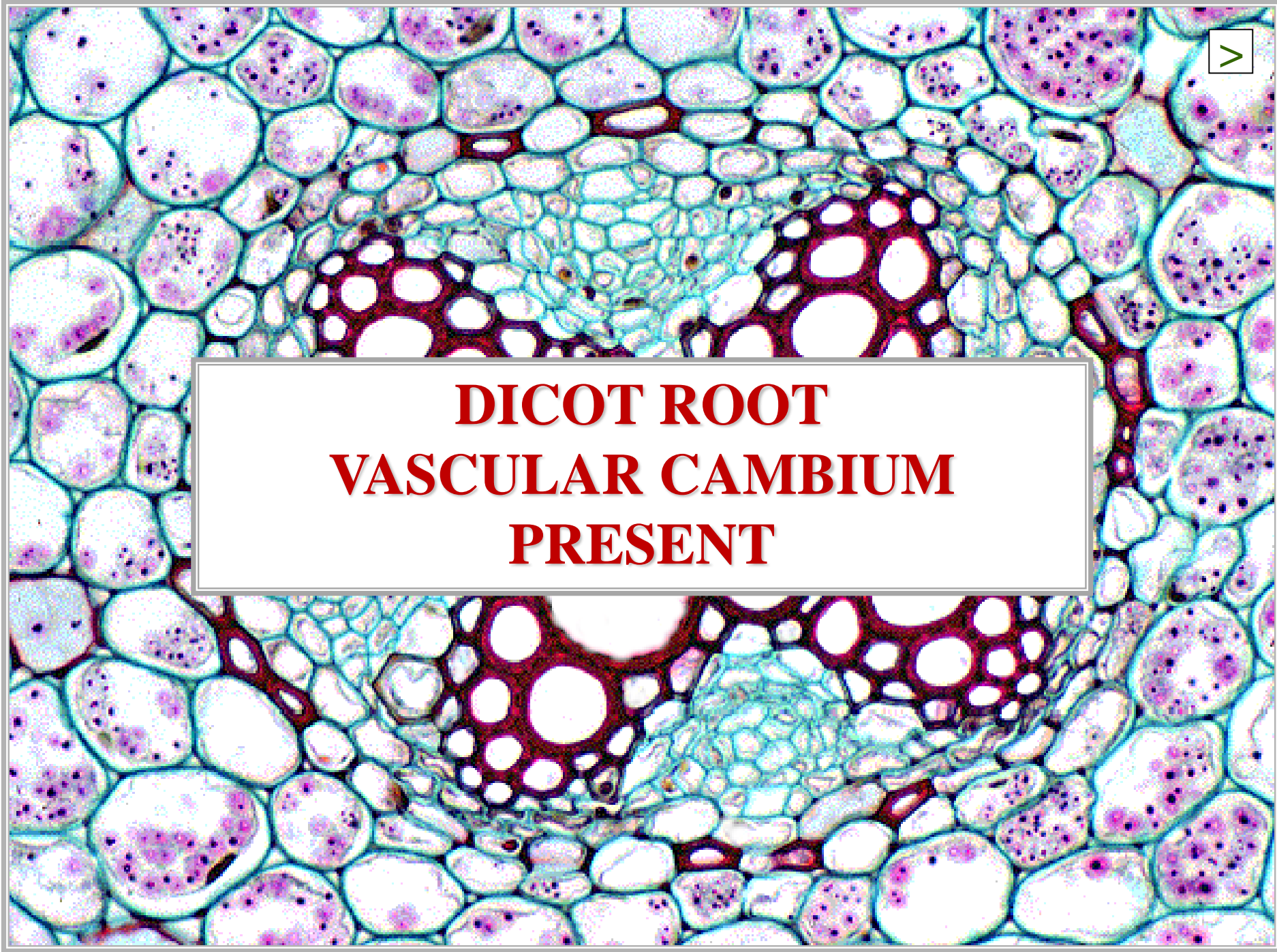


A light micrograph of a plant stem cross-section. The vascular bundles are arranged in a ring, with each bundle containing a central protoxylem lacuna. The bundles are arranged in a pattern where the primary xylem is on the inner side and the primary phloem is on the outer side. The arrangement of the bundles is actinostele. The stem is stained with a combination of dyes, likely safranin and fast green, to highlight different tissues. A small green arrow in the top right corner points to the right. A red text box at the bottom contains the text 'PROTOSTELE / ACTINOSTELE'.

PROTOSTELE / ACTINOSTELE



**DICOT ROOT
VASCULAR CAMBIUM
PRESENT**





**DICOT ROOT
SECONDARY GROWTH
PRESENT**



DICOT PRIMARY STEM ANATOMY

?

[]

[]

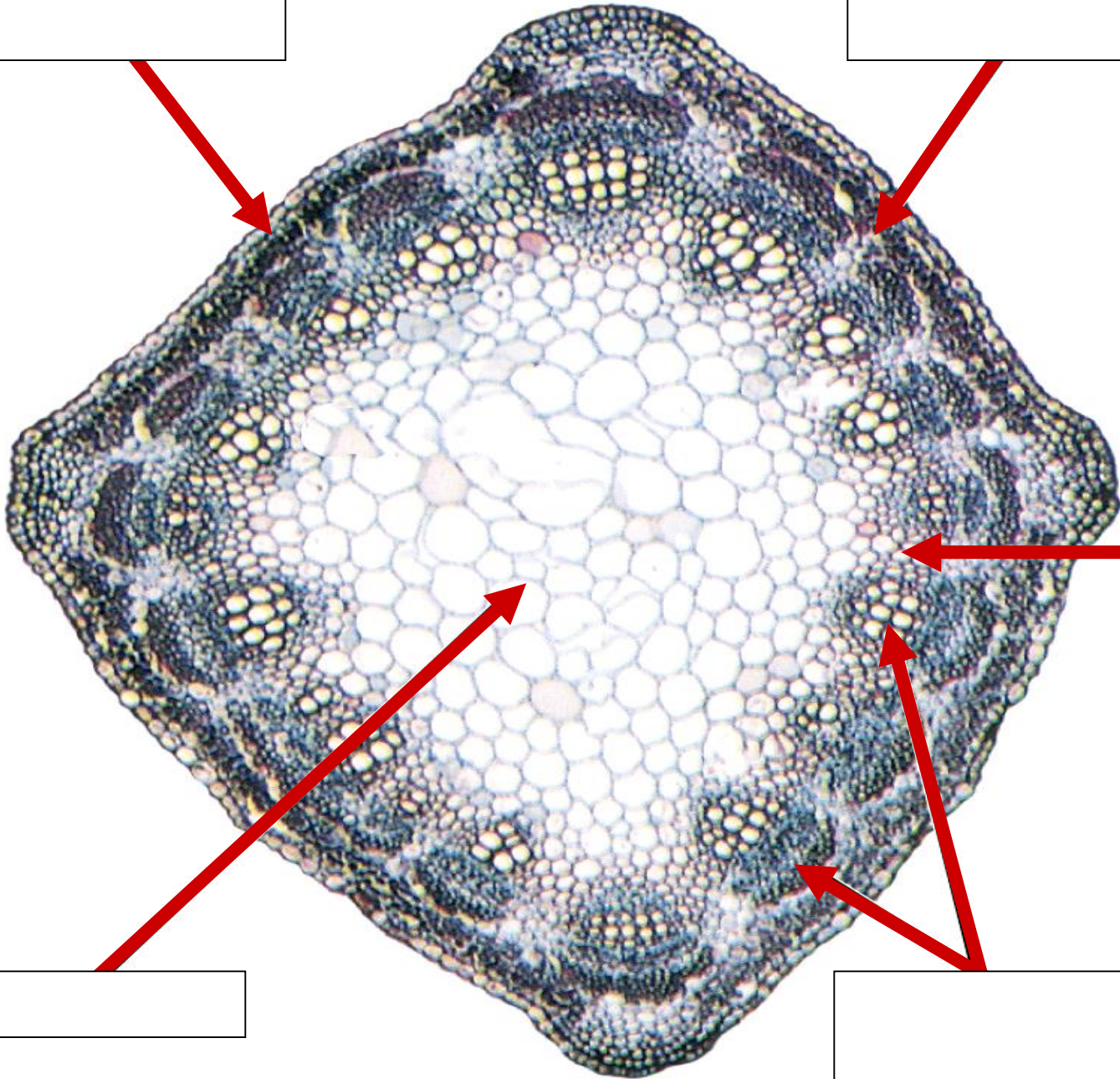
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STEM

C.S.

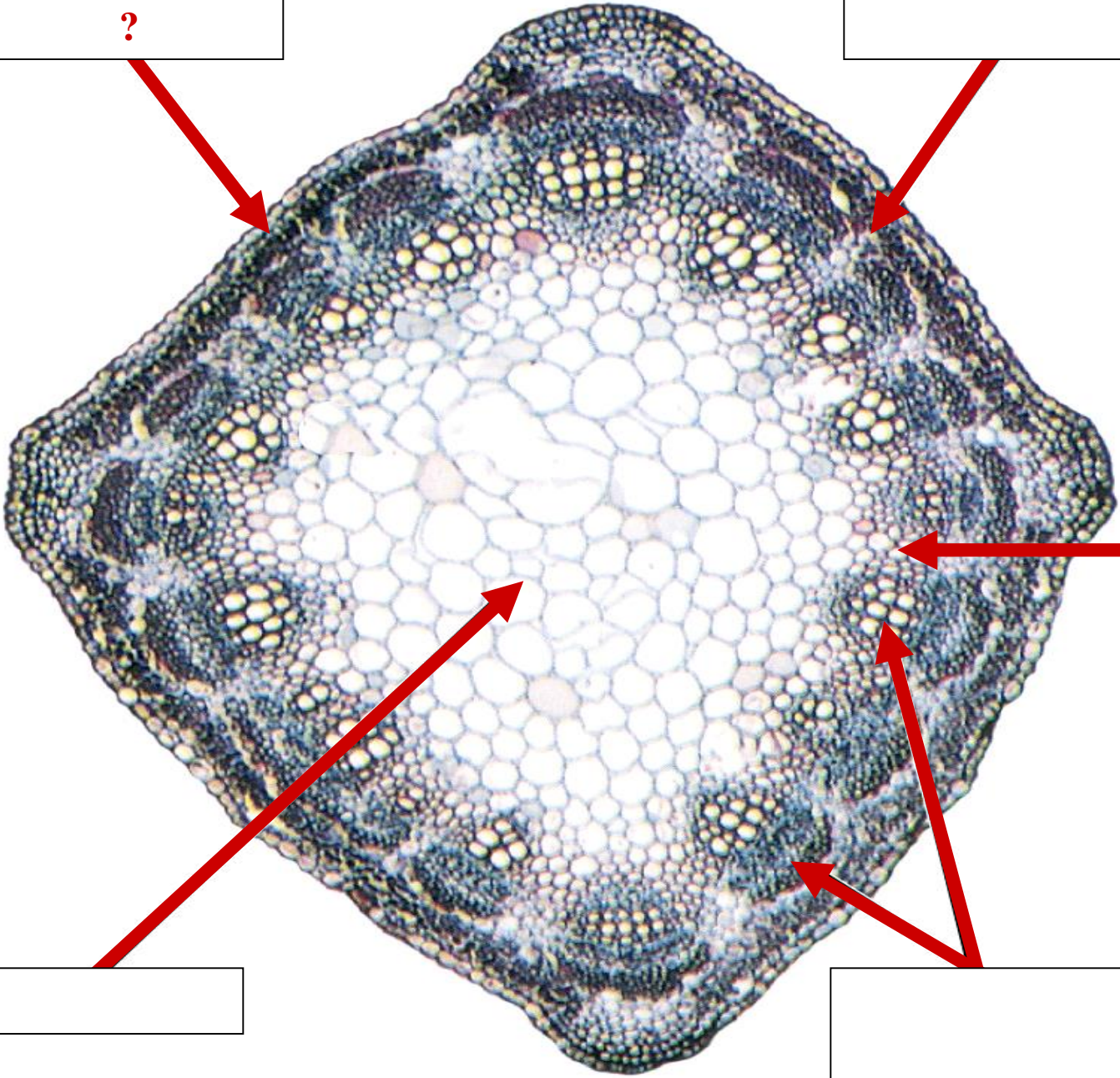
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[]



C

?

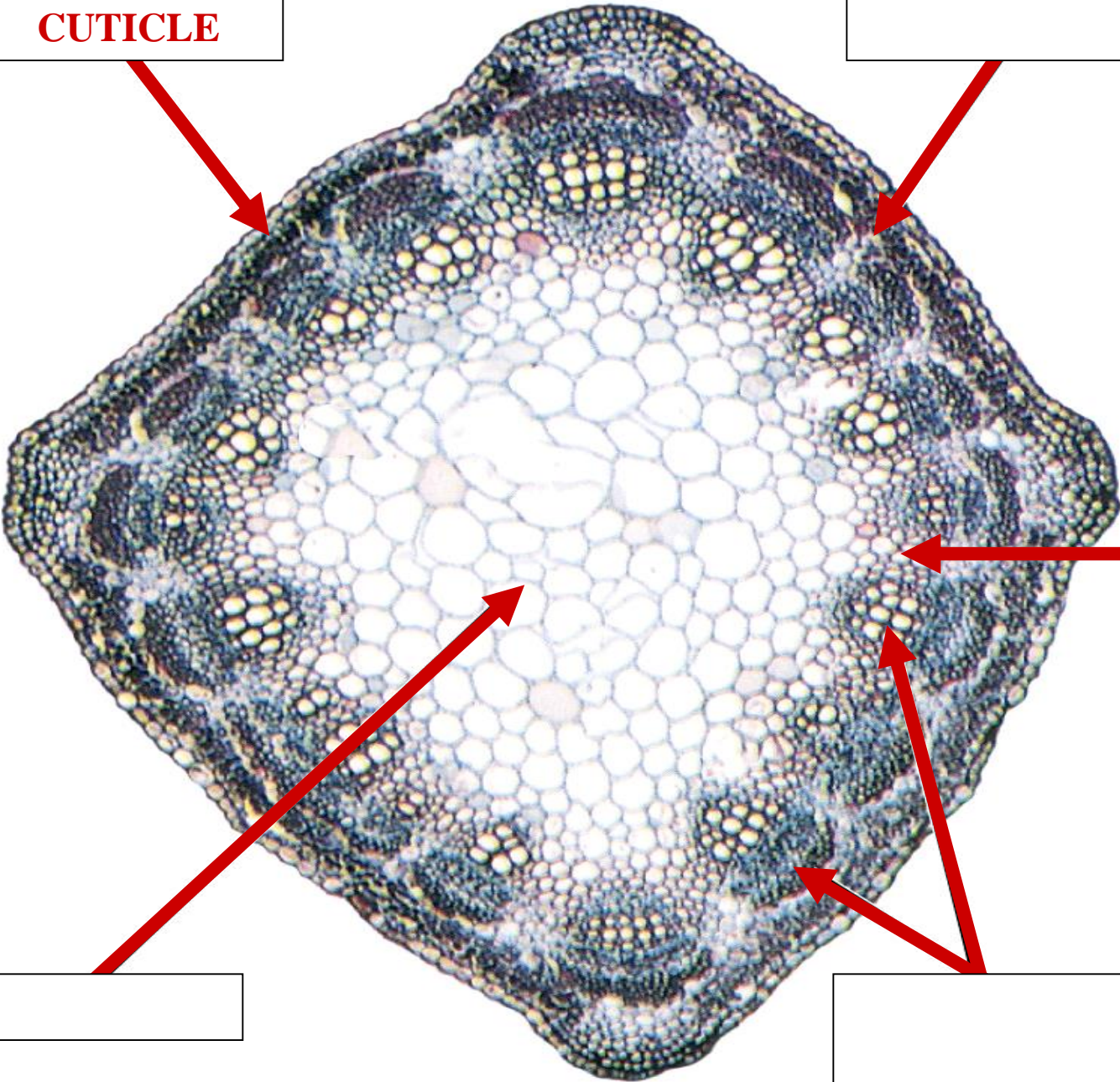


STEM

C.S.

?

CUTICLE

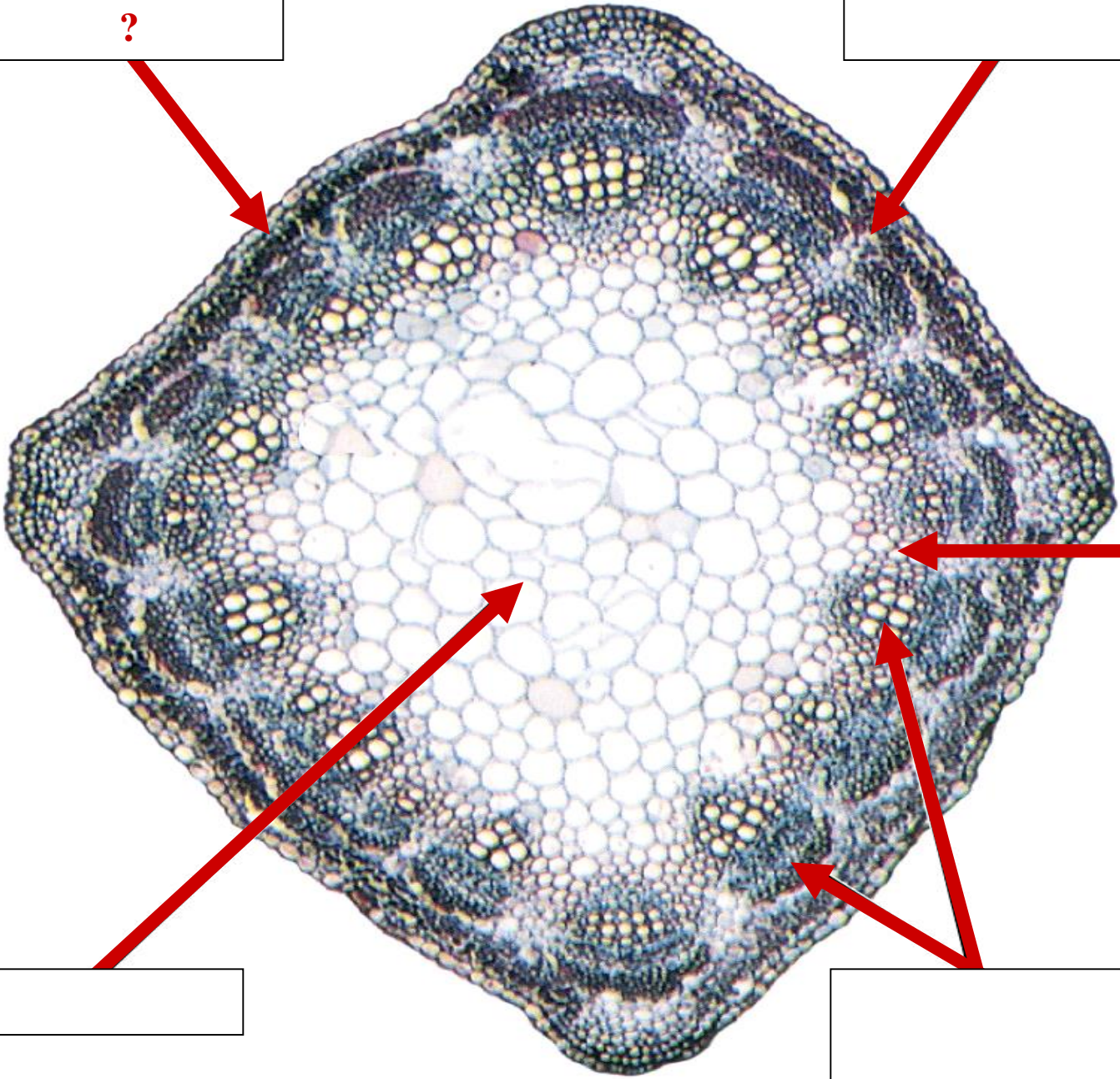


STEM

C.S.

E

?

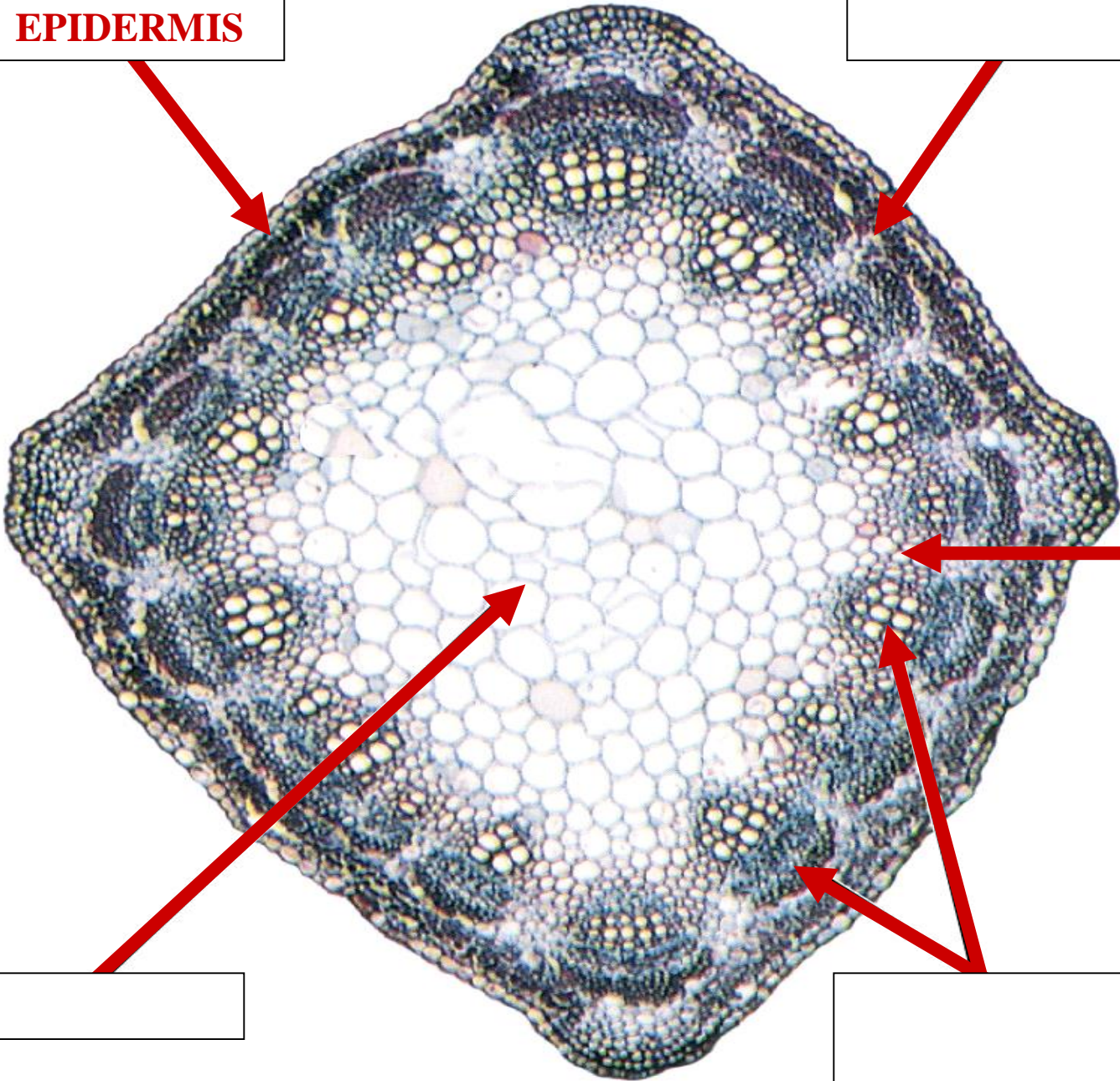


STEM

C.S.

?

EPIDERMIS



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STEM

C.S.

