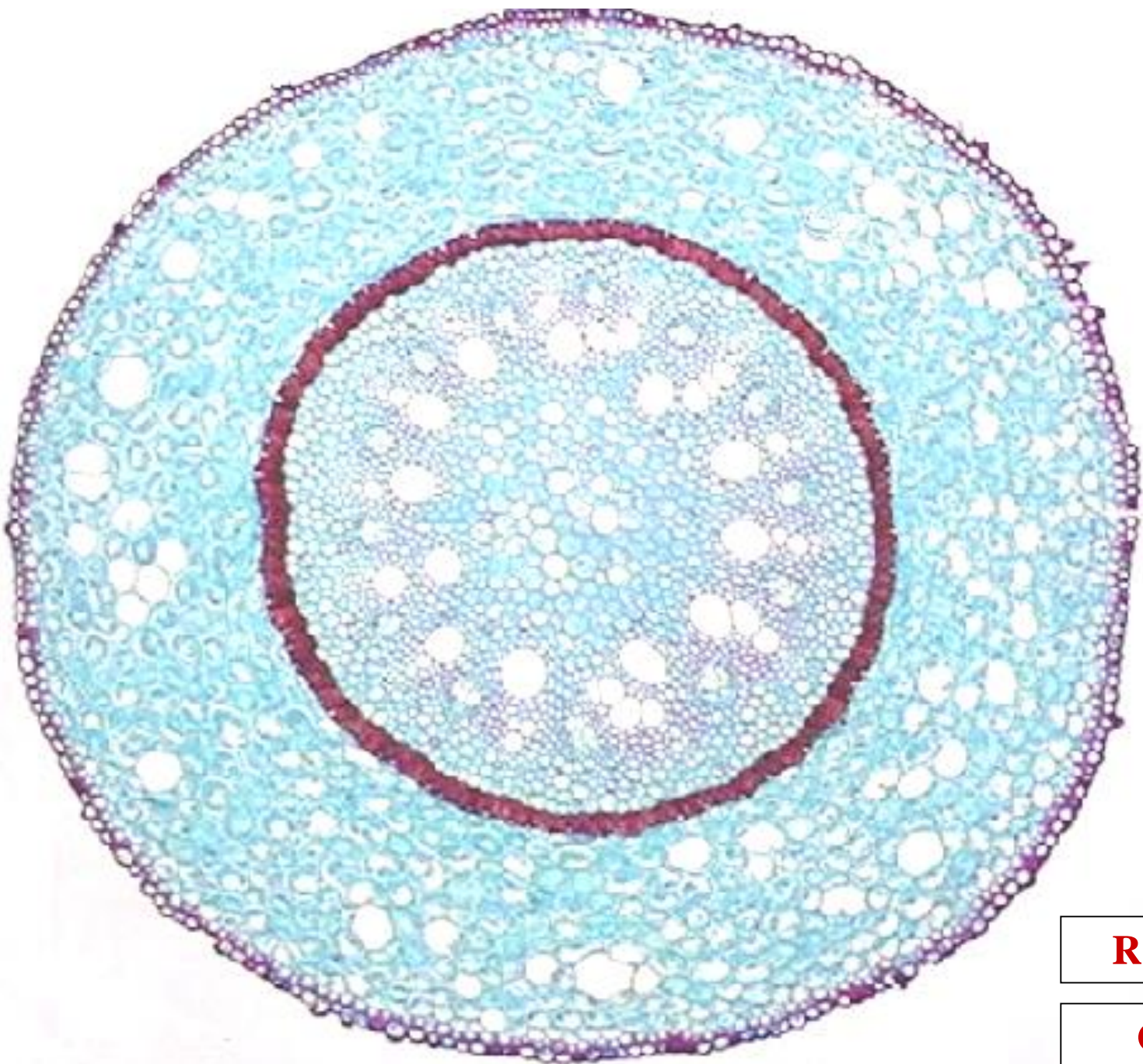
WOOD



MONOCOT ANATOMY



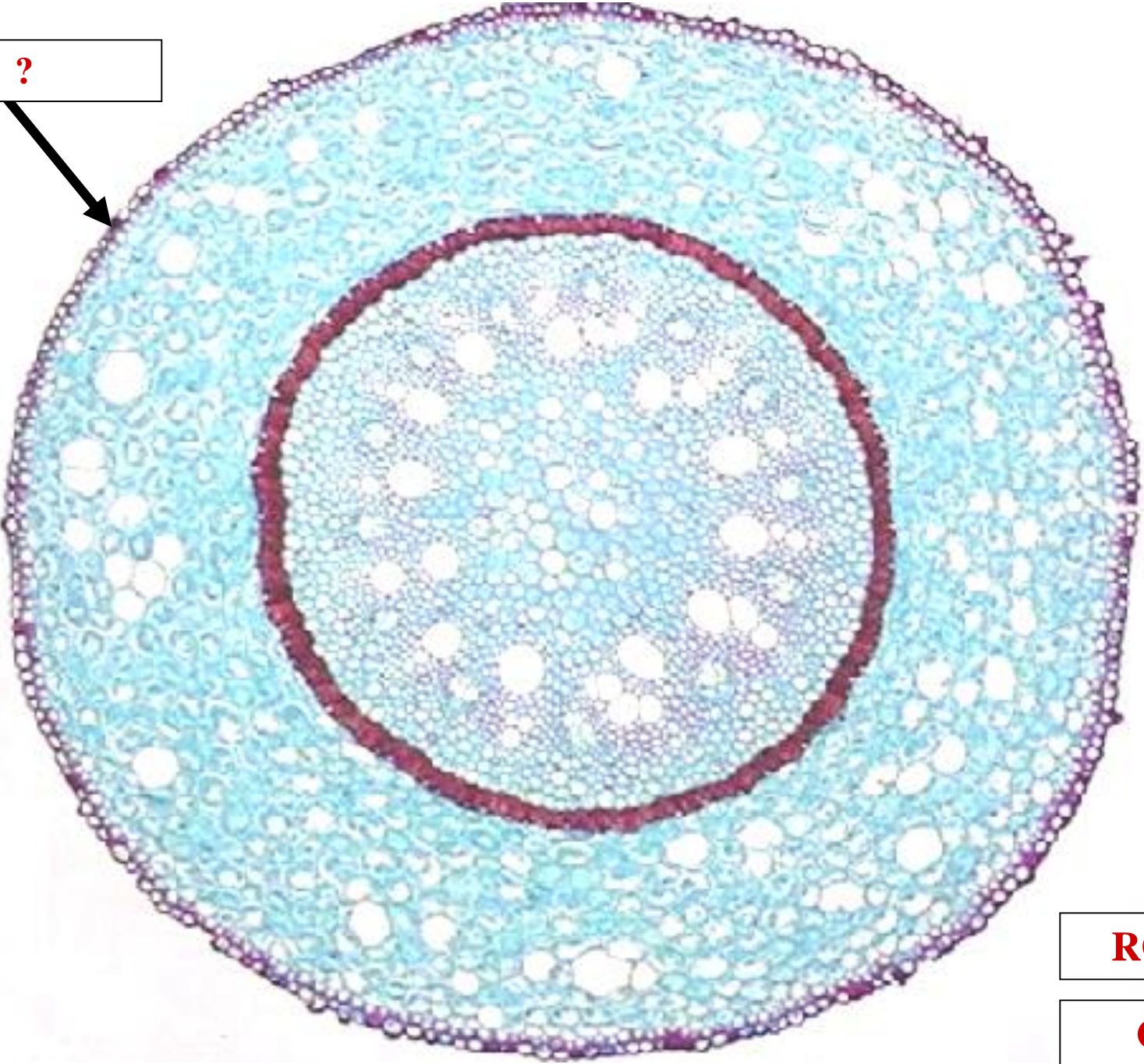
MONOCOT ROOT ANATOMY



ROOT

C.S.

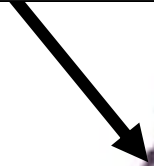
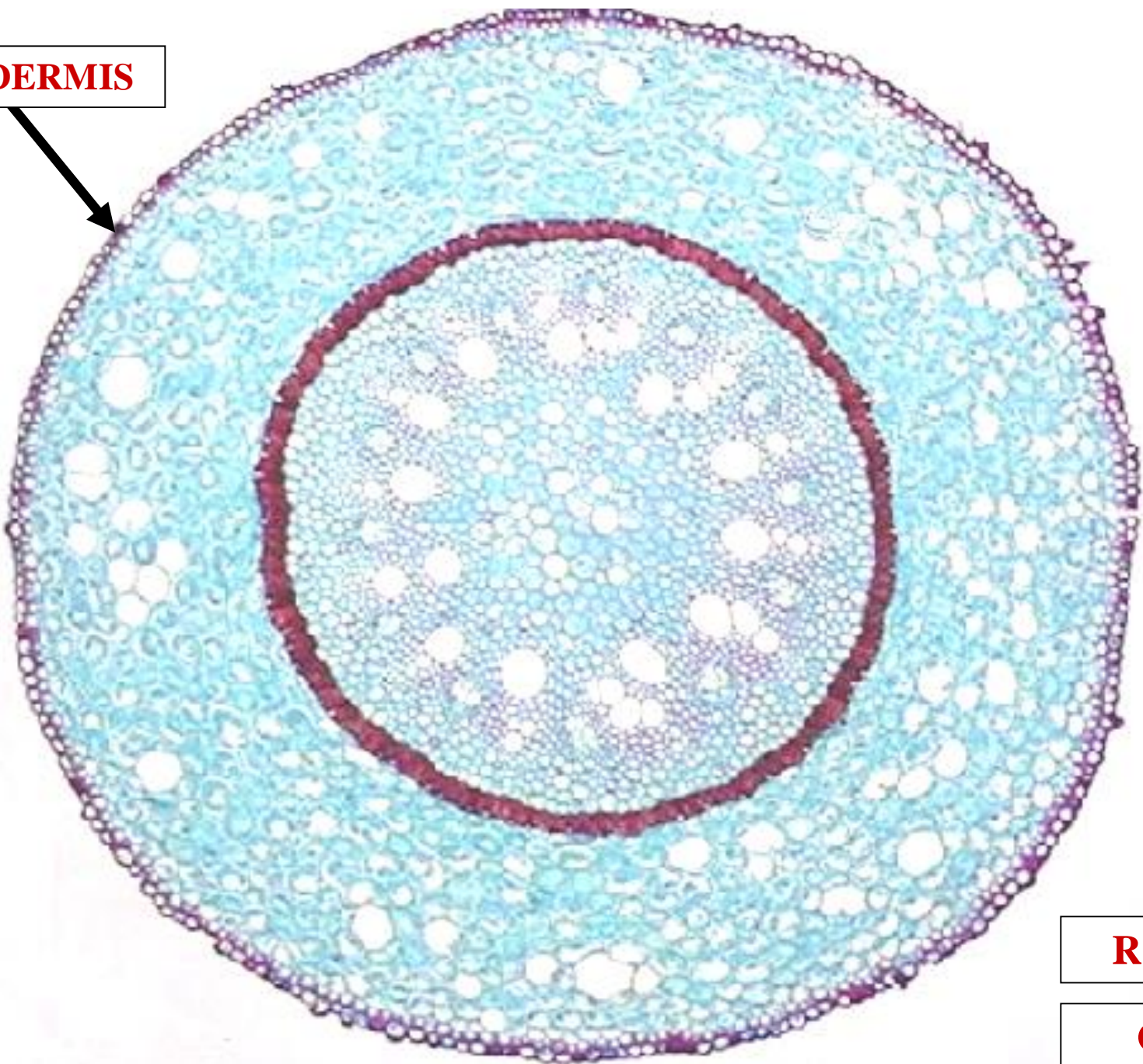
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ROOT

C.S.

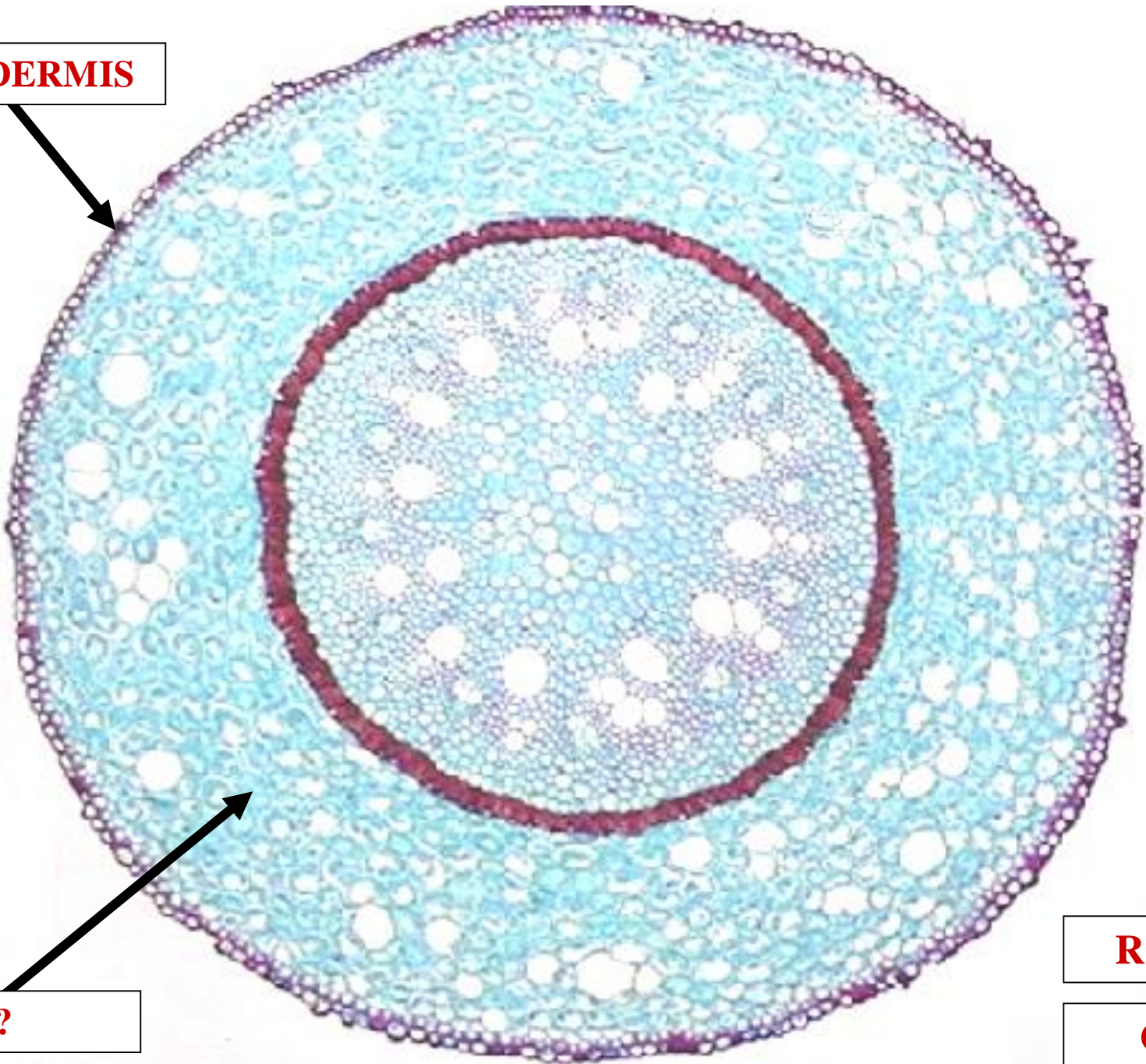
EPIDERMIS



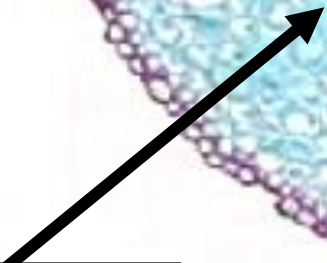
ROOT

C.S.

EPIDERMIS



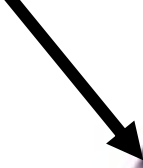
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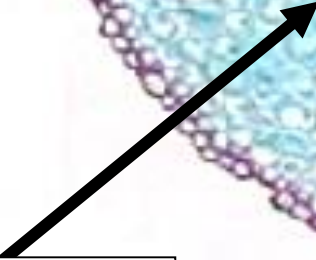
ROOT

C.S.

EPIDERMIS

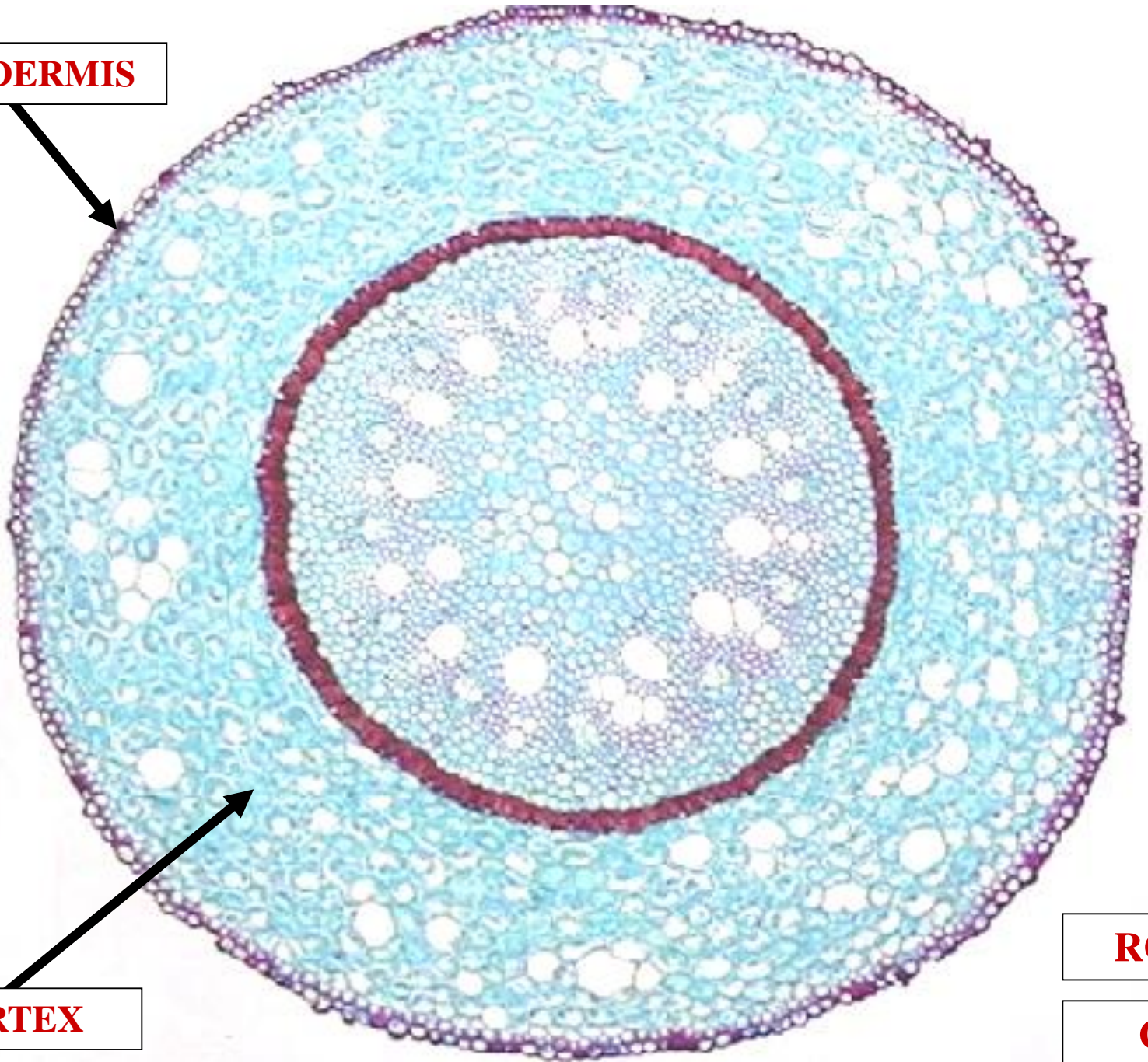


CORTEX



ROOT

C.S.





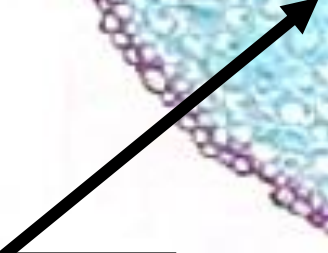
EPIDERMIS



**STELE
REGION**

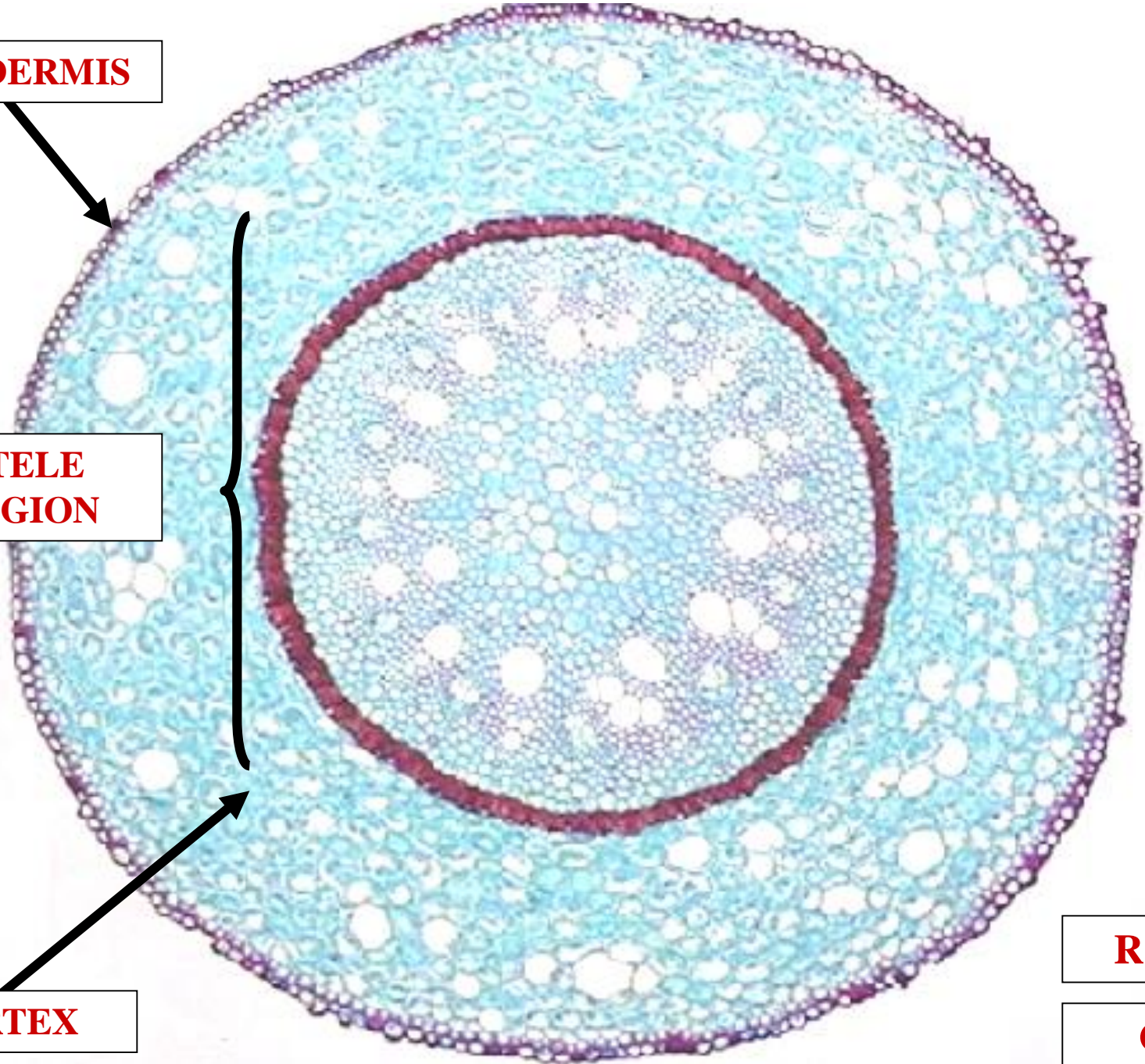


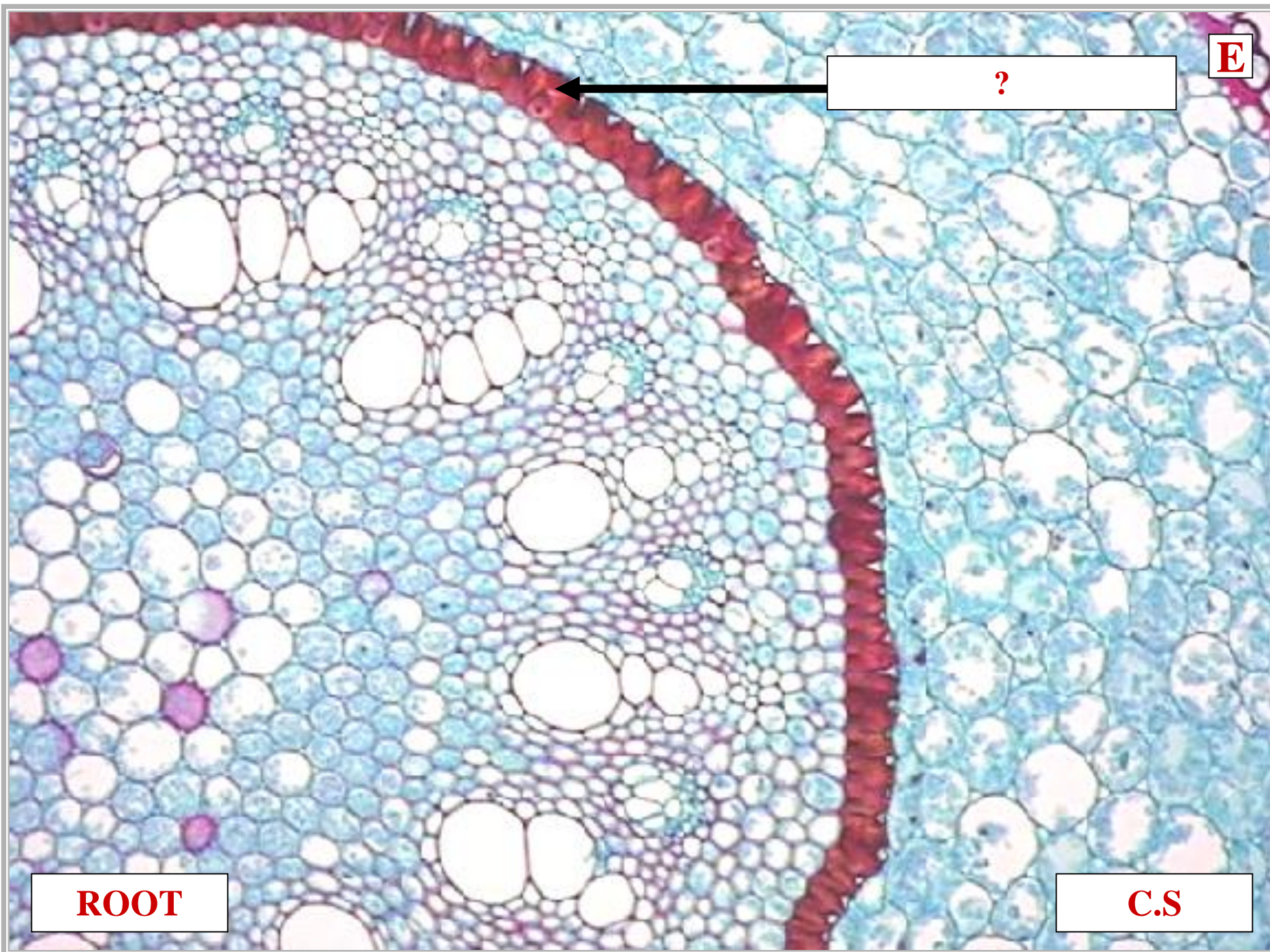
CORTEX



ROOT

C.S.



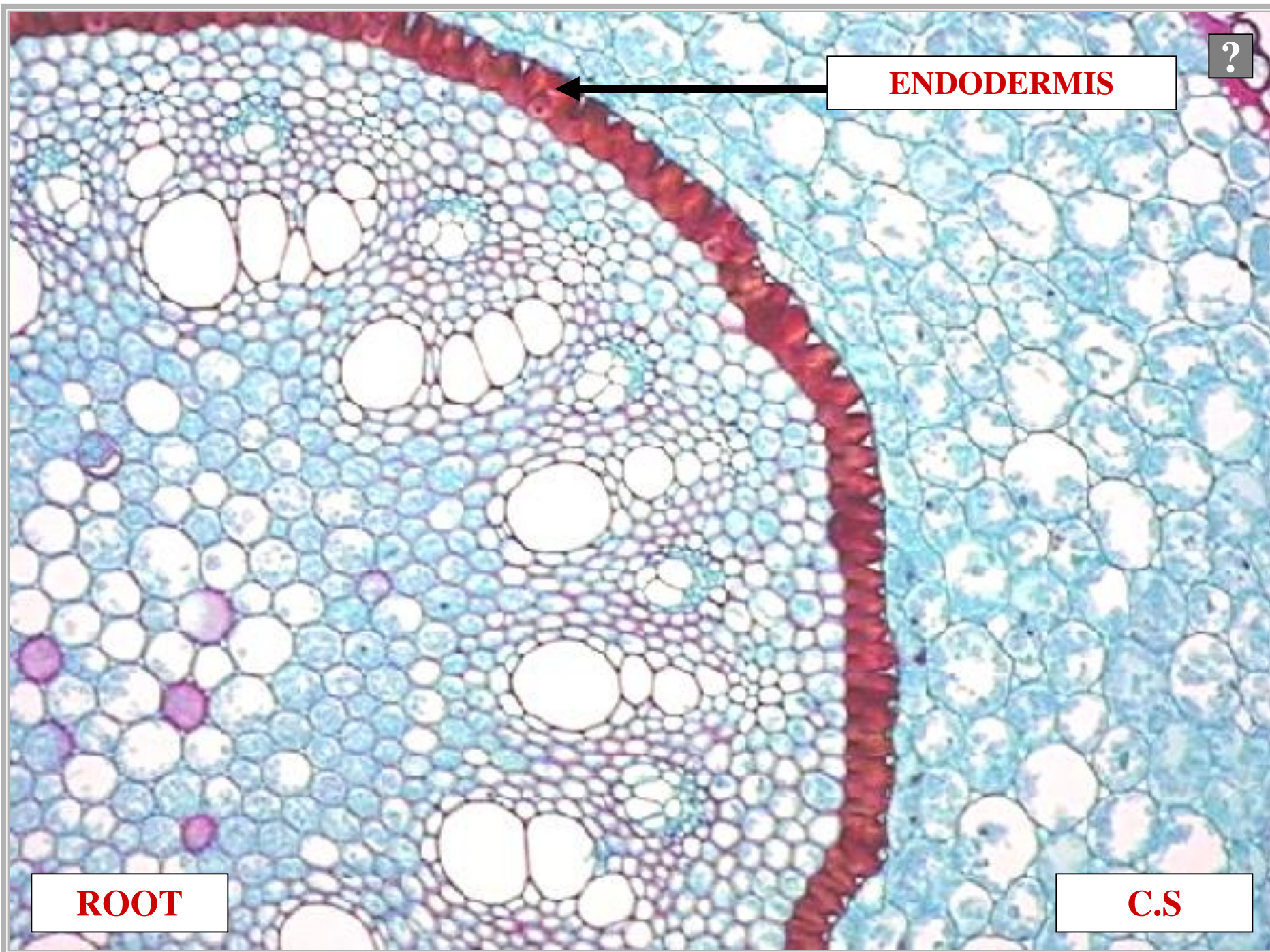


E

?