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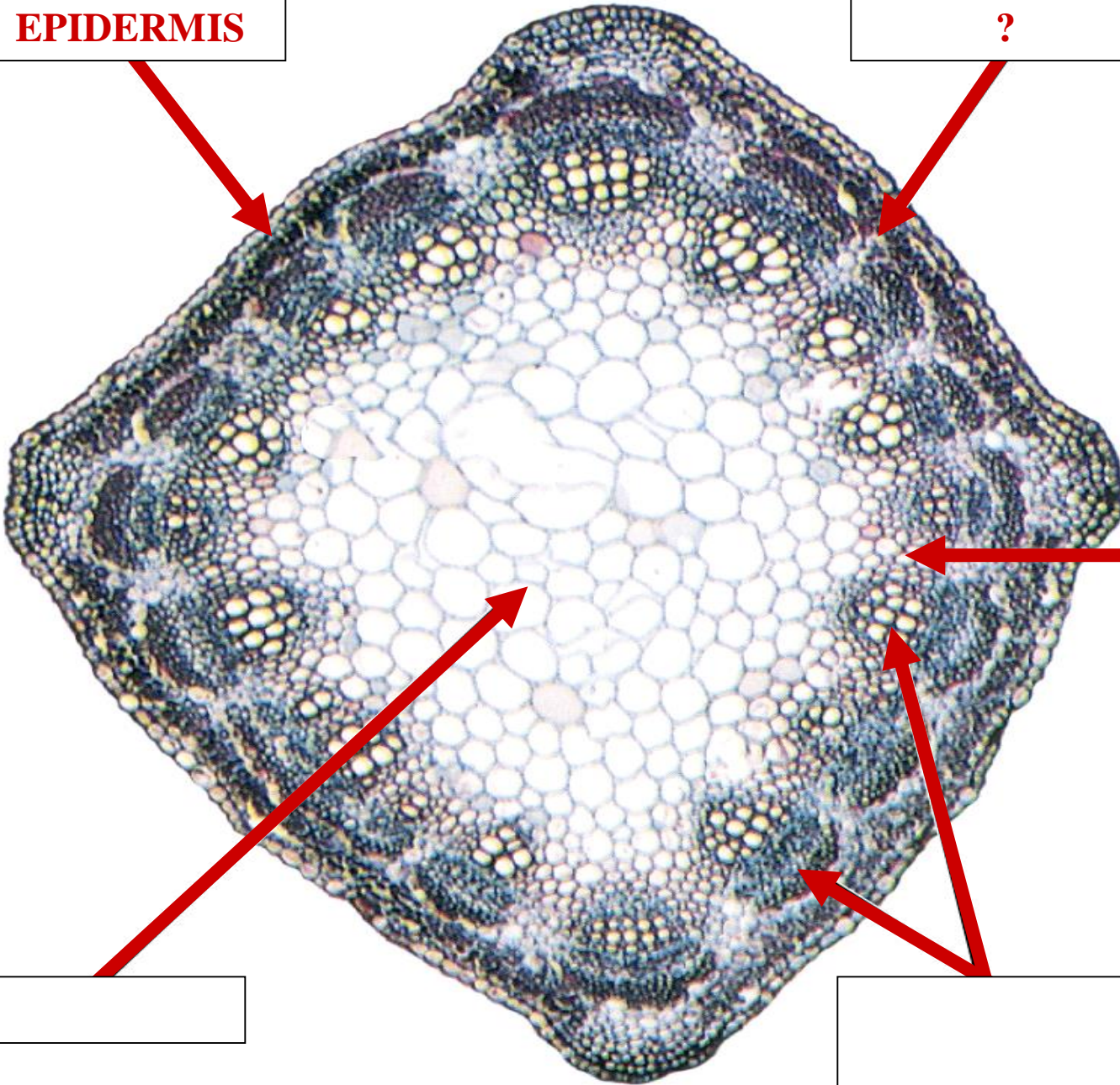
C

EPIDERMIS

?

STEM

C.S.



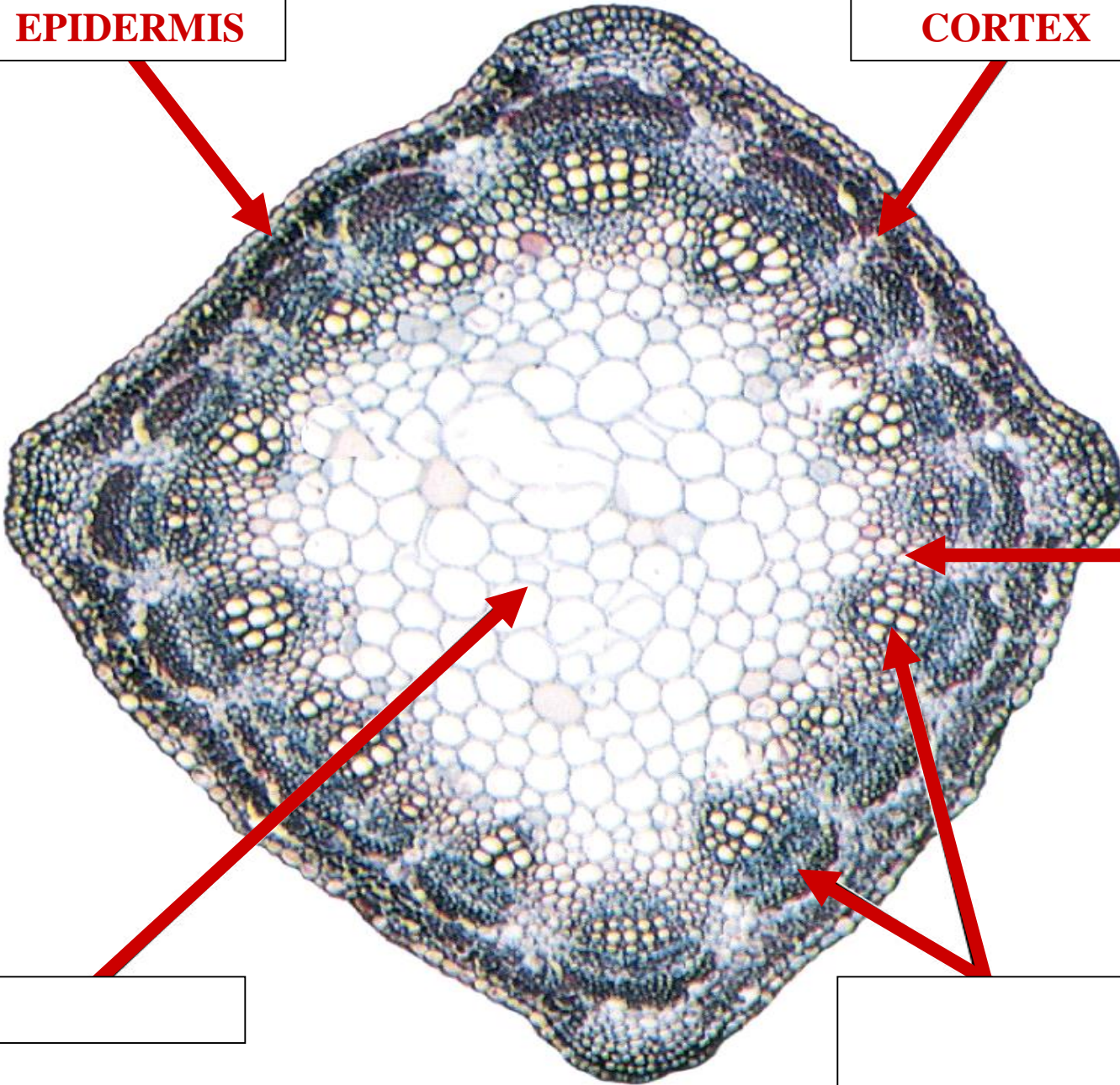
C

EPIDERMIS

CORTEX

STEM

C.S.



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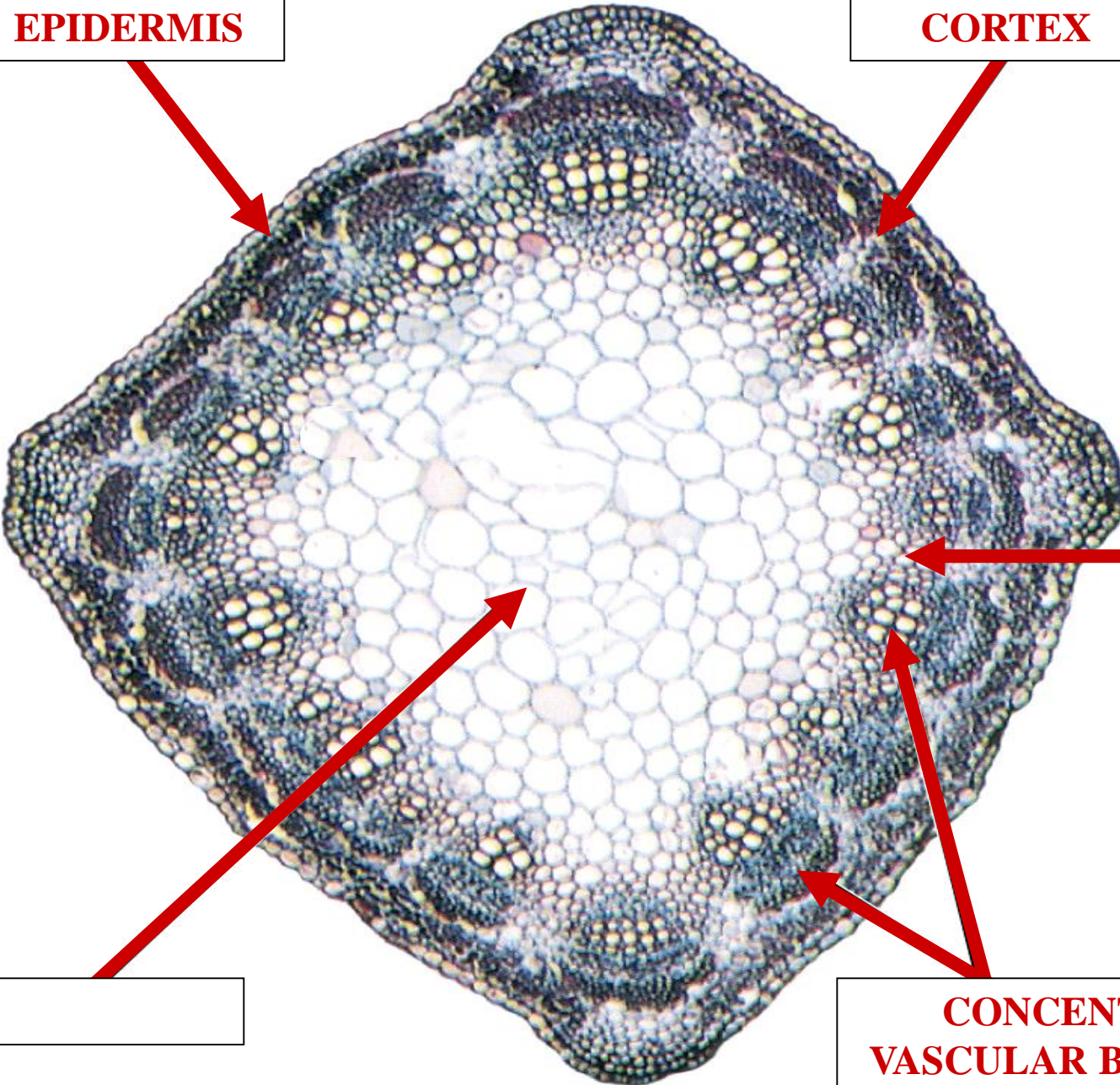
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EPIDERMIS

CORTEX

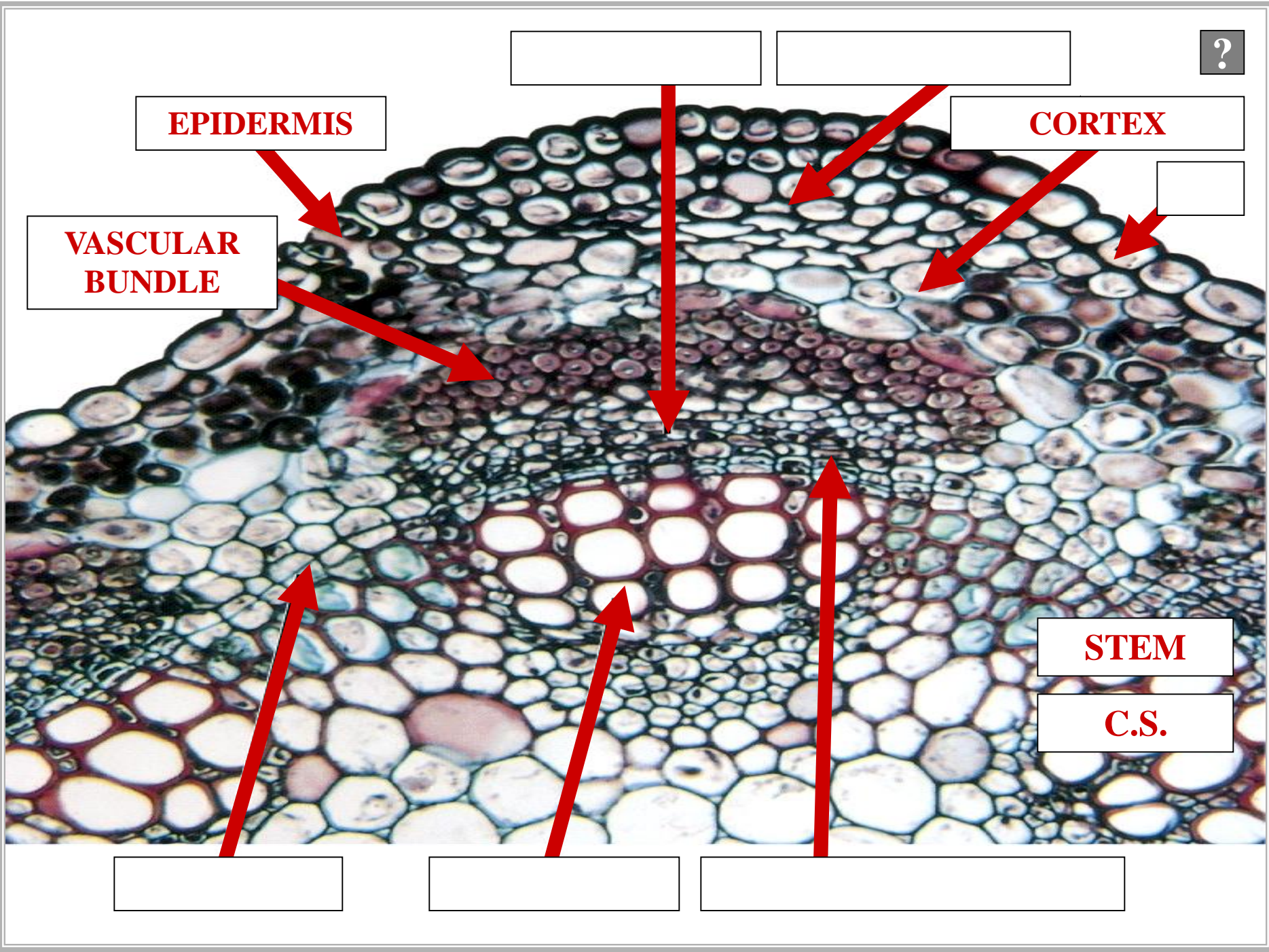


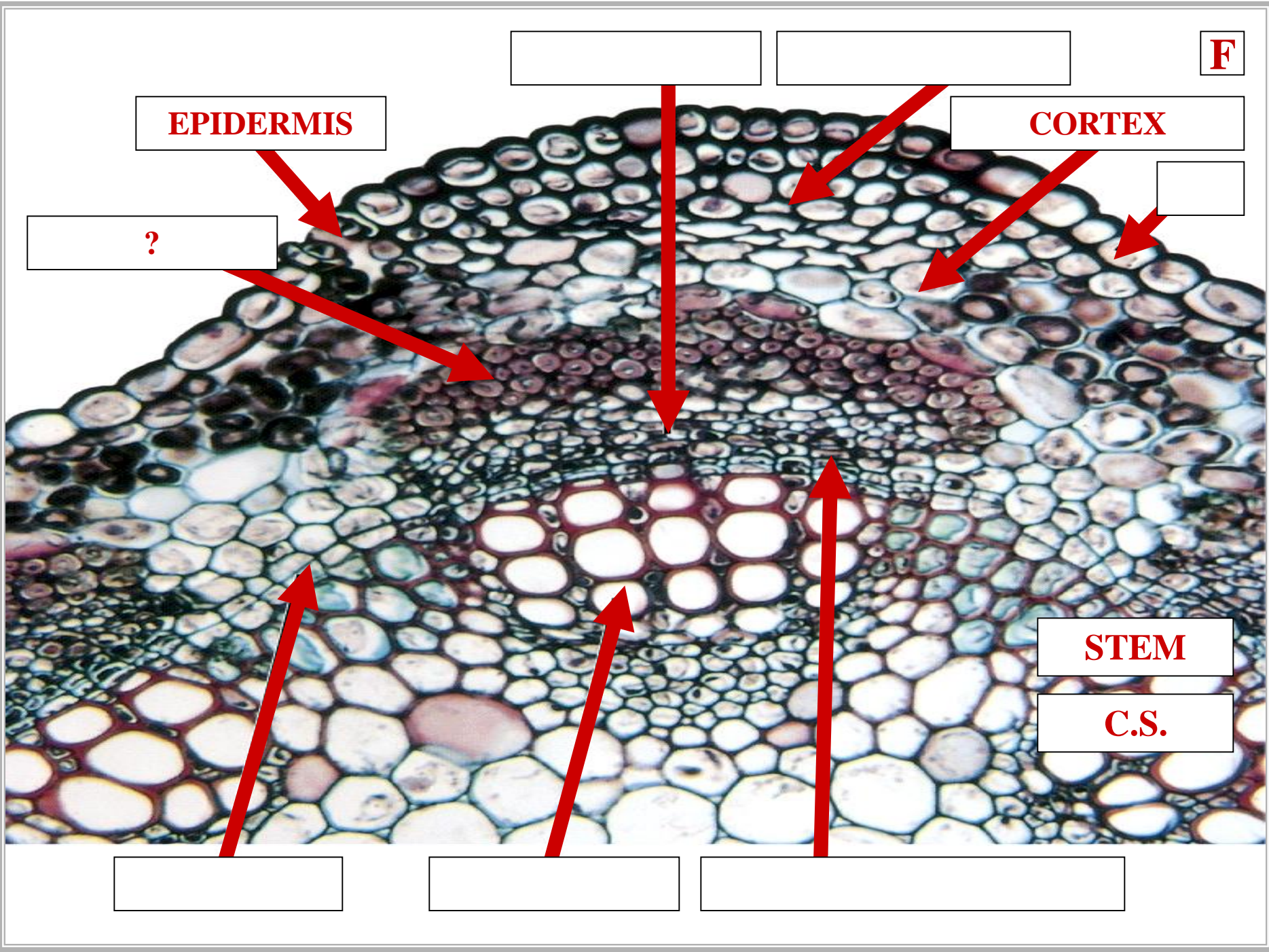
STEM

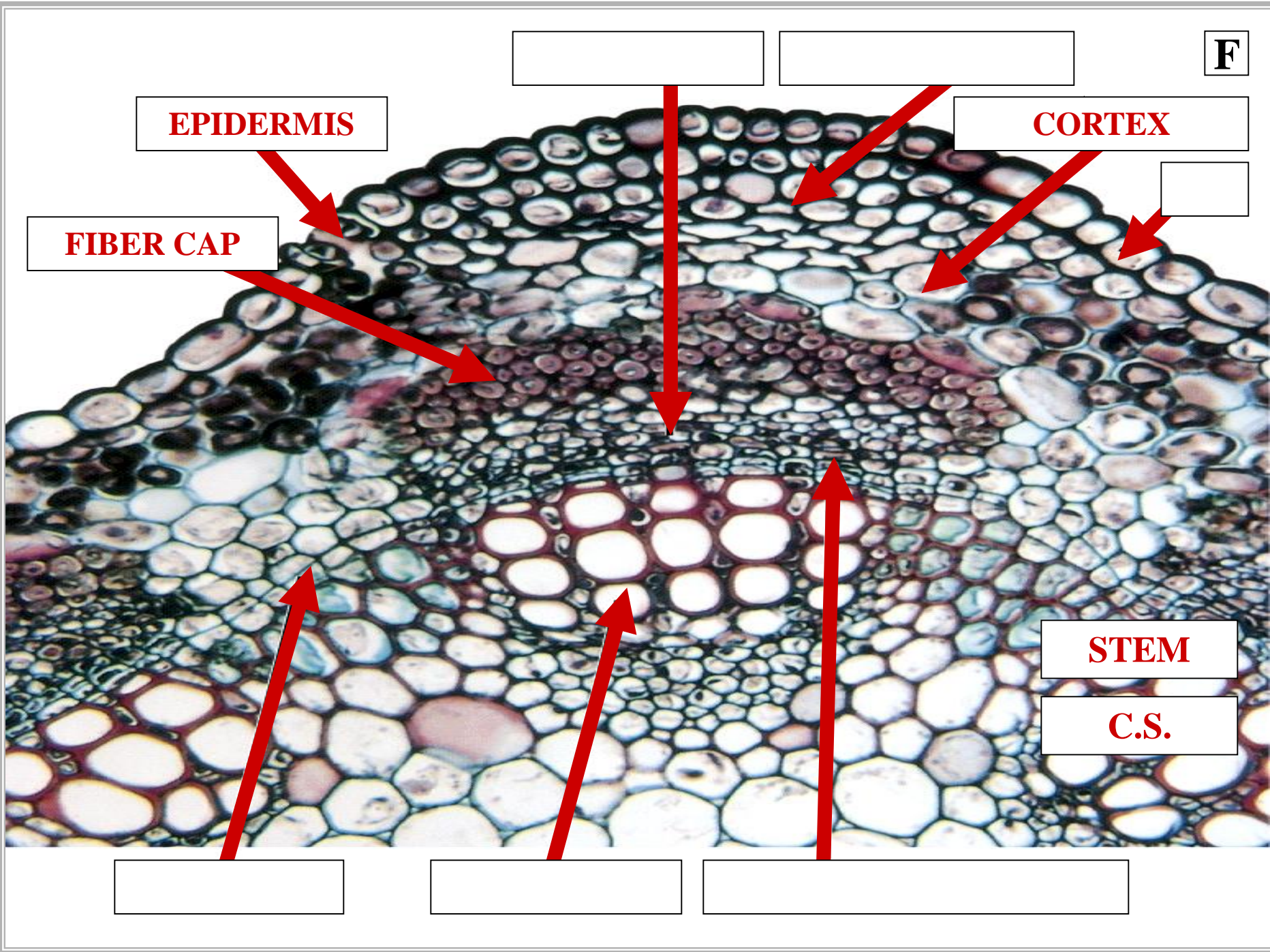
C.S.

**CONCENTRIC
VASCULAR BUNDLES**









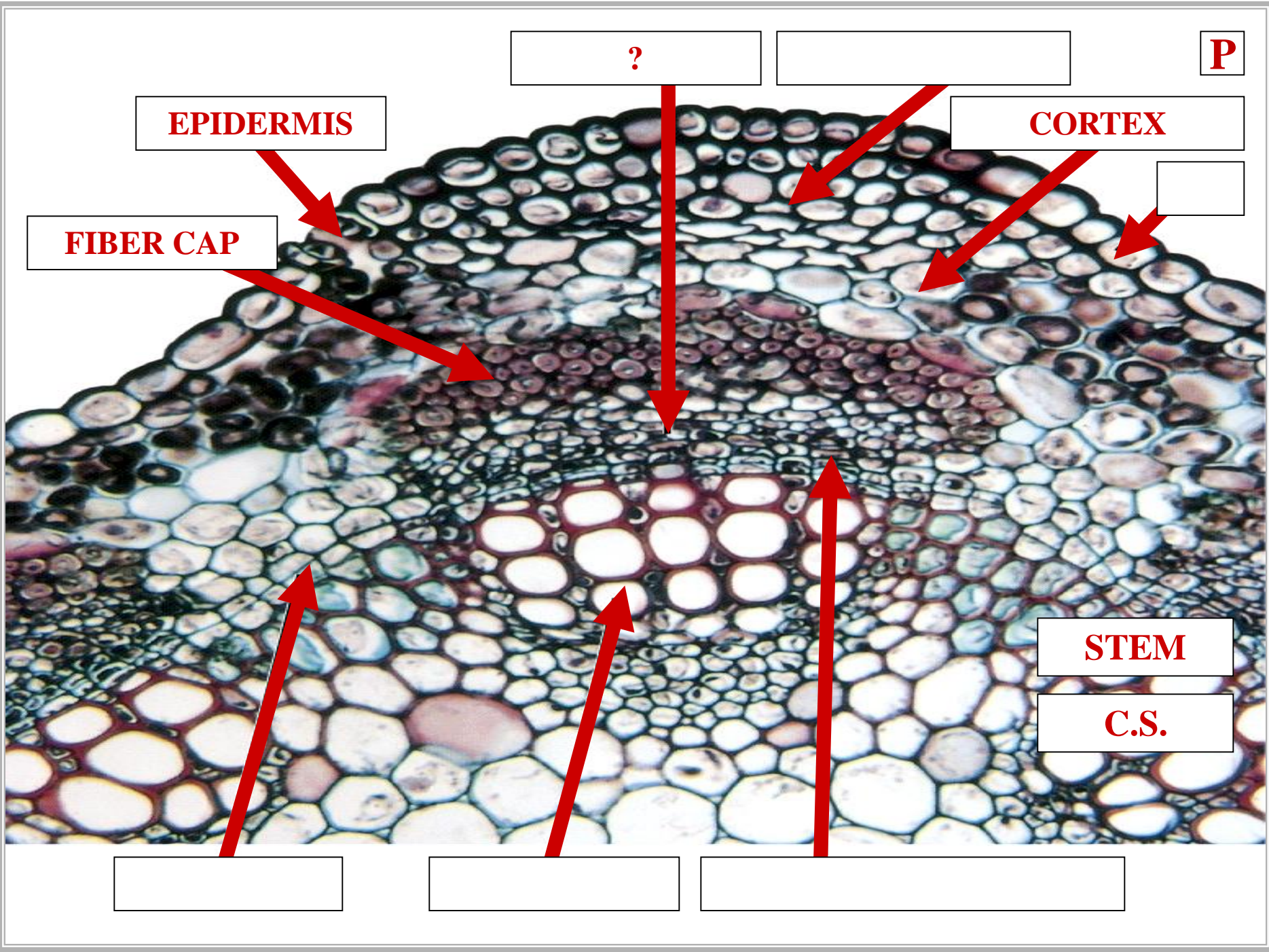
FIBER CAP

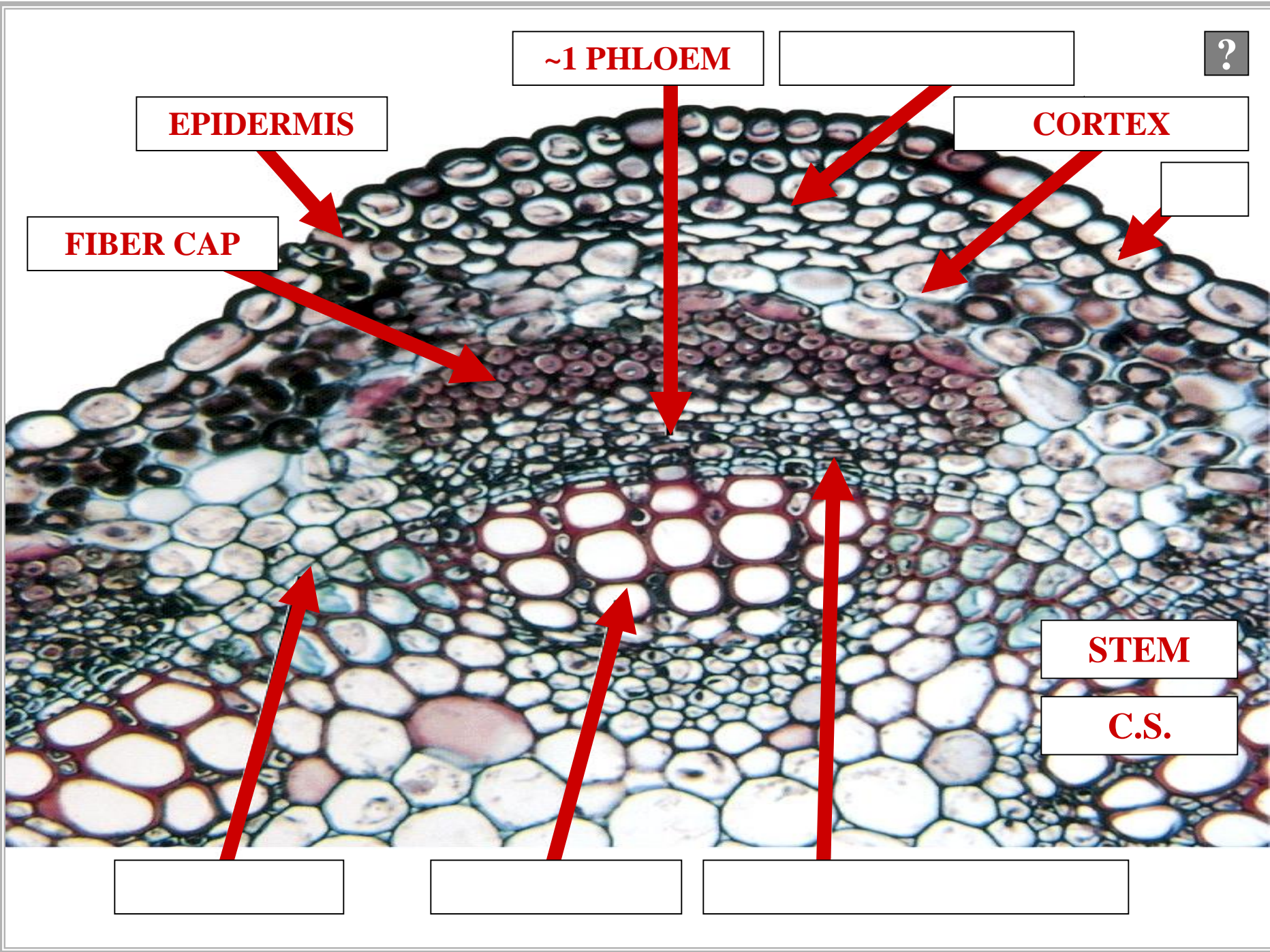


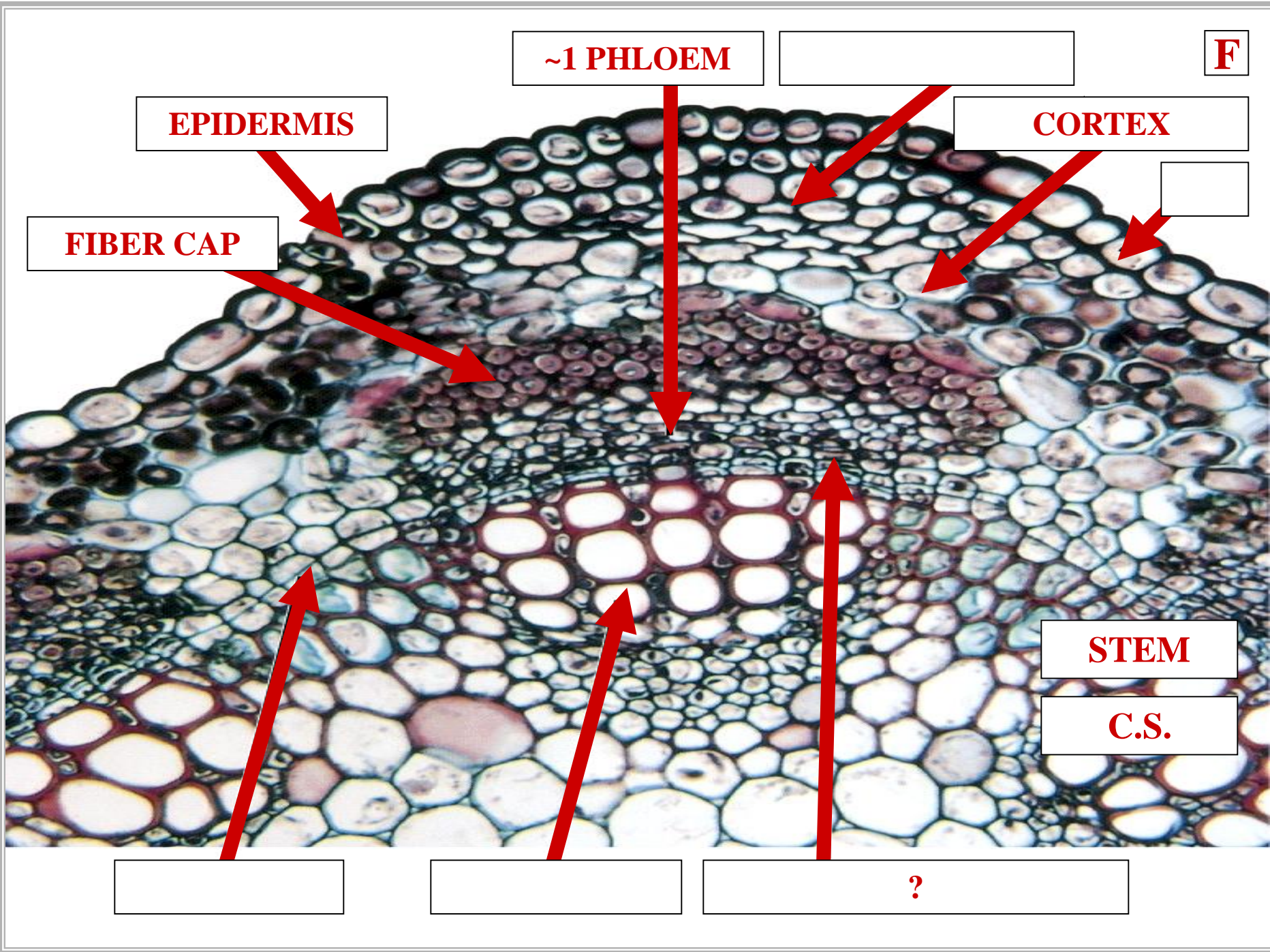
FIBER CAP

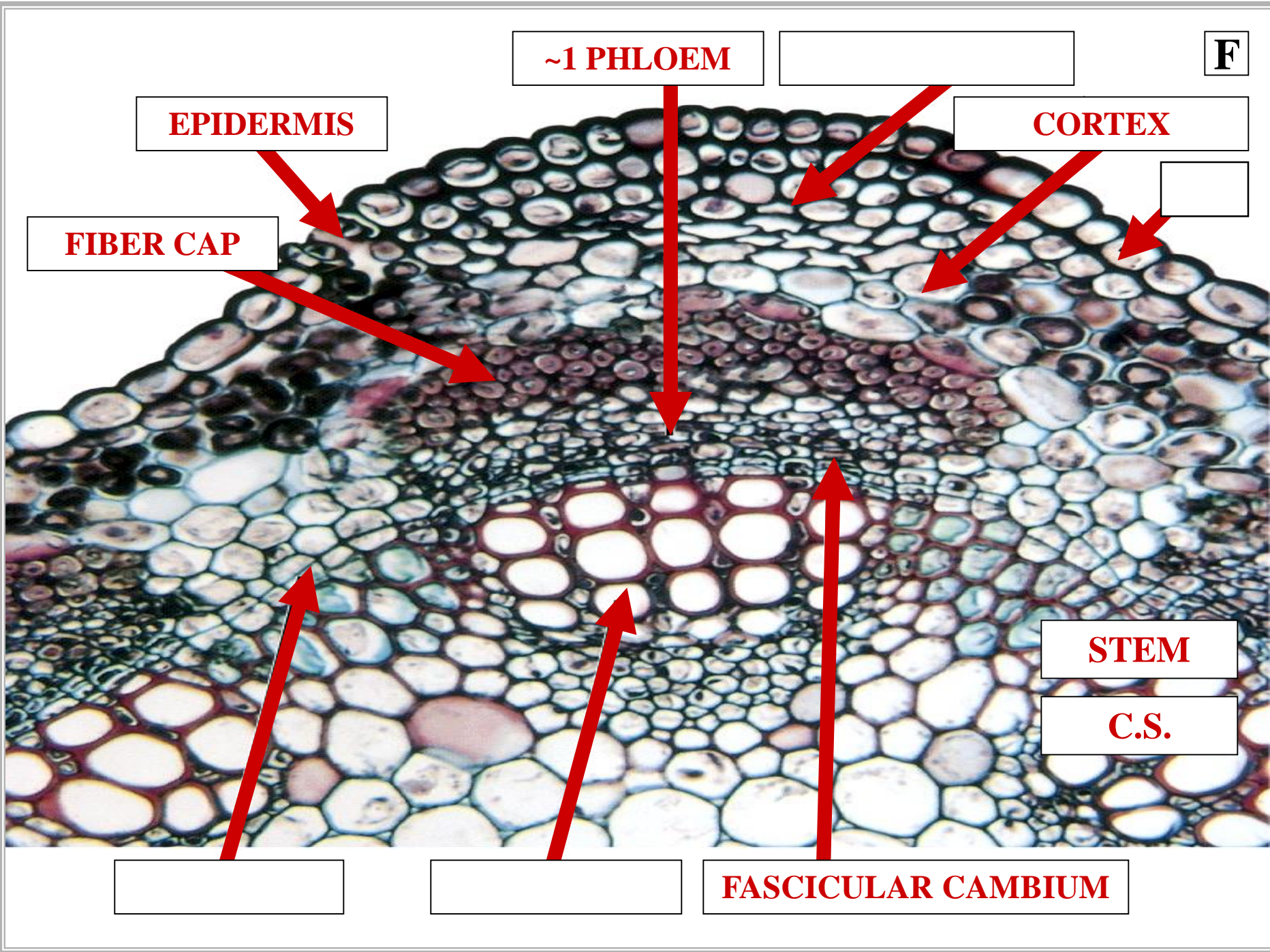
**PROVIDES BUNDLE
STRUCTURAL
SUPPORT**

FIBER CAP









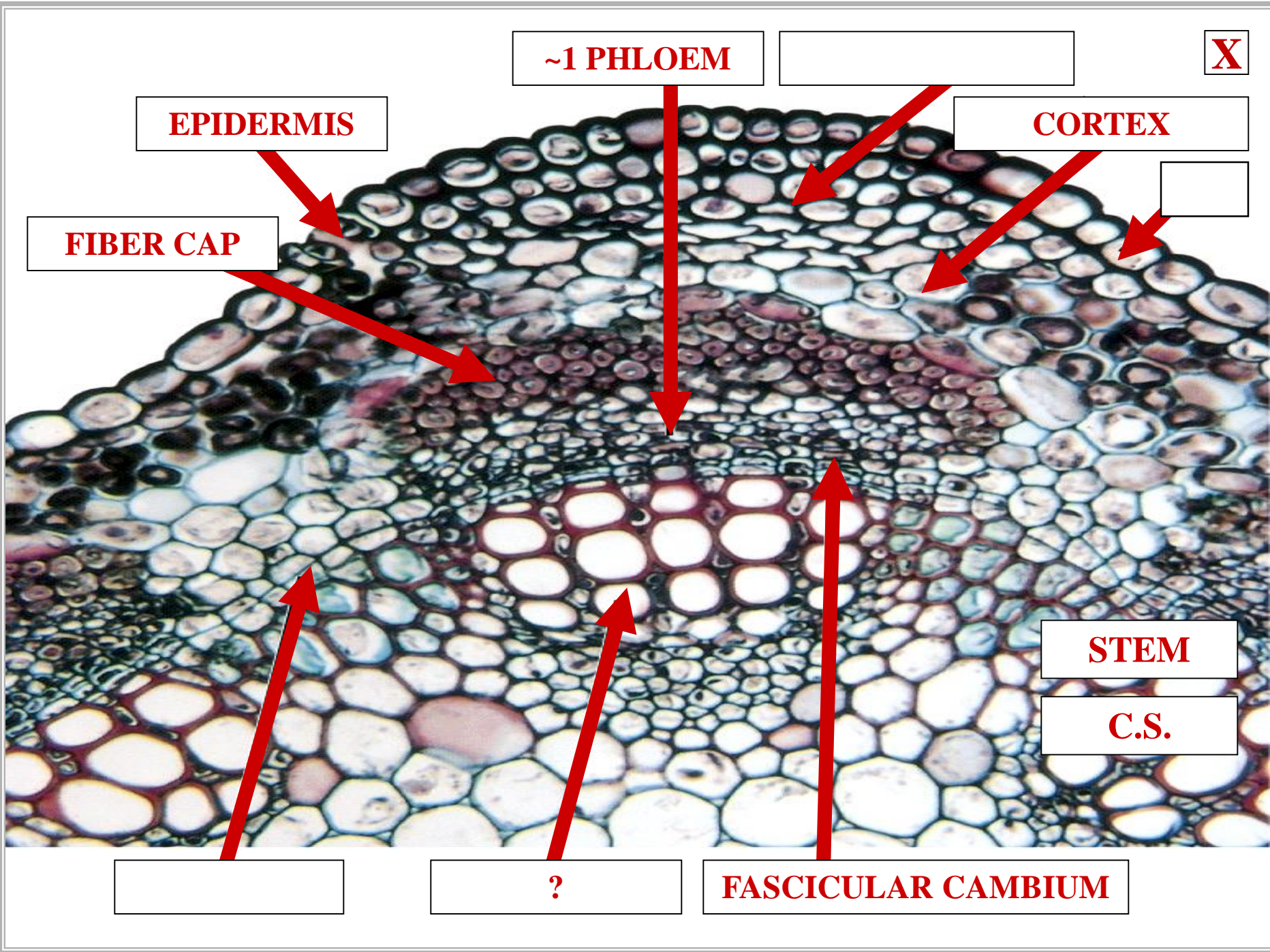
FASCICULAR CAMBIUM

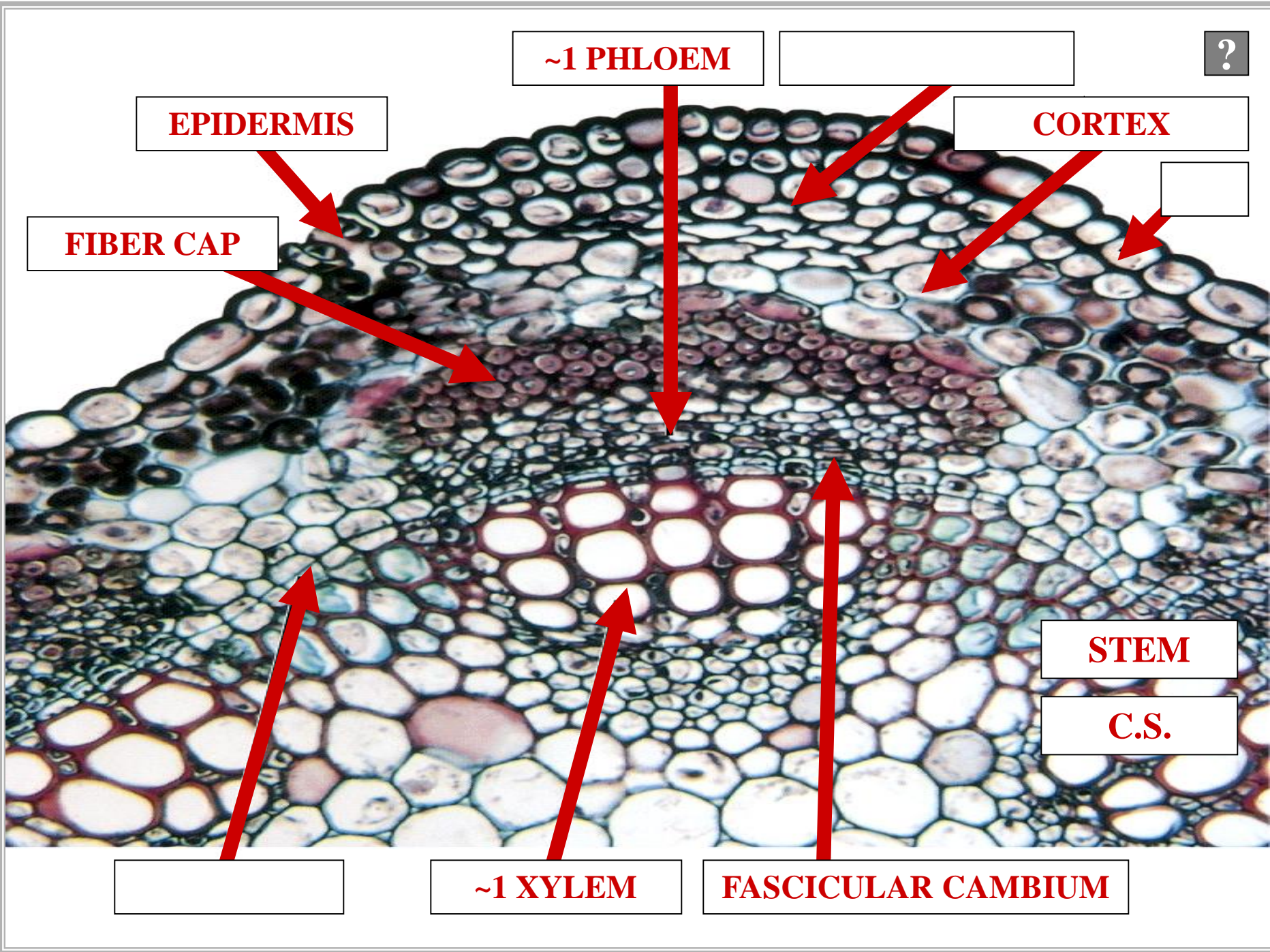


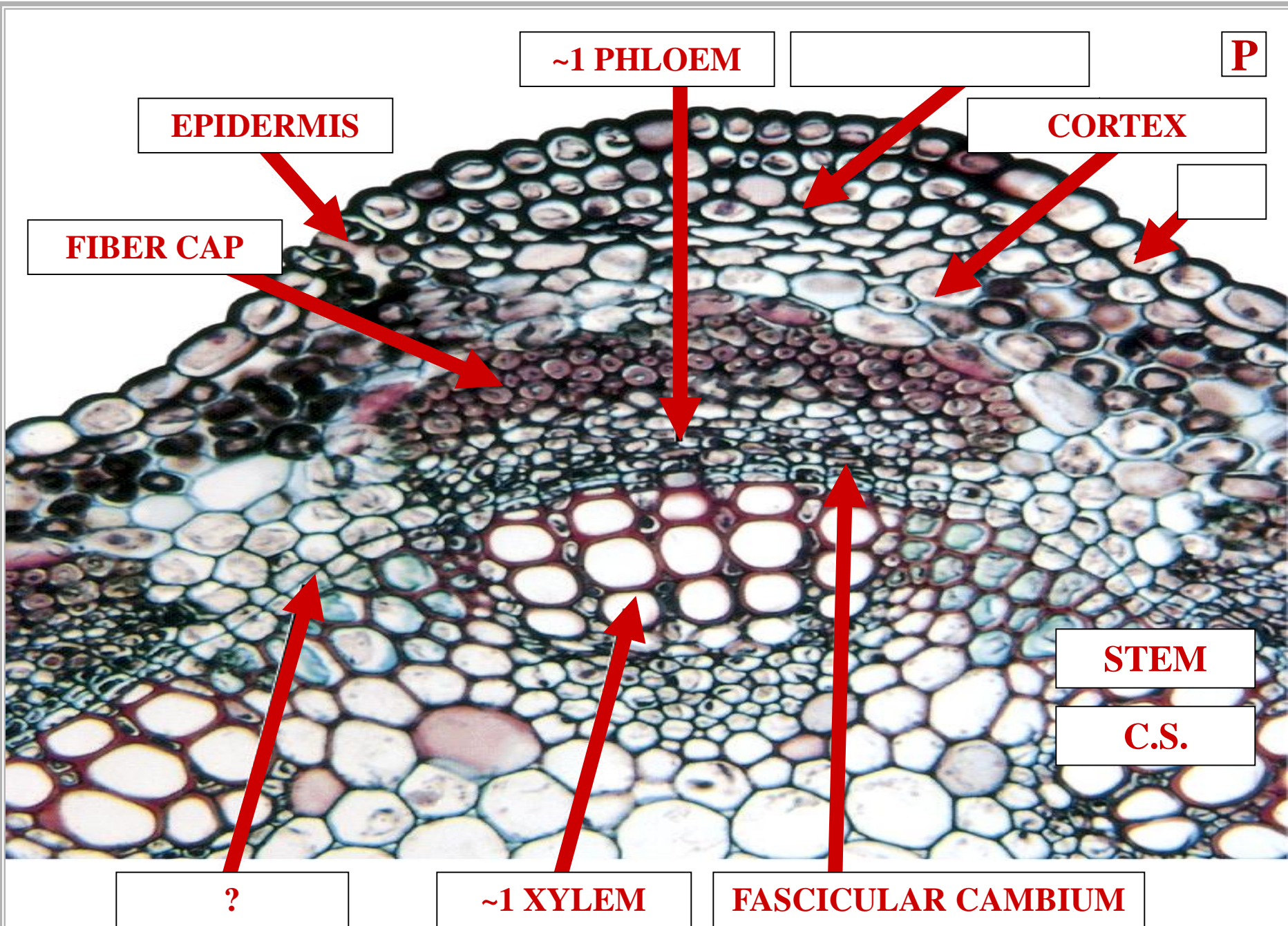
FASCICULAR CAMBIUM

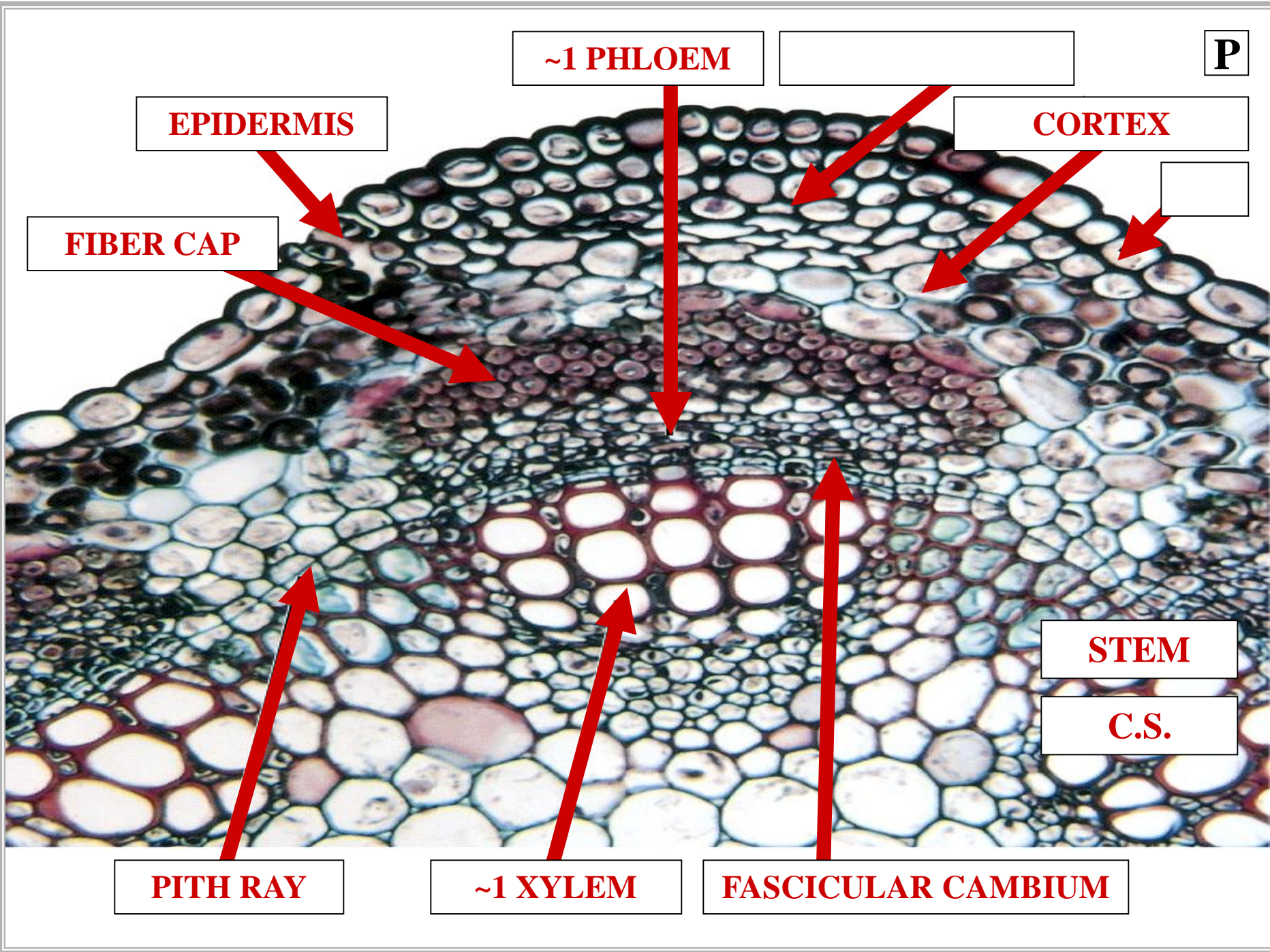
MERISTEMATIC

FASCICULAR CAMBIUM









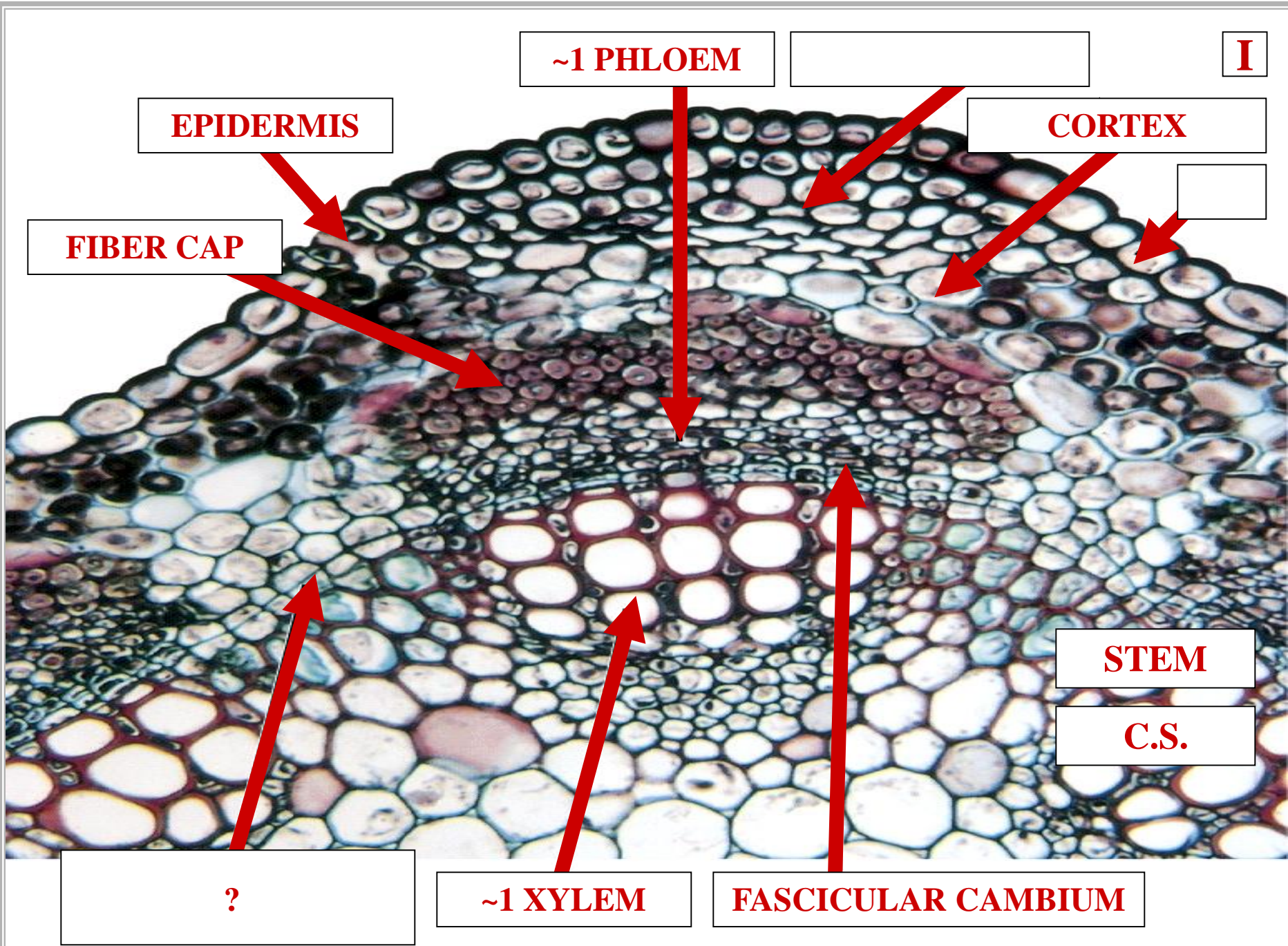
PITH RAY