ROOT

C.S

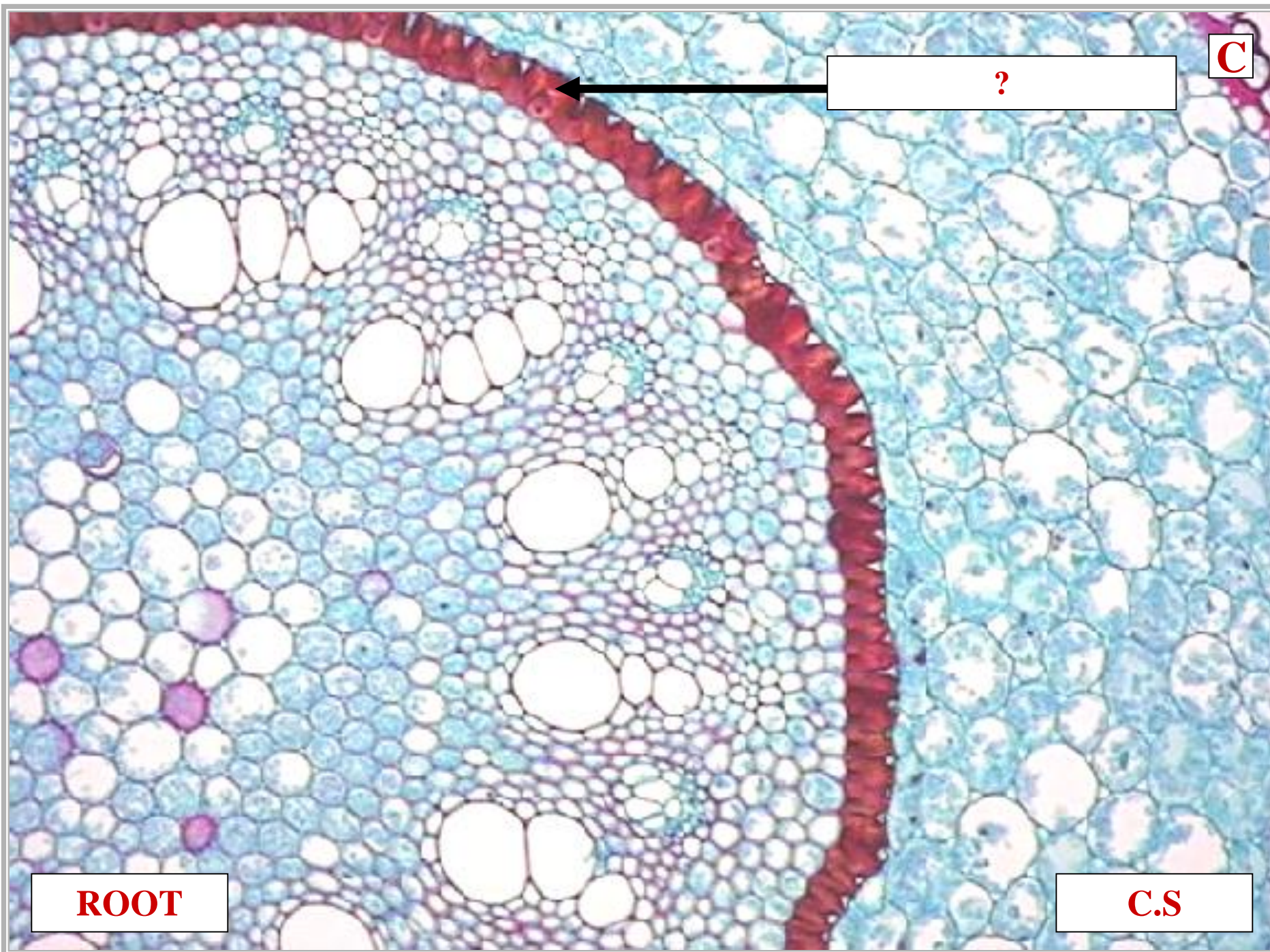


?

ENDODERMIS

ROOT

C.S



C

?

ROOT

C.S

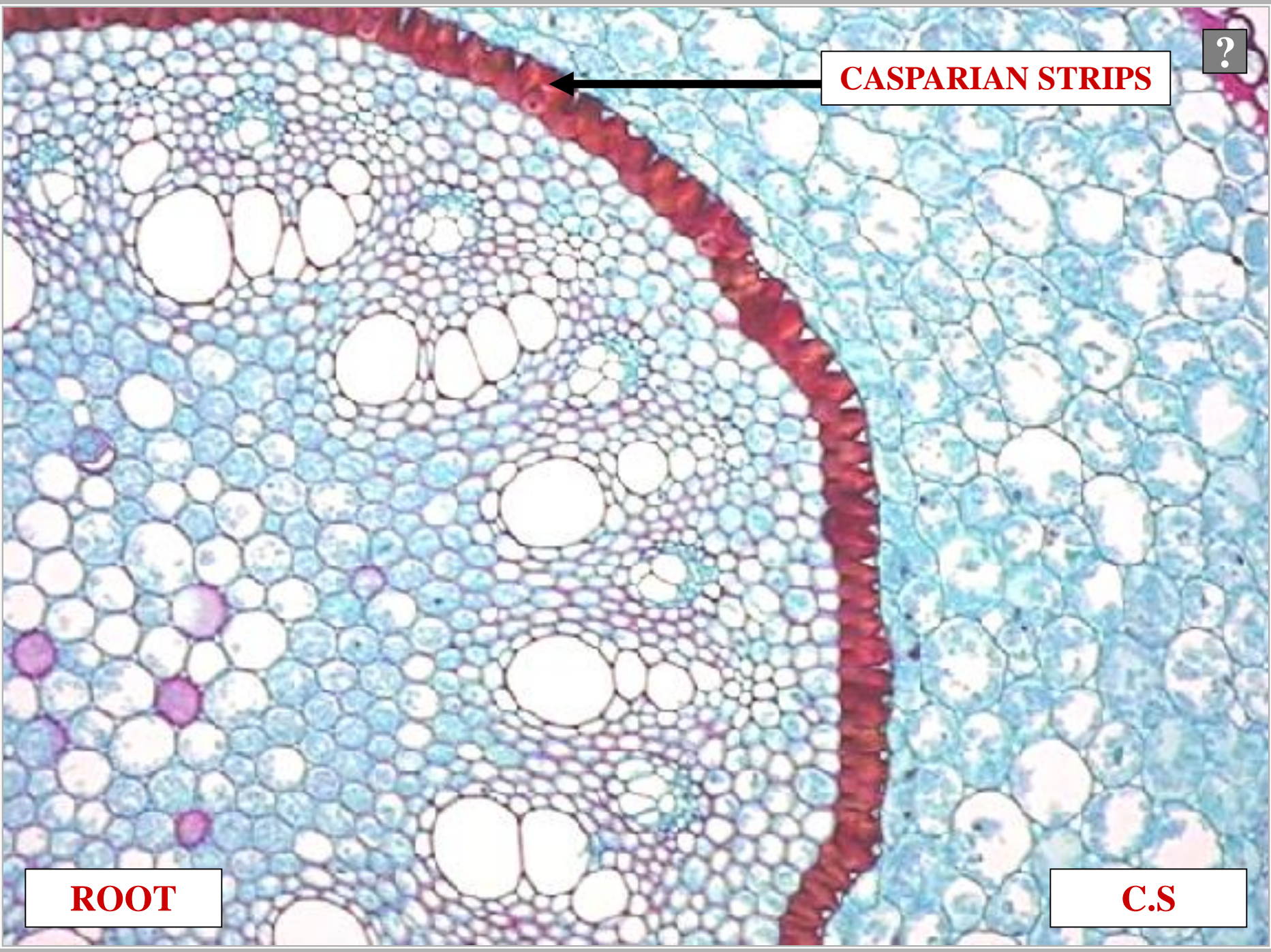
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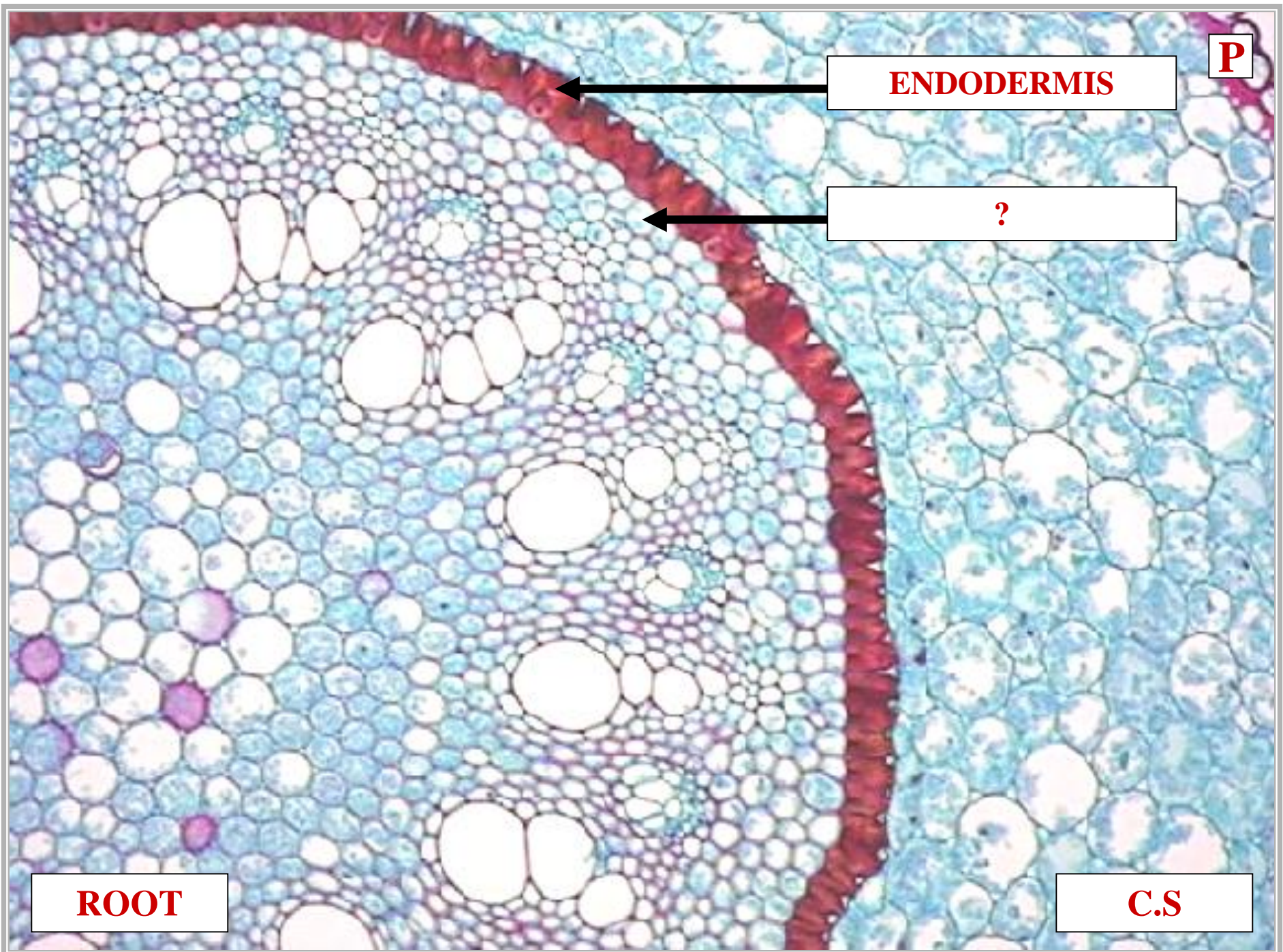
CASPARIAN STRIPS



ROOT

C.S





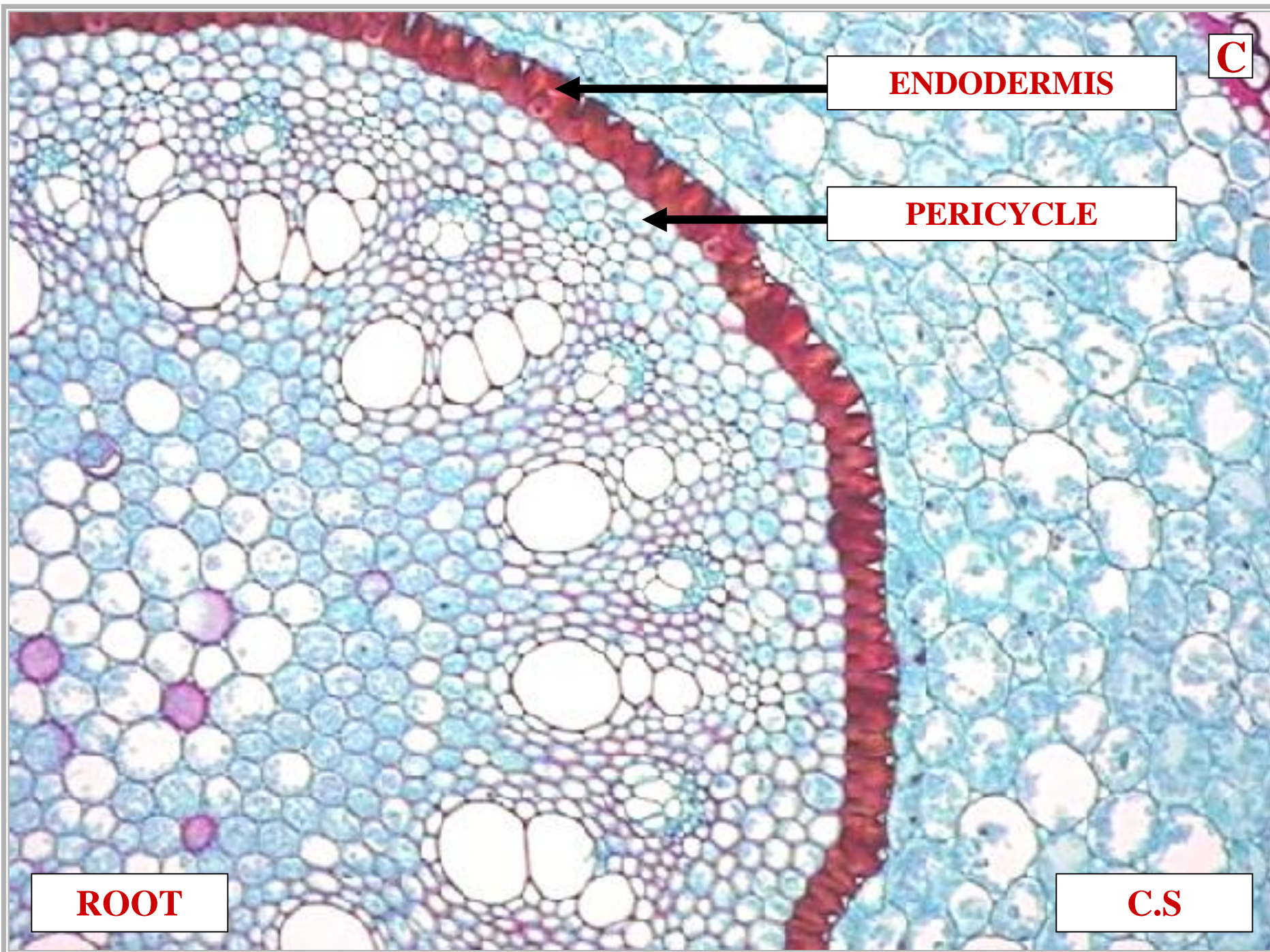
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ENDODERMIS

?

ROOT

C.S



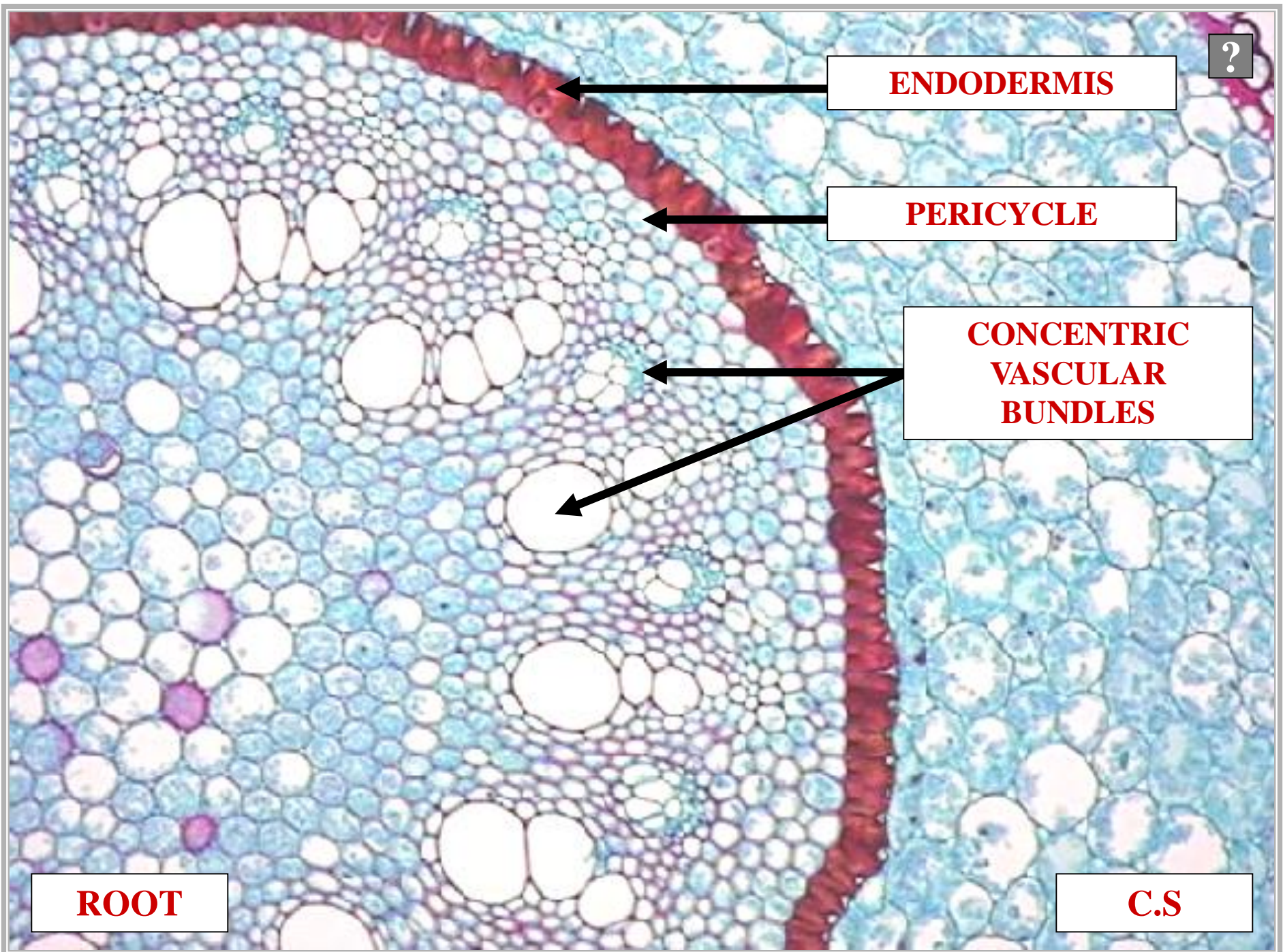
C

ENDODERMIS

PERICYCLE

ROOT

C.S



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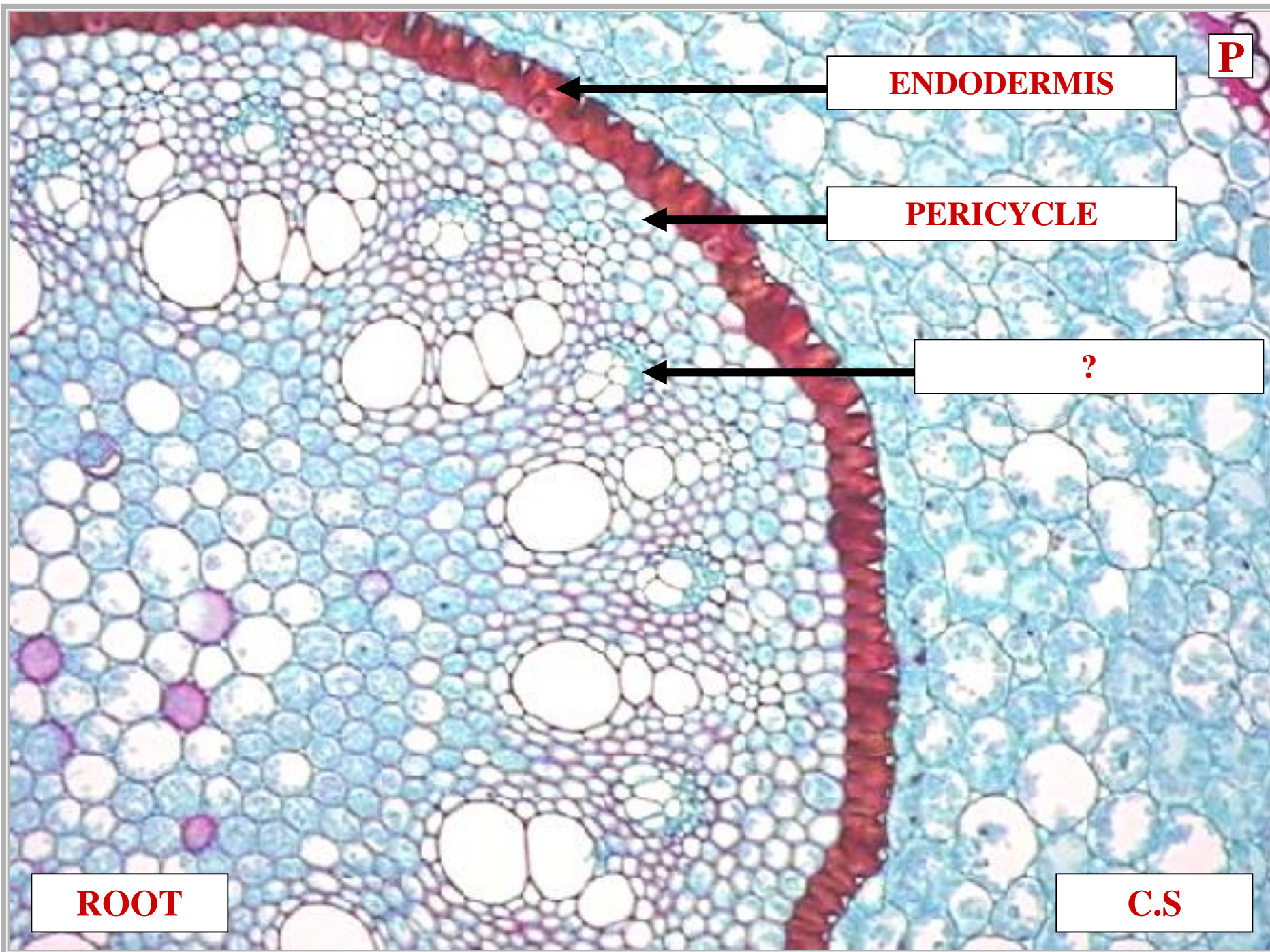
ENDODERMIS

PERICYCLE

**CONCENTRIC
VASCULAR
BUNDLES**

ROOT

C.S



P

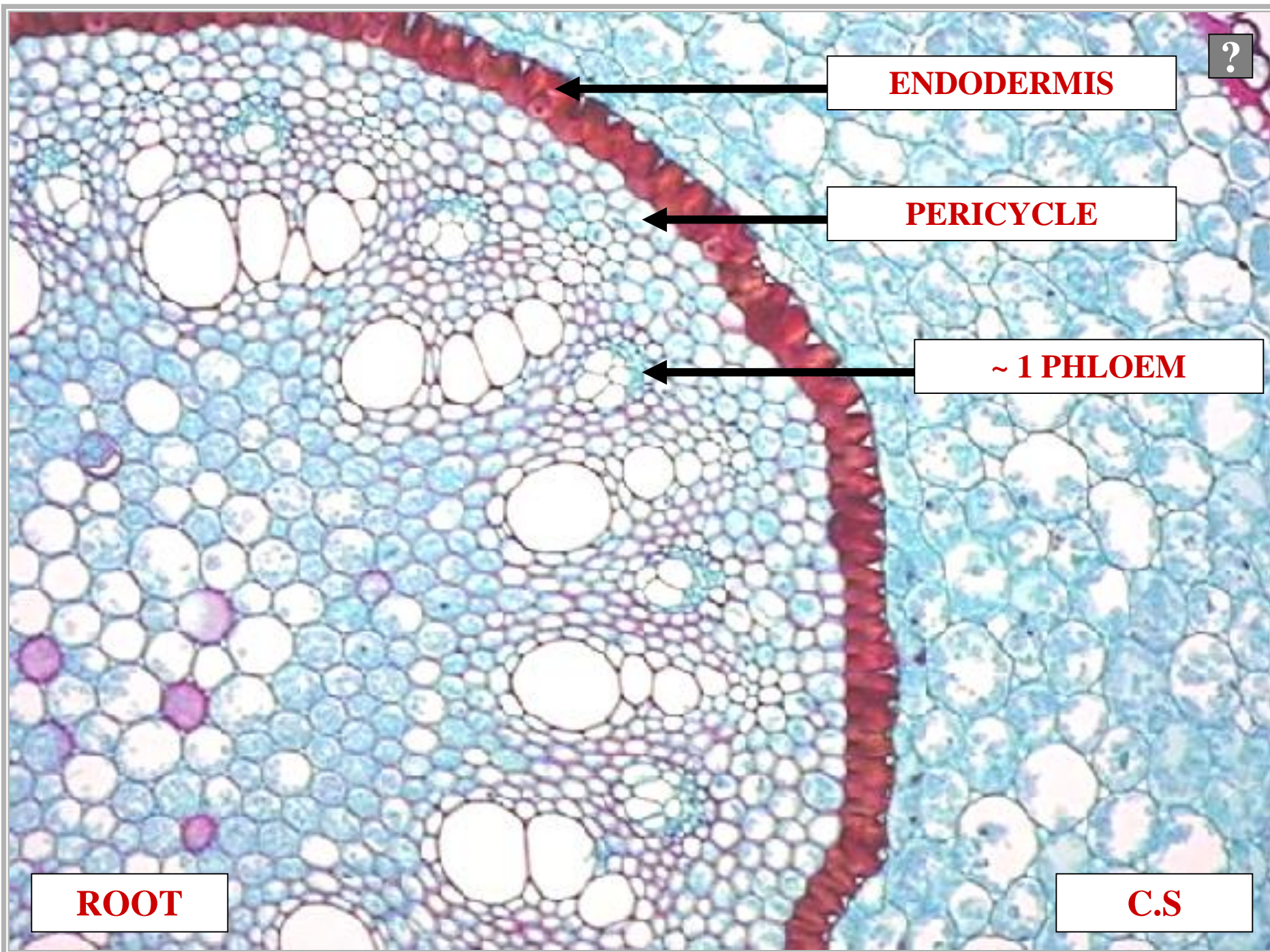
ENDODERMIS

PERICYCLE

?

ROOT

C.S



?