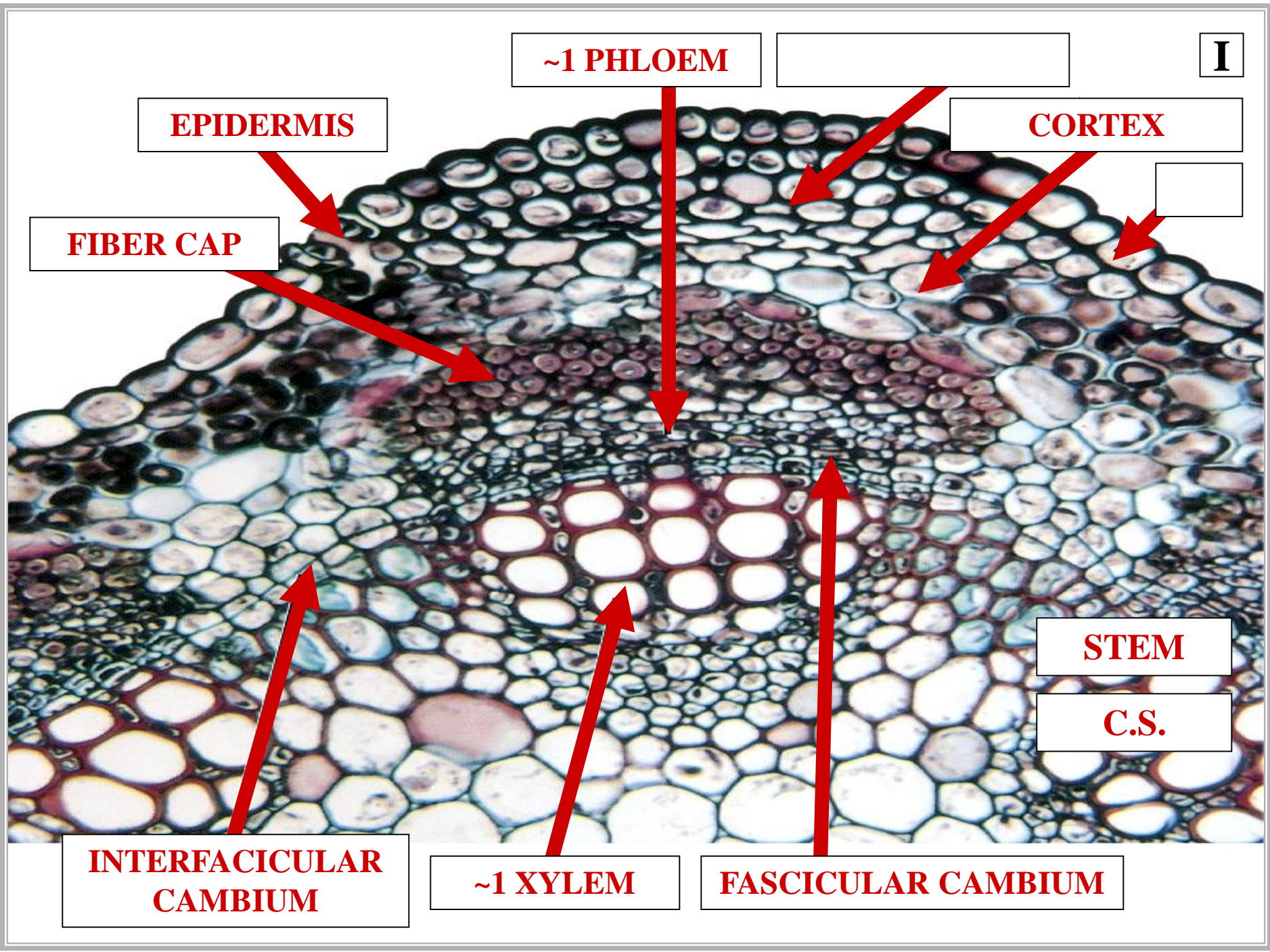


PITH RAY

**CORTEX TO PITH
CONDUIT**

PITH RAY





~1 PHLOEM

I

EPIDERMIS

CORTEX

FIBER CAP

STEM

C.S.

INTERFASCICULAR
CAMBIUM

~1 XYLEM

FASCICULAR CAMBIUM

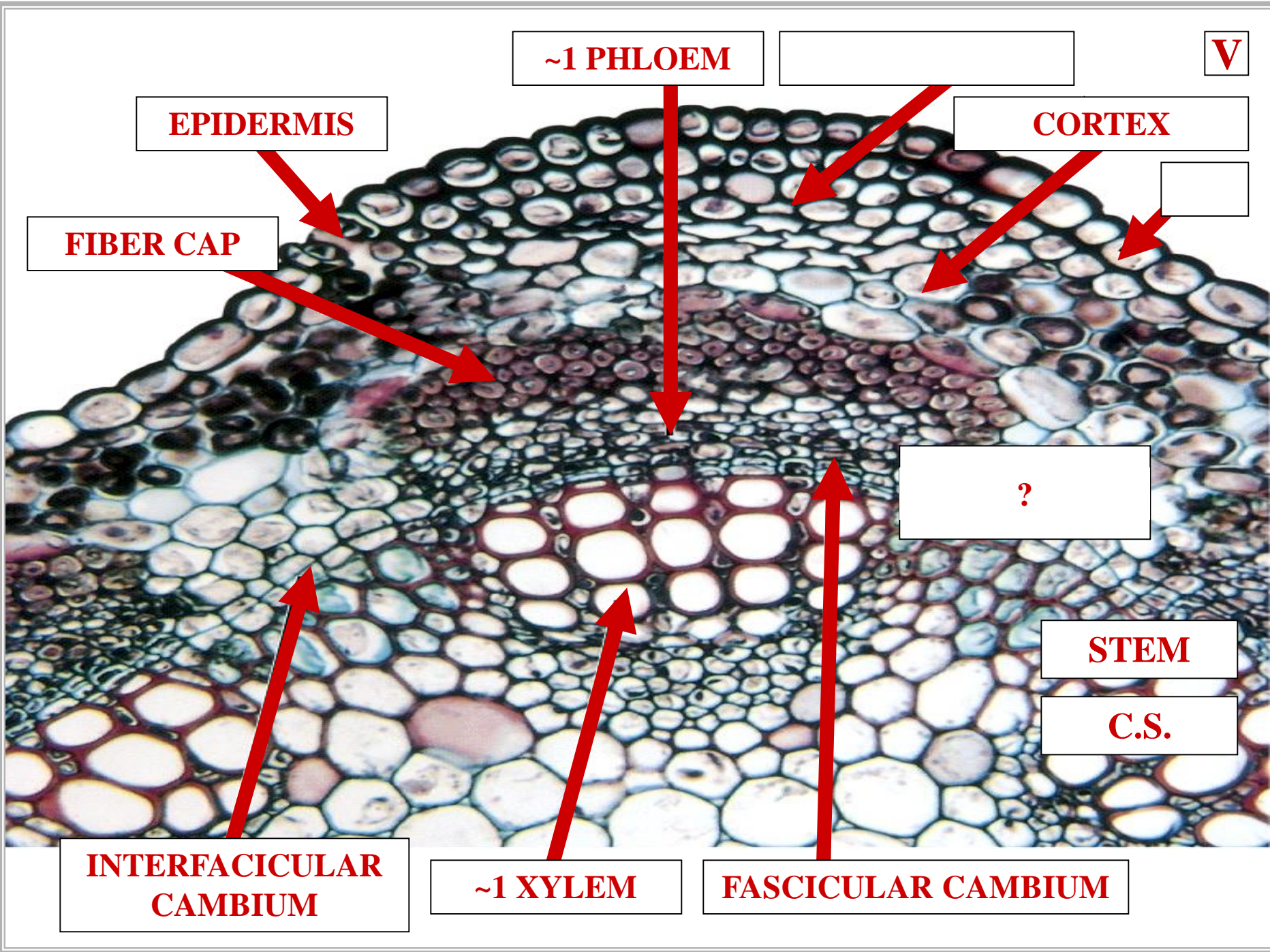
INTERFASCICULAR CAMBIUM

INTERFASCICULAR CAMBIUM



MERISTEMATIC

**INTERFASCICULAR
CAMBIUM**



~1 PHLOEM

V

EPIDERMIS

CORTEX

FIBER CAP

?

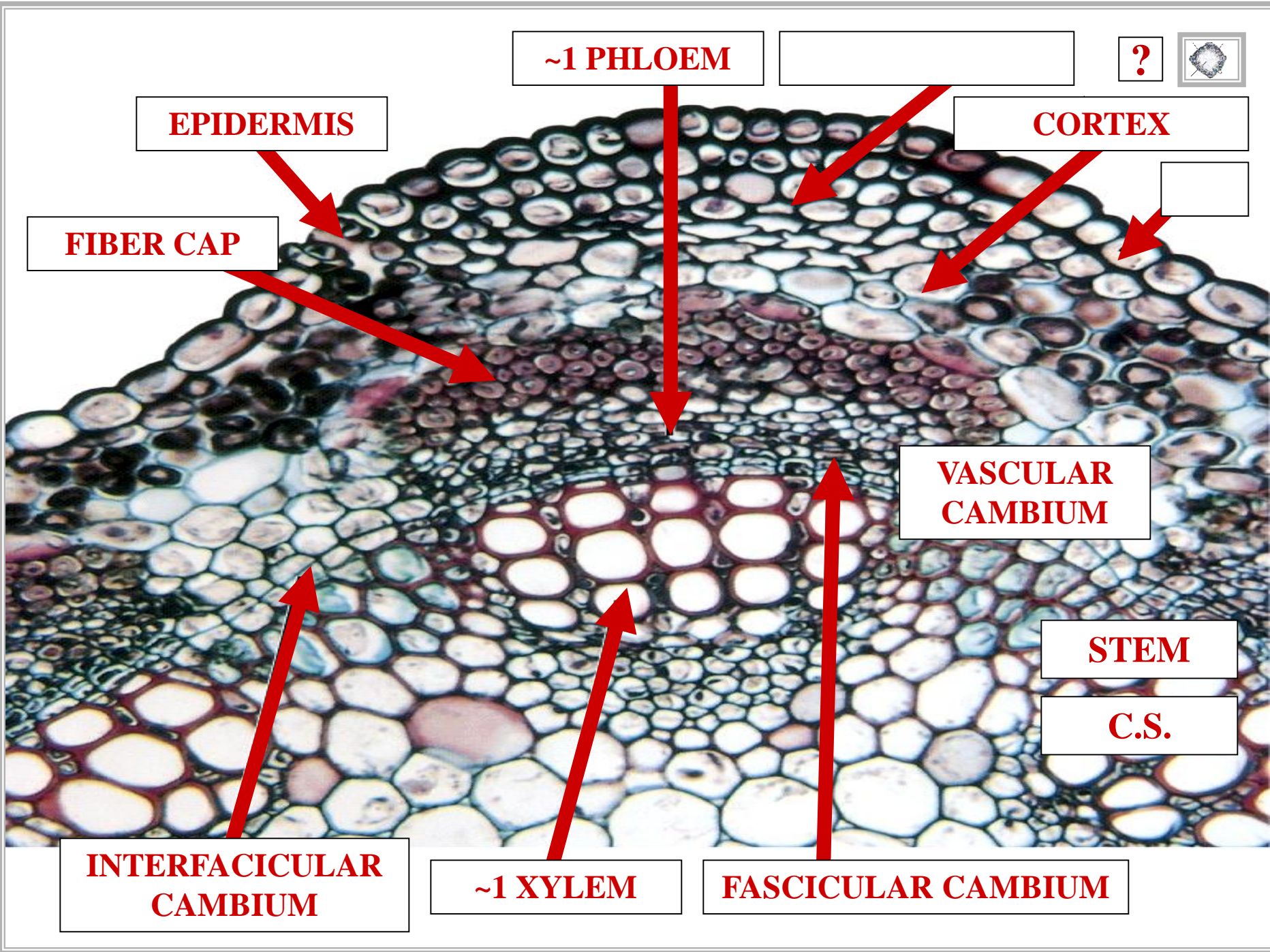
STEM

C.S.

INTERFACICULAR CAMBIUM

~1 XYLEM

FASCICULAR CAMBIUM



EPIDERMIS

CORTEX

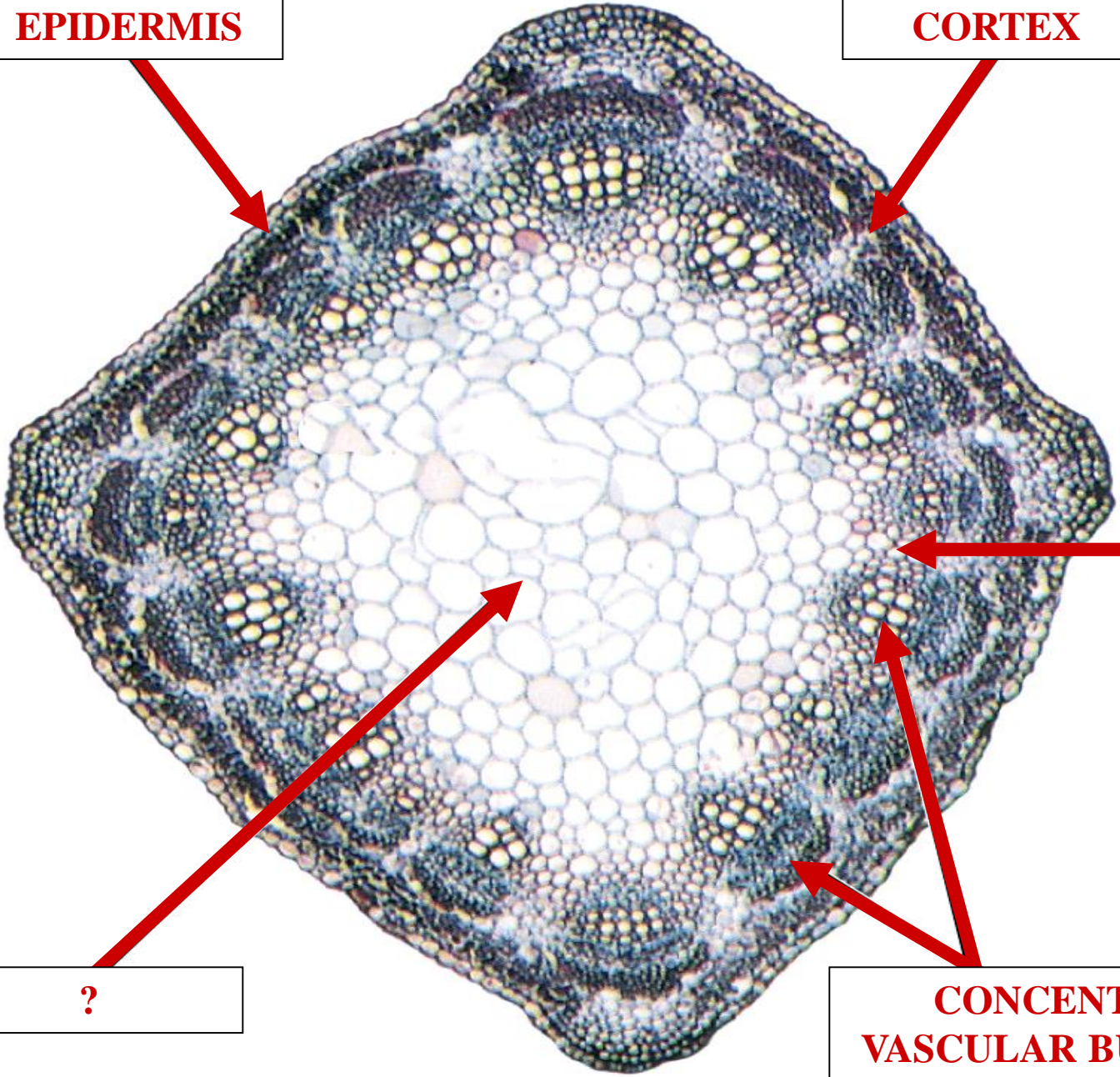
PITH RAY

STEM

C.S.

?