ENDODERMIS

PERICYCLE

~ 1 PHLOEM

ROOT

C.S

X

ENDODERMIS

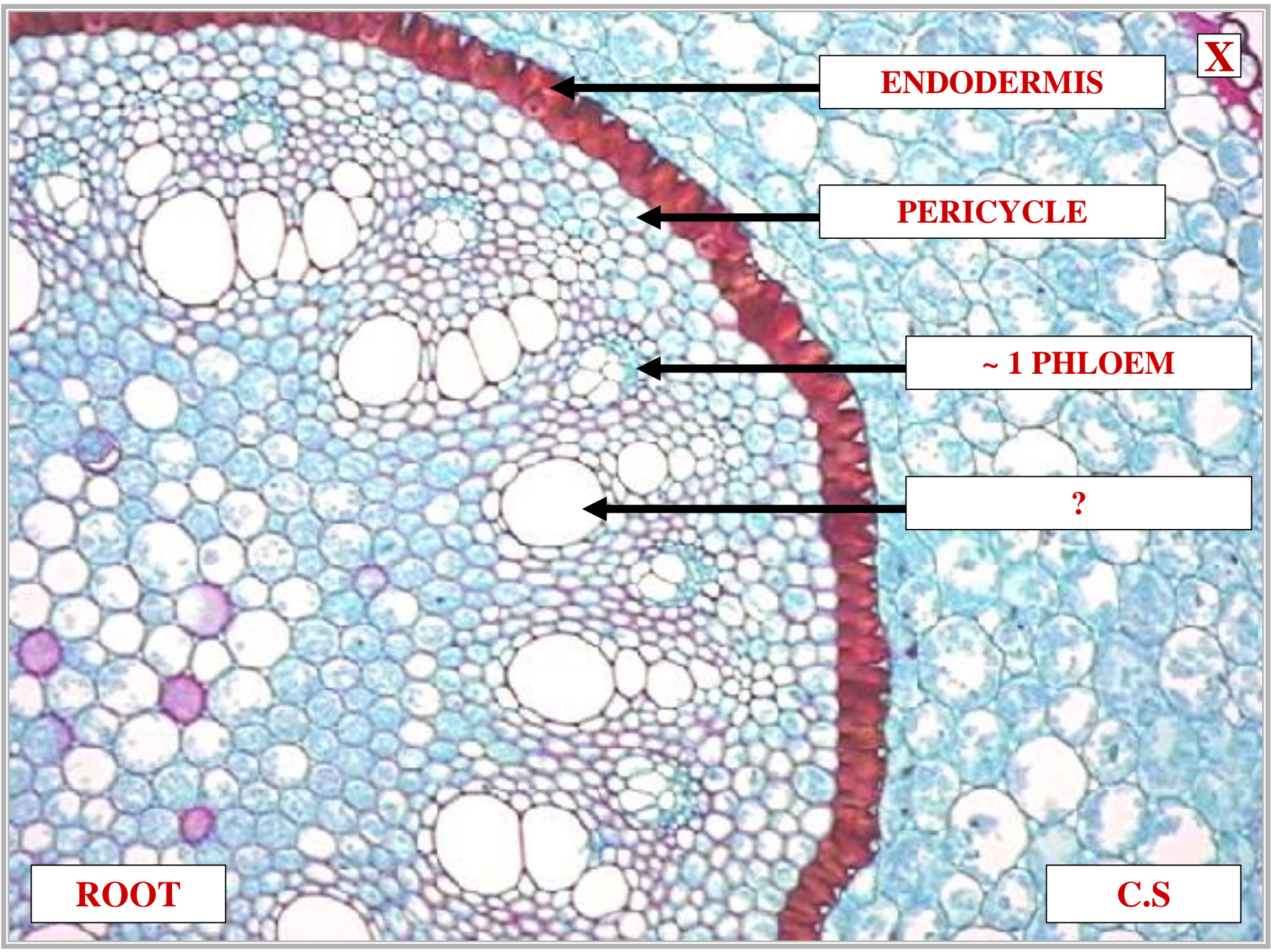
PERICYCLE

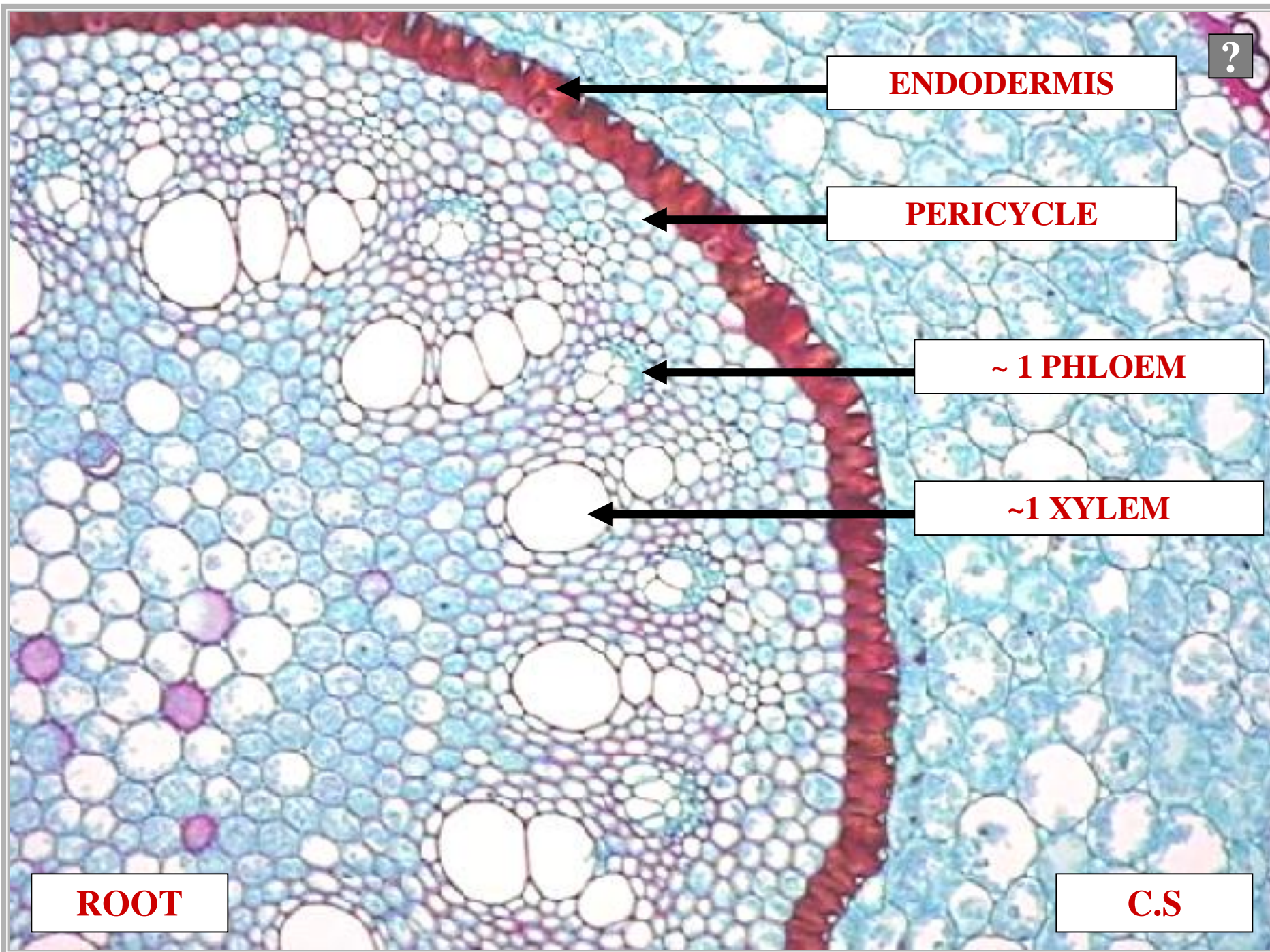
~ 1 PHLOEM

?

ROOT

C.S





?

ENDODERMIS

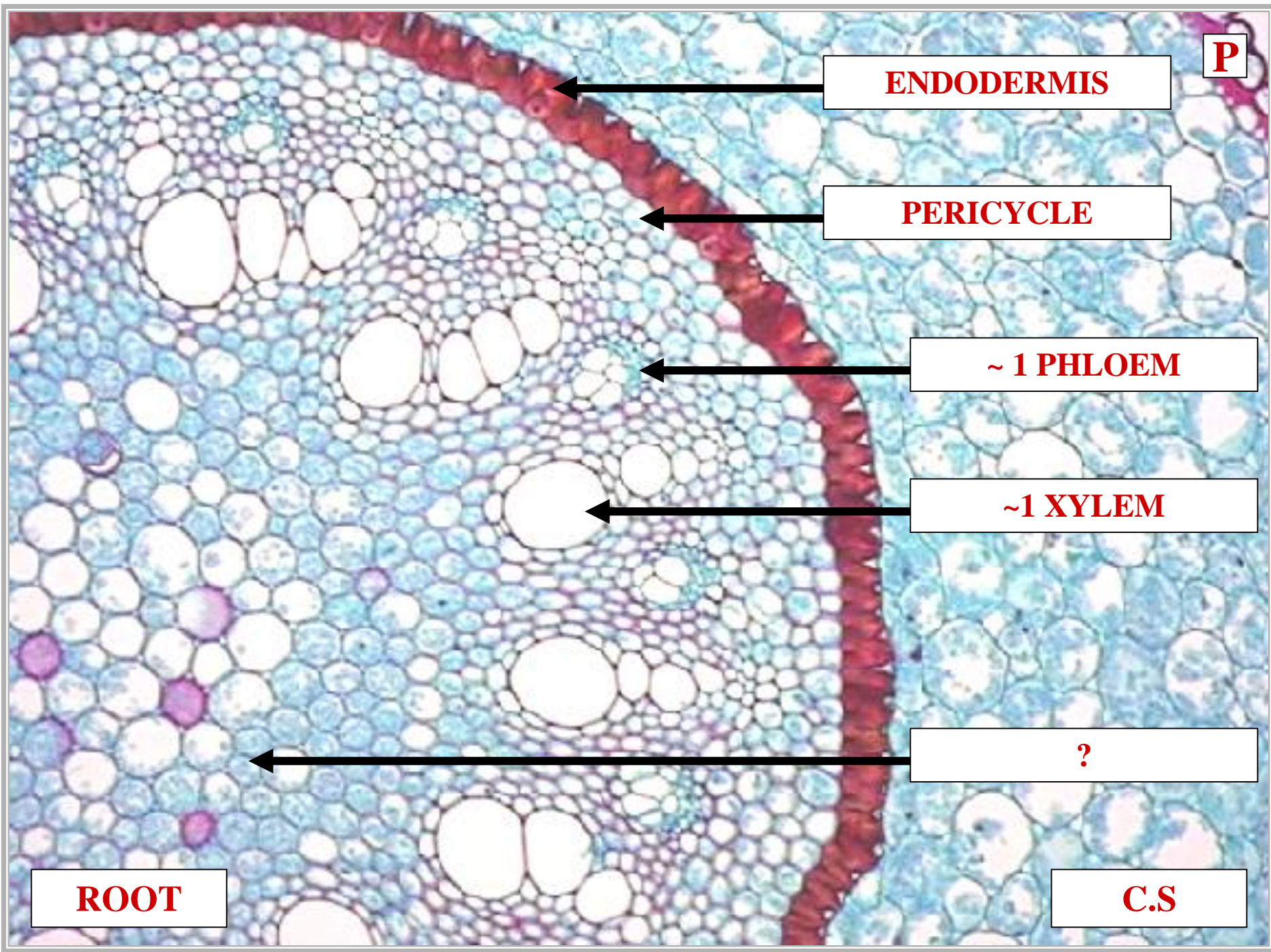
PERICYCLE

~ 1 PHLOEM

~1 XYLEM

ROOT

C.S



P

ENDODERMIS

PERICYCLE

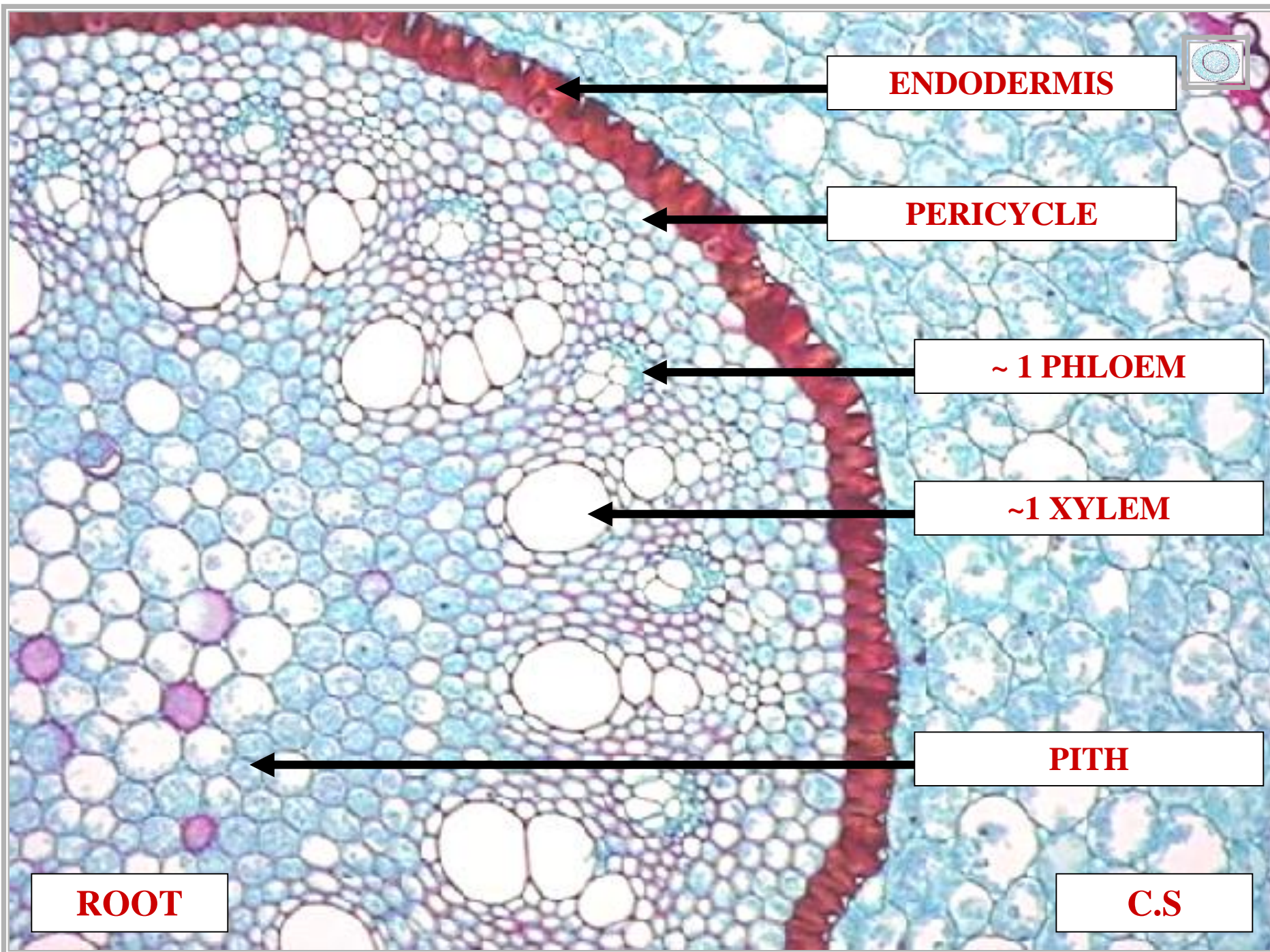
~ 1 PHLOEM

~ 1 XYLEM

?

ROOT

C.S



ENDODERMIS

PERICYCLE

~ 1 PHLOEM

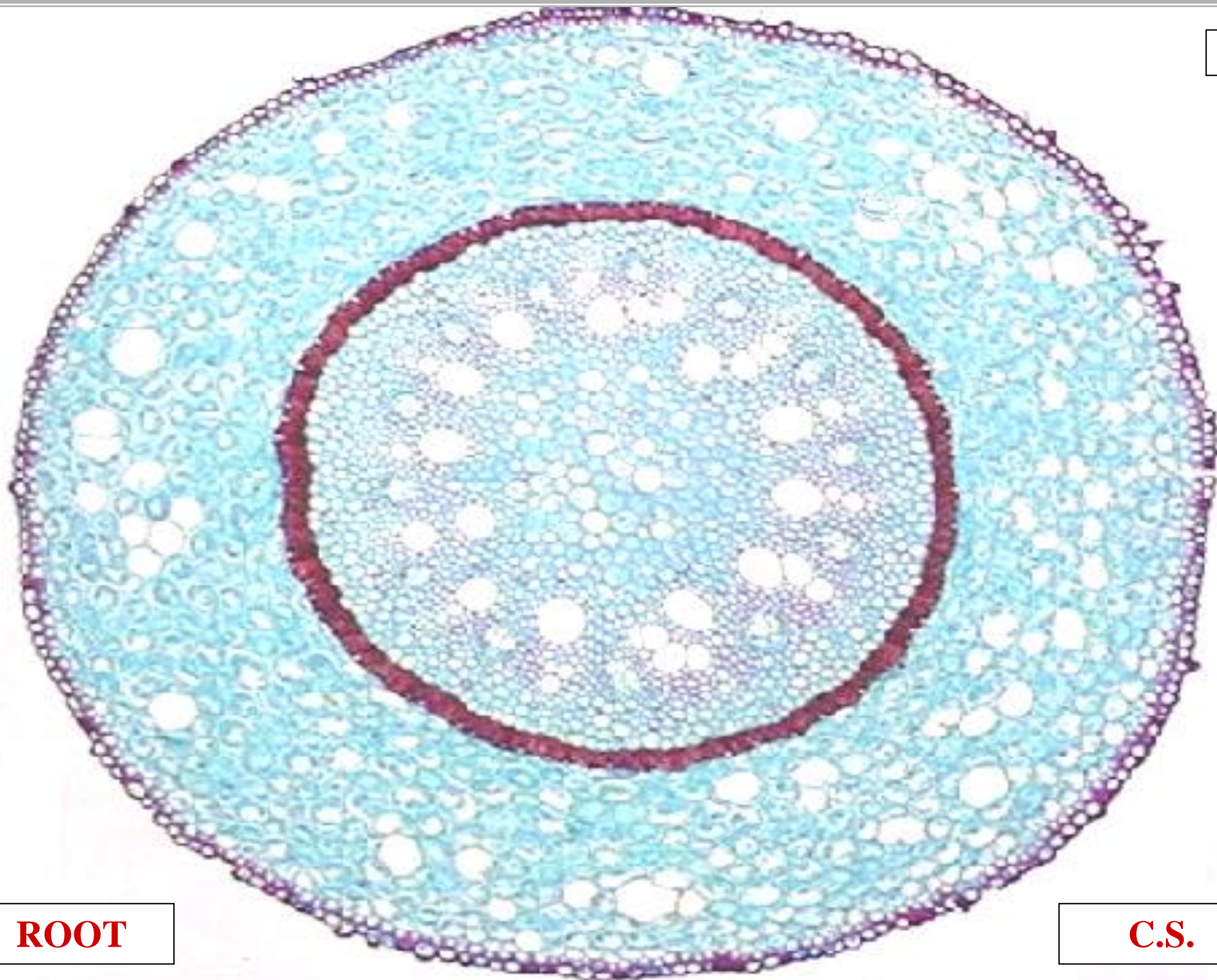
~1 XYLEM

PITH

ROOT

C.S

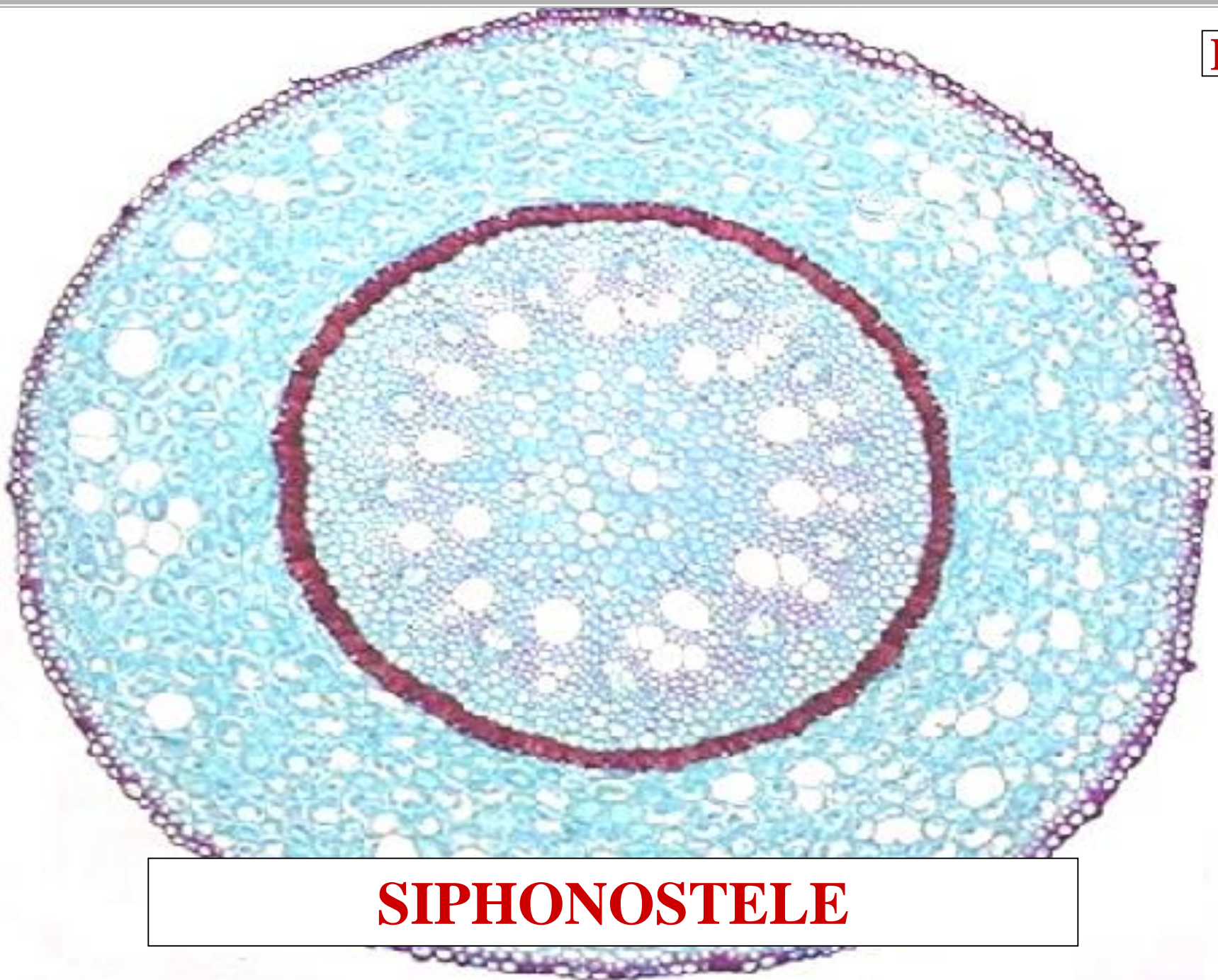
S



ROOT

C.S.

E



SIPHONOSTELE



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AB

SIPHONOSTELE / EUSTELE



AB



**MONOCOT ROOT
VASCULAR CAMBIUM
ABSENT**

SIPHONOSTELE / EUSTELE

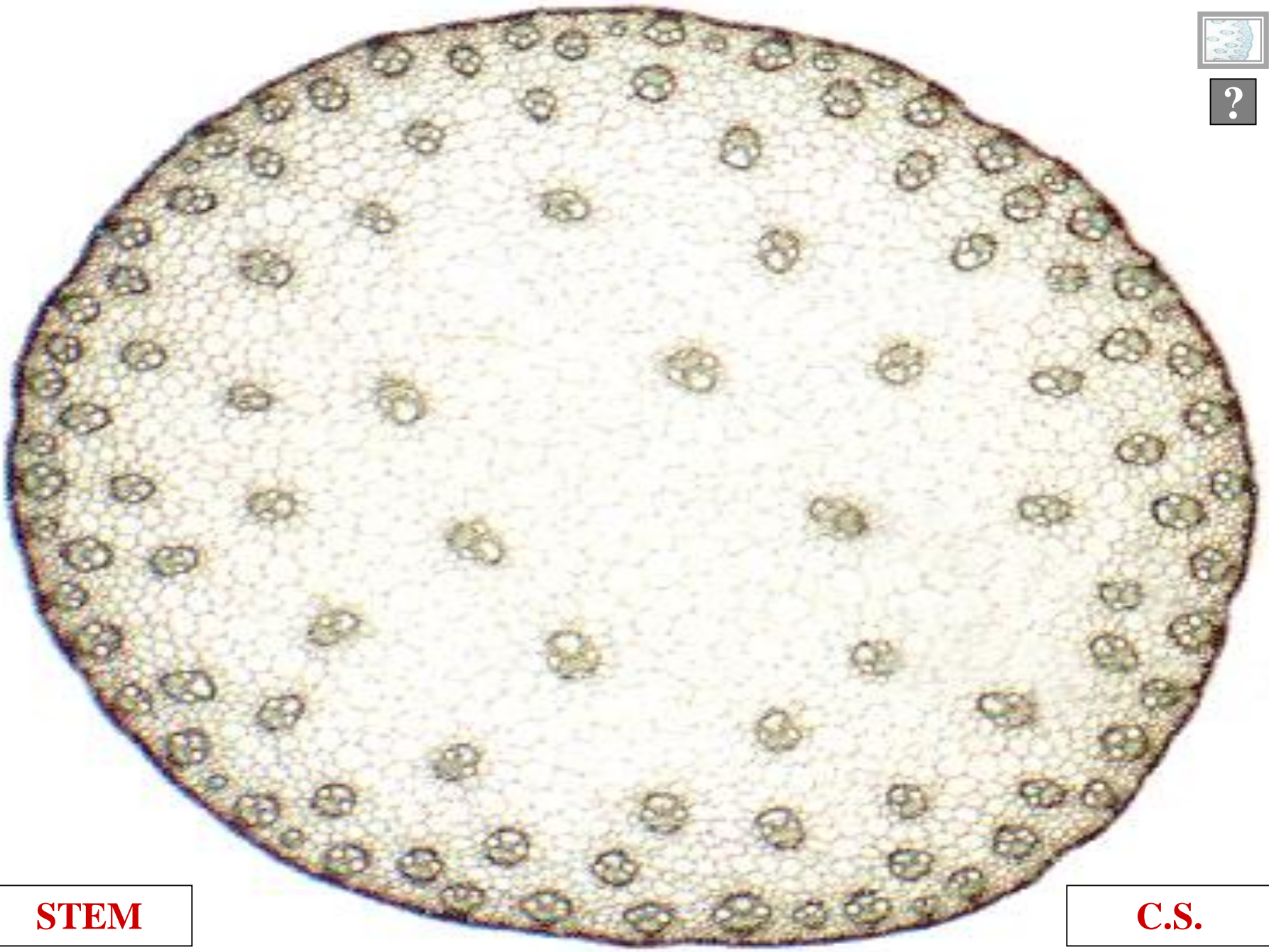


**MONOCOT ROOT
SECONDARY GROWTH
ABSENT**

SIPHONOSTELE / EUSTELE



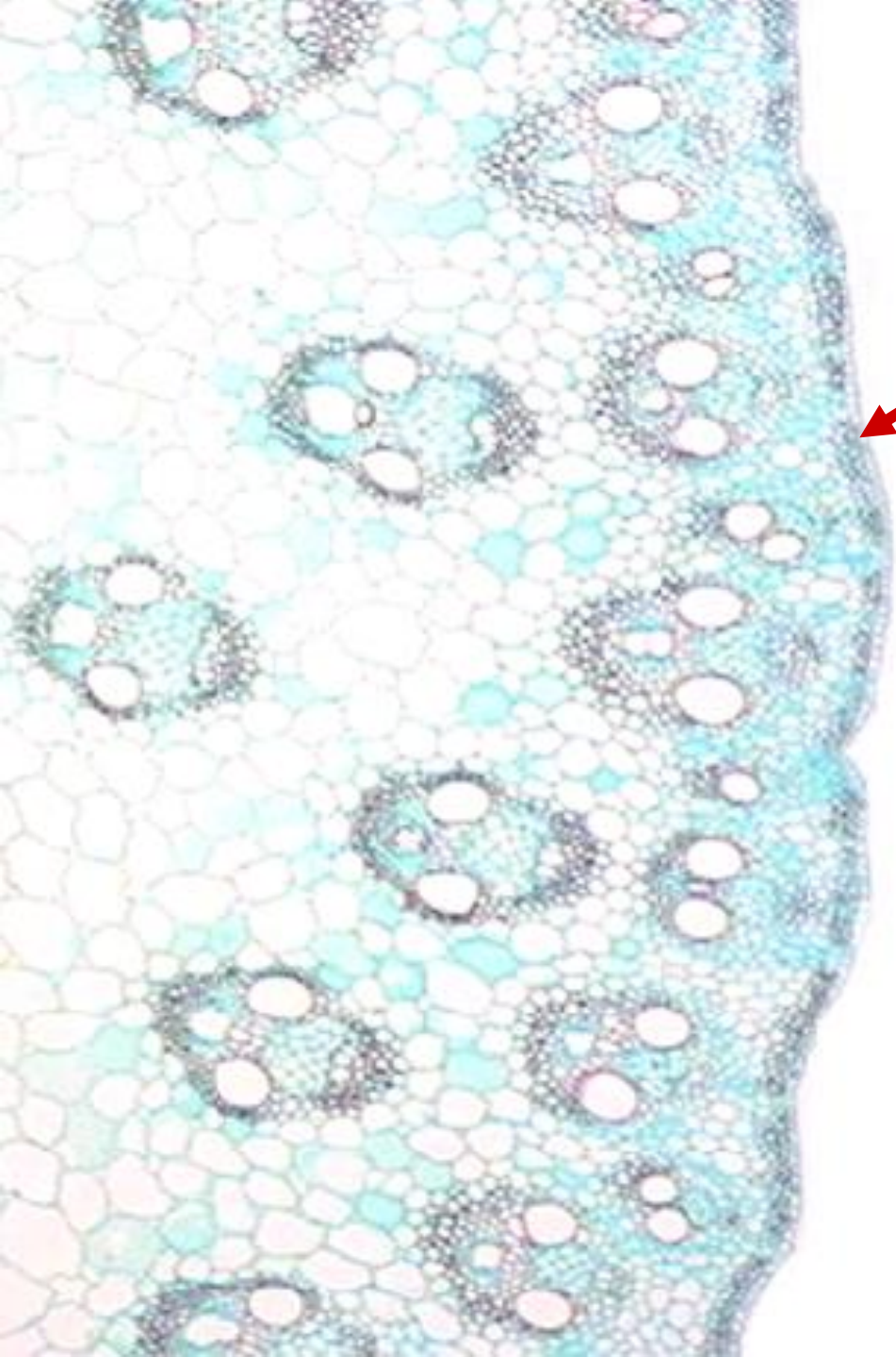
MONOCOT STEM ANATOMY



?

STEM

C.S.