CONCENTRIC
VASCULAR BUNDLES



EPIDERMIS

CORTEX



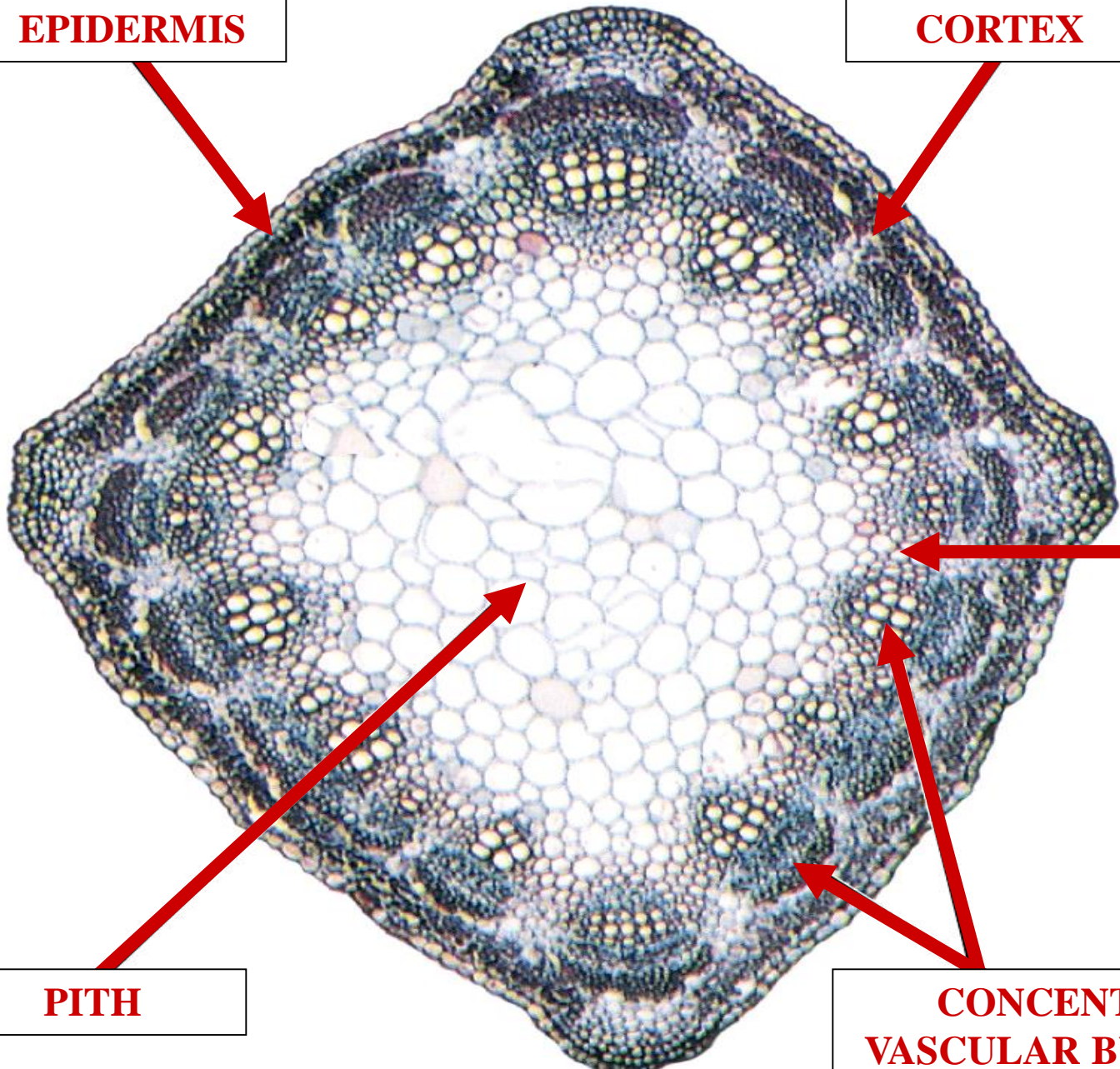
PITH RAY

STEM

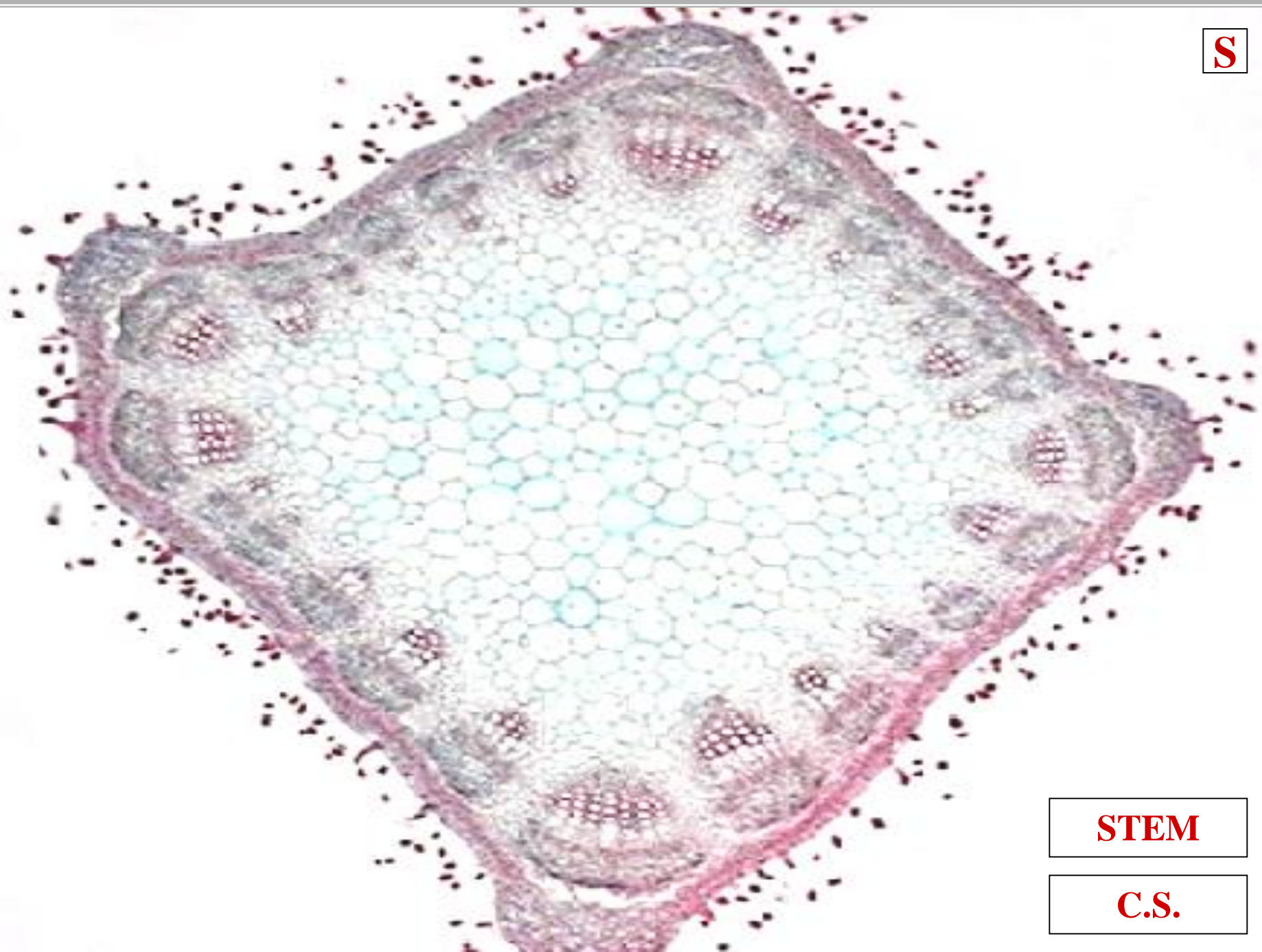
C.S.

PITH

**CONCENTRIC
VASCULAR BUNDLES**

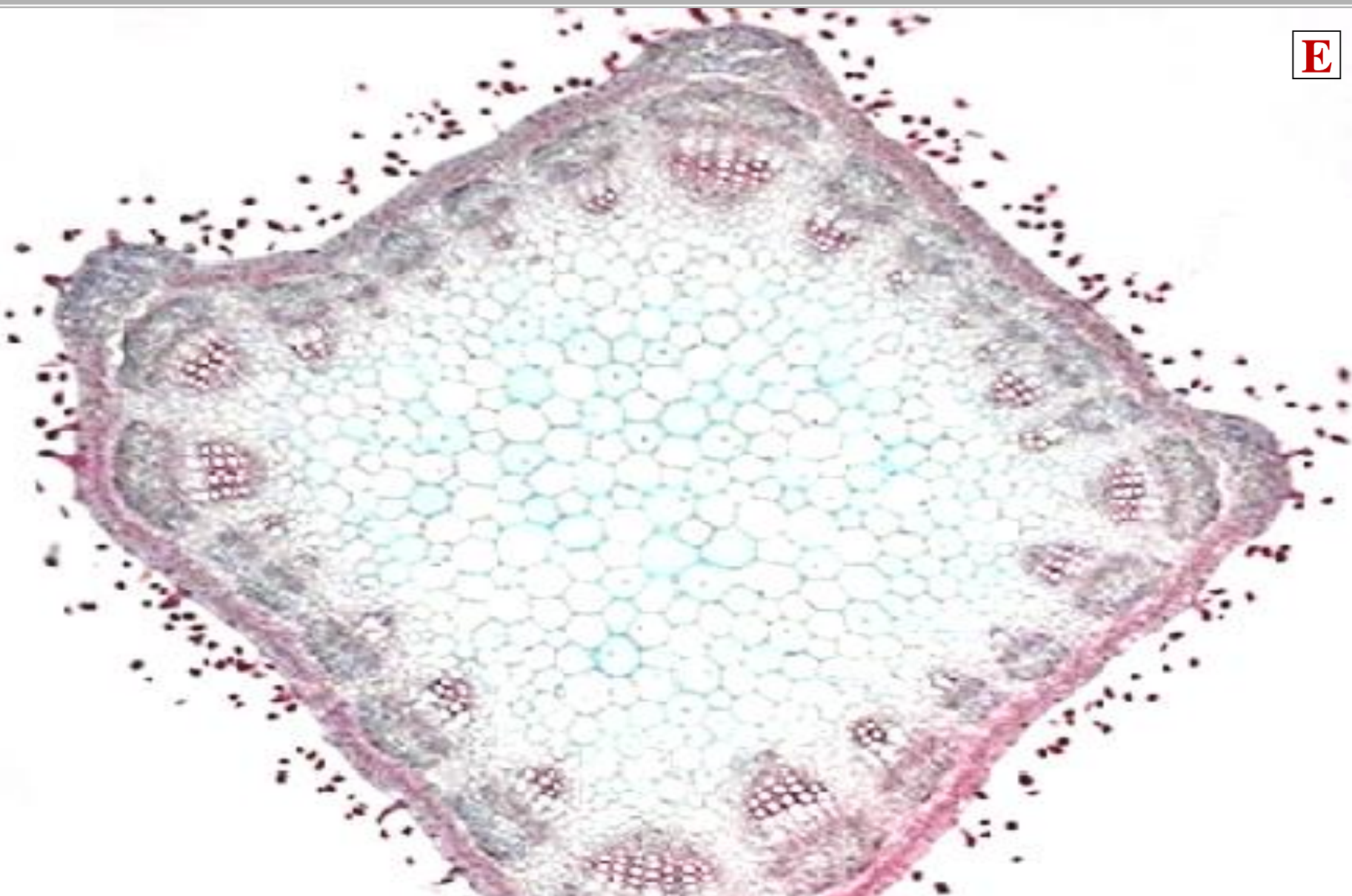


S

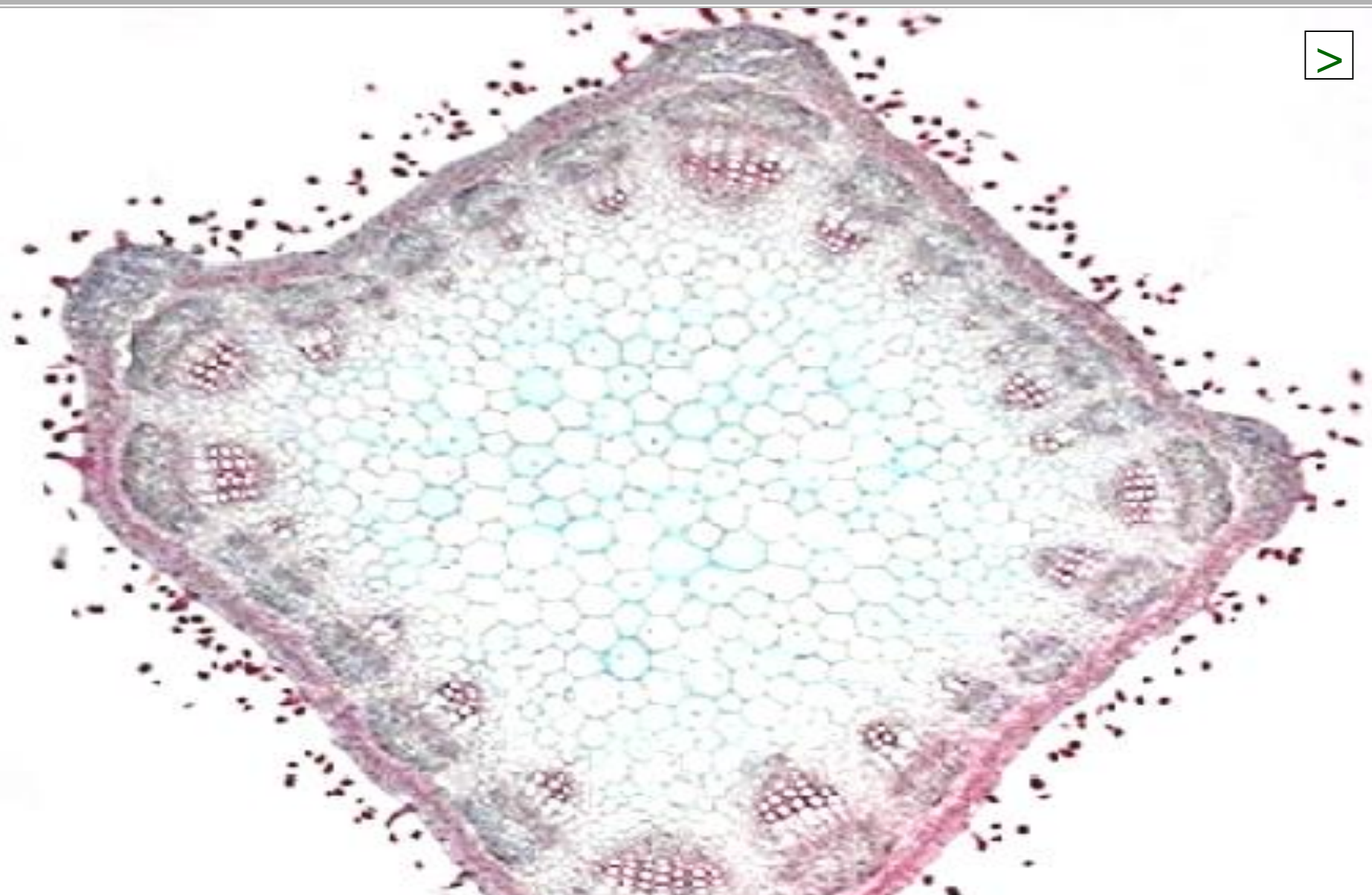


STEM

C.S.



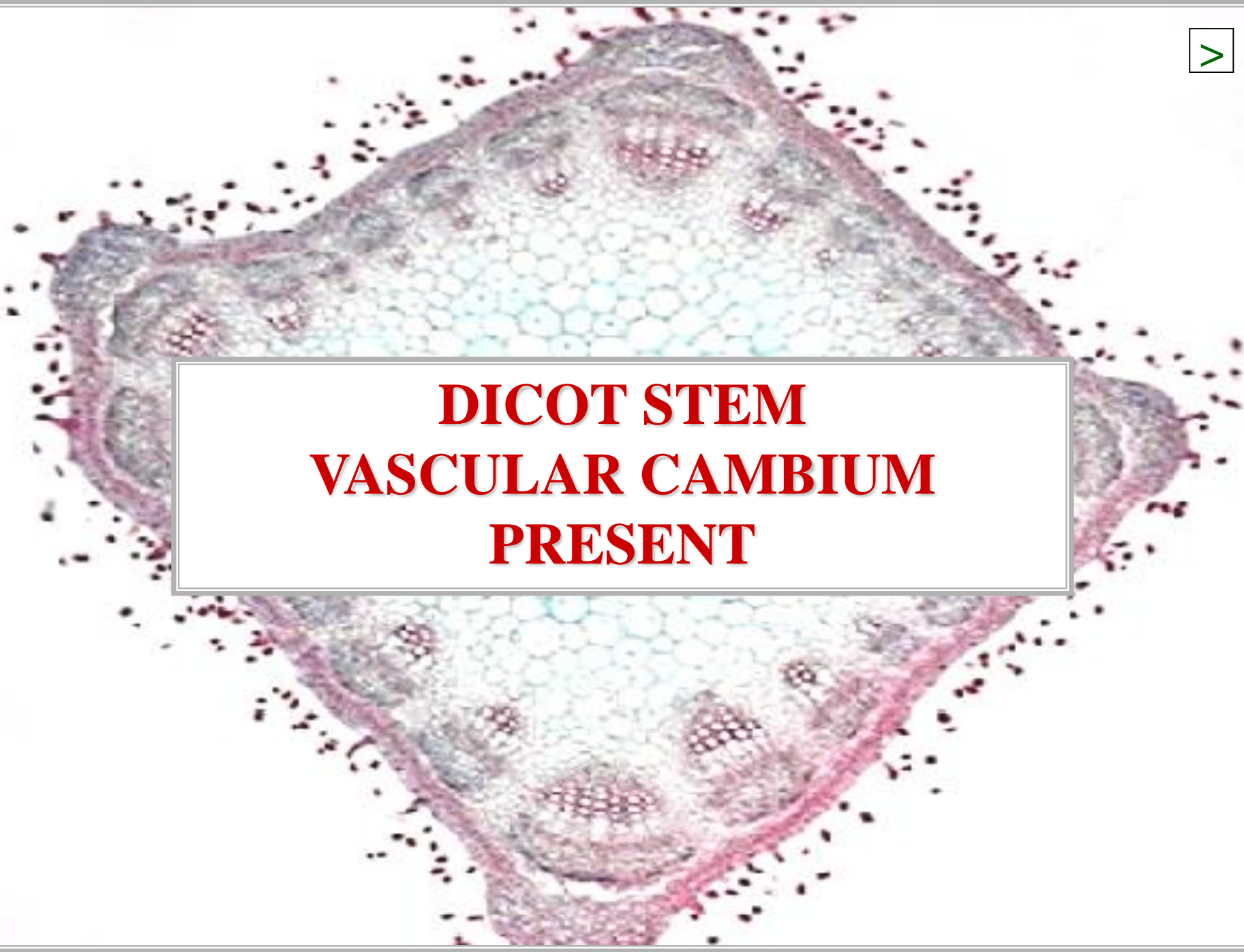
SIPHONOSTELE



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 cambium is producing secondary xylem (wood) towards the center and secondary phloem (bark) towards the periphery. The central pith is visible as a cluster of small, light-colored cells. The overall structure shows clear evidence of secondary growth.

**DICOT STEM
SECONDARY GROWTH
PRESENT**

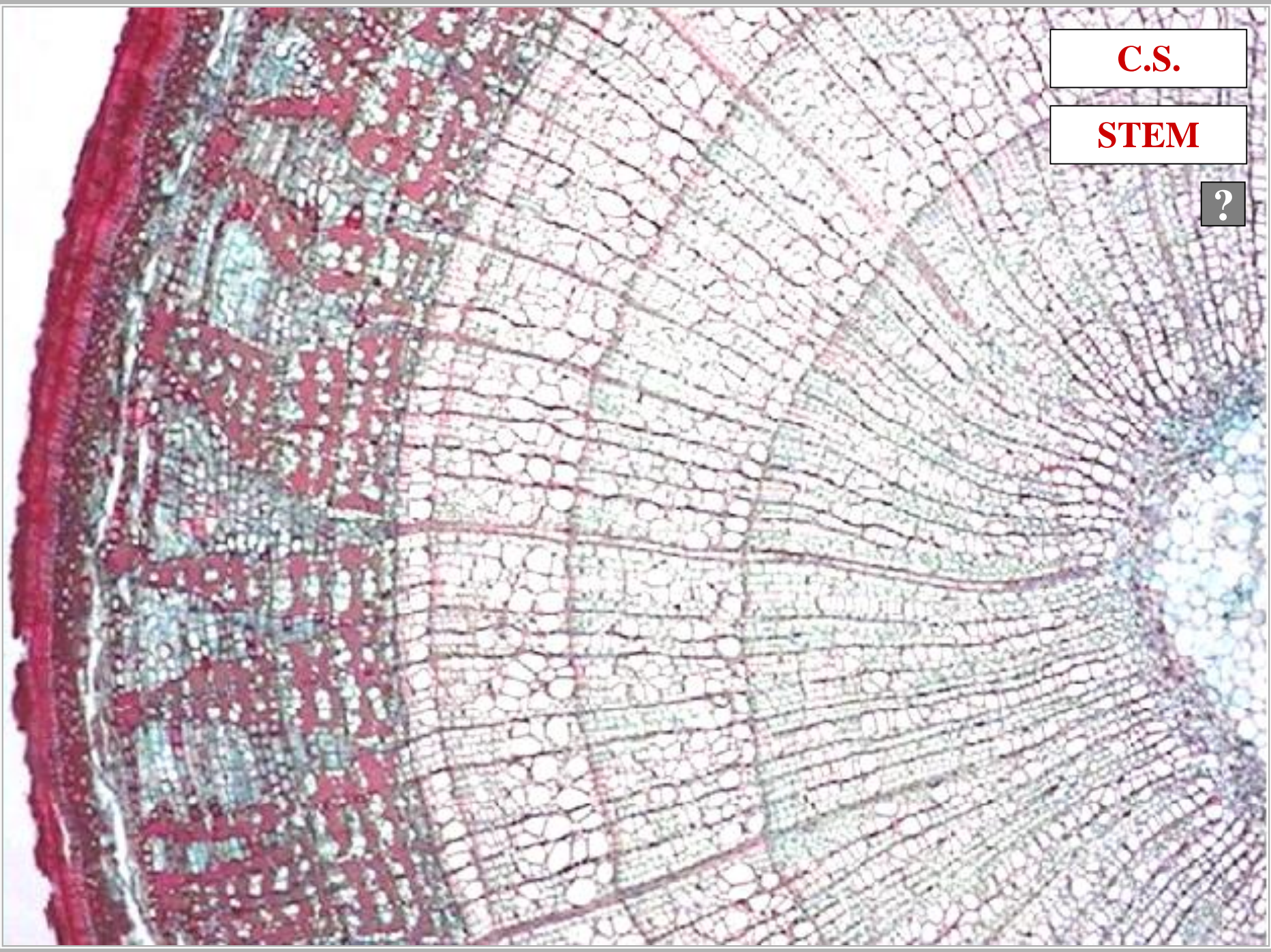


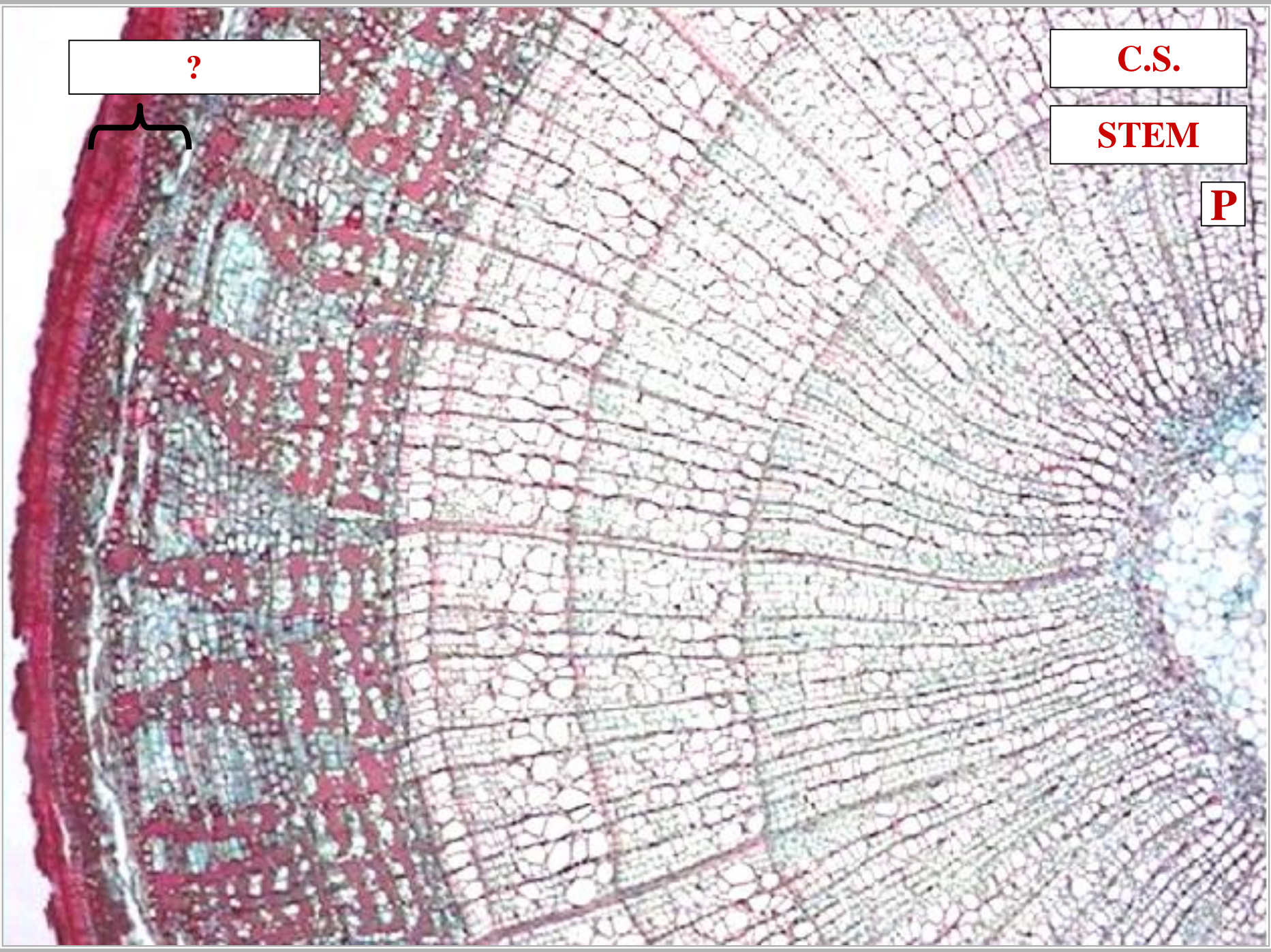
DICOT SECONDARY STEM ANATOMY

C.S.

STEM

?





?

C.S.

STEM

P

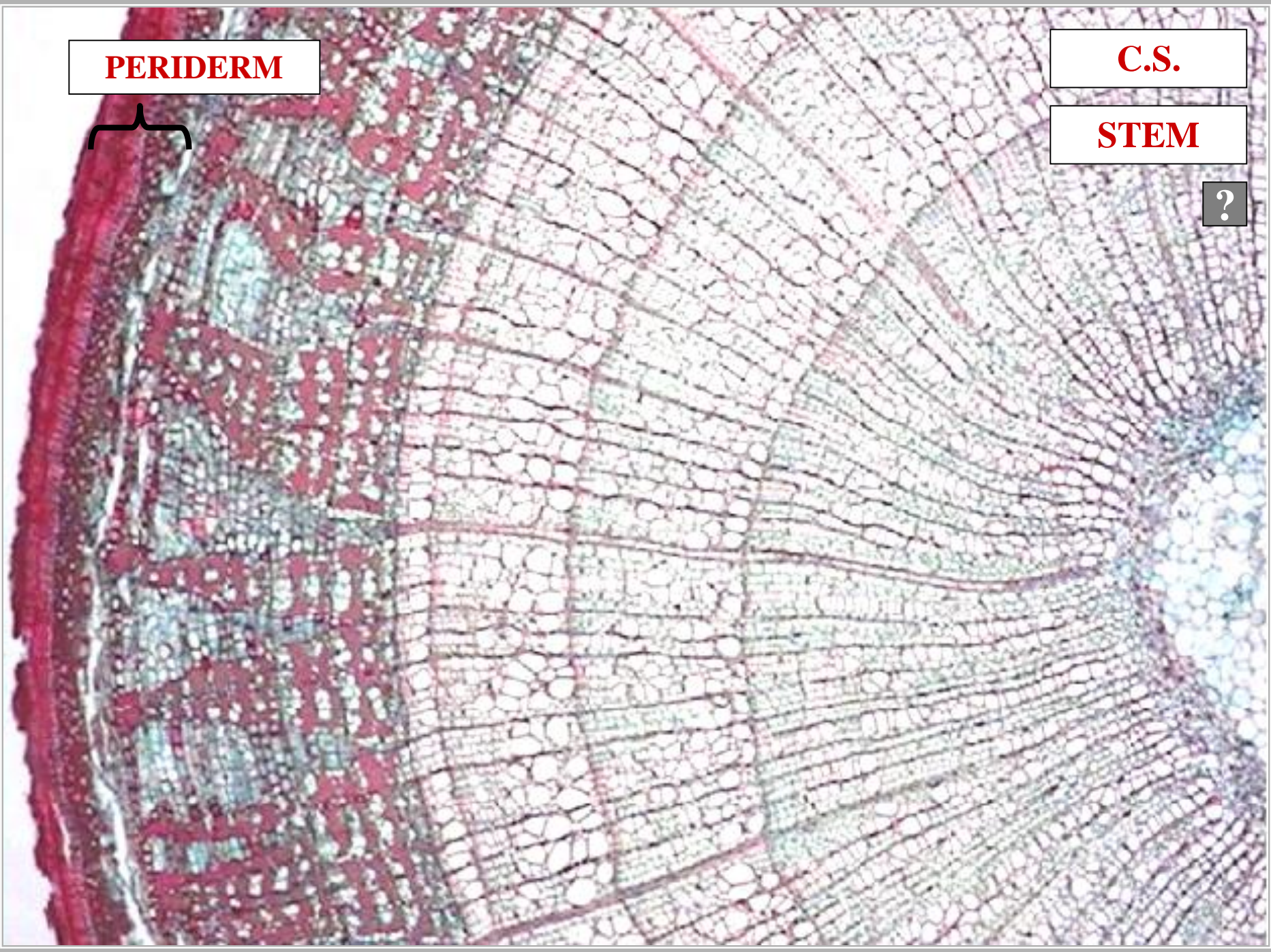


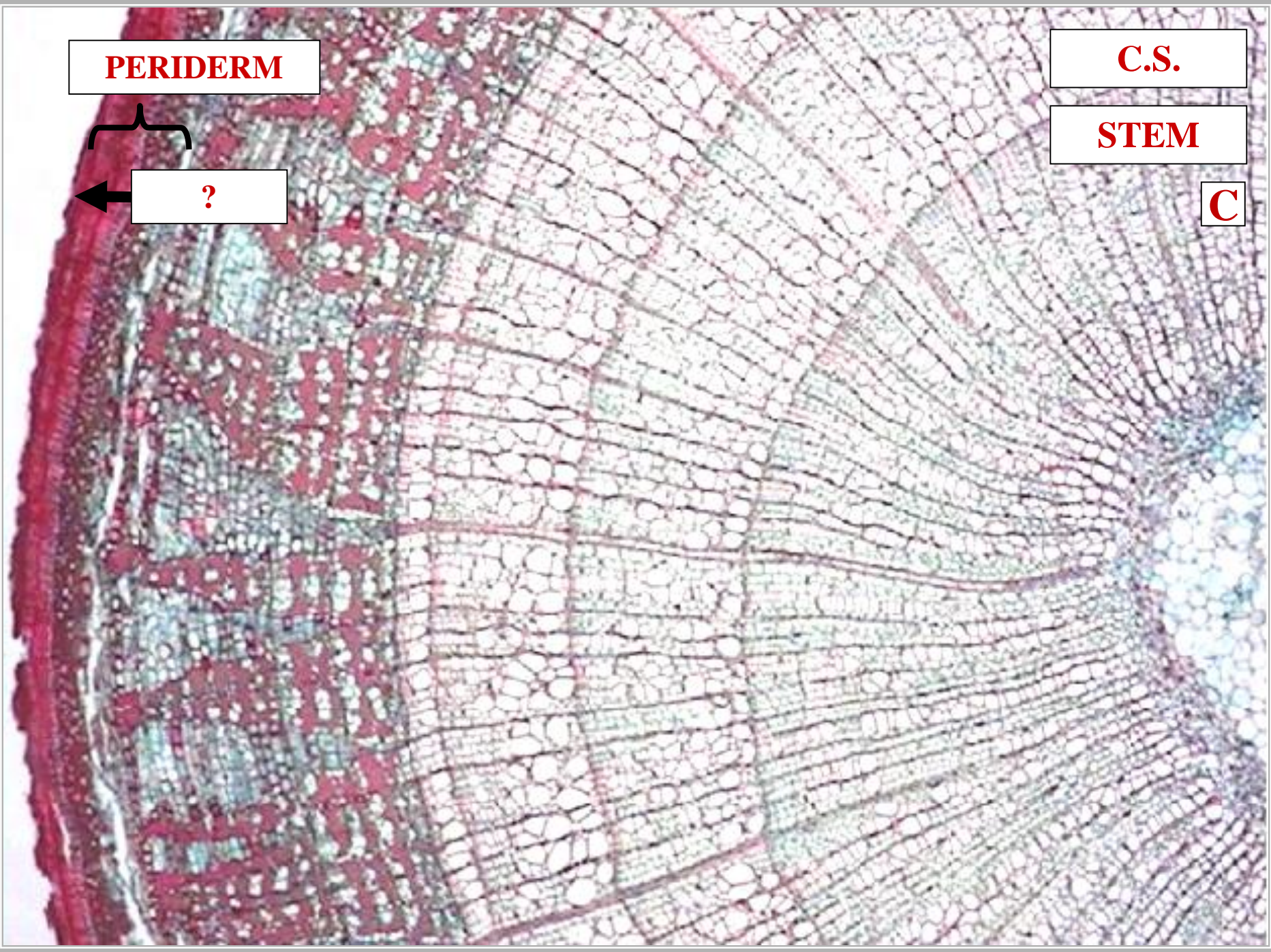
PERIDERM

C.S.

STEM

?





PERIDERM

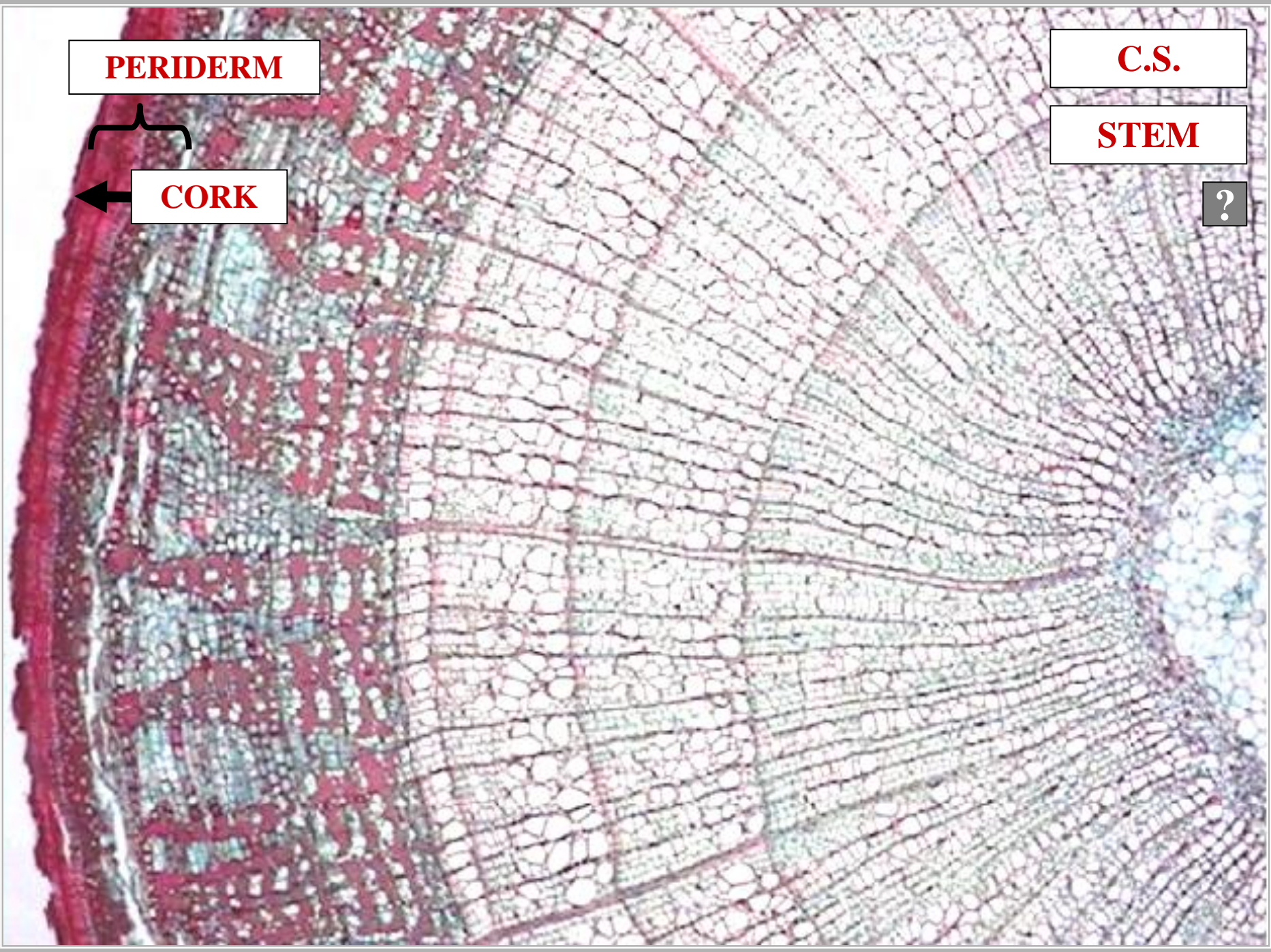
C.S.

STEM

C

?





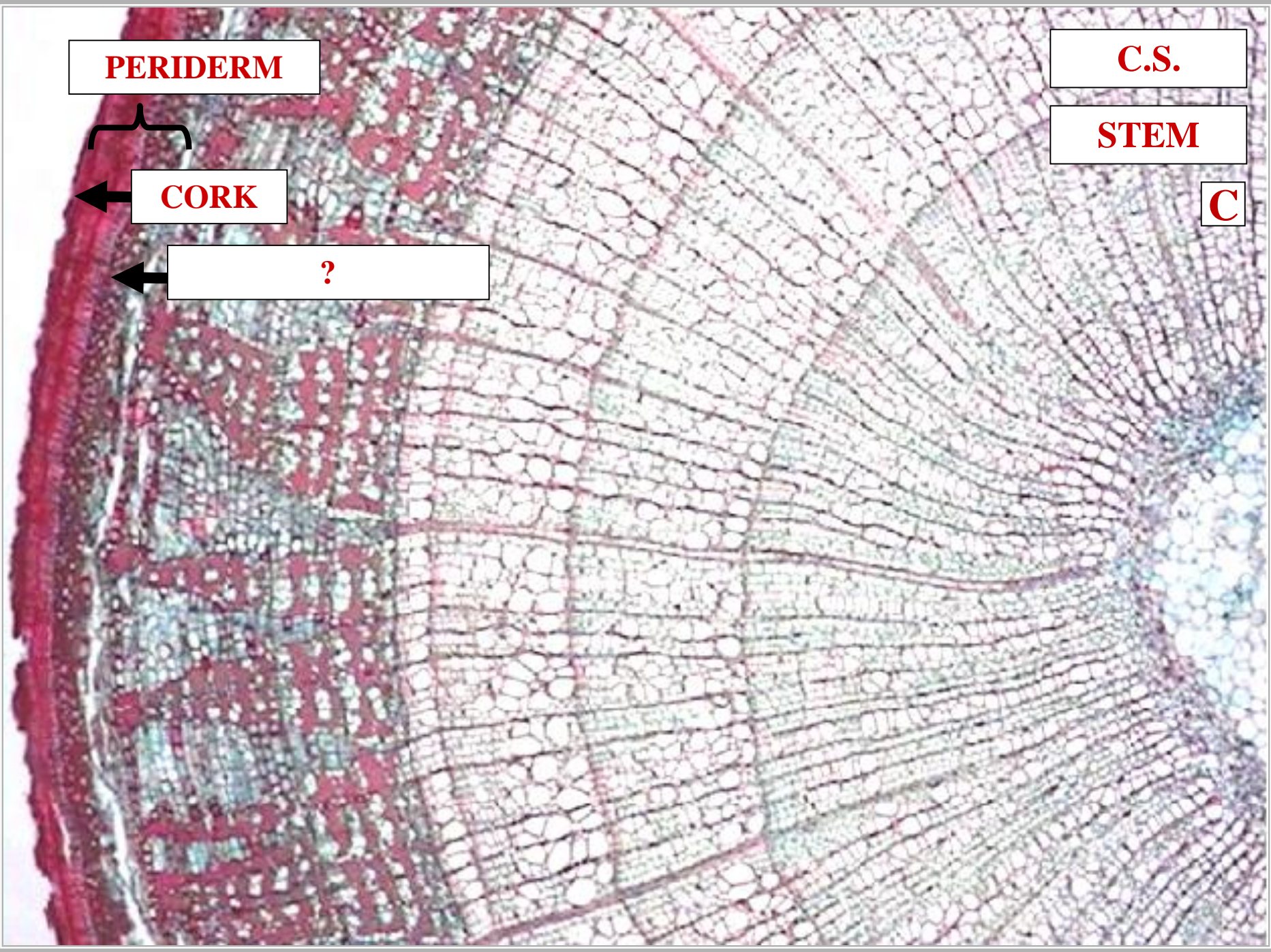
PERIDERM

C.S.

STEM

CORK

?



PERIDERM

C.S.

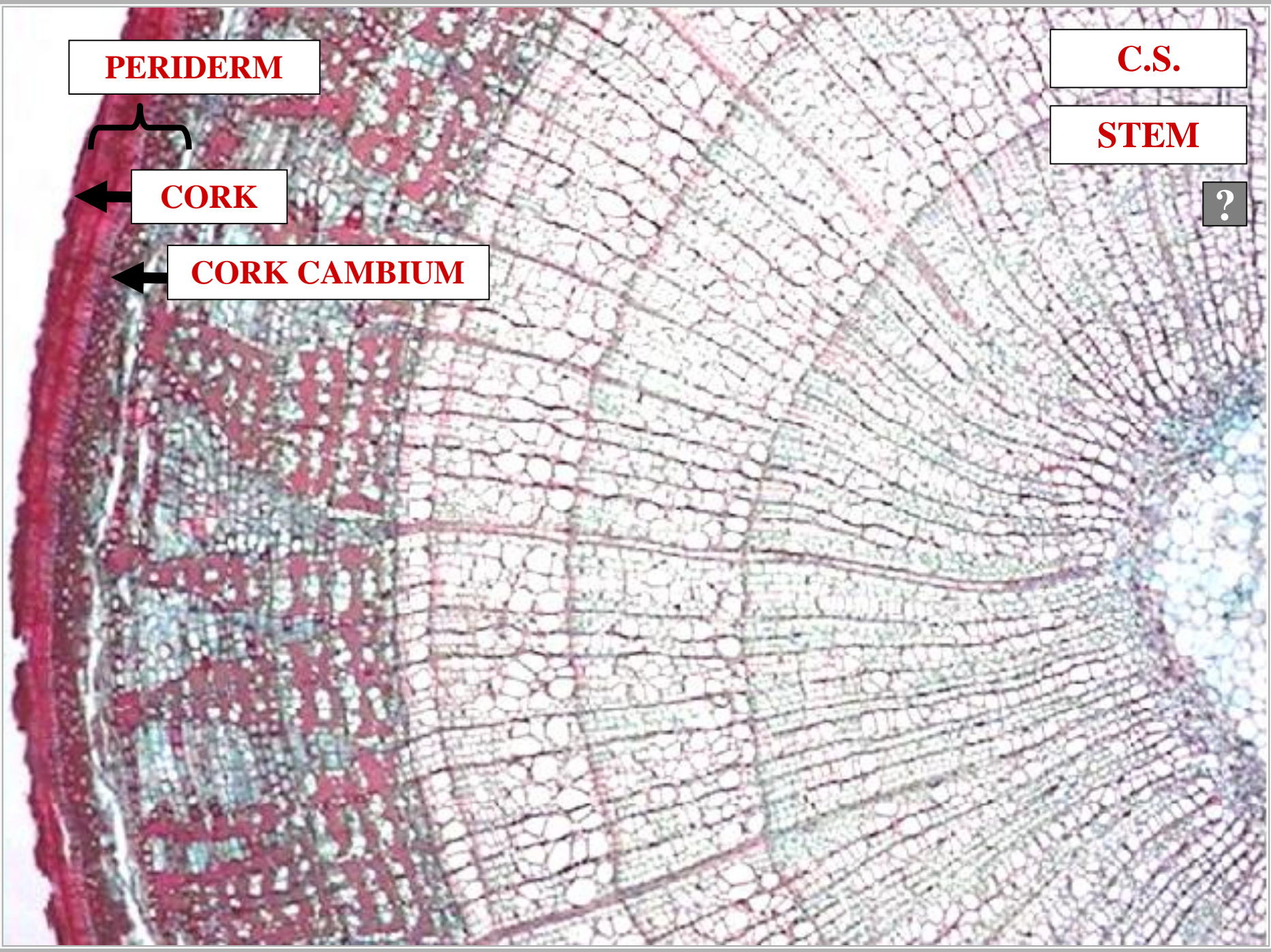
STEM

C



CORK

?



PERIDERM

C.S.

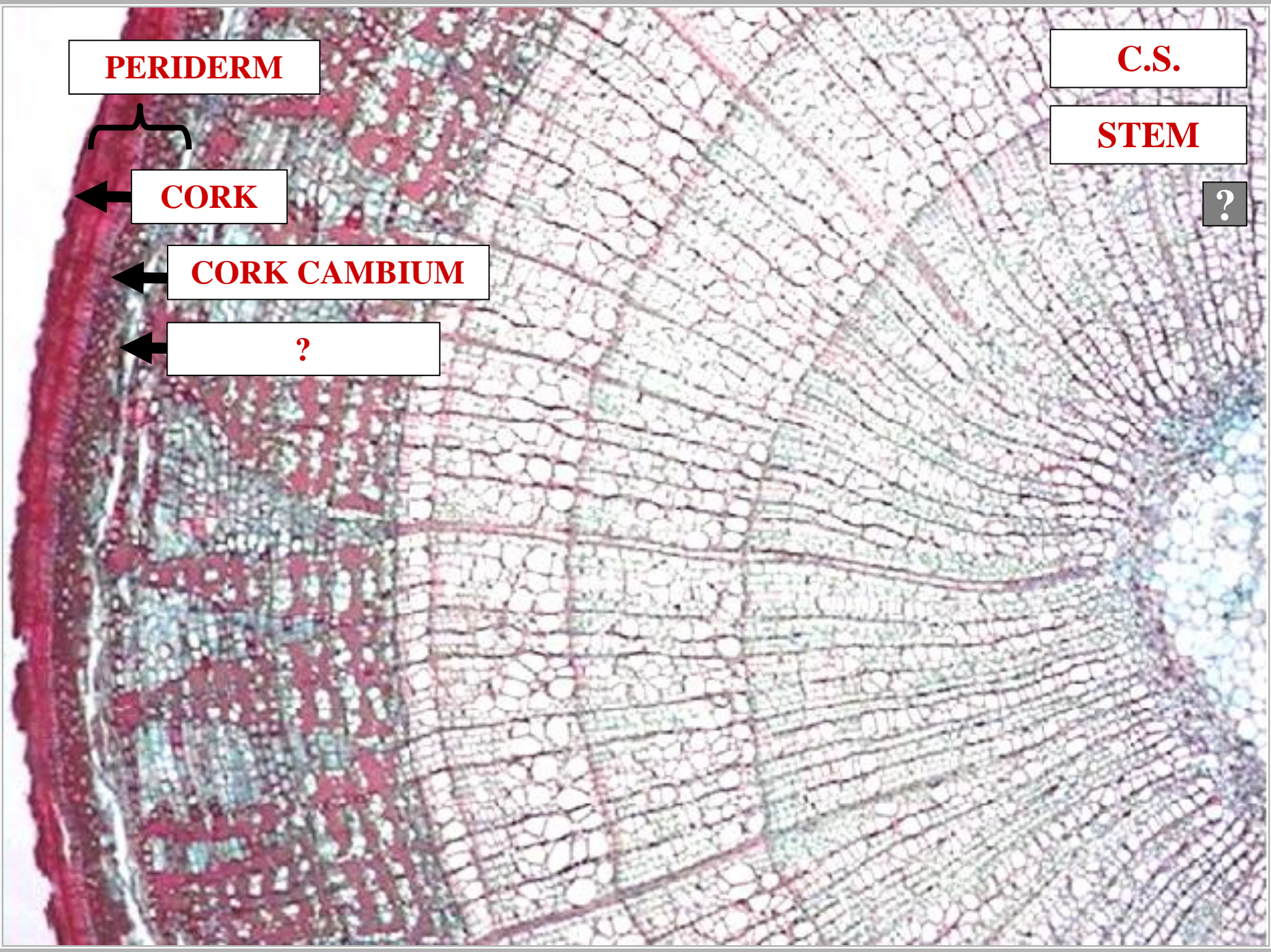
STEM

?



CORK

CORK CAMBIUM



PERIDERM

C.S.

STEM

?

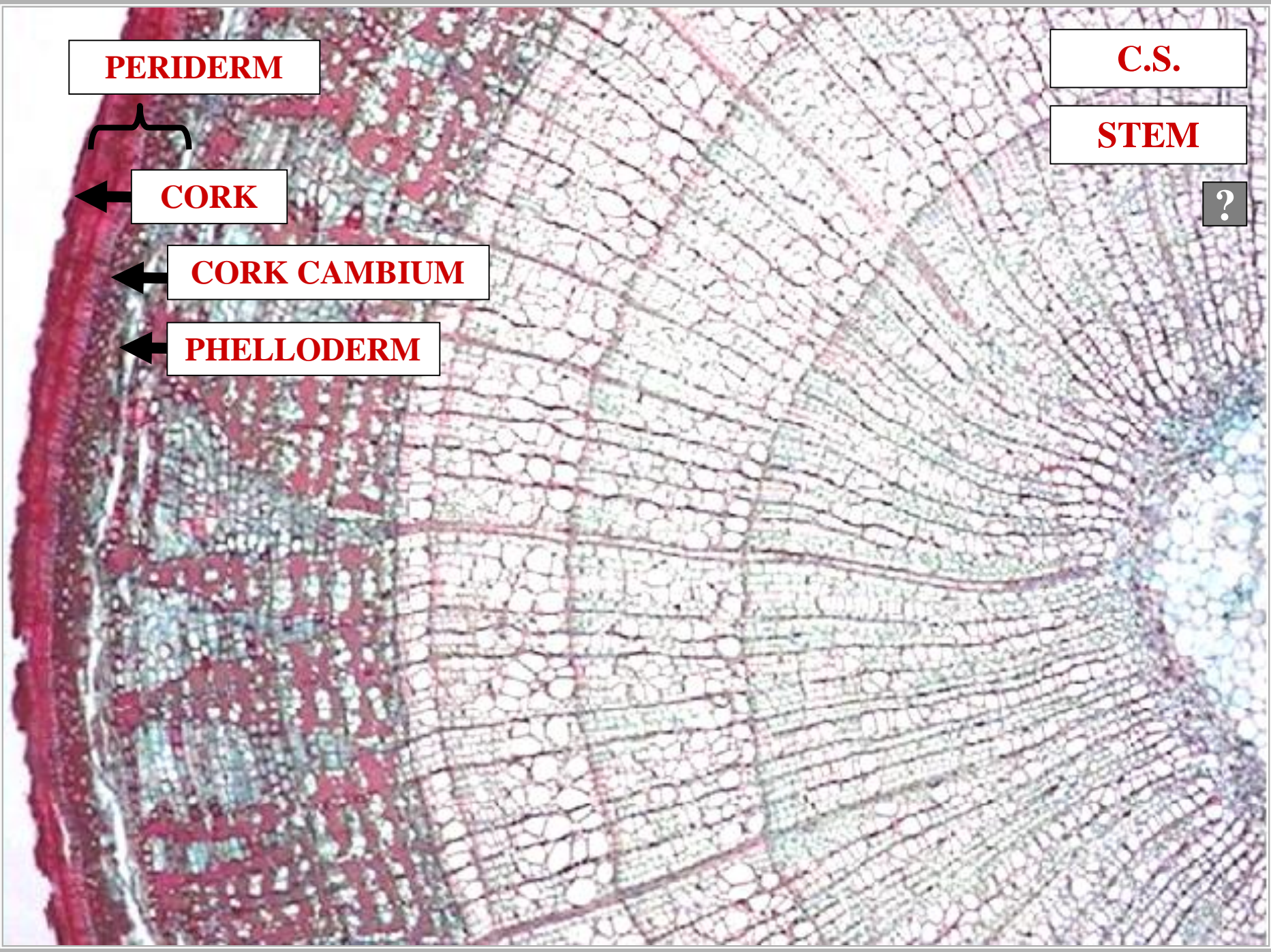


CORK

CORK CAMBIUM

?





PERIDERM

C.S.

STEM

?