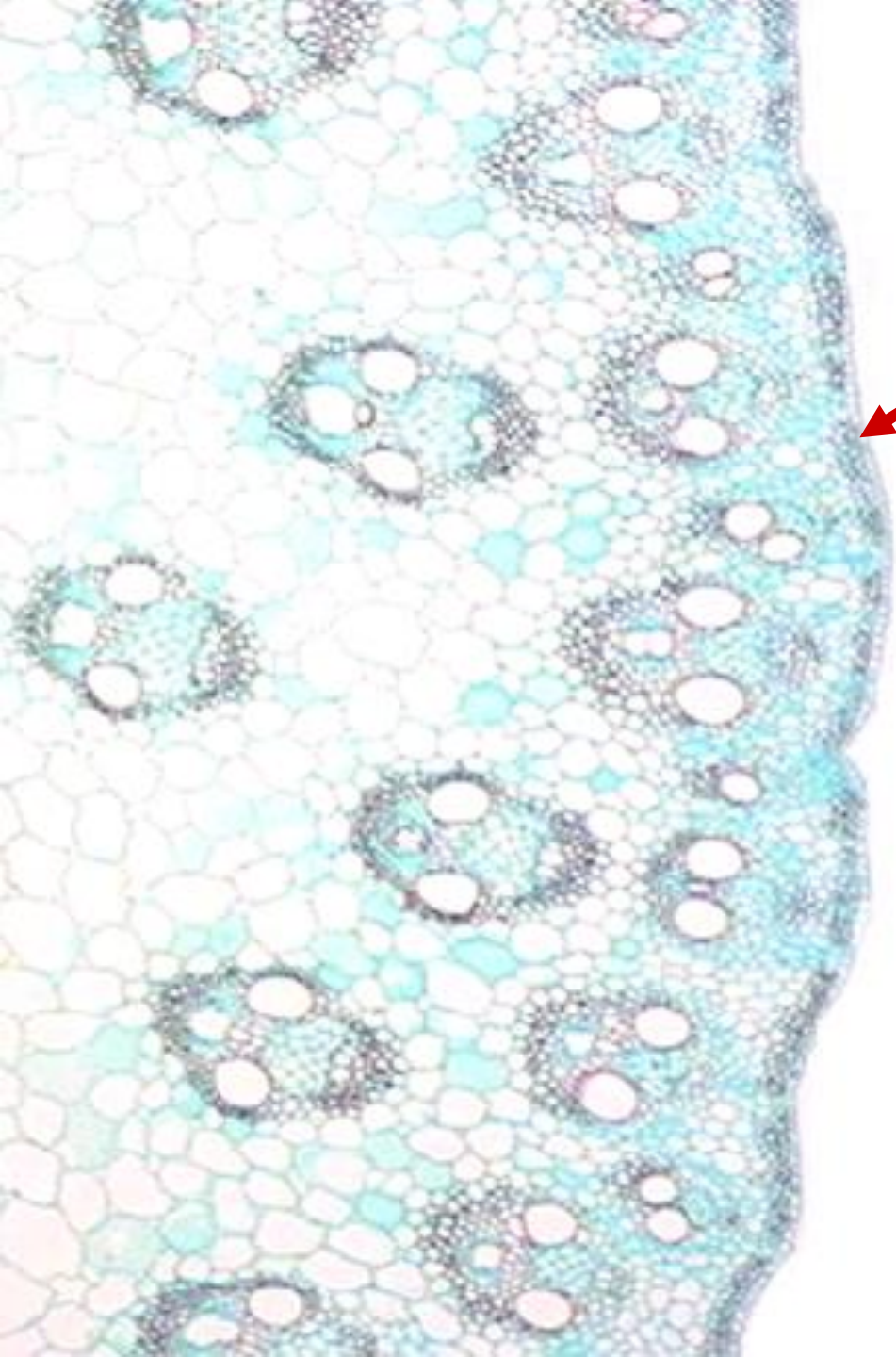


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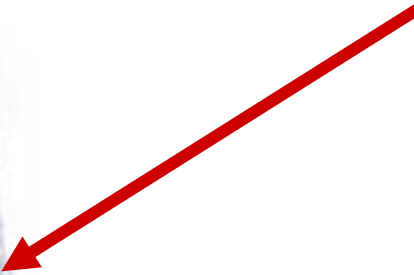


STEM

C.S.

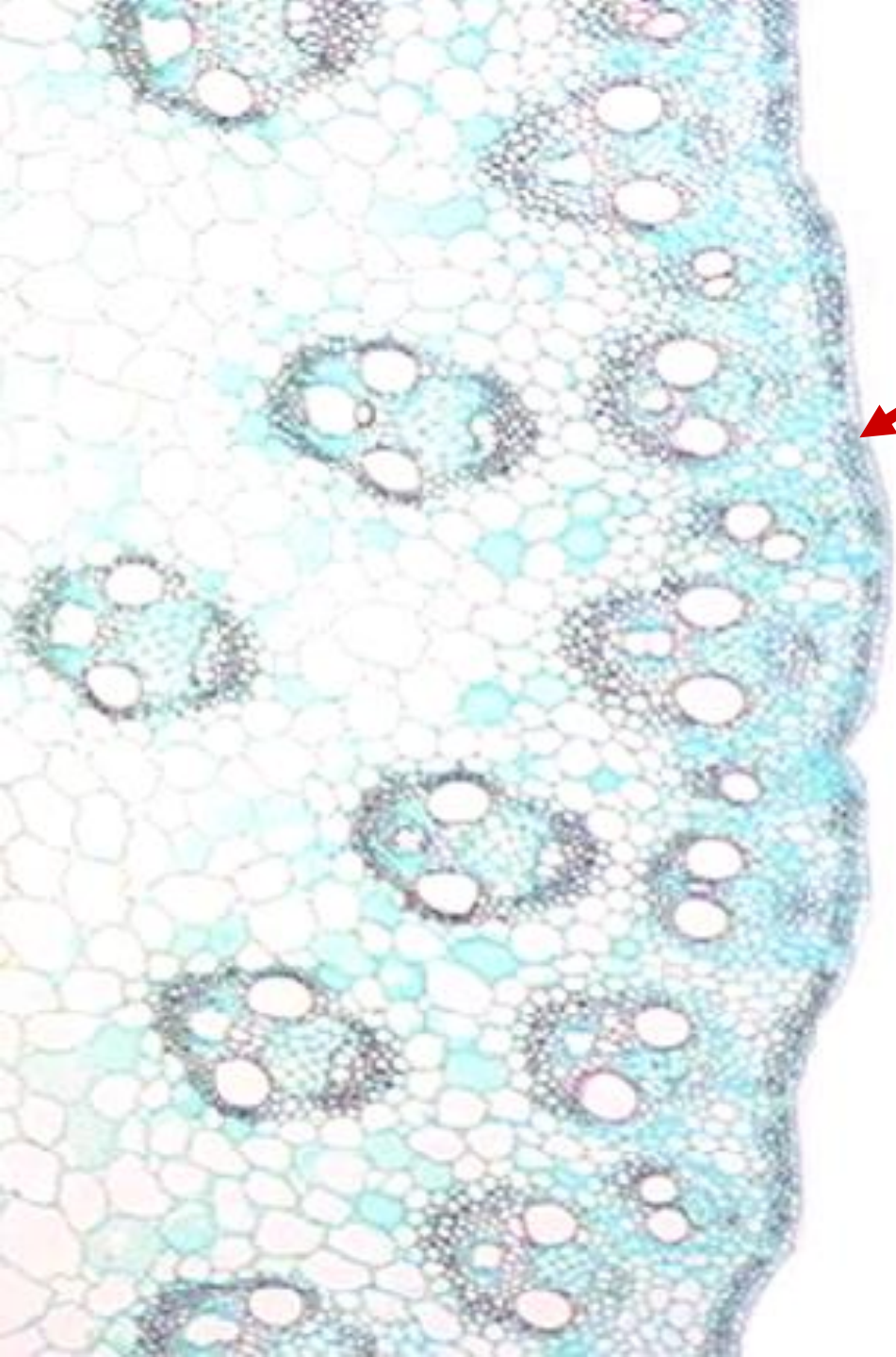


CUTICLE



STEM

C.S.

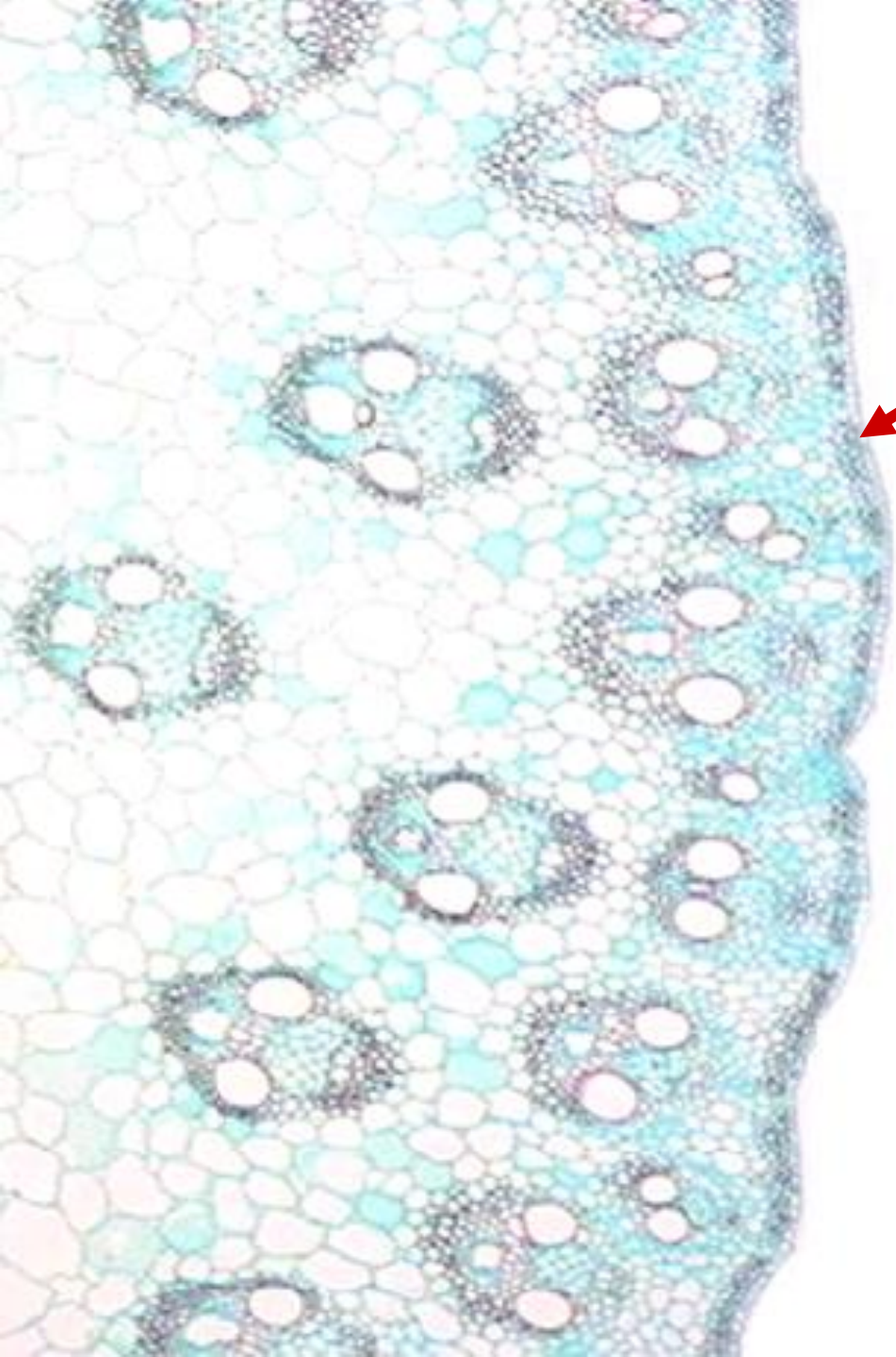


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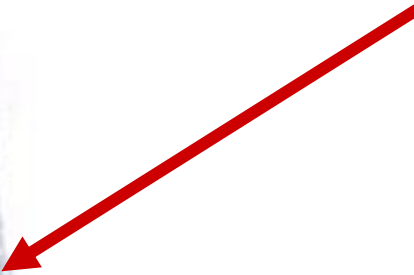


STEM

C.S.

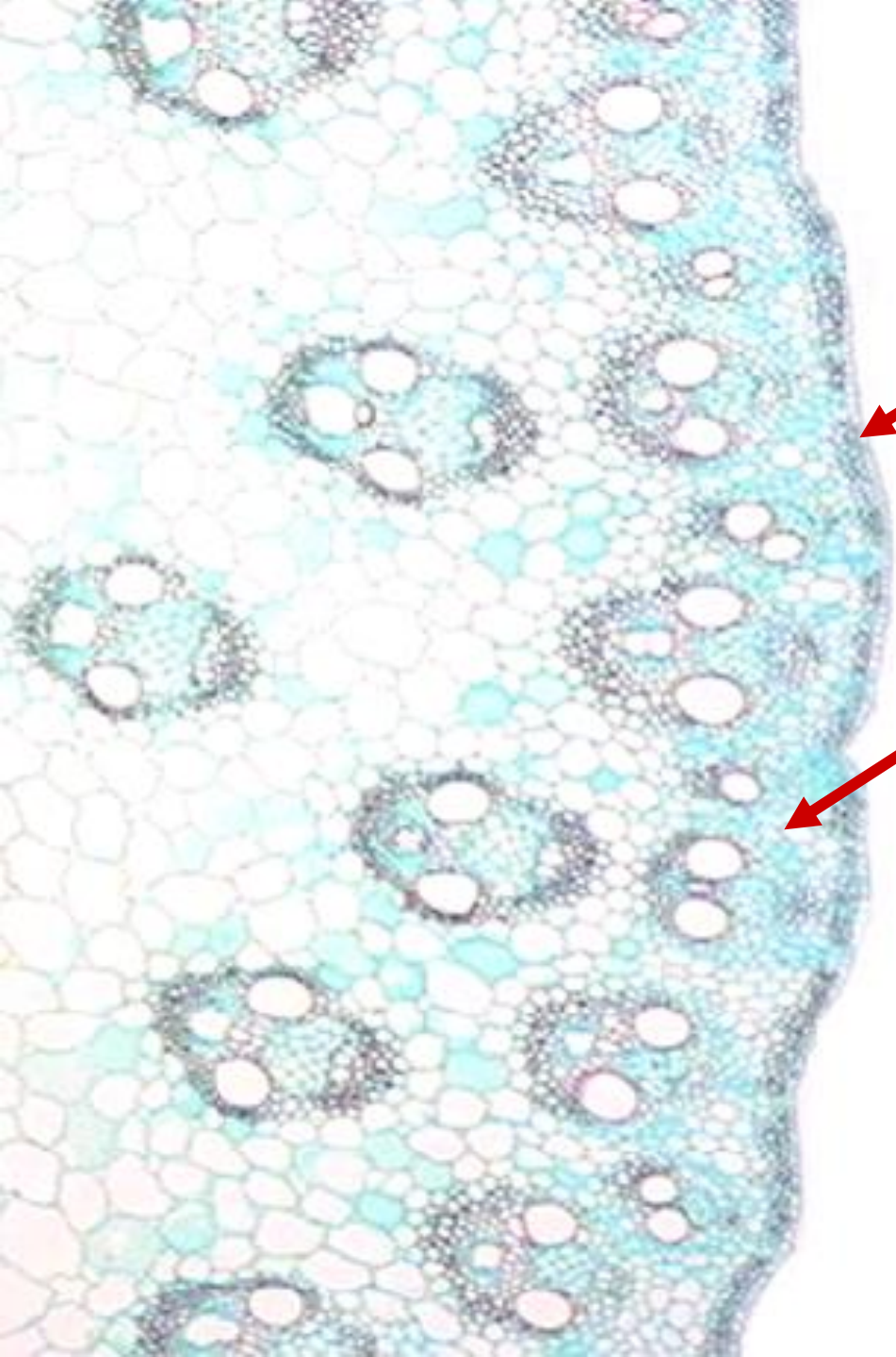


EPIDERMIS

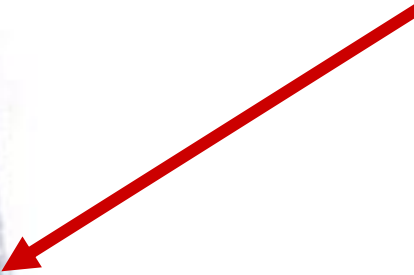


STEM

C.S.



EPIDERMIS

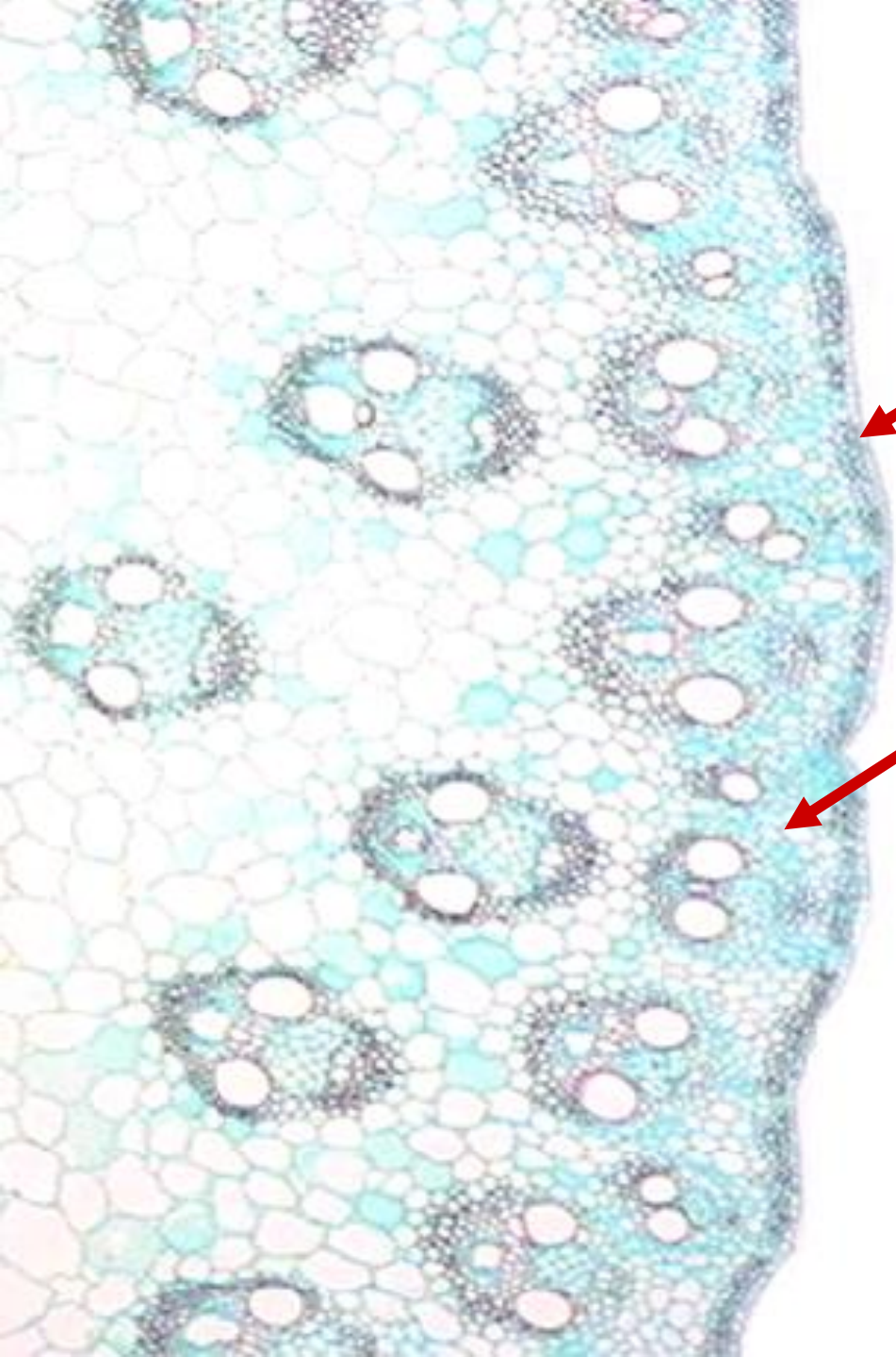


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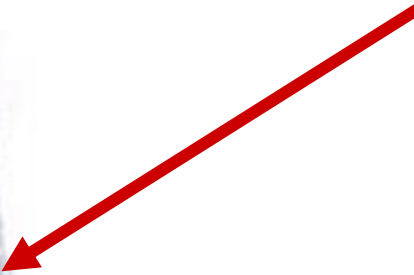


STEM

C.S.



EPIDERMIS

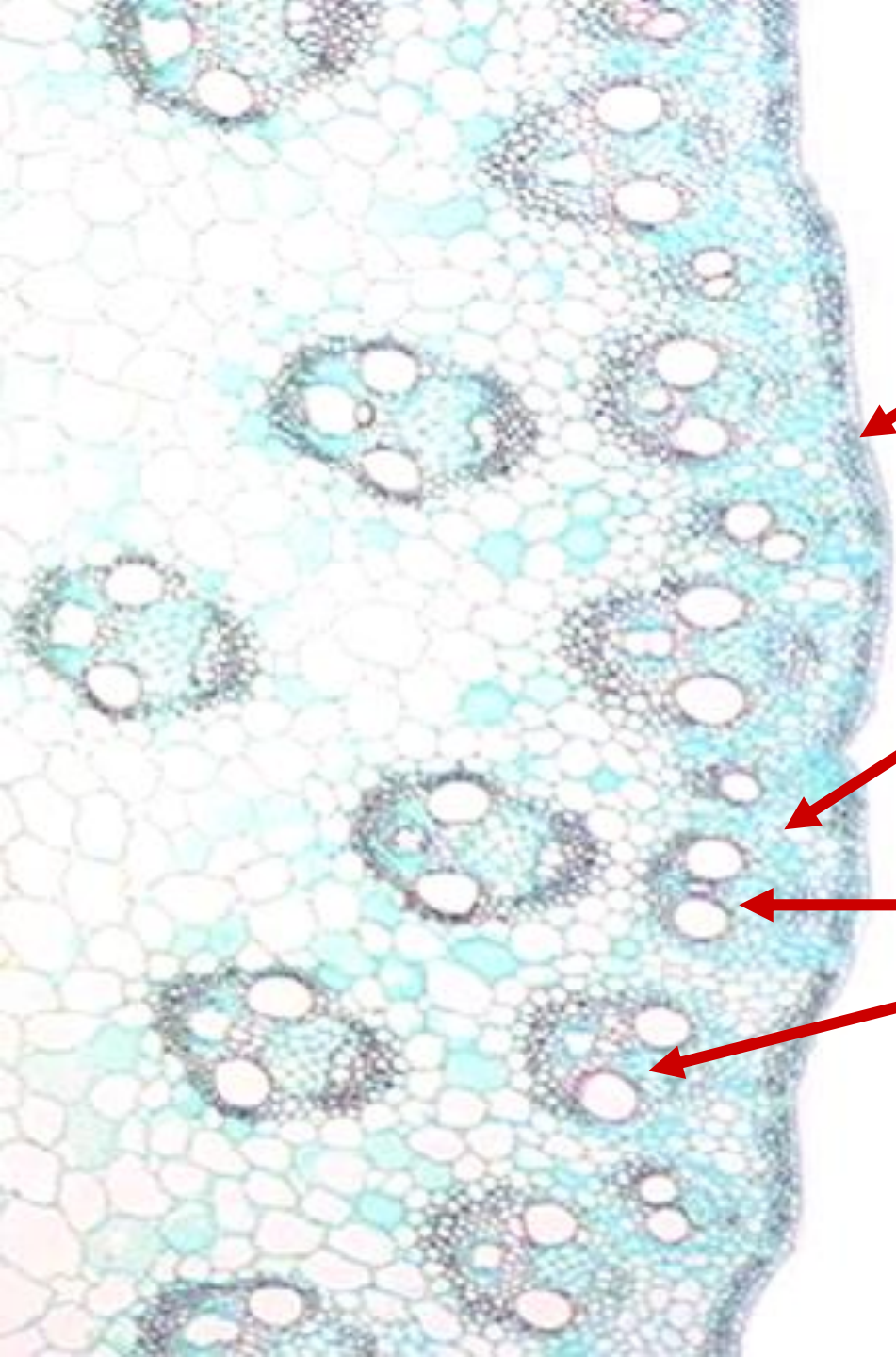


CORTEX



STEM

C.S.



EPIDERMIS

CORTEX

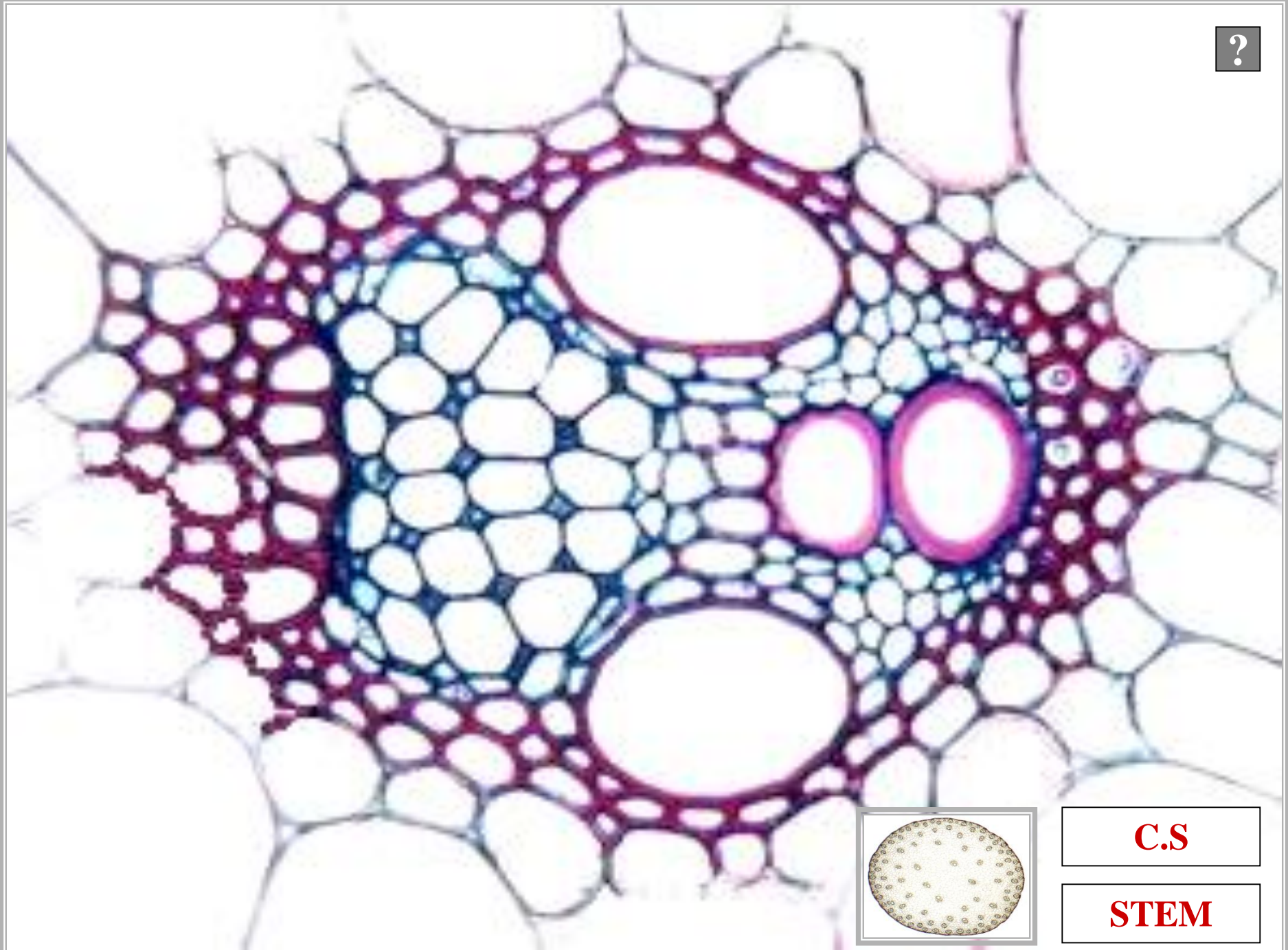
**SCATTERED
VASCULAR
BUNDLES**



STEM

C.S.