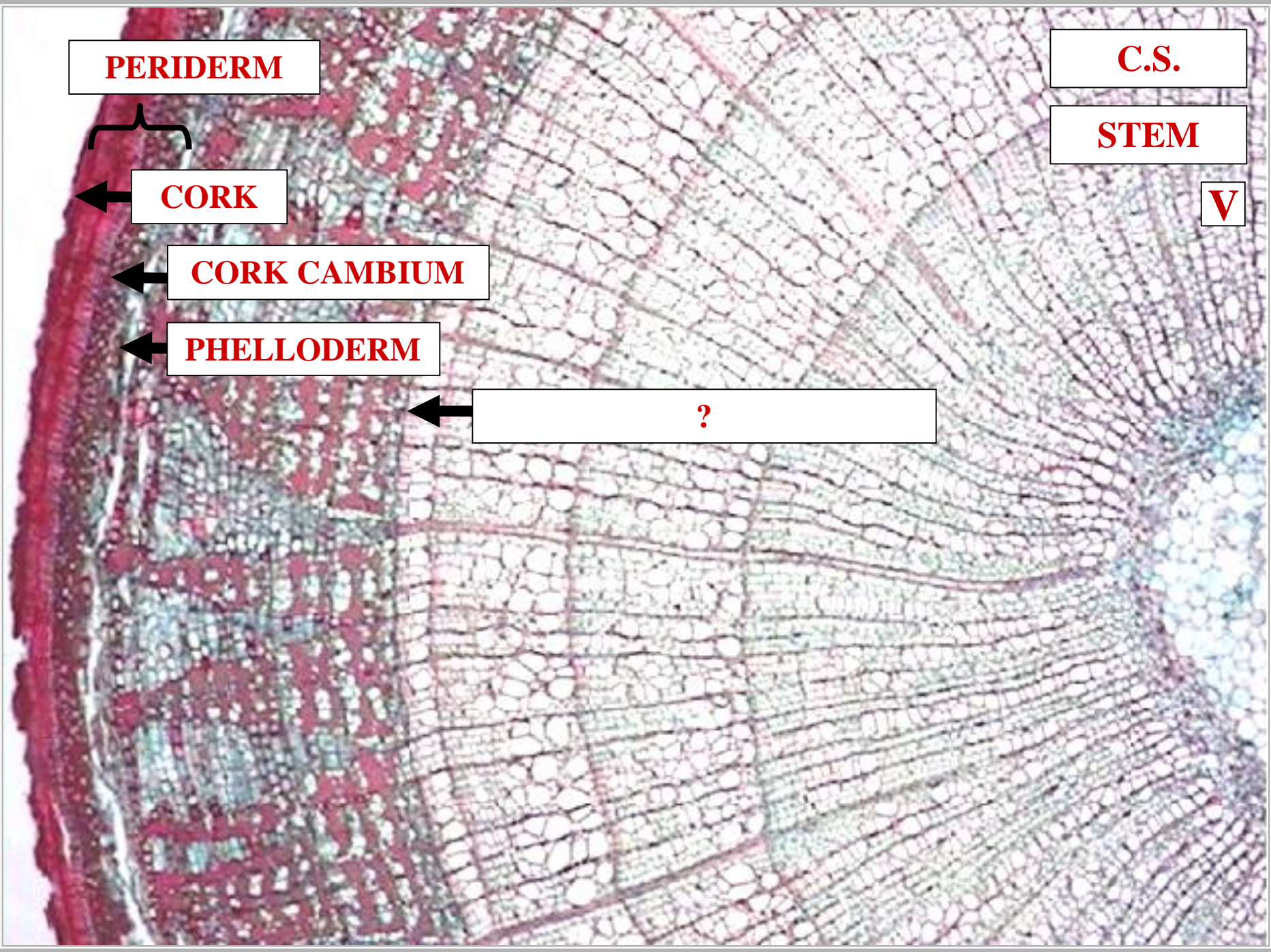


CORK

CORK CAMBIUM

PHELLODERM





PERIDERM

C.S.

STEM

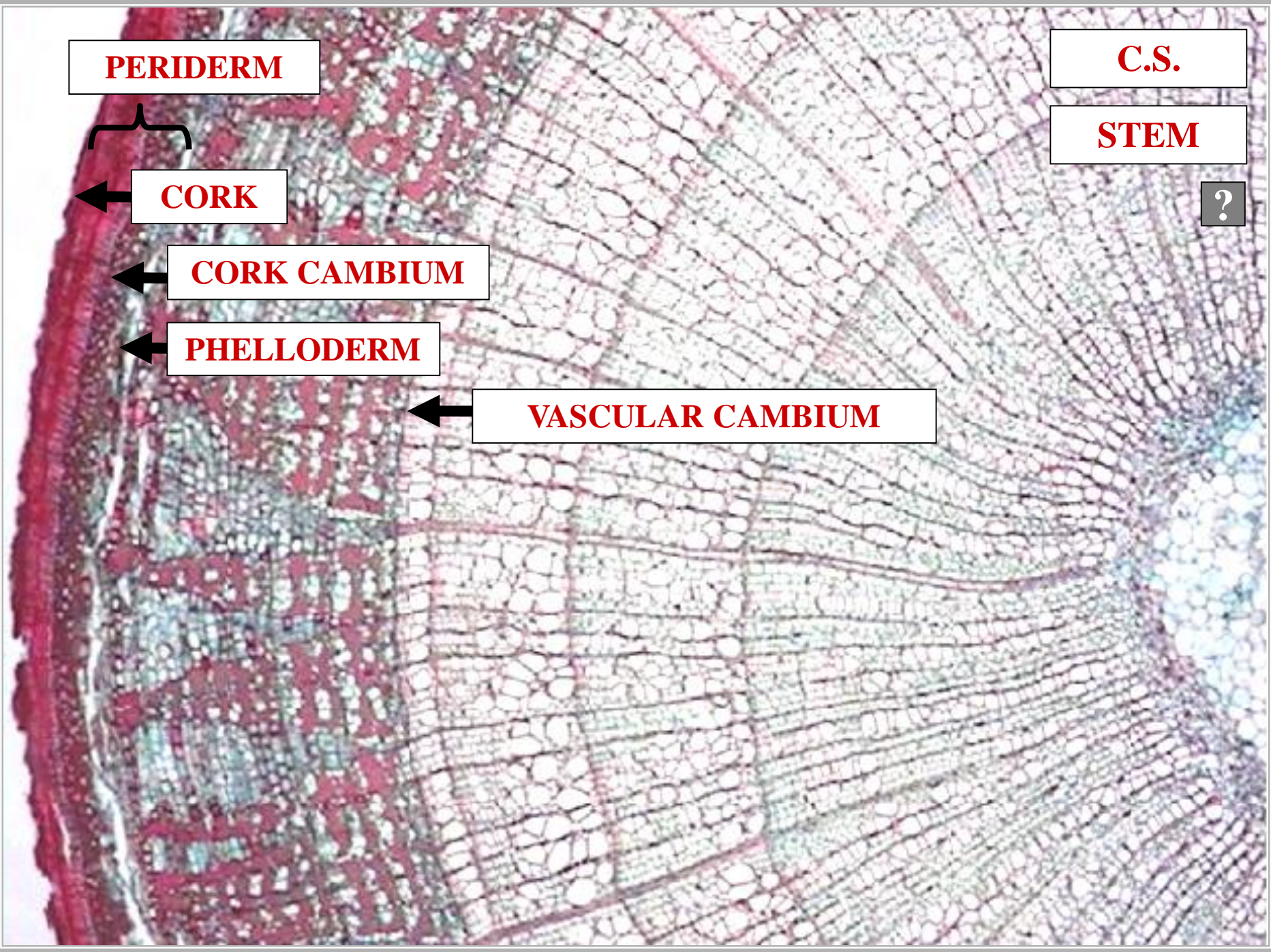
V

CORK

CORK CAMBIUM

PHELLODERM

?



PERIDERM

C.S.

STEM

?

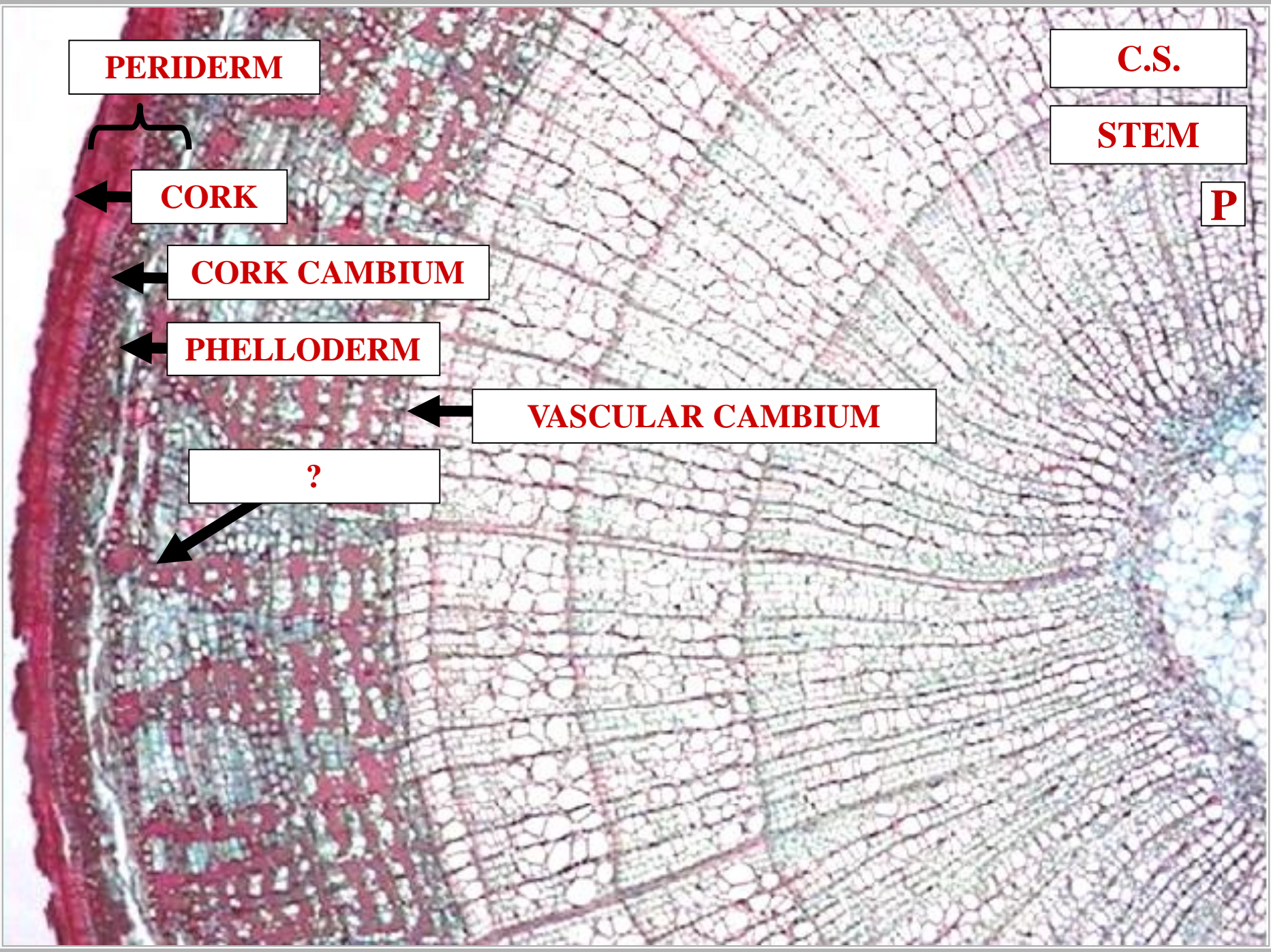


CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM



PERIDERM

C.S.

STEM

P



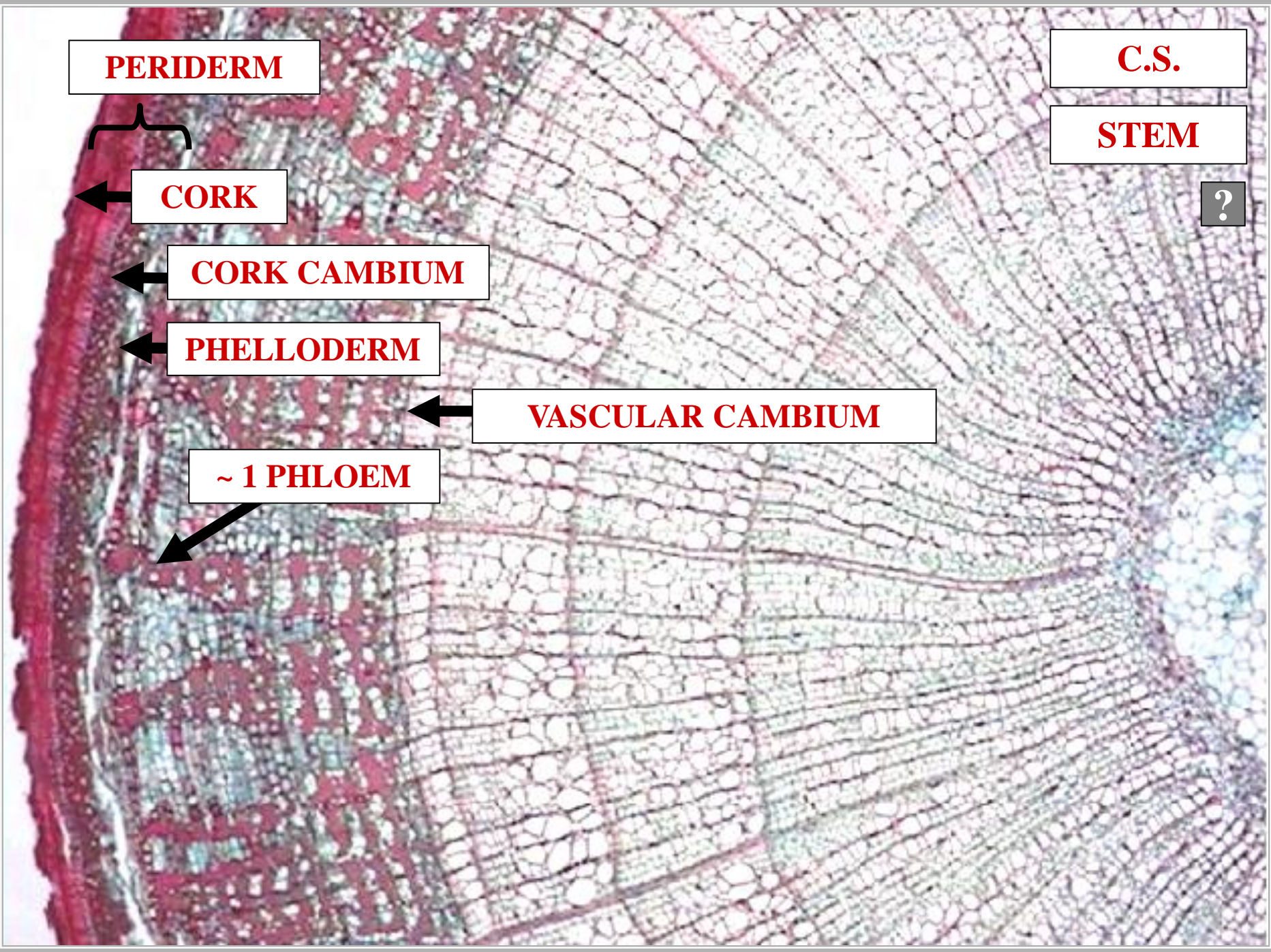
CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

?



PERIDERM

C.S.

STEM

?



CORK

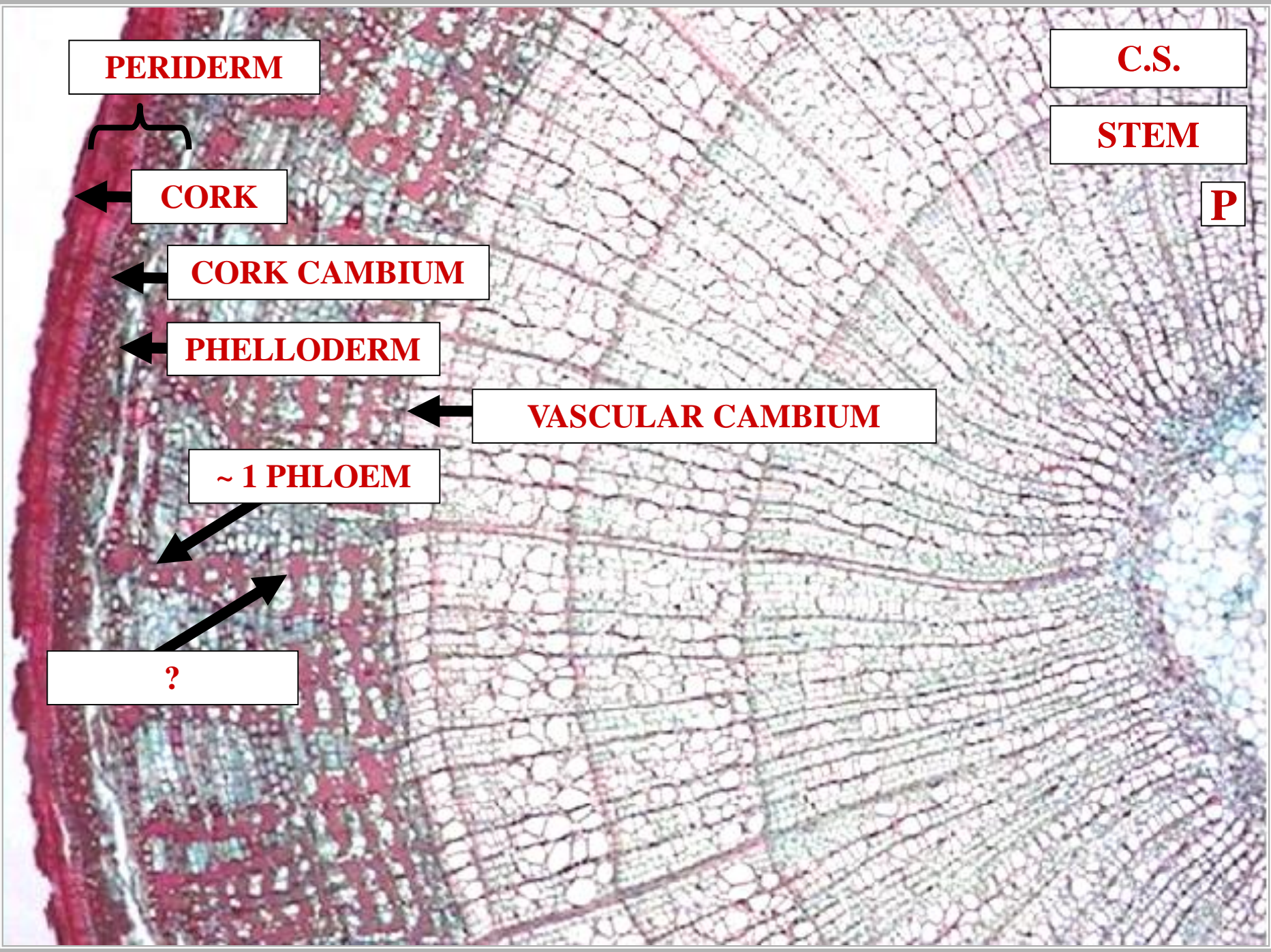
CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM





PERIDERM

C.S.

STEM

P

CORK

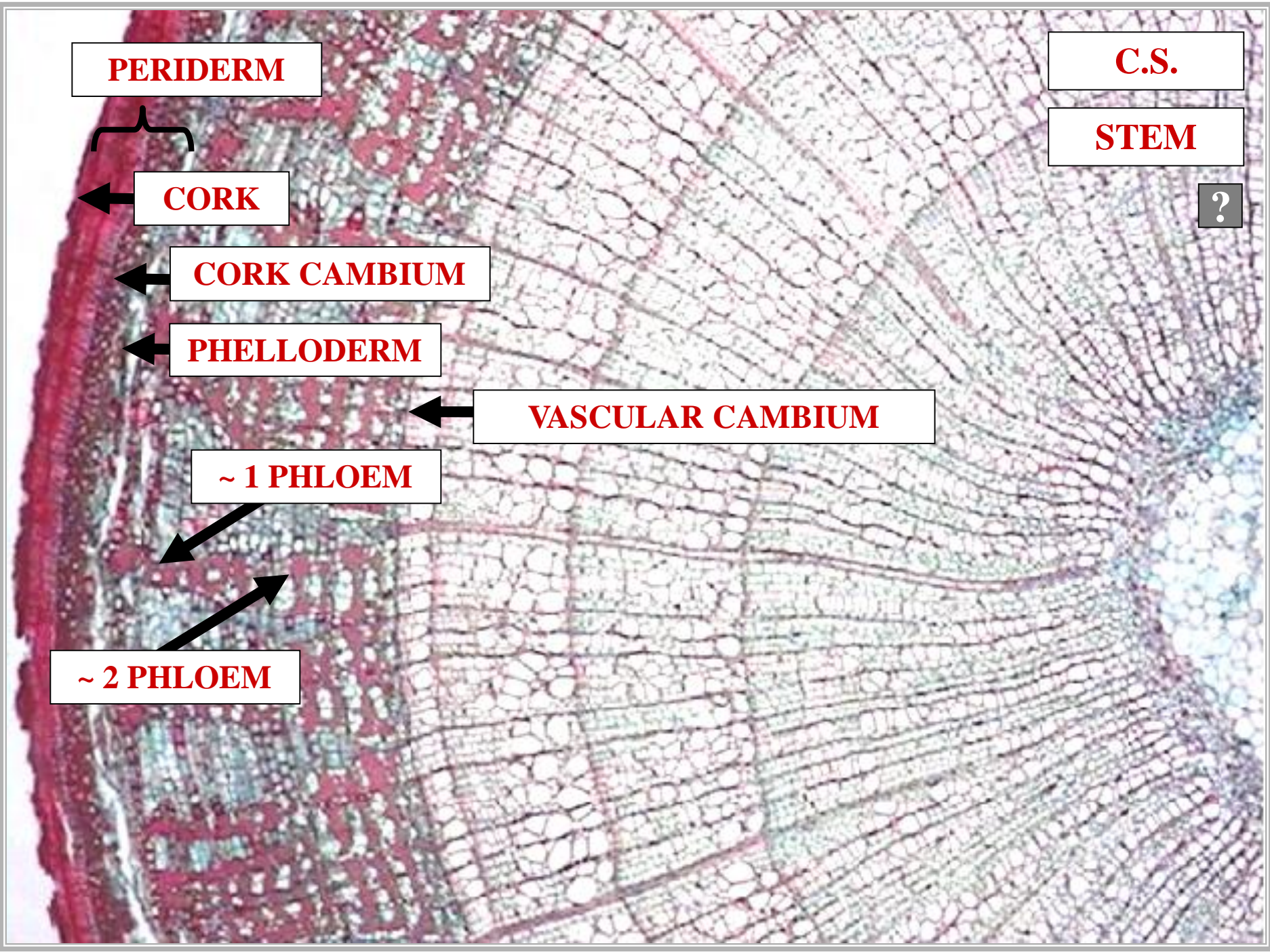
CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

?



PERIDERM

C.S.

STEM

?



CORK

CORK CAMBIUM

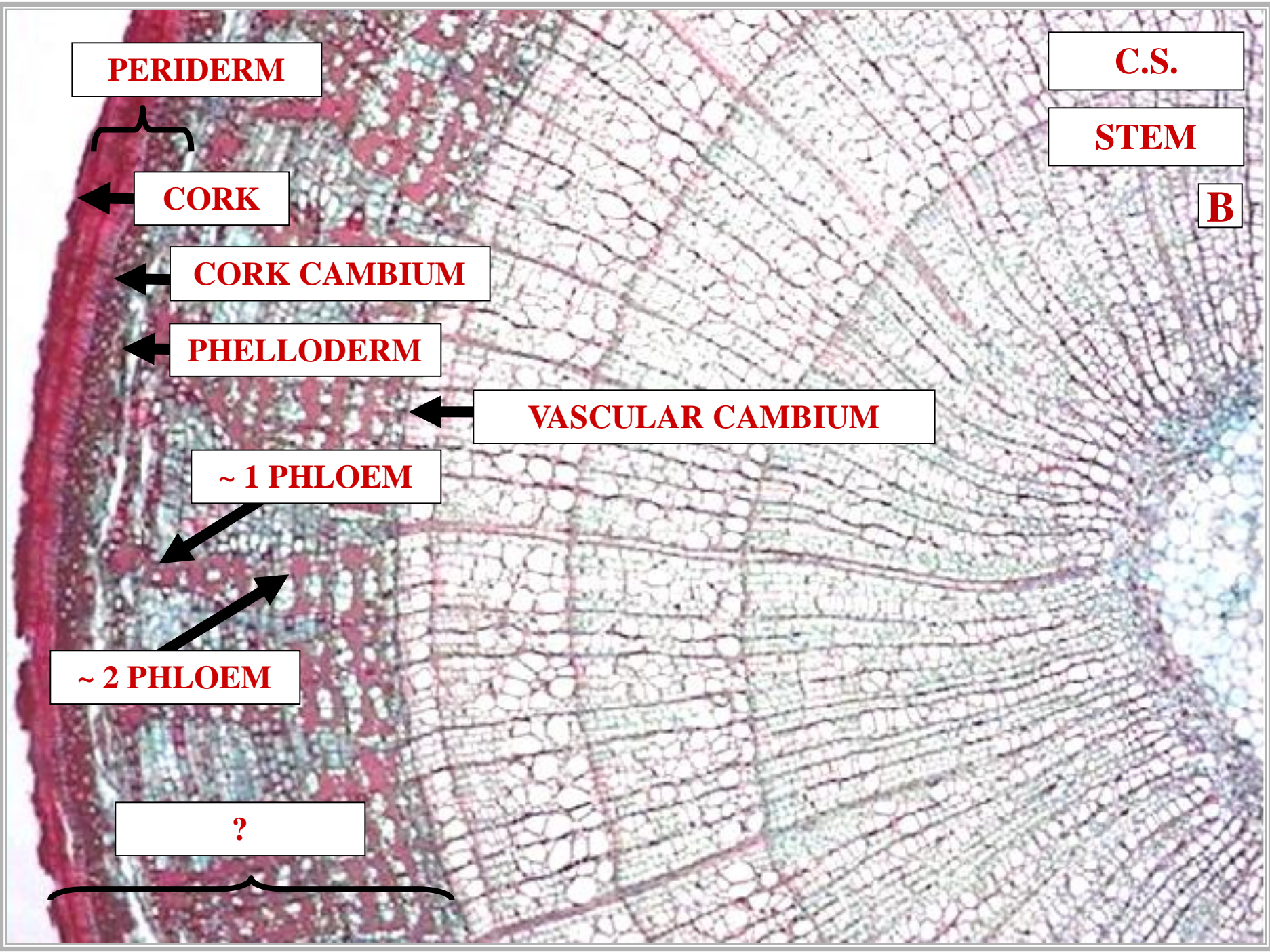
PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM





PERIDERM

C.S.