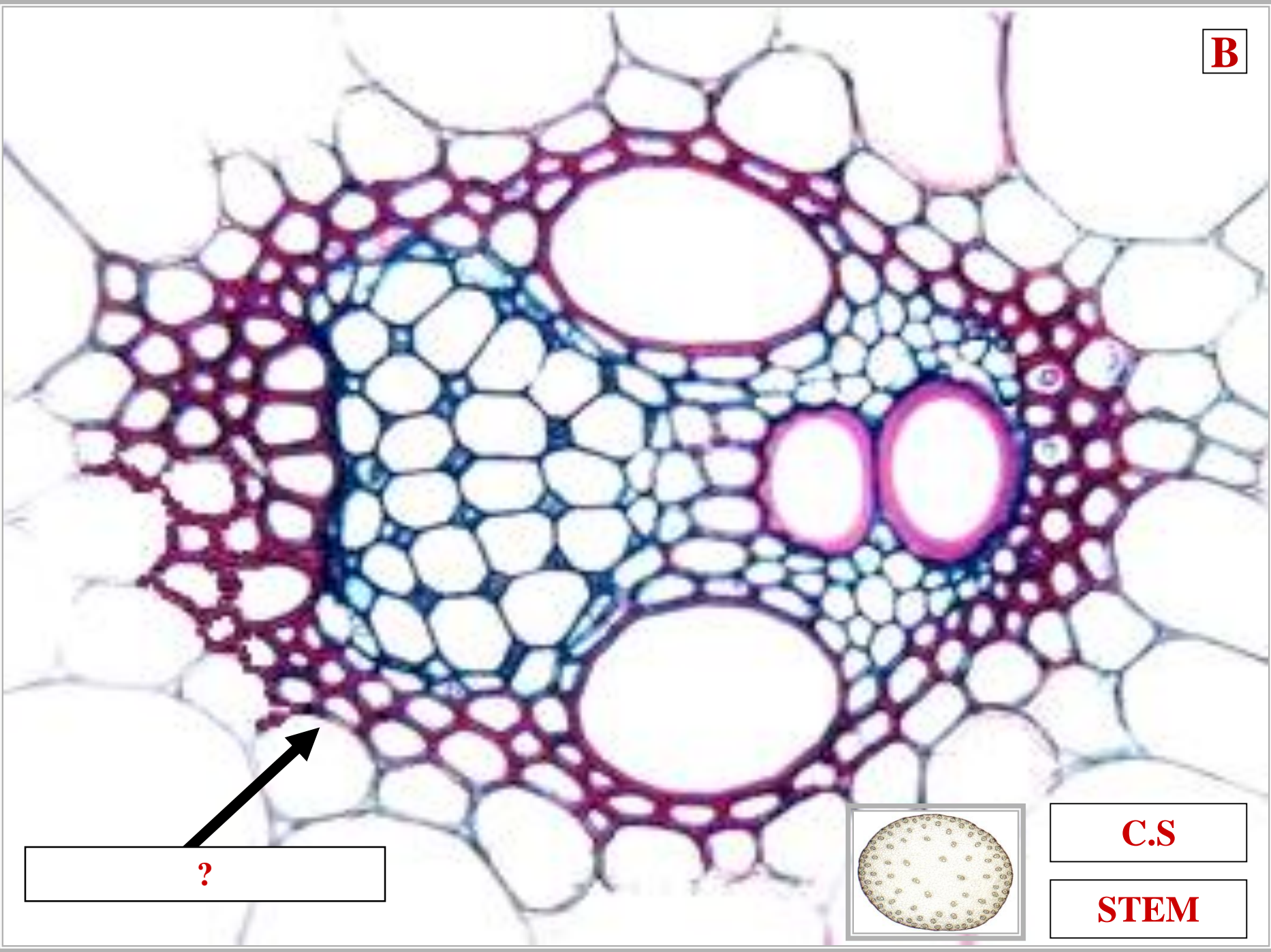
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C.S

STEM

B



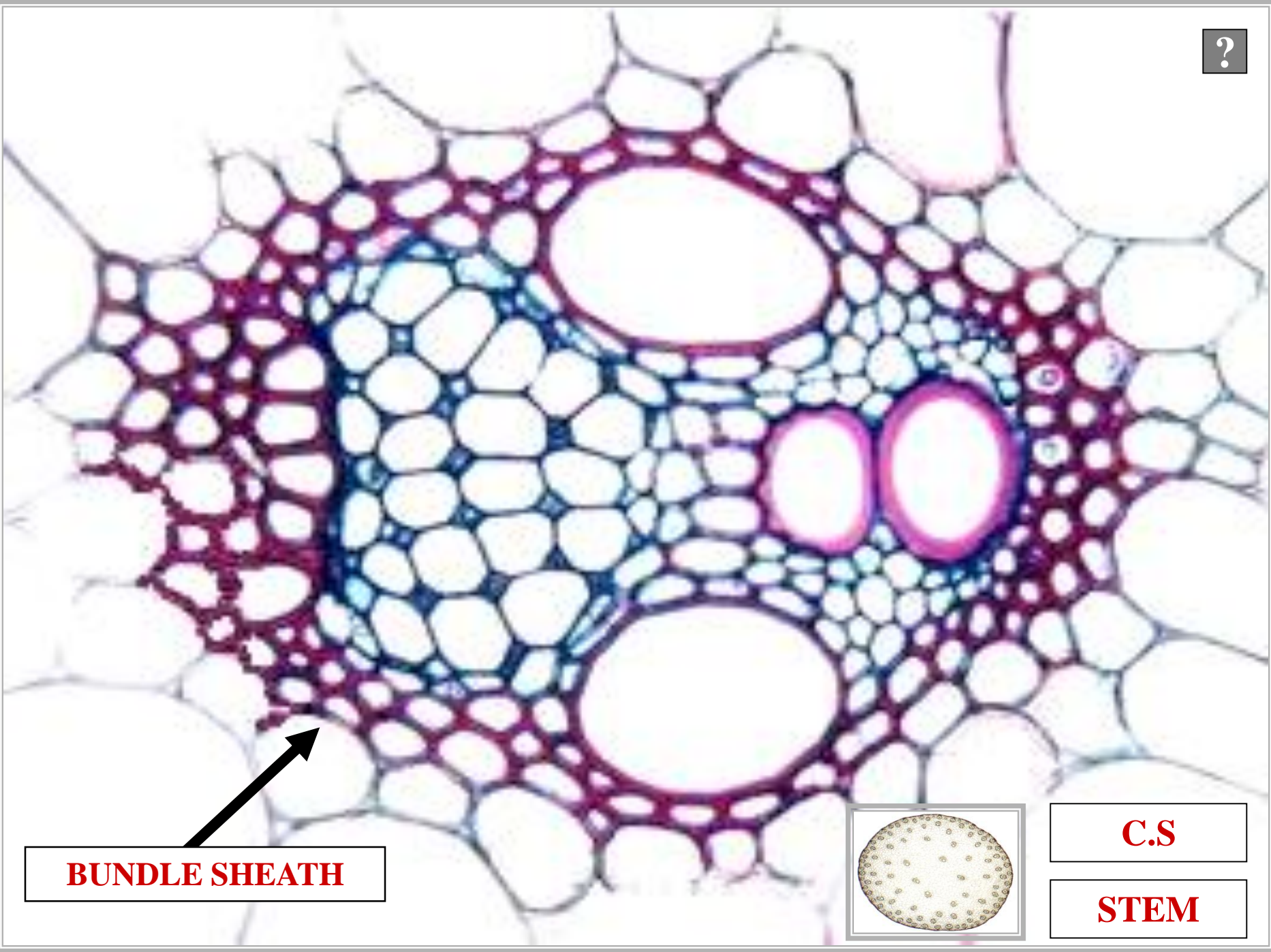
?



C.S

STEM

?



BUNDLE SHEATH

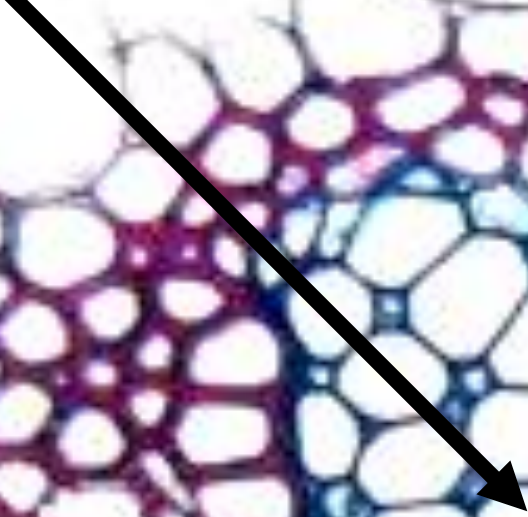


C.S

STEM

P

?



BUNDLE SHEATH

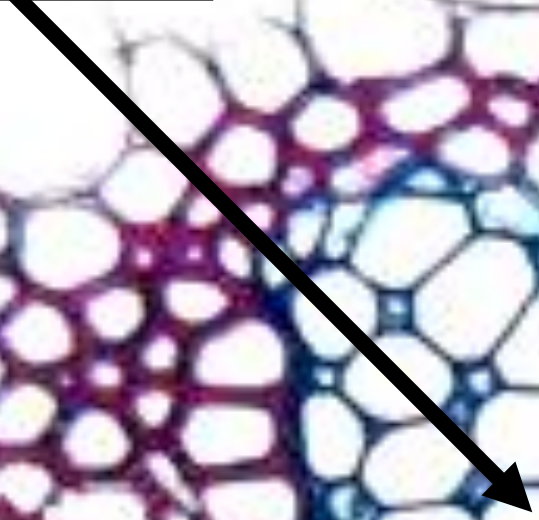


C.S

STEM

?

~1 PHLOEM



BUNDLE SHEATH



C.S

STEM

X

~1 PHLOEM

?

BUNDLE SHEATH

C.S

STEM





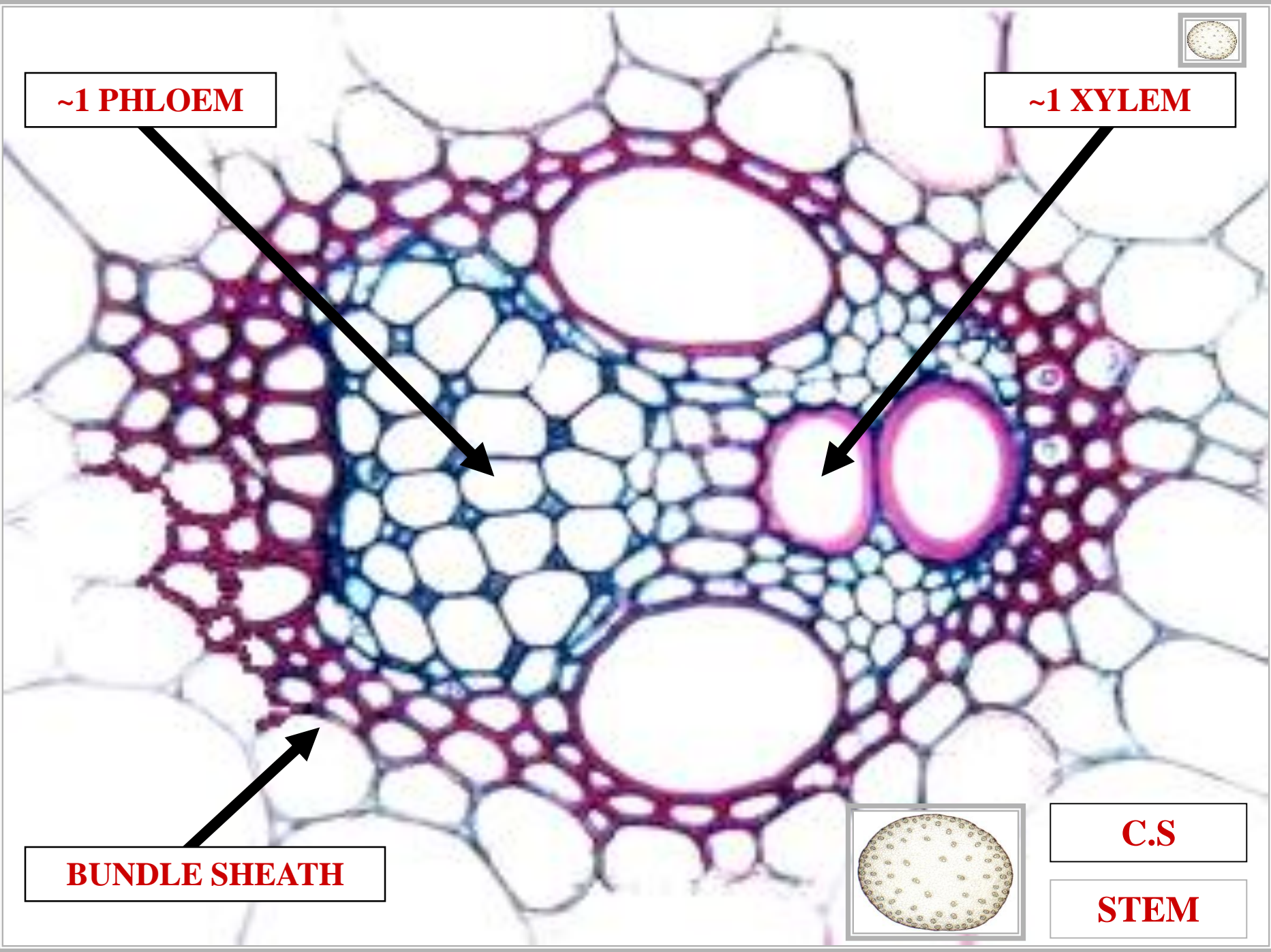
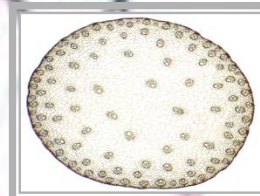
~1 PHLOEM

~1 XYLEM

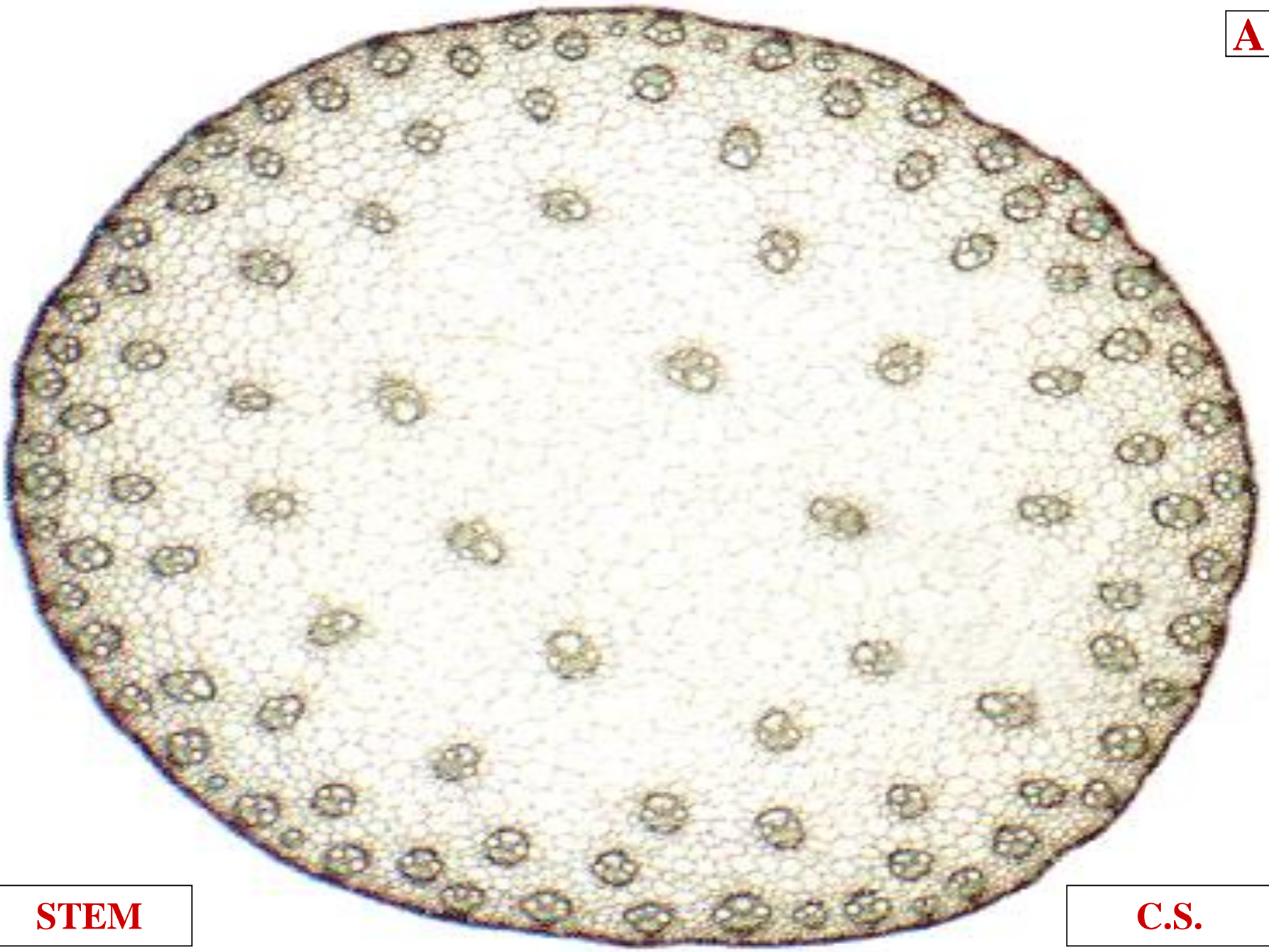
BUNDLE SHEATH

C.S

STEM

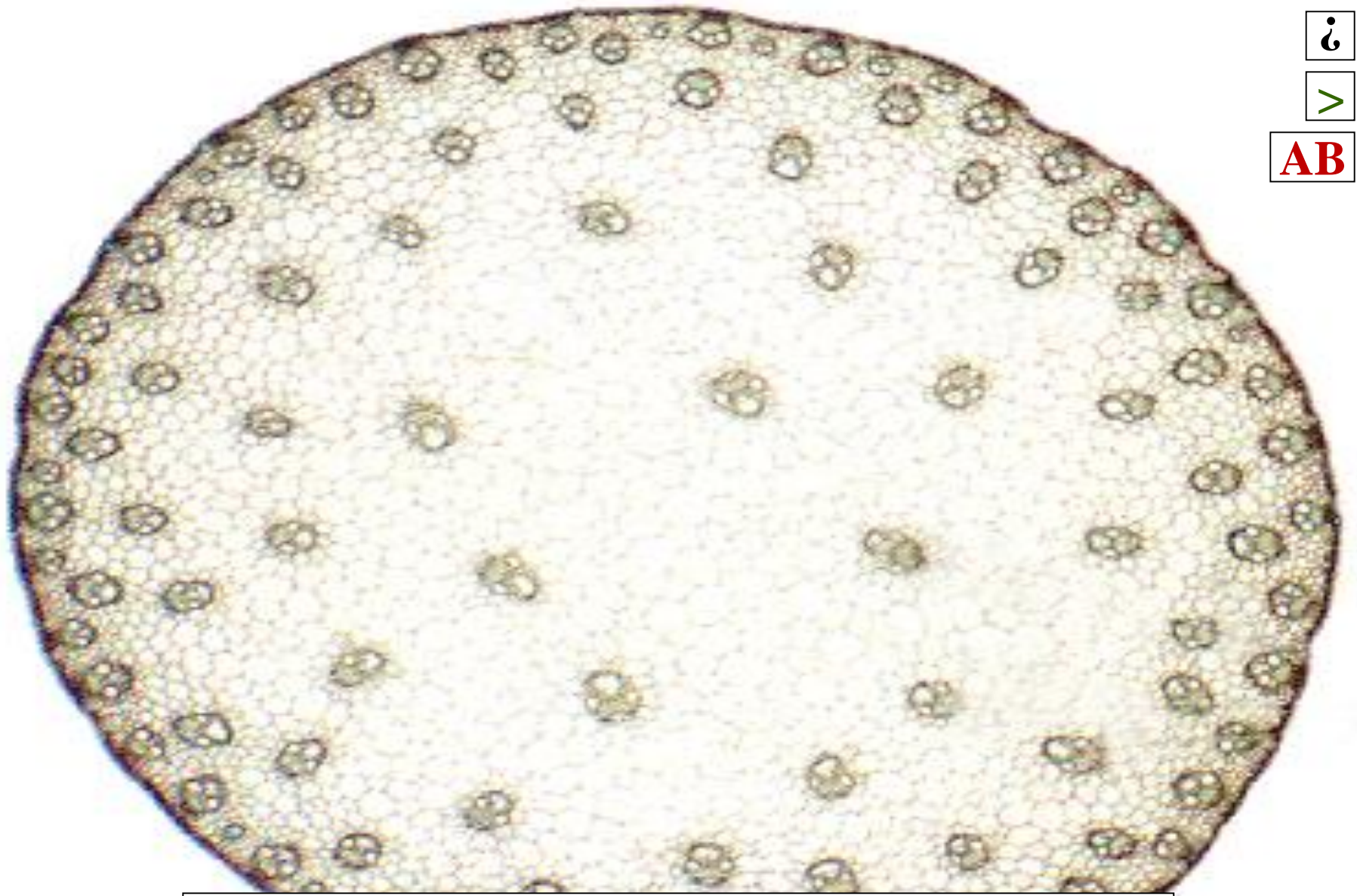


A



STEM

C.S.



i

>

AB

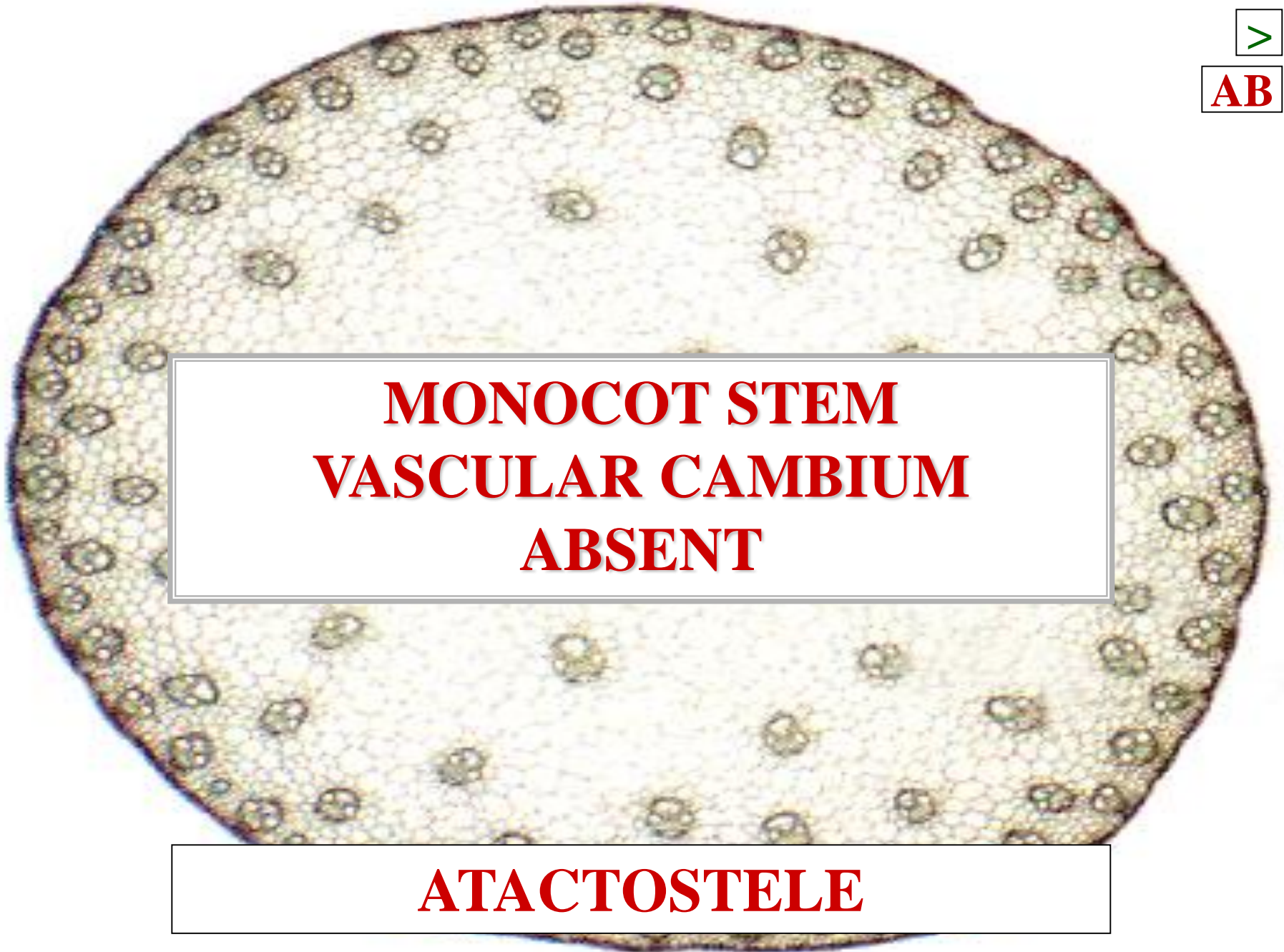
ATACTOSTELE

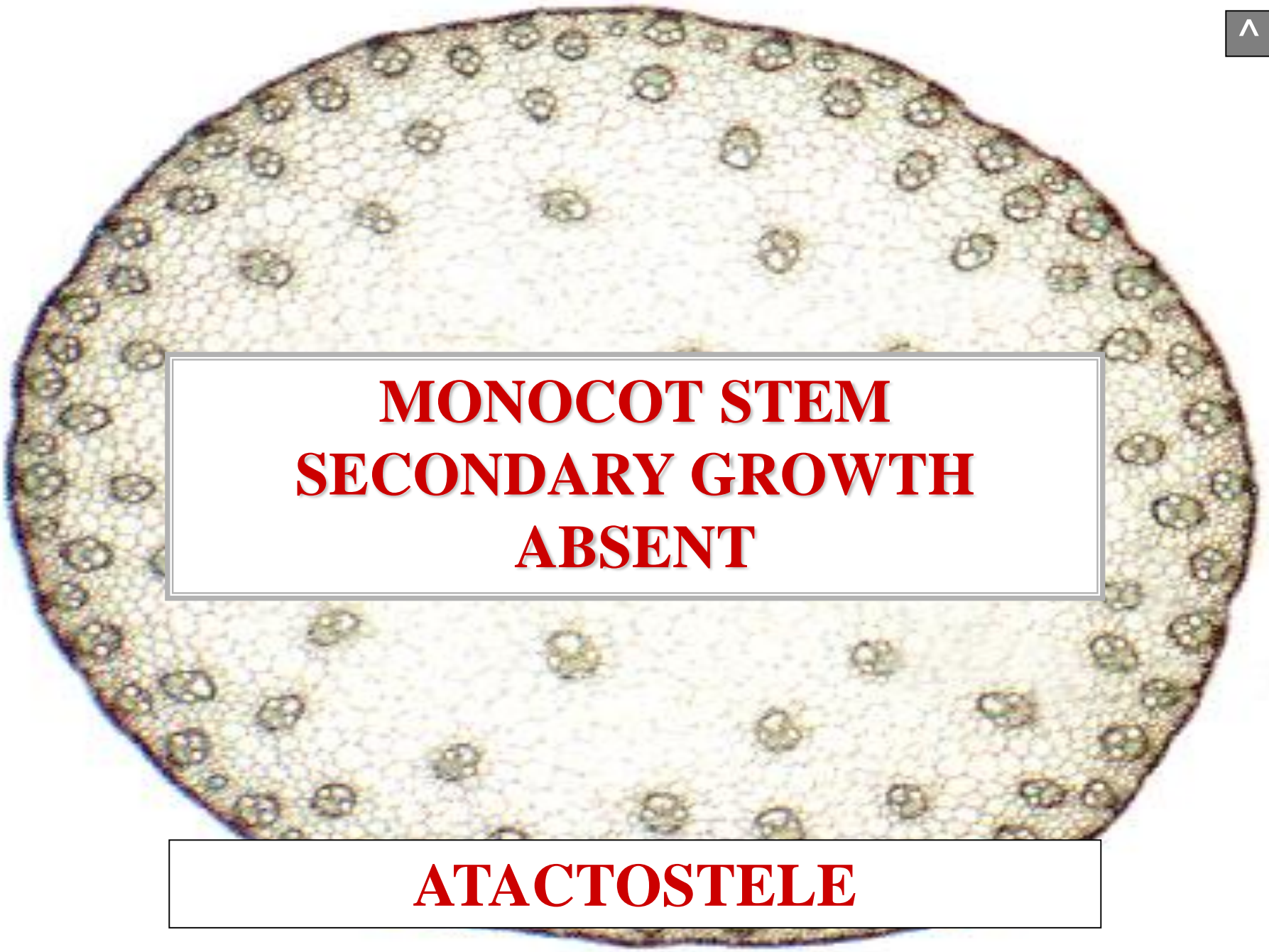


AB

**MONOCOT STEM
VASCULAR CAMBIUM
ABSENT**

ATACTOSTELE





**MONOCOT STEM
SECONDARY GROWTH
ABSENT**

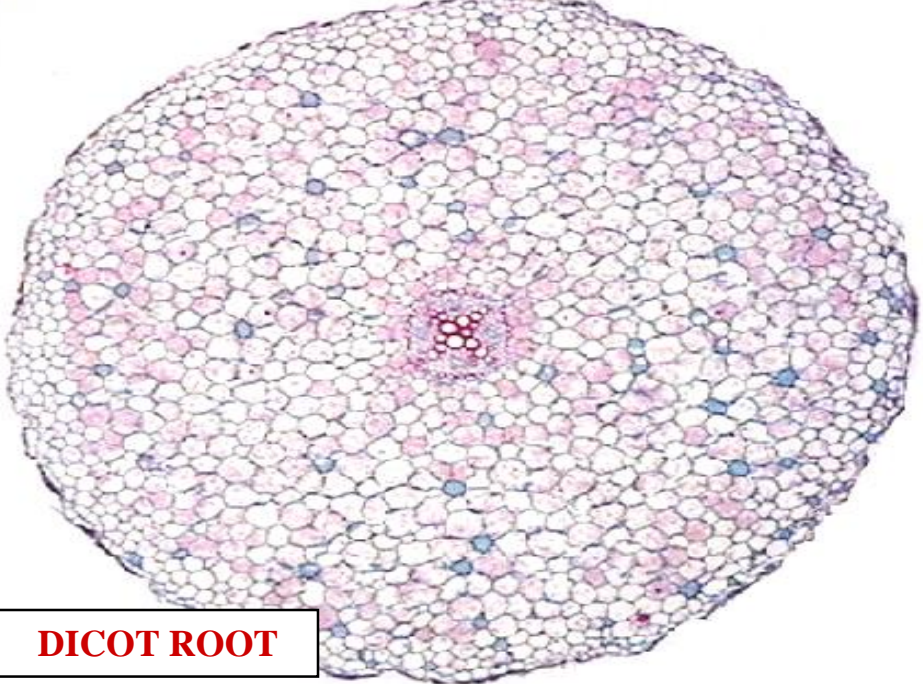
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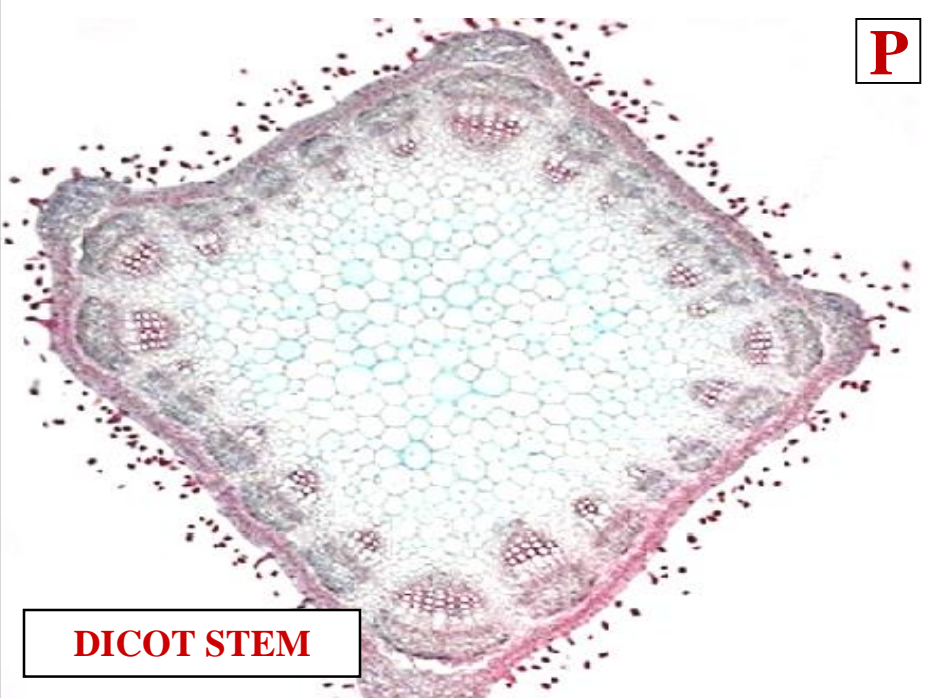
STELE SUMMARY



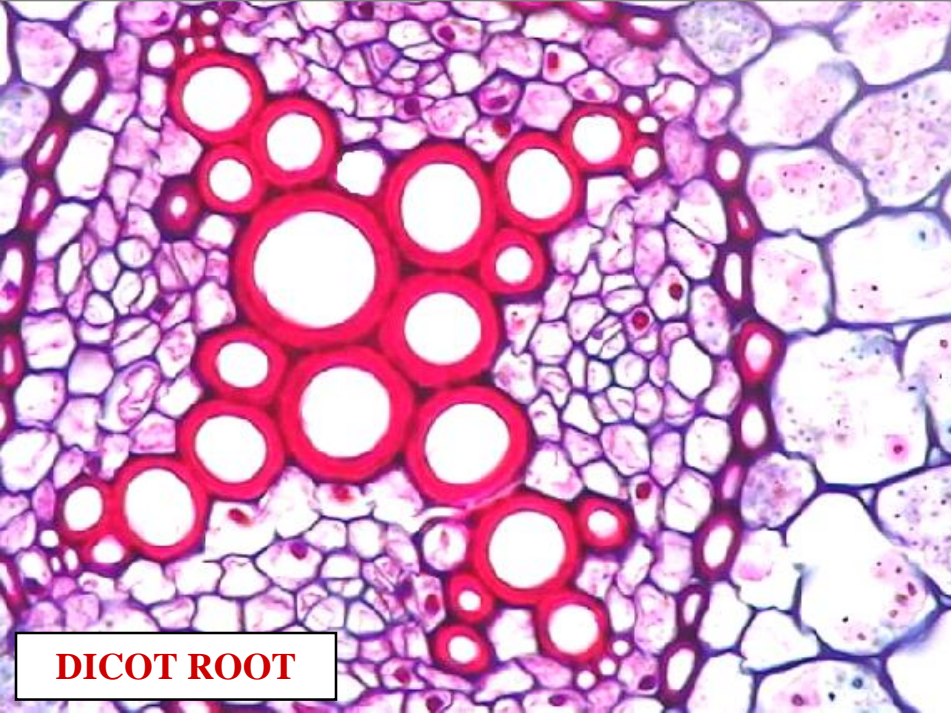
STELE SUMMARY DICOTS



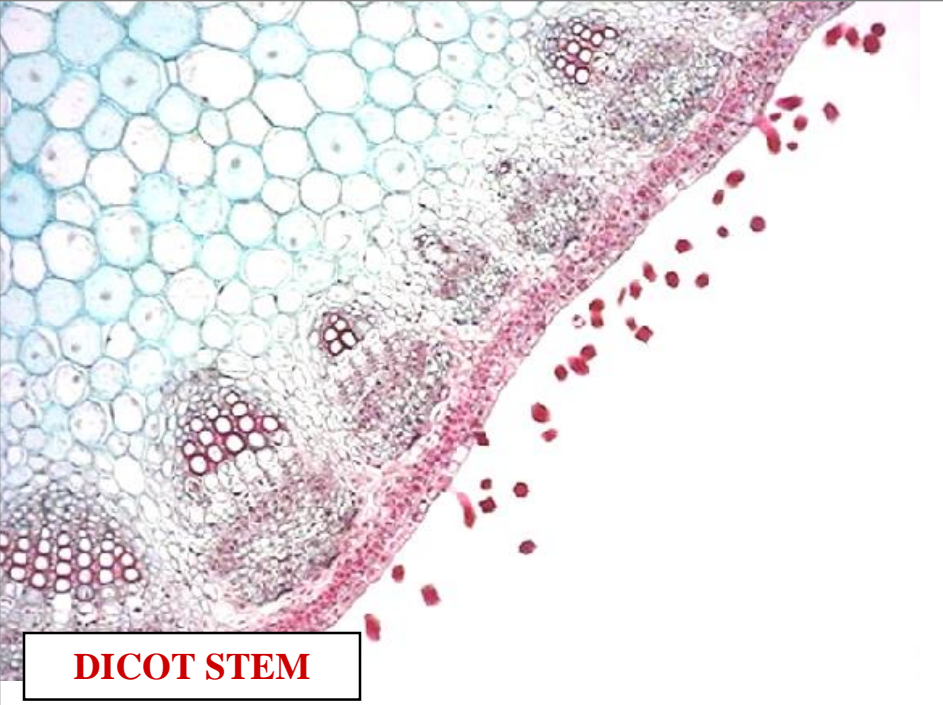
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DICOT STEM

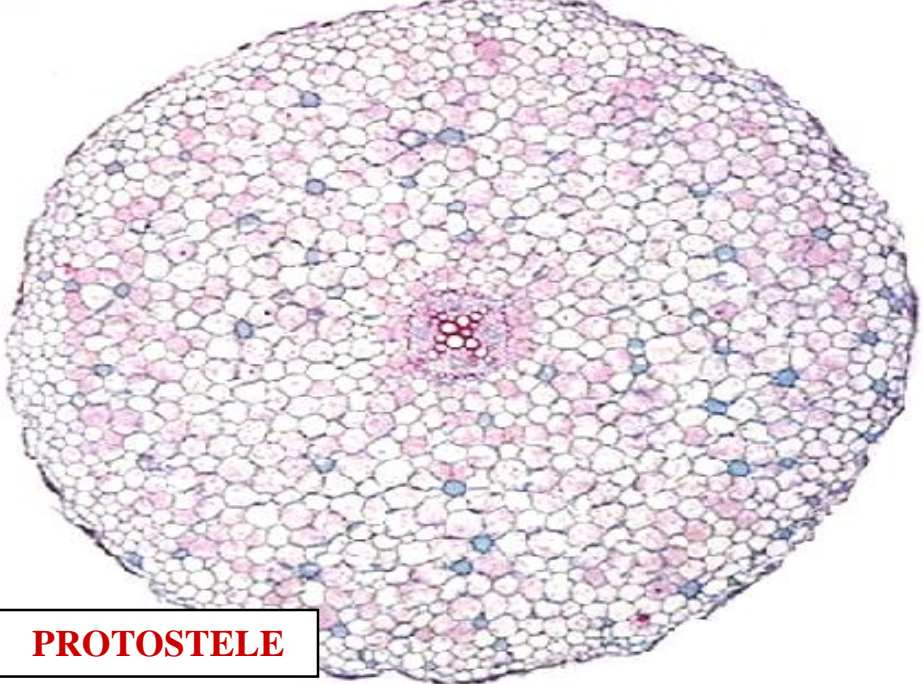


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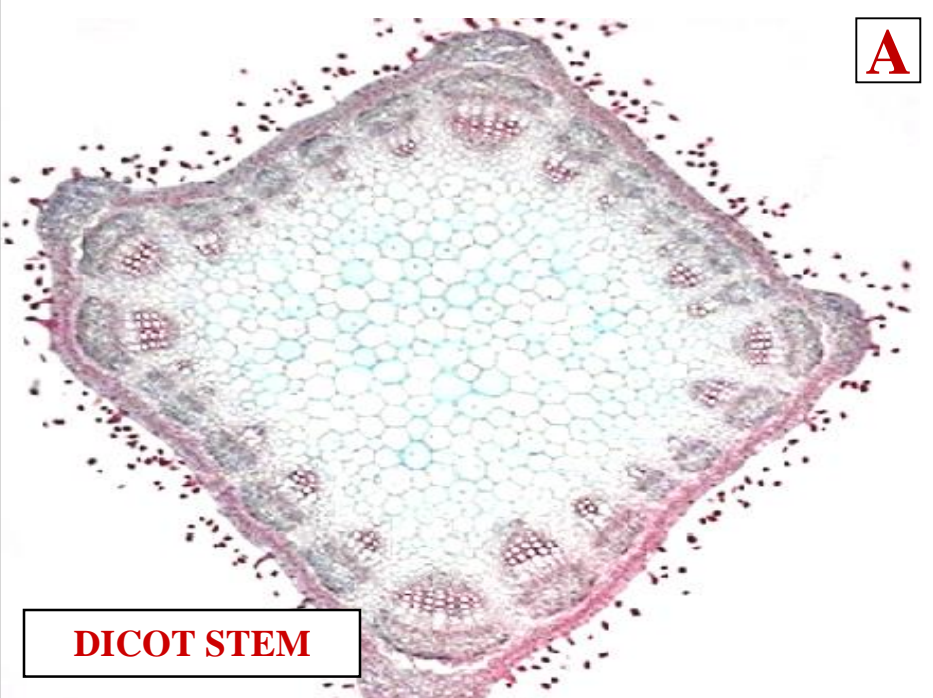


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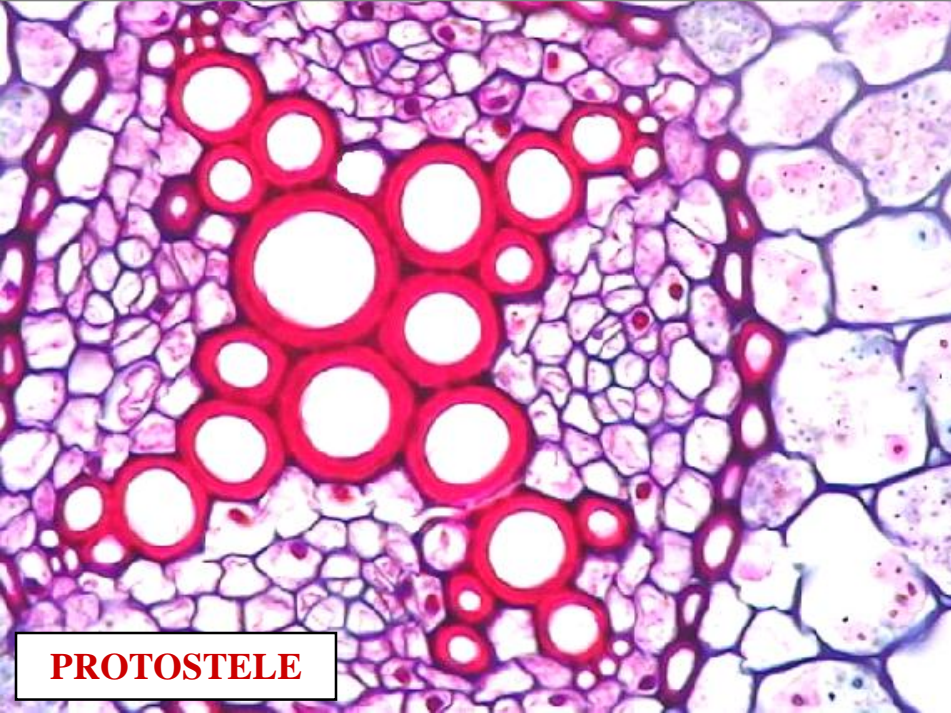
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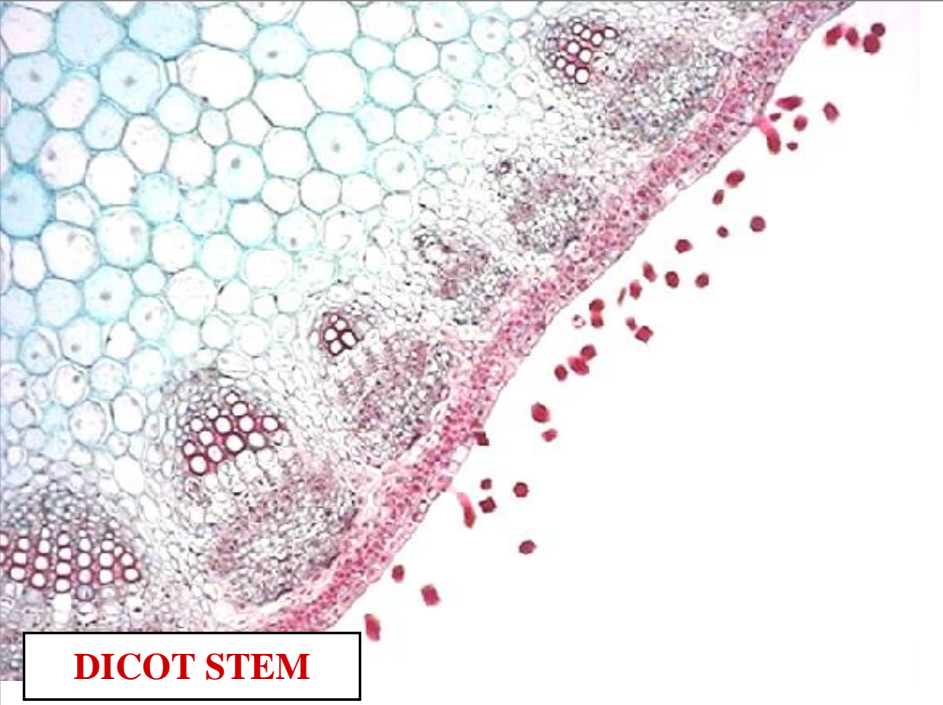
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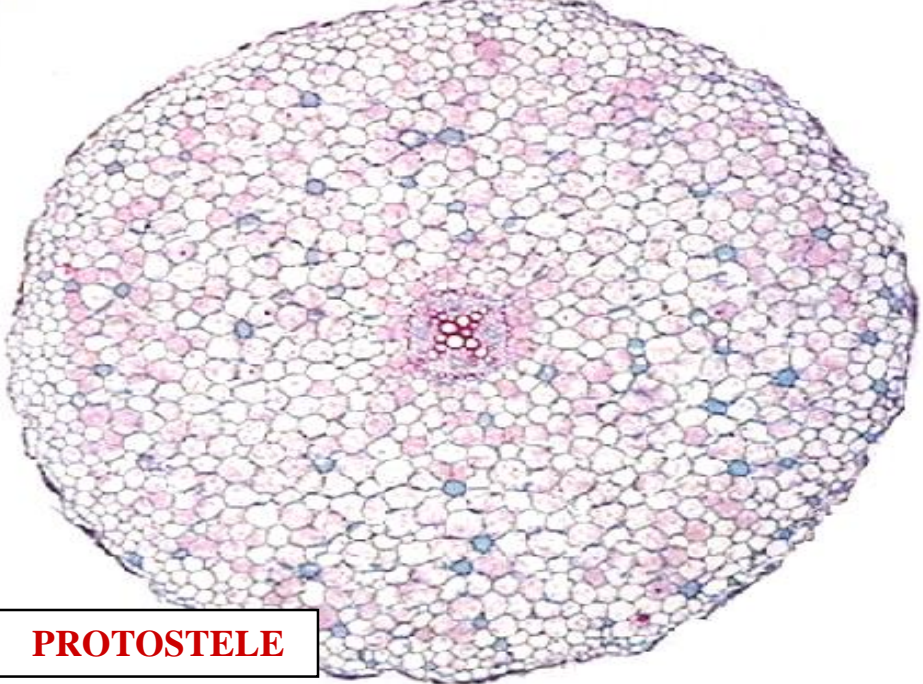
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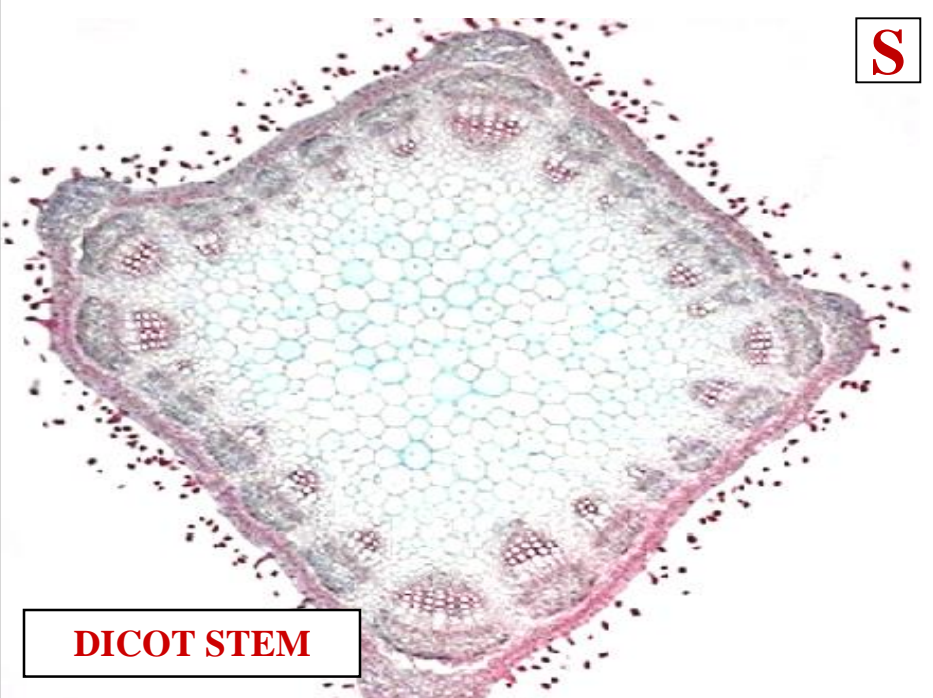
PROTOSTELE



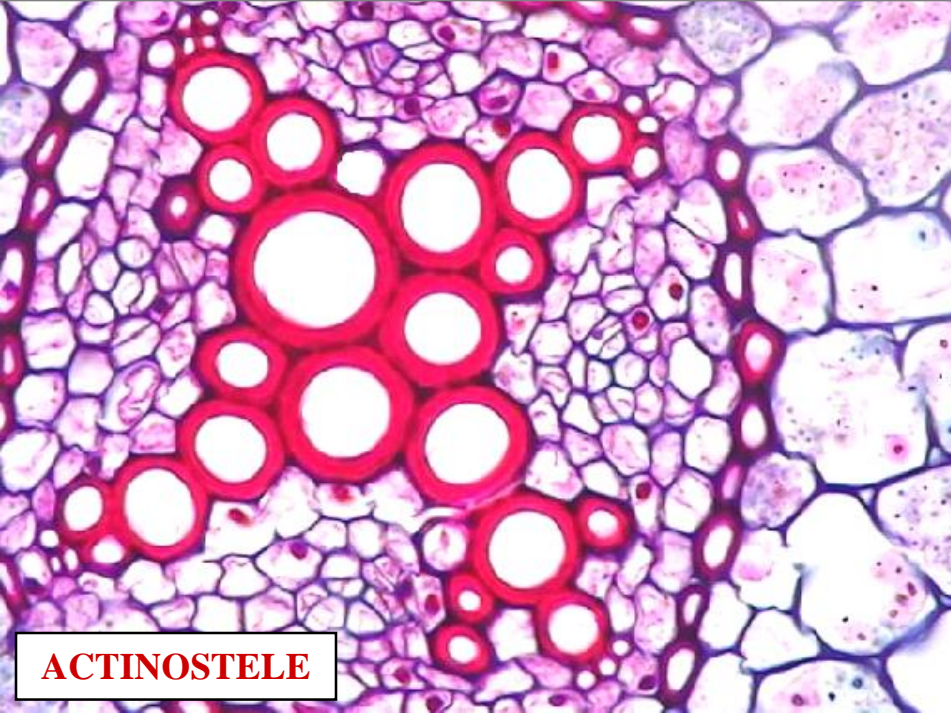
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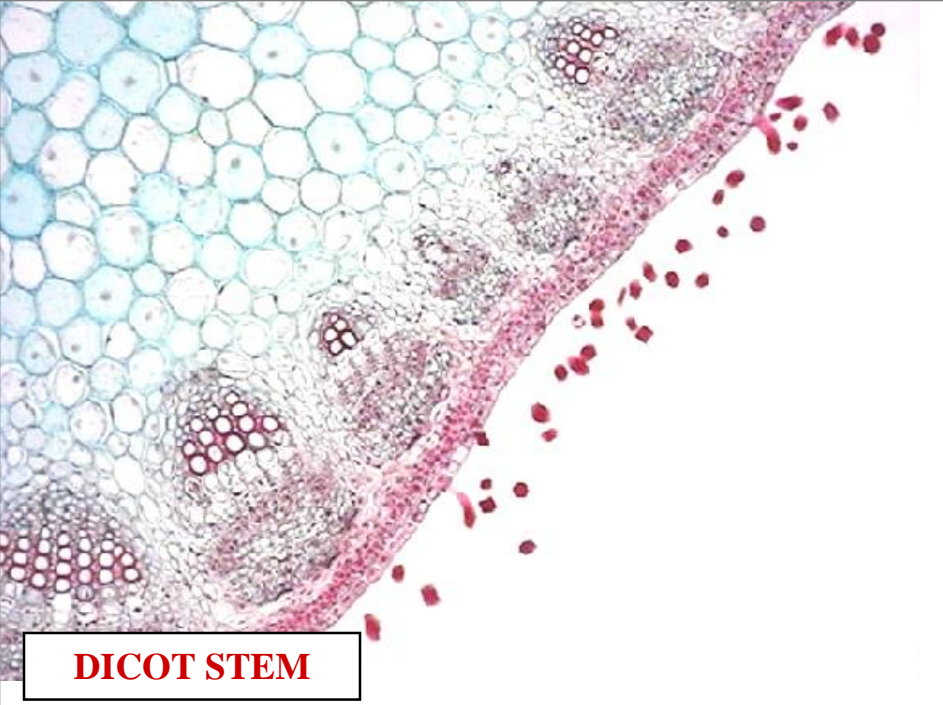
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DICOT STEM

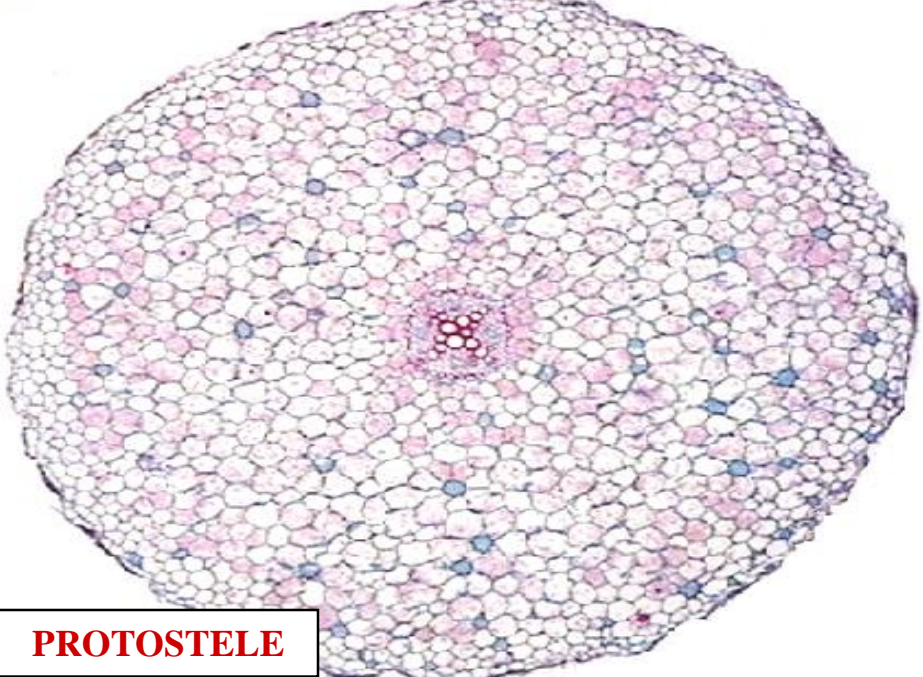


ACTINOSTELE



DICOT STEM

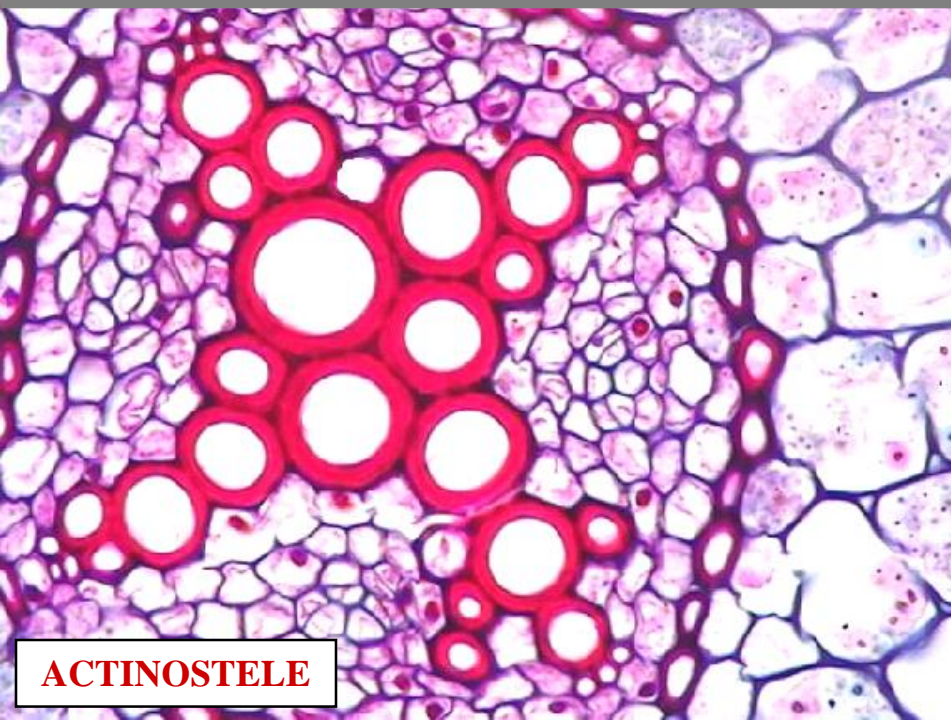
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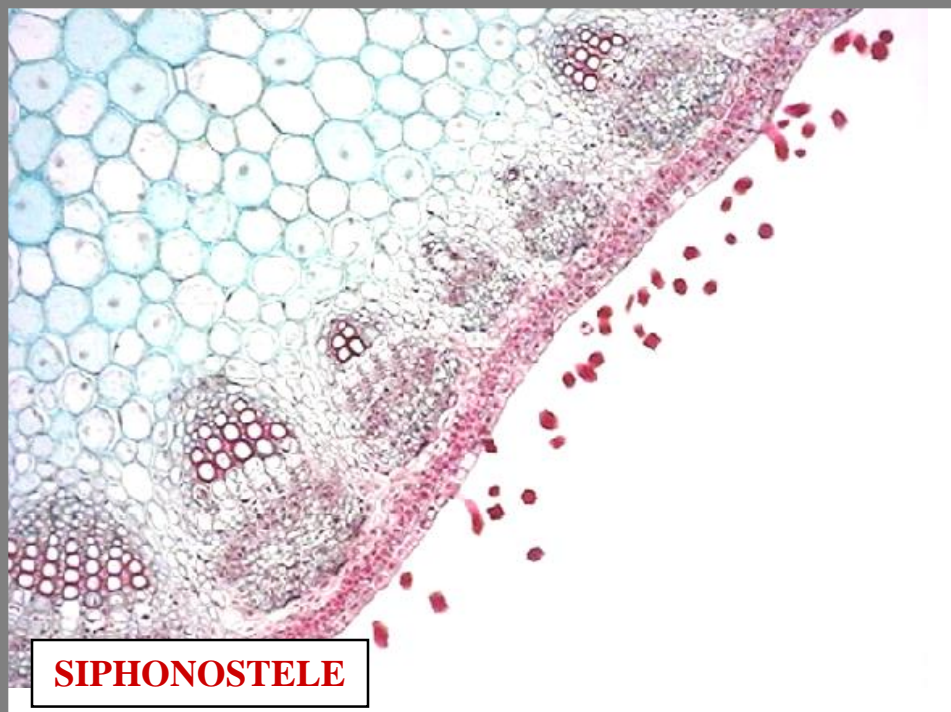
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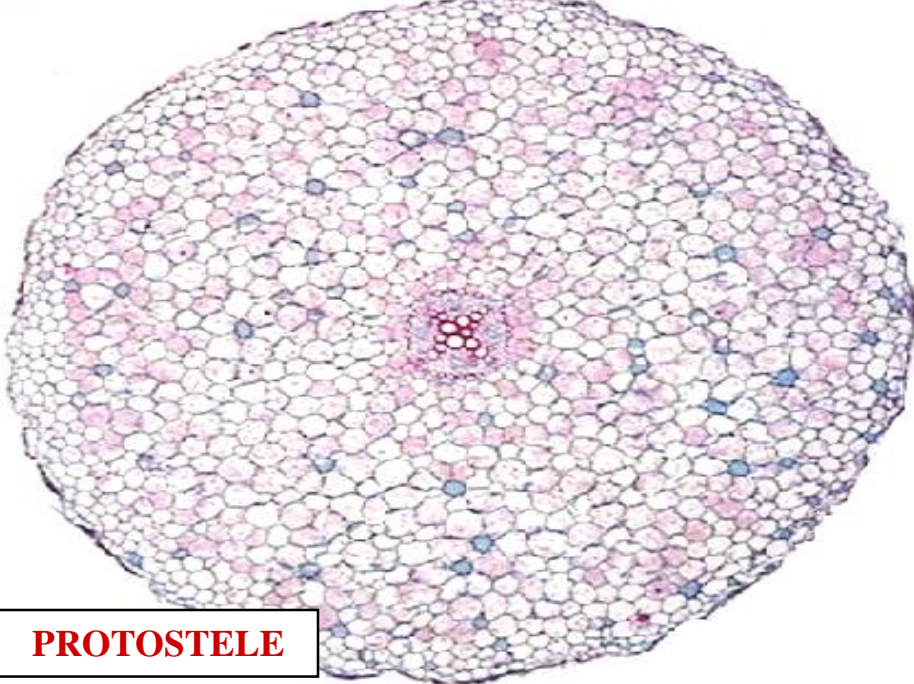
SIPHONOSTELE



ACTINOSTELE



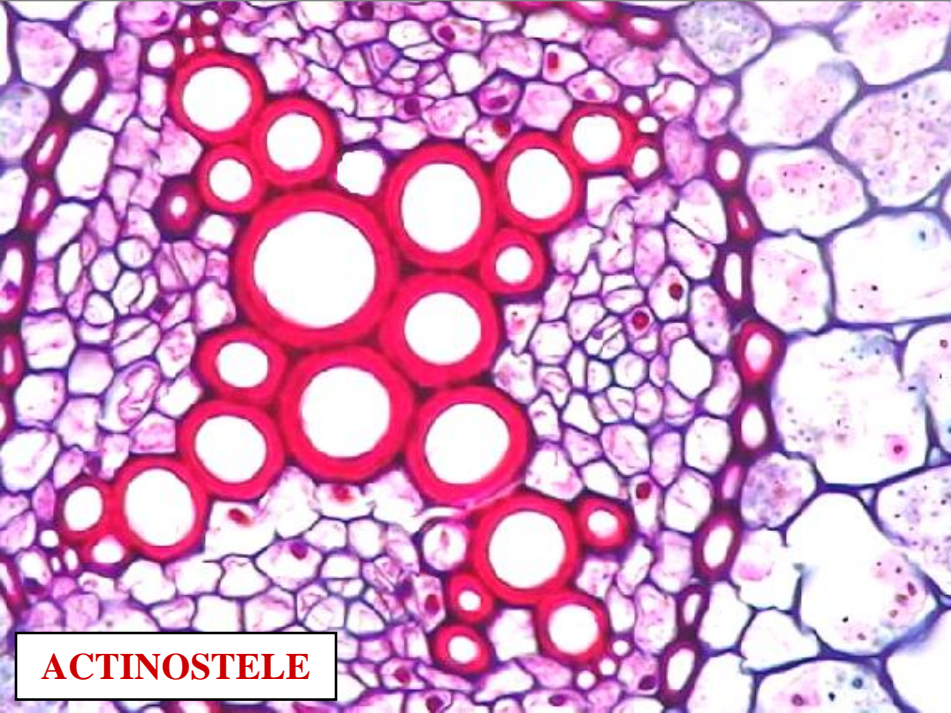
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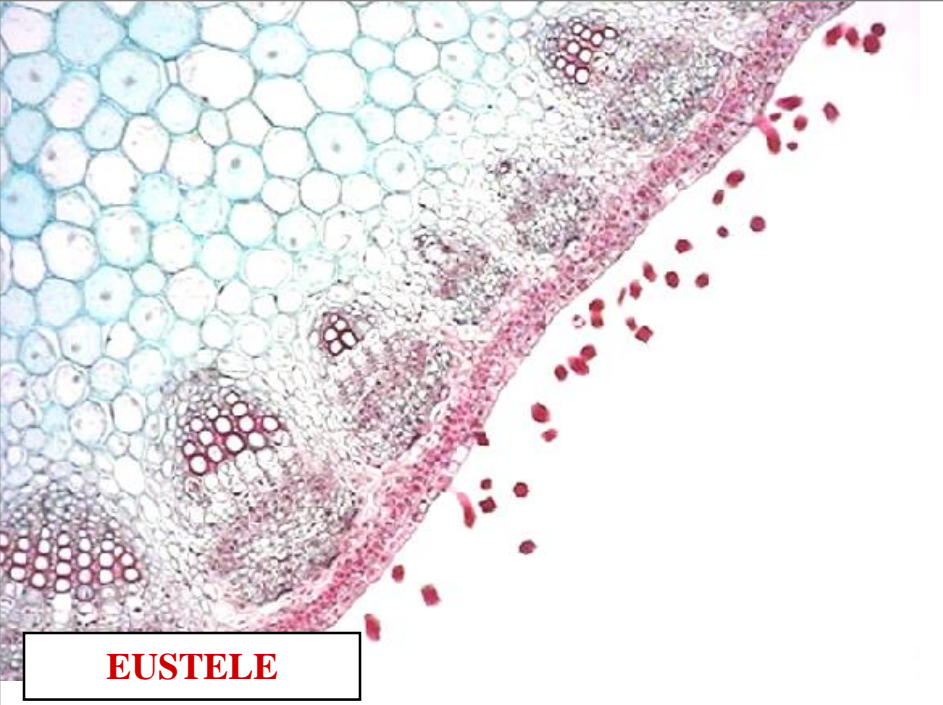
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SIPHONOSTELE



ACTINOSTELE

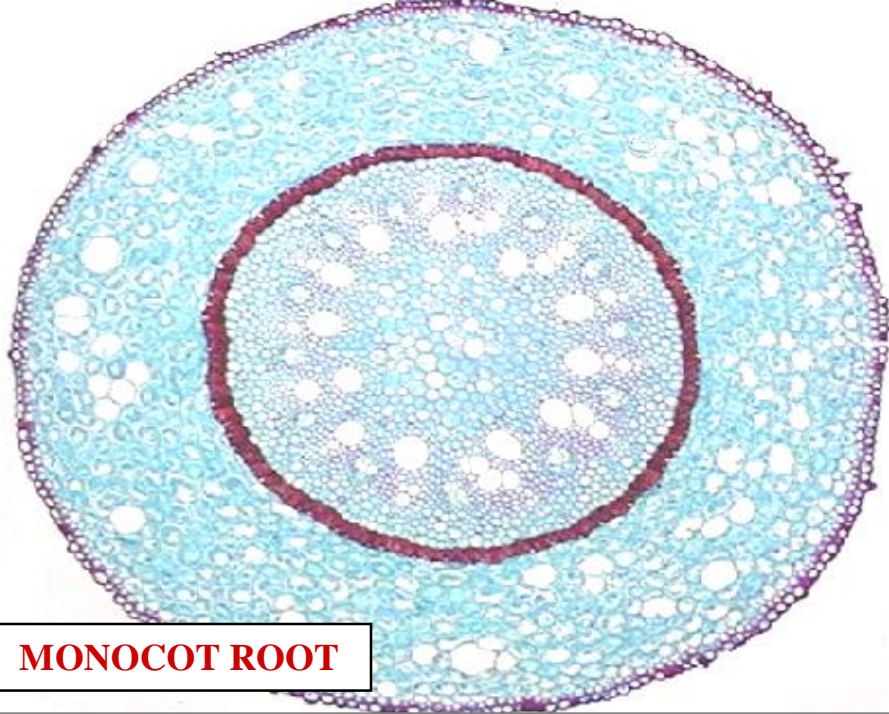


EUSTELE

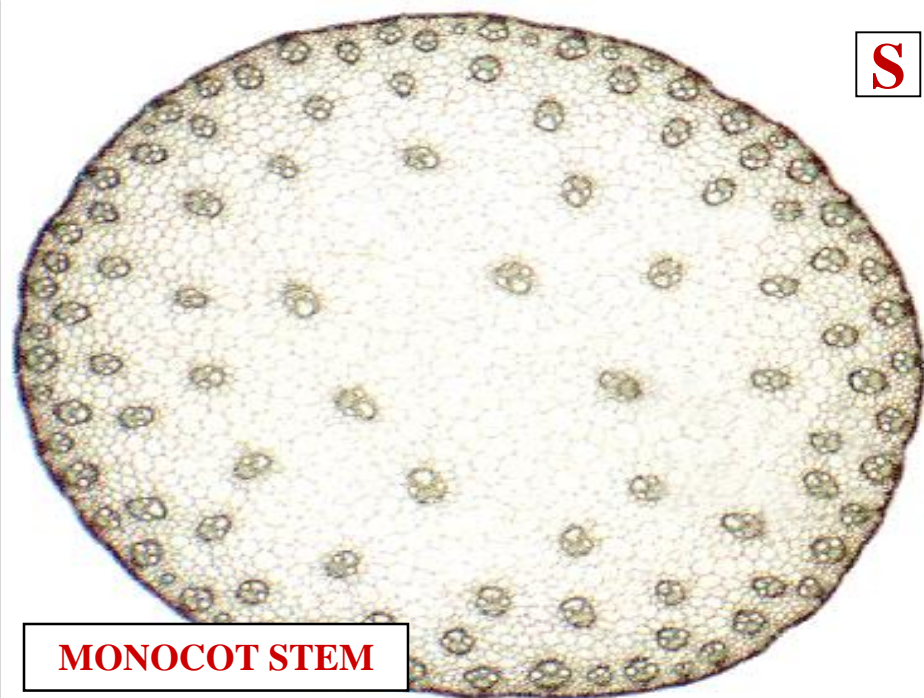




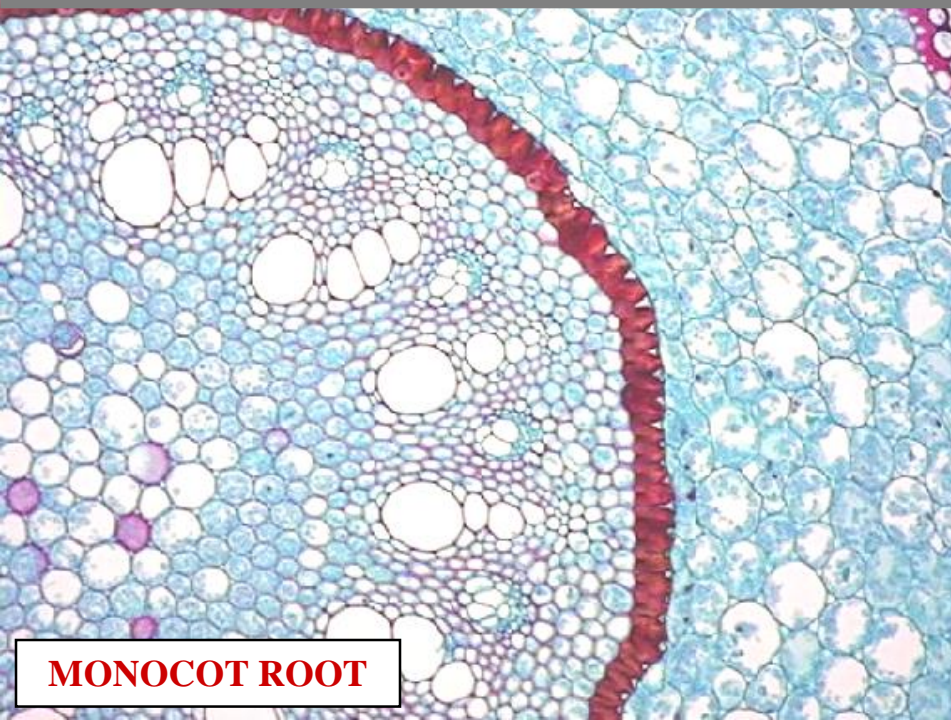
STELE SUMMARY MONOCOTS



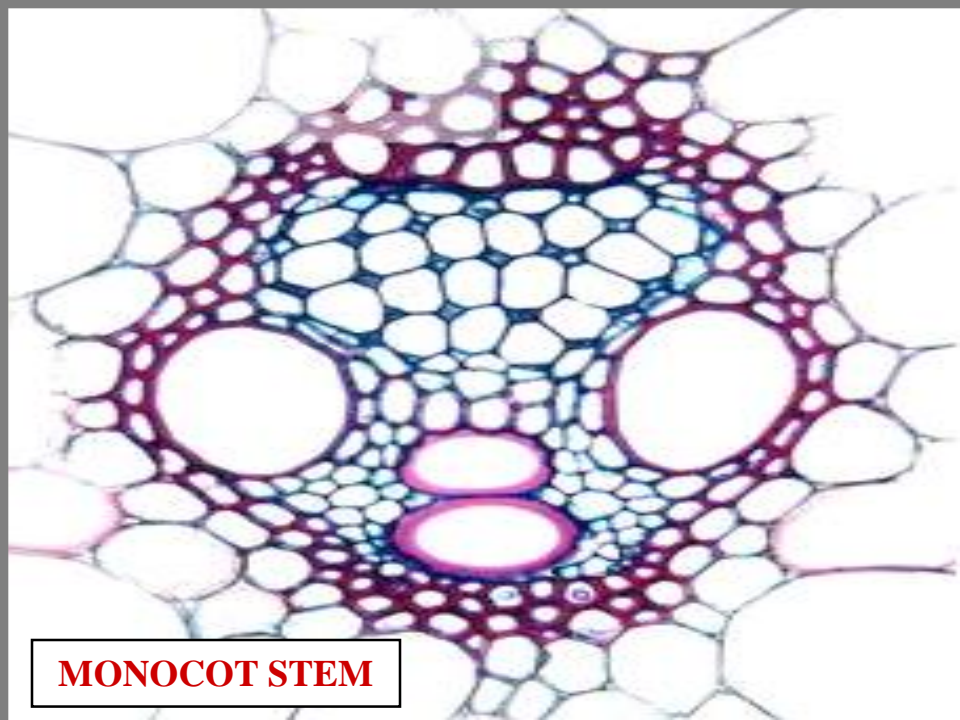
MONOCOT ROOT



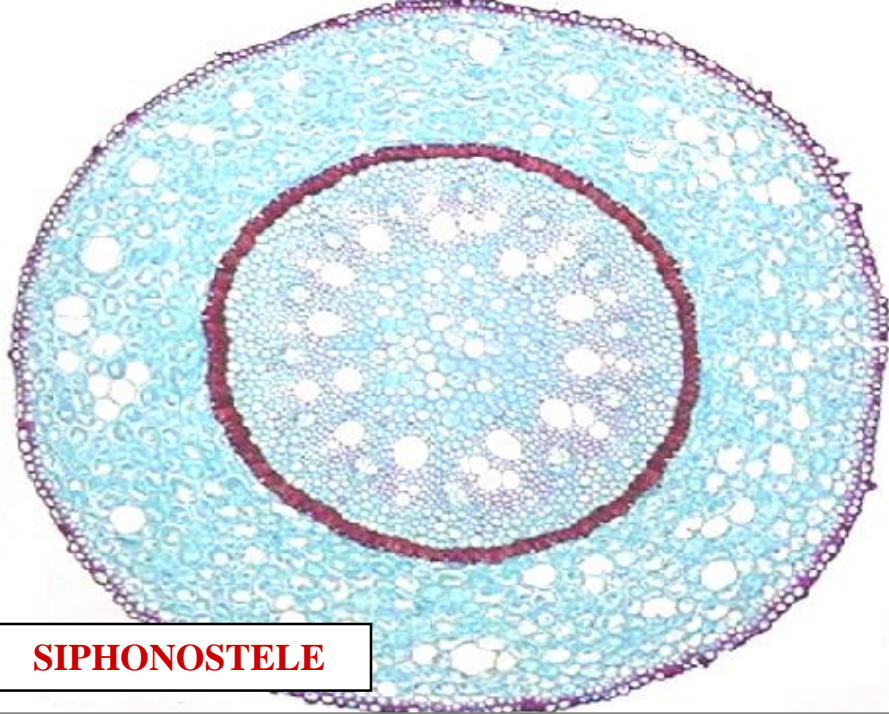
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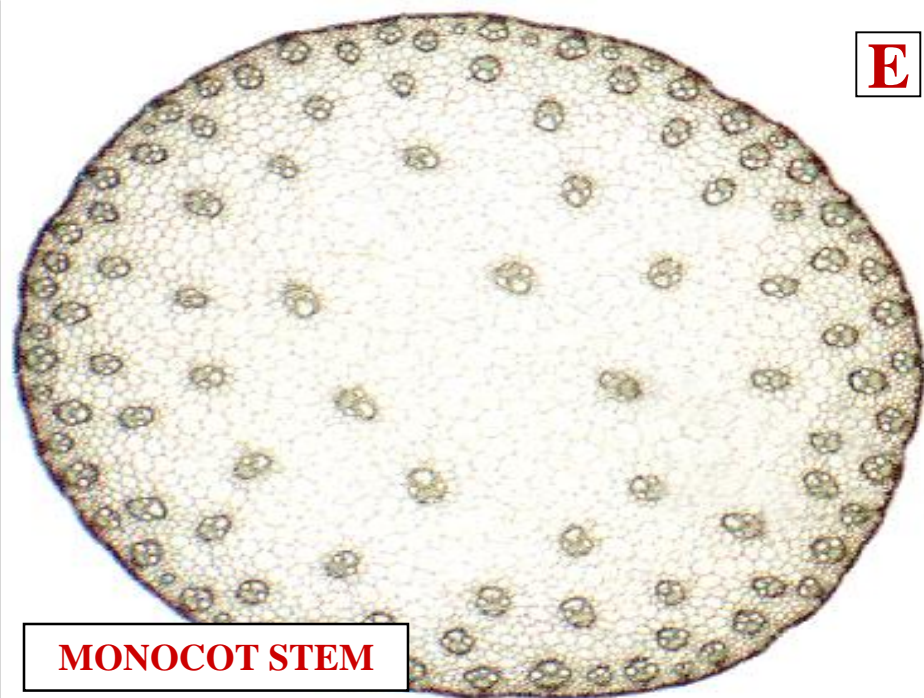
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MONOCOT STEM

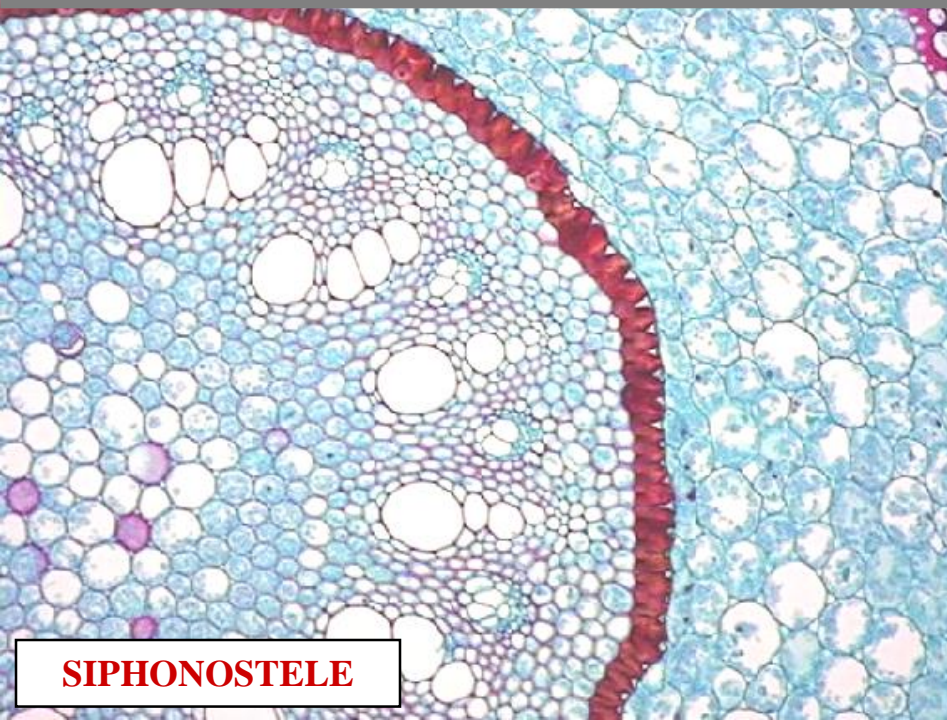


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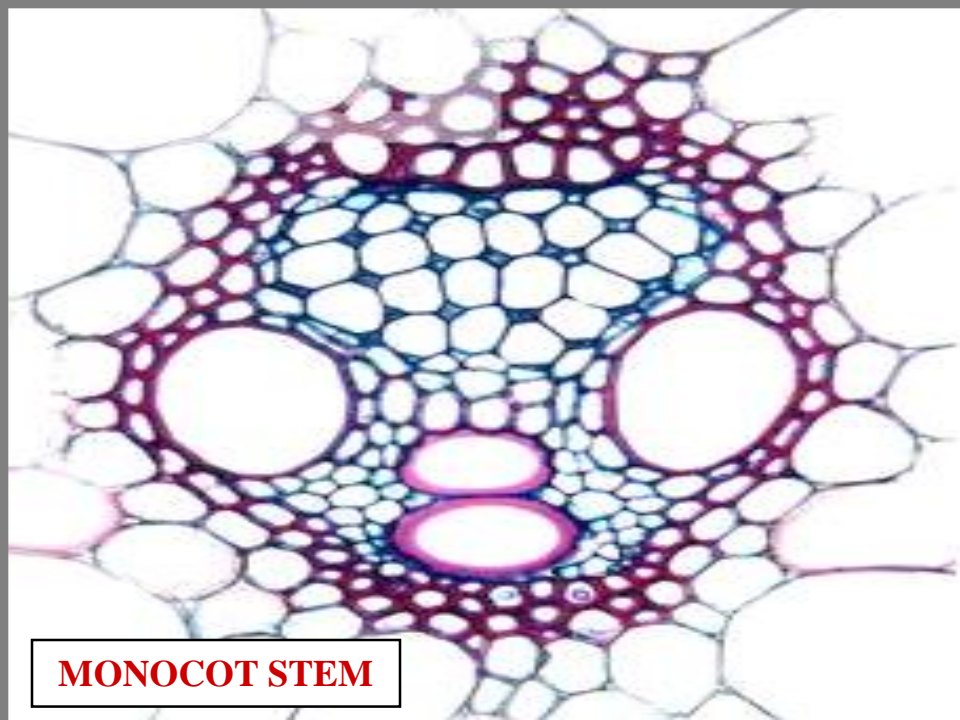


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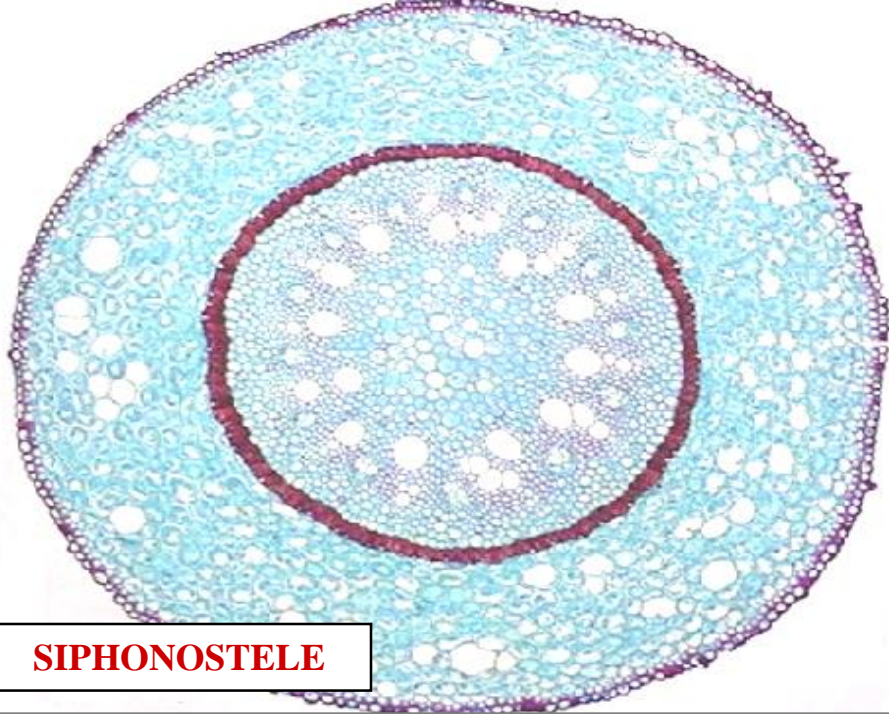
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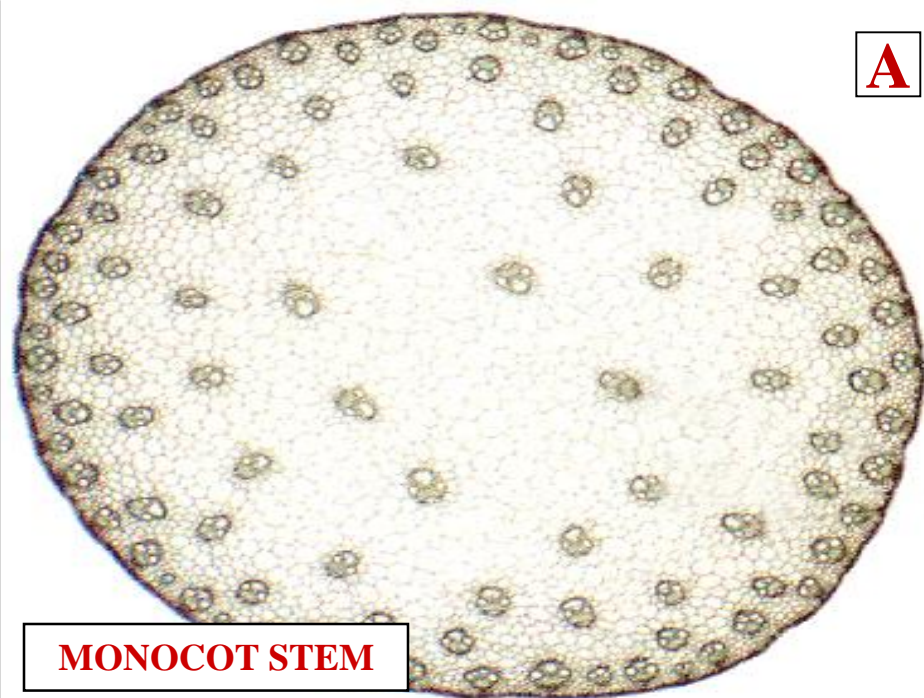
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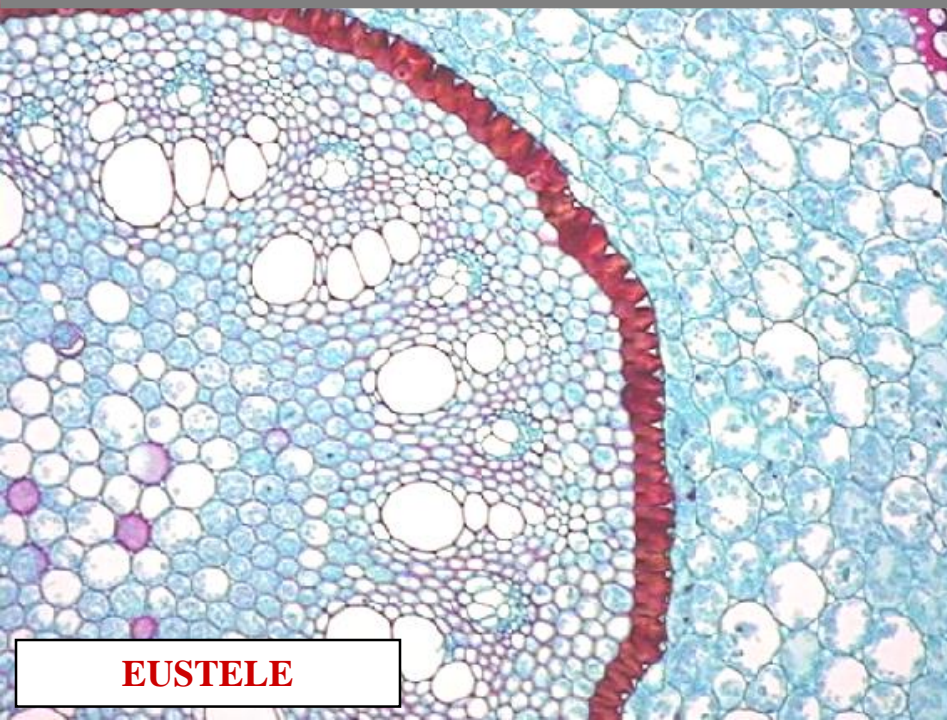


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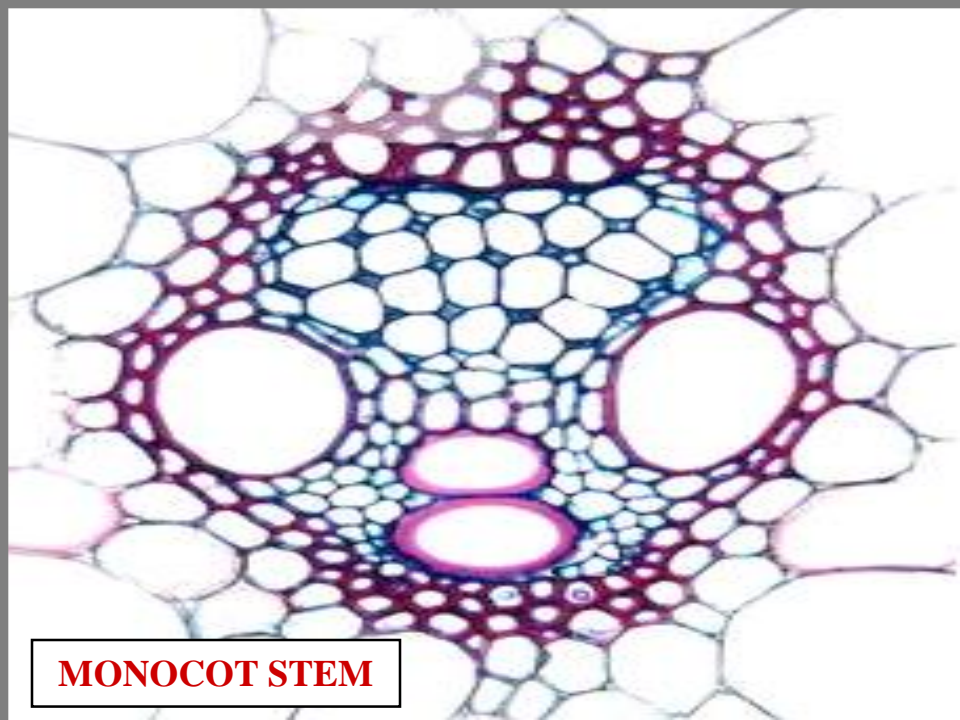


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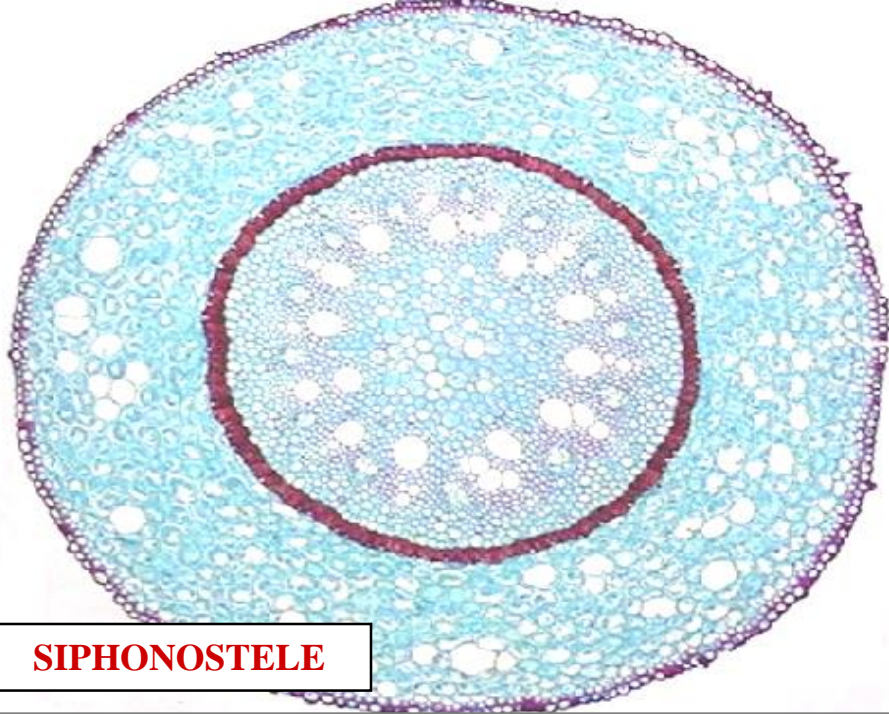
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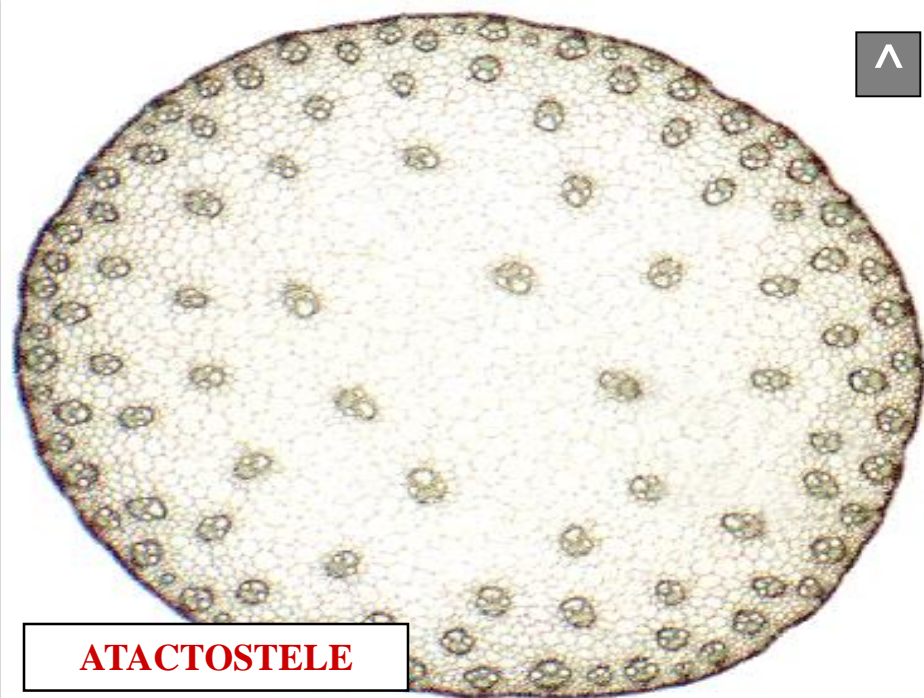
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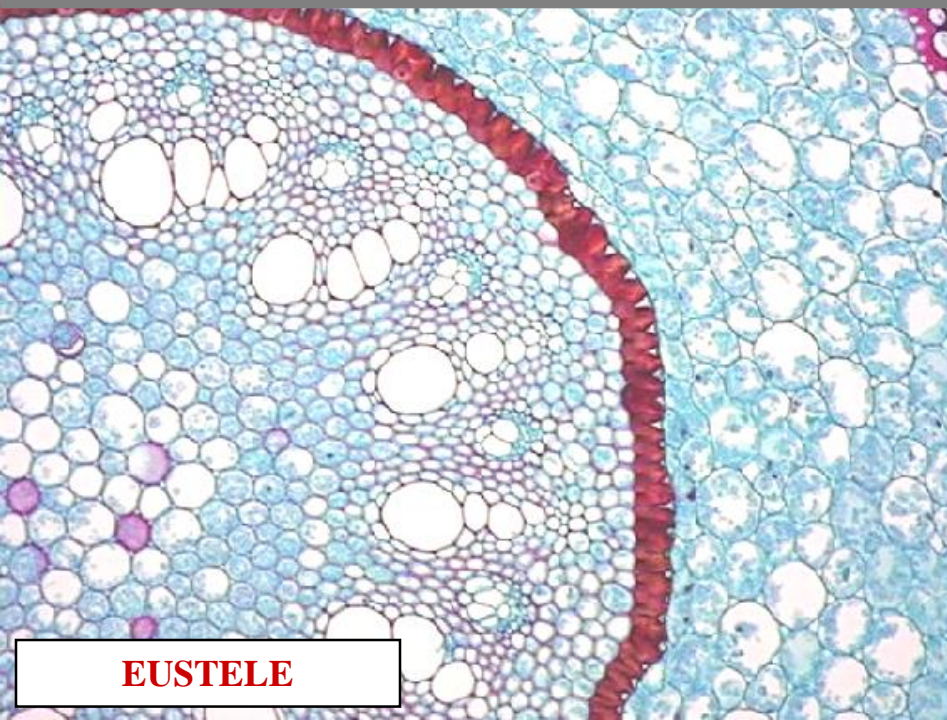
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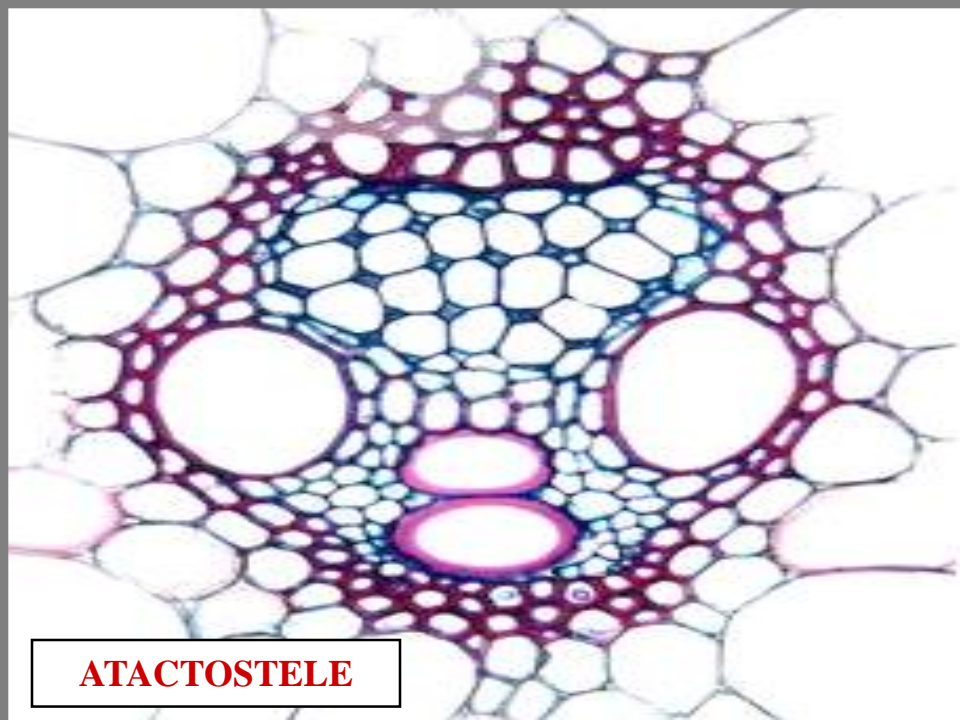
SIPHONOSTELE



ATACTOSTELE



EUSTELE



ATACTOSTELE



STEM MORPHOLOGY

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ANGIOSPERM STEM

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NODE

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NODE

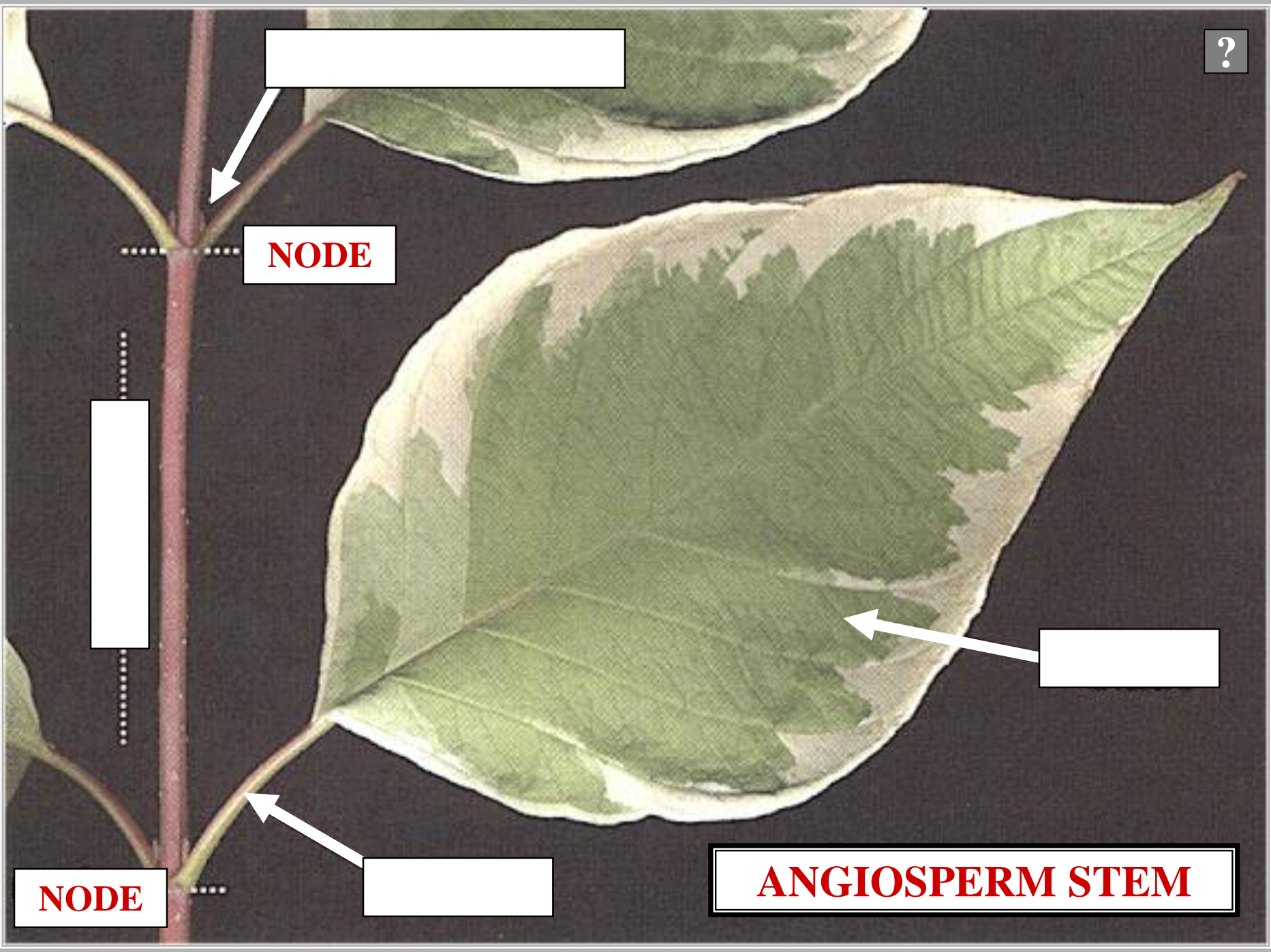
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ANGIOSPERM STEM



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NODE



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[Blank box]



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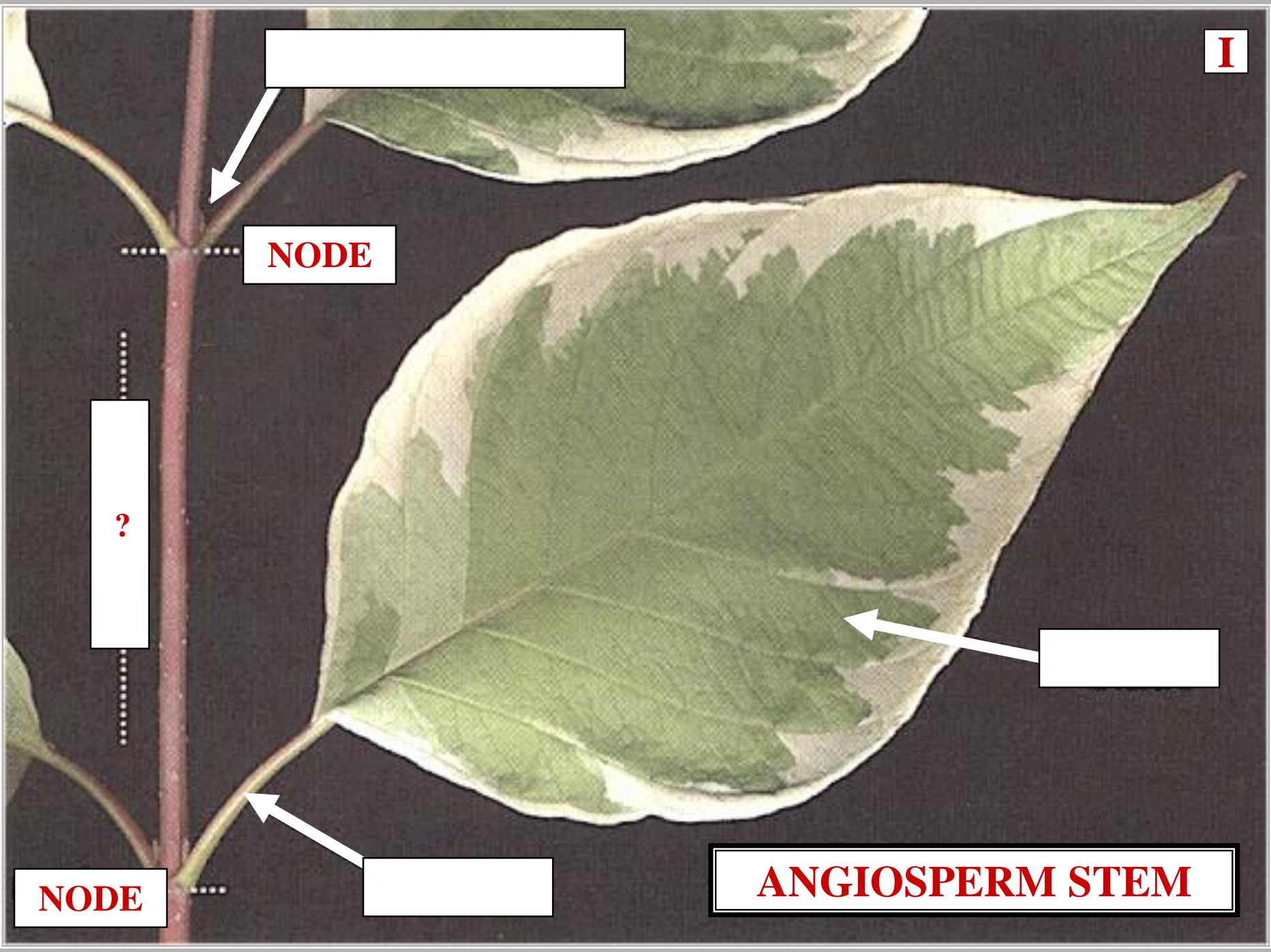
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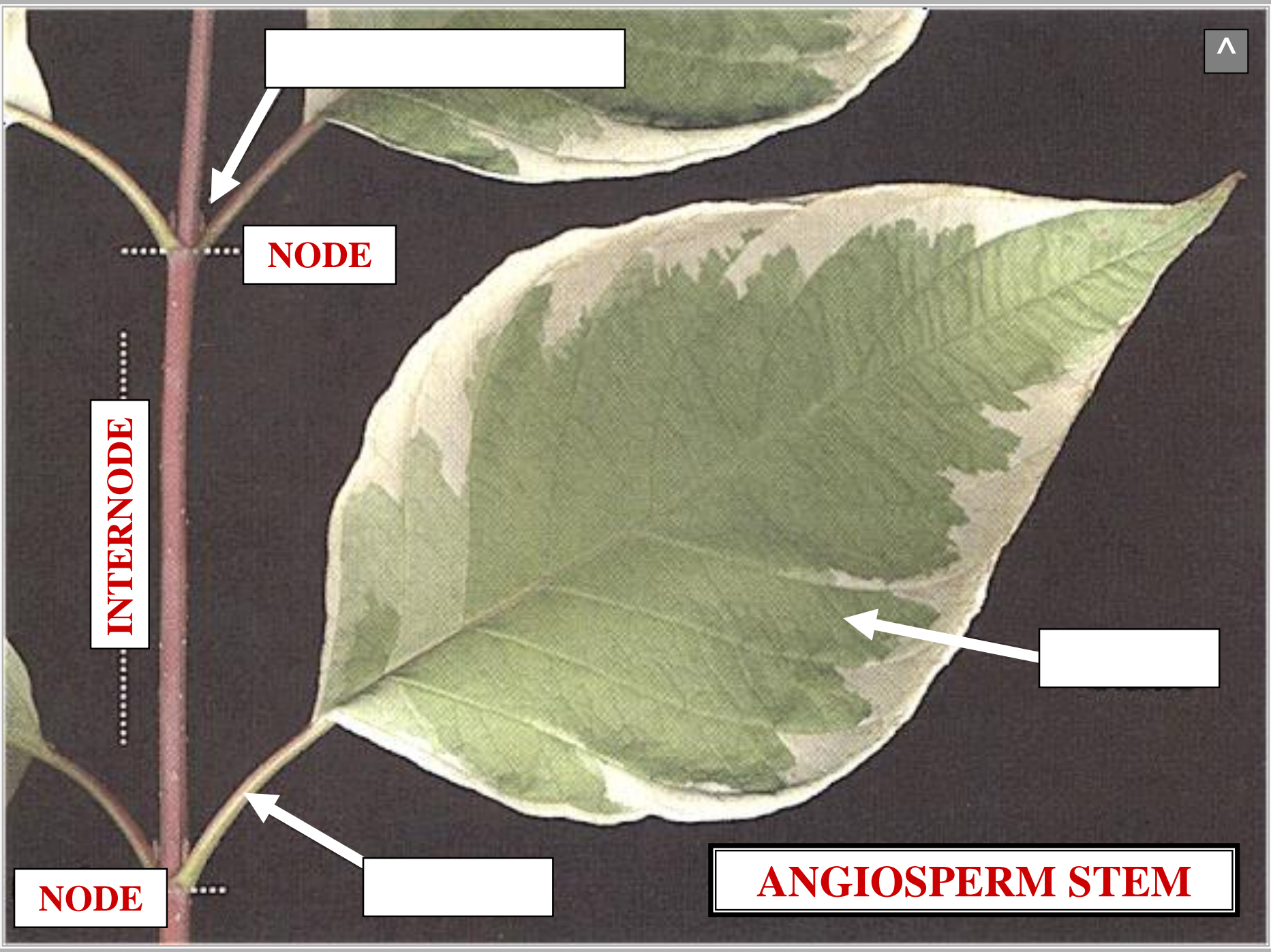


NODE



ANGIOSPERM STEM





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NODE

INTERNODE

[Blank white box]



[Blank white box]



NODE

ANGIOSPERM STEM



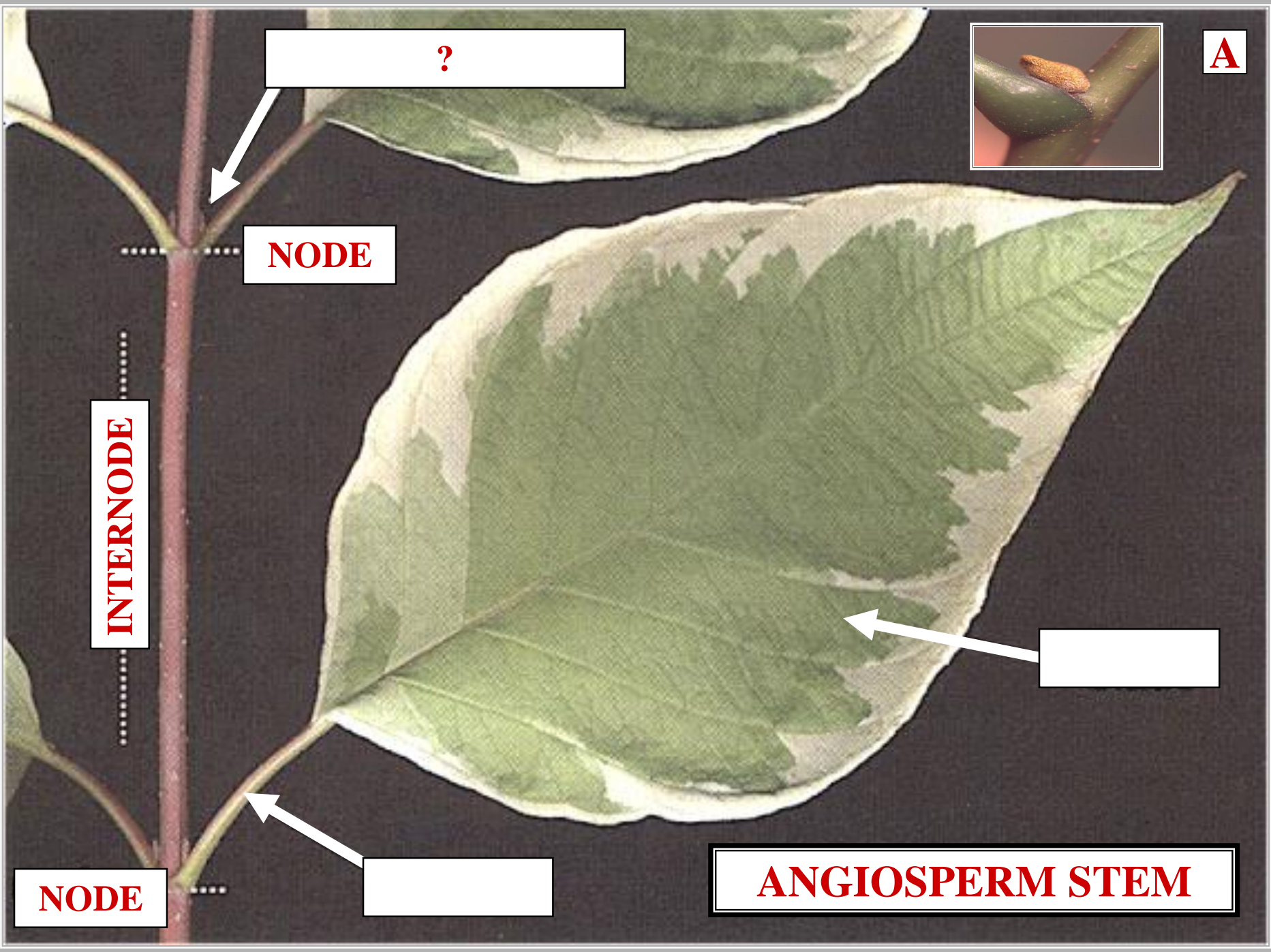
LEAF



QUESTION

**HOW IS A LEAF
LOCATED UPON
A STEM?**

QUESTION



?



A

NODE

INTERNODE

NODE

ANGIOSPERM STEM

AXILLARY BUD

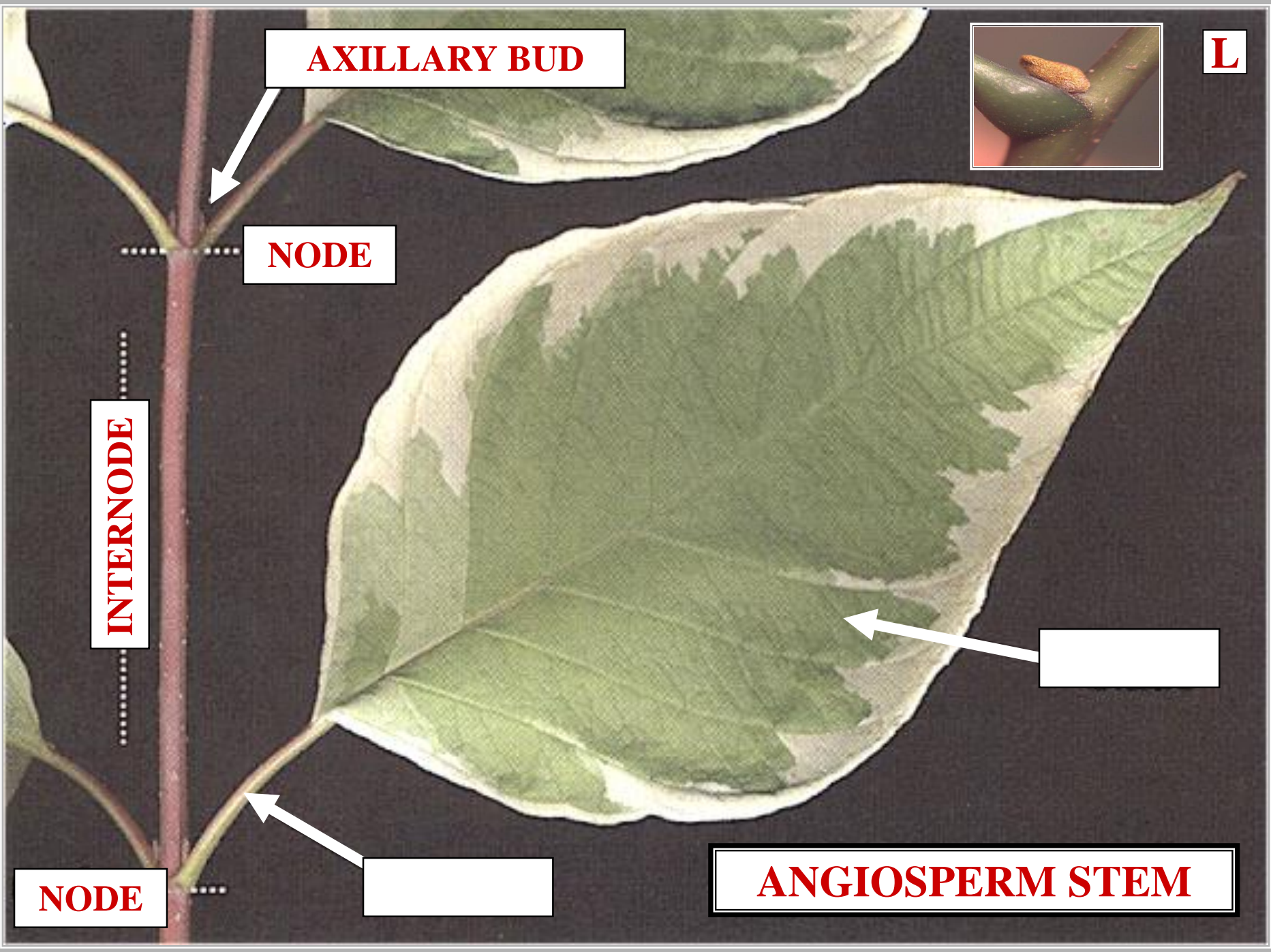
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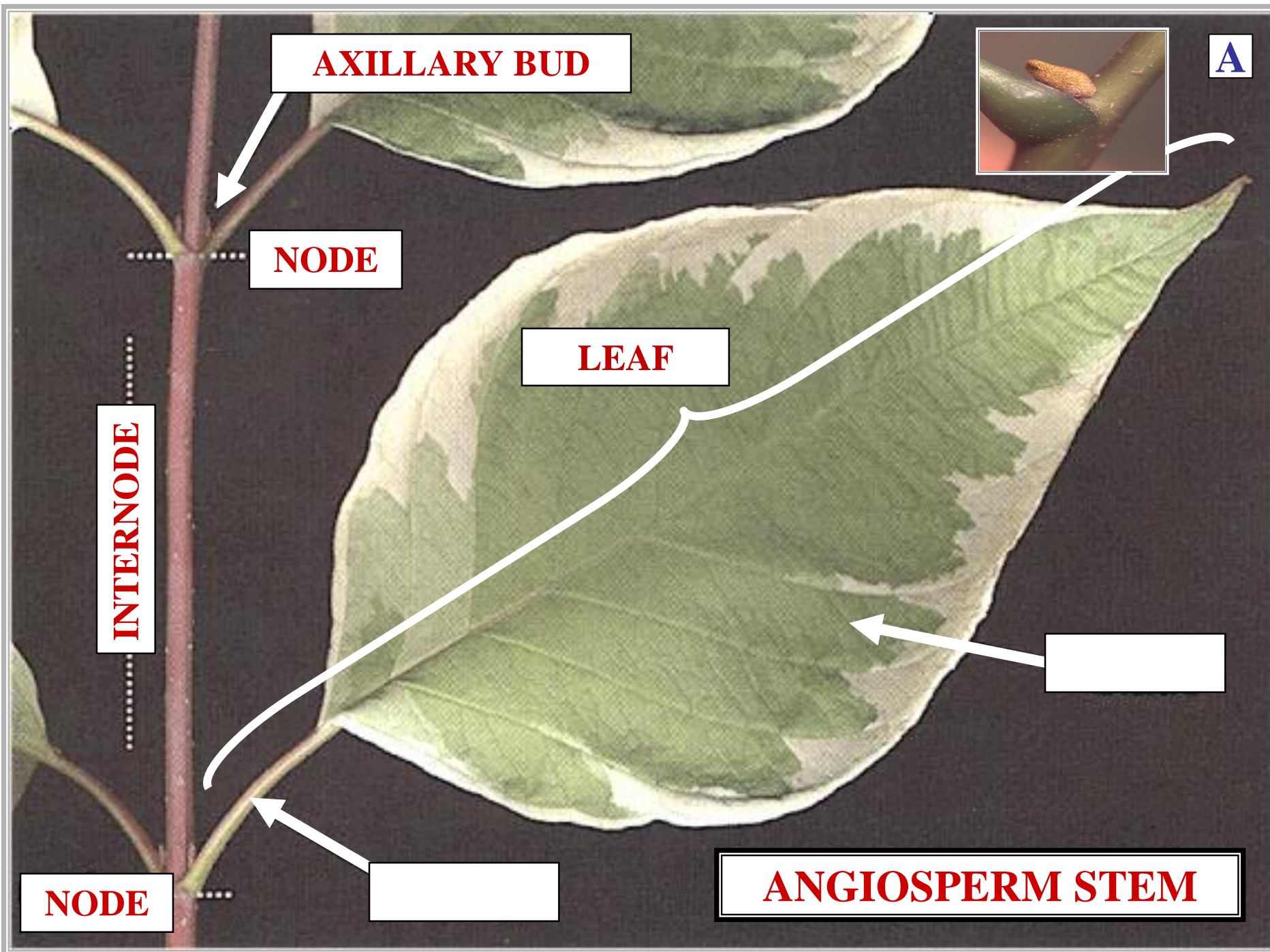
INTERNODE

NODE

ANGIOSPERM STEM

L





AXILLARY BUD



A

NODE

LEAF

INTERNODE

[Empty box]

NODE

[Empty box]

ANGIOSPERM STEM



ANSWER

**LOCATE
AXILLARY BUD**

ANSWER



LEAF PHYLLOTAXY