STEM

B

CORK

CORK CAMBIUM

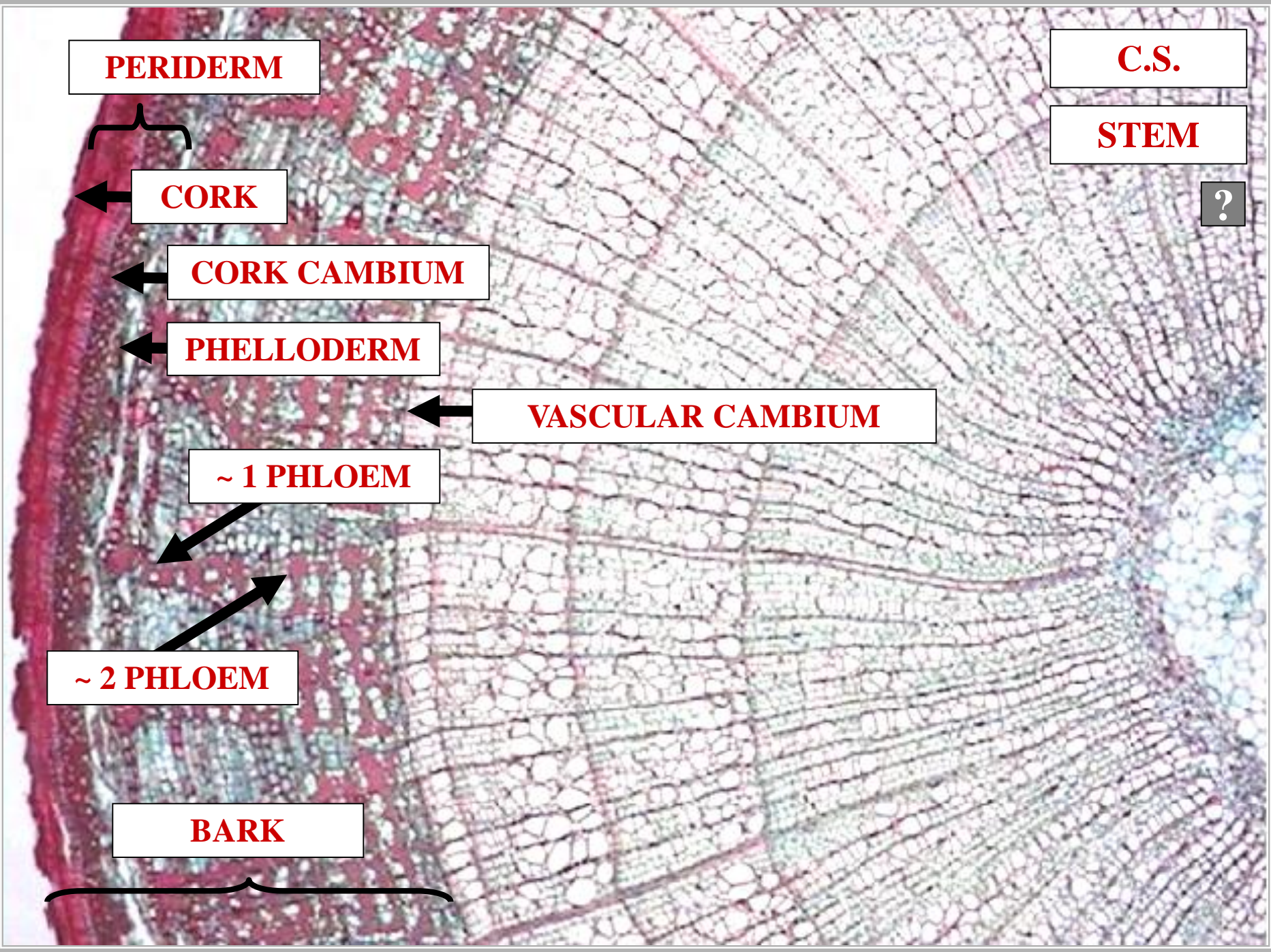
PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM

?



PERIDERM

C.S.

STEM

?

CORK

CORK CAMBIUM

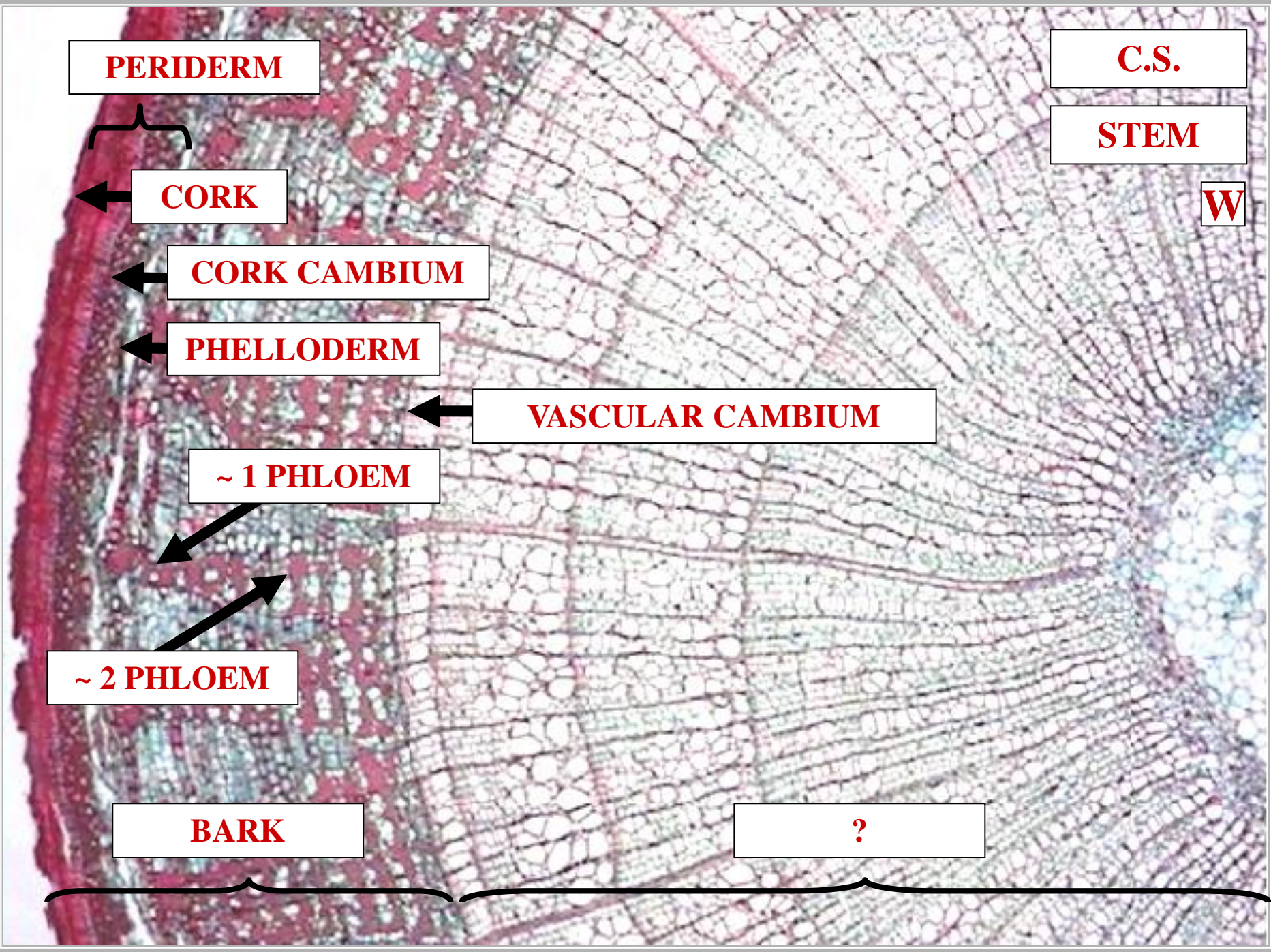
PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM

BARK



PERIDERM

C.S.

STEM

W

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

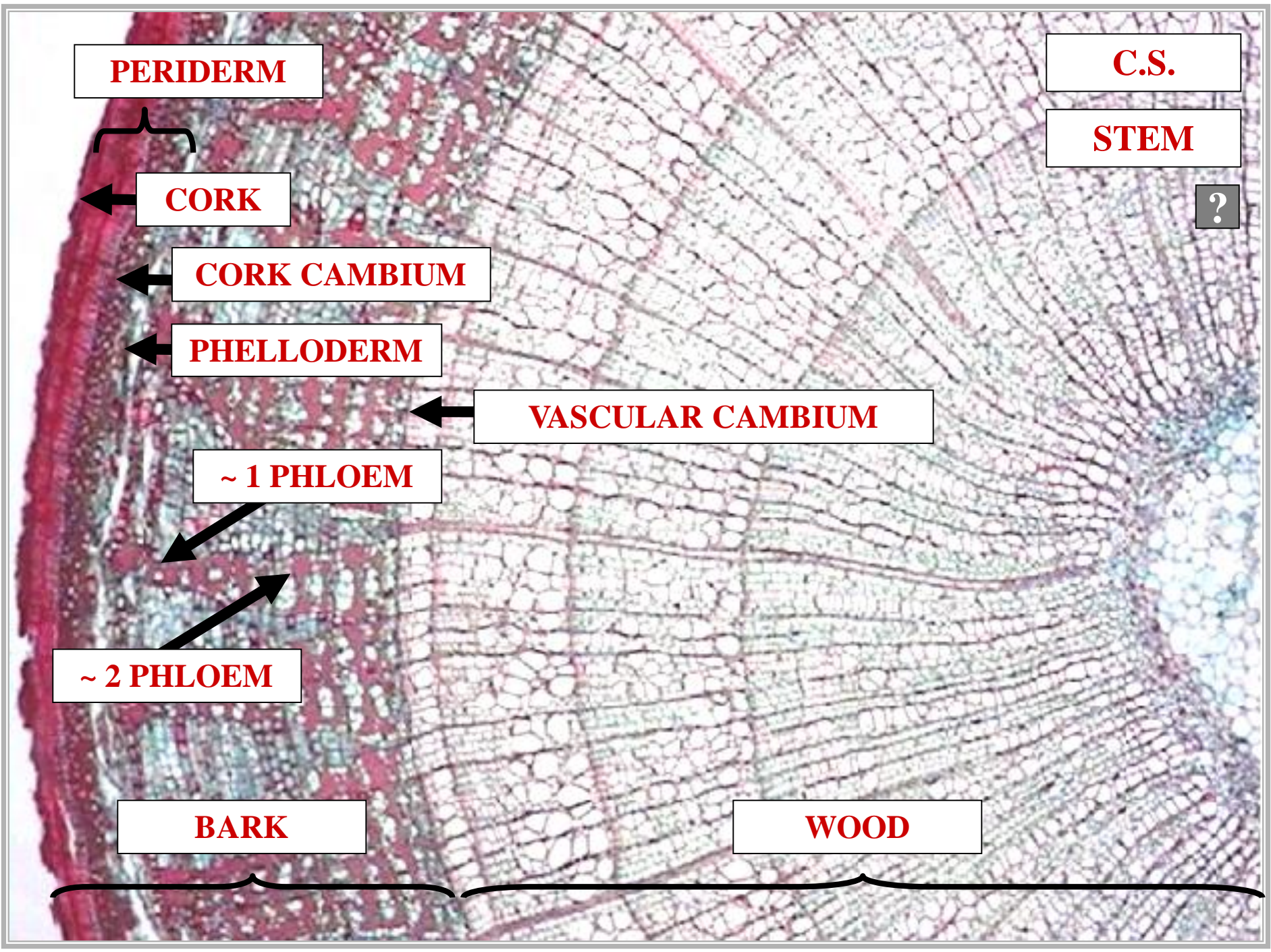
~ 1 PHLOEM

~ 2 PHLOEM

BARK

?

?



PERIDERM

C.S.

STEM

?

CORK

CORK CAMBIUM

PHELLODERM

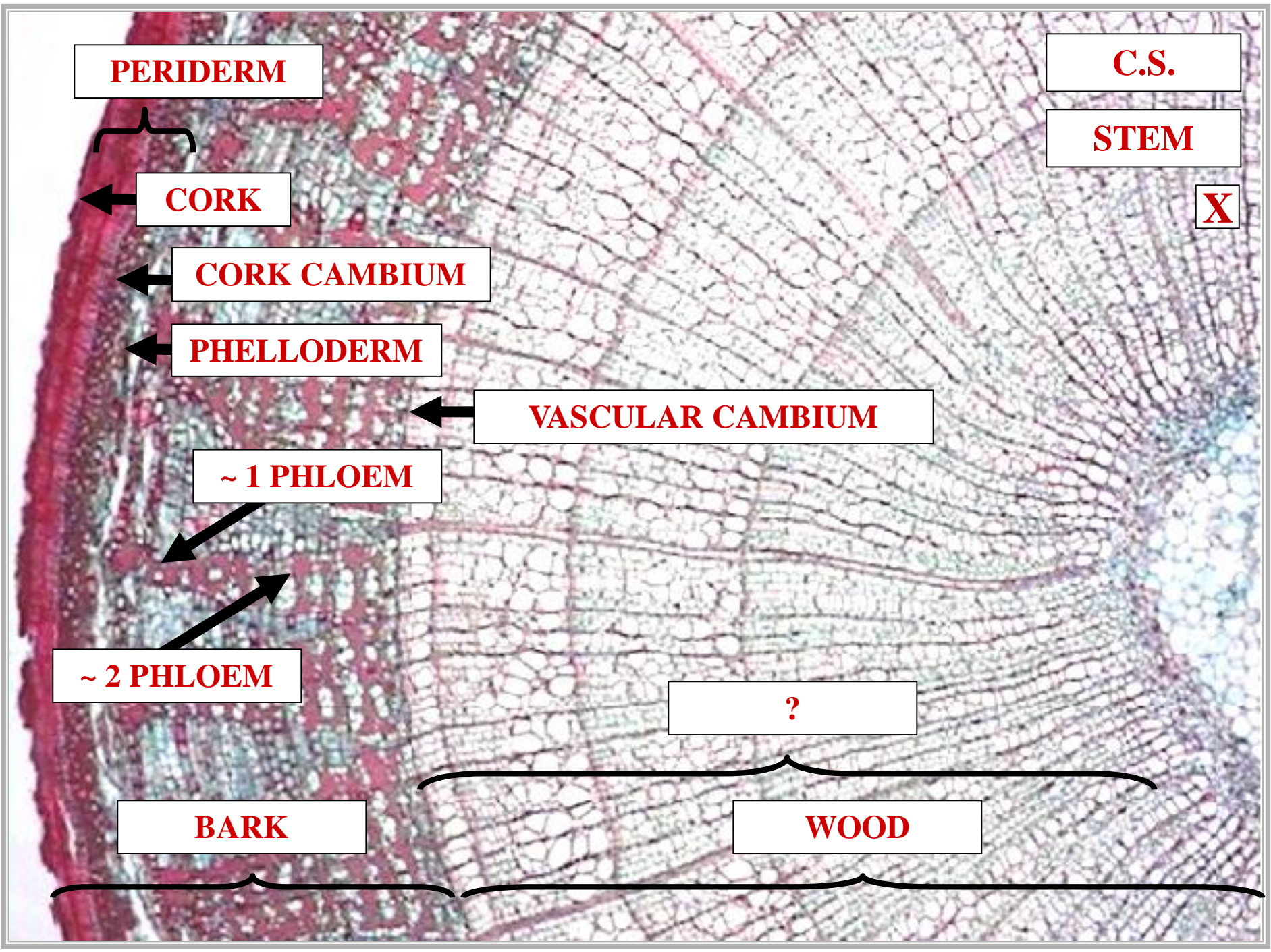
VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM

BARK

WOOD



PERIDERM

C.S.

STEM

X

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

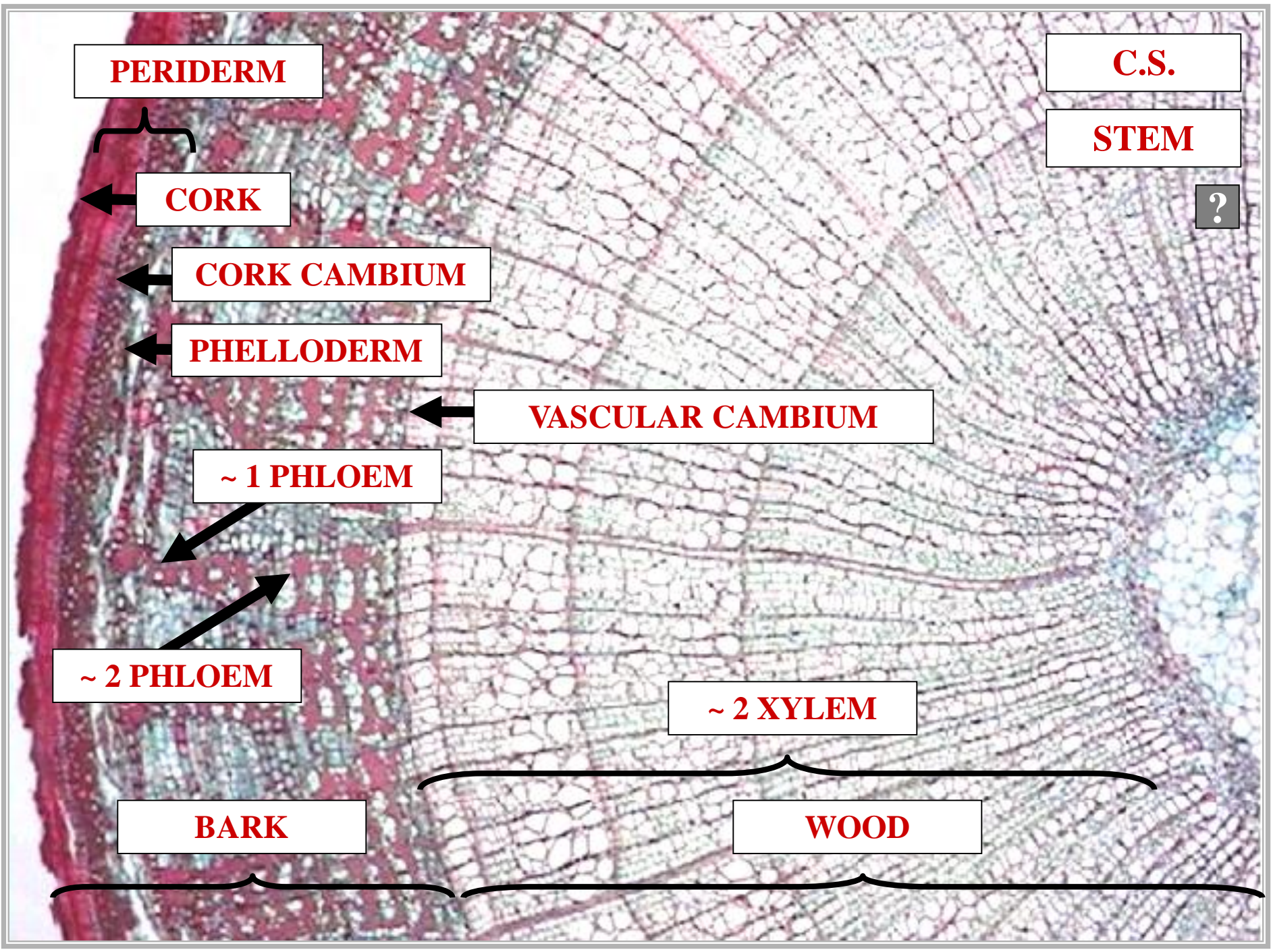
~ 1 PHLOEM

?

~ 2 PHLOEM

BARK

WOOD



PERIDERM

C.S.

STEM

?

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

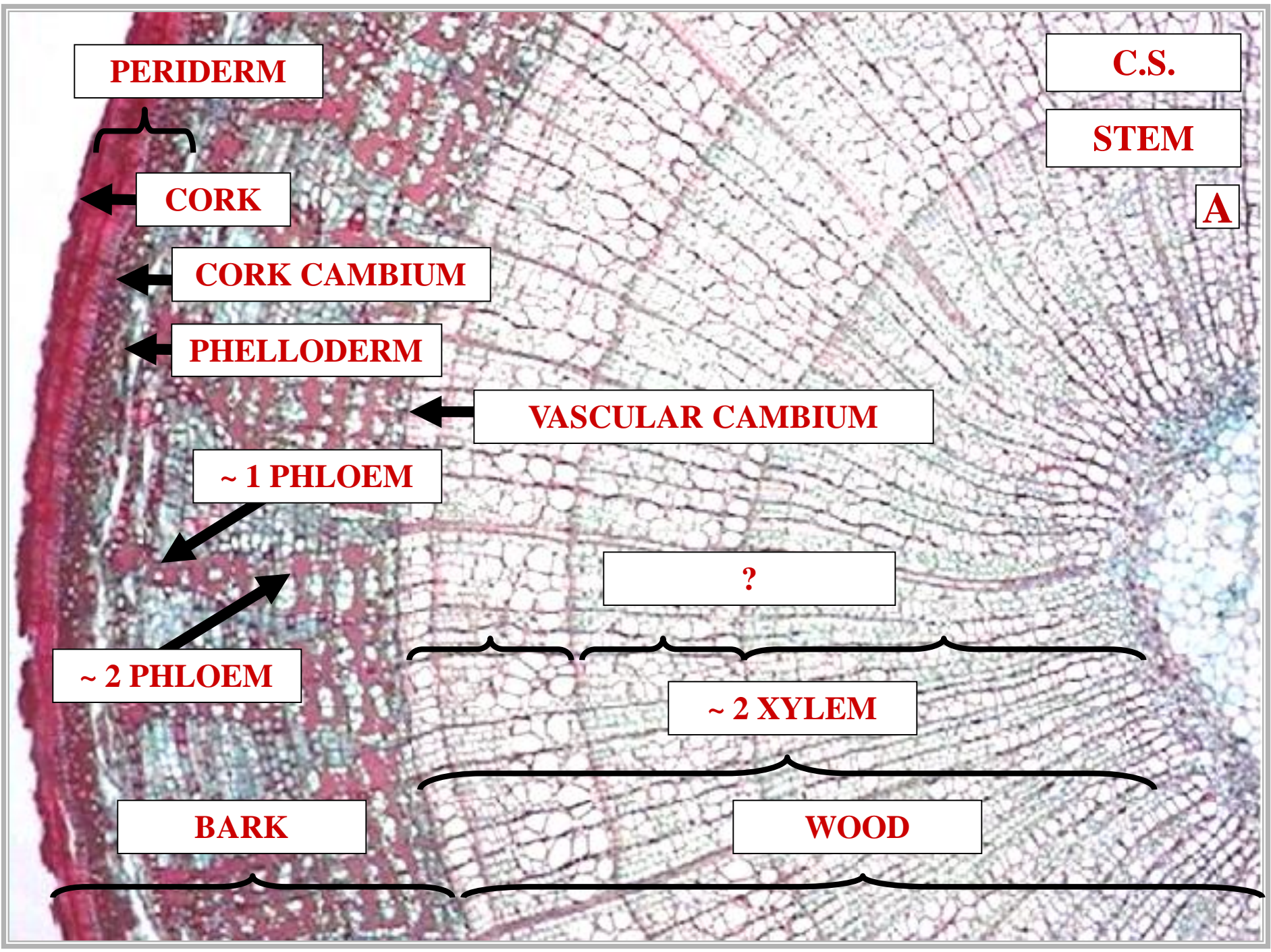
~ 1 PHLOEM

~ 2 PHLOEM

~ 2 XYLEM

BARK

WOOD



PERIDERM

C.S.

STEM

A

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

?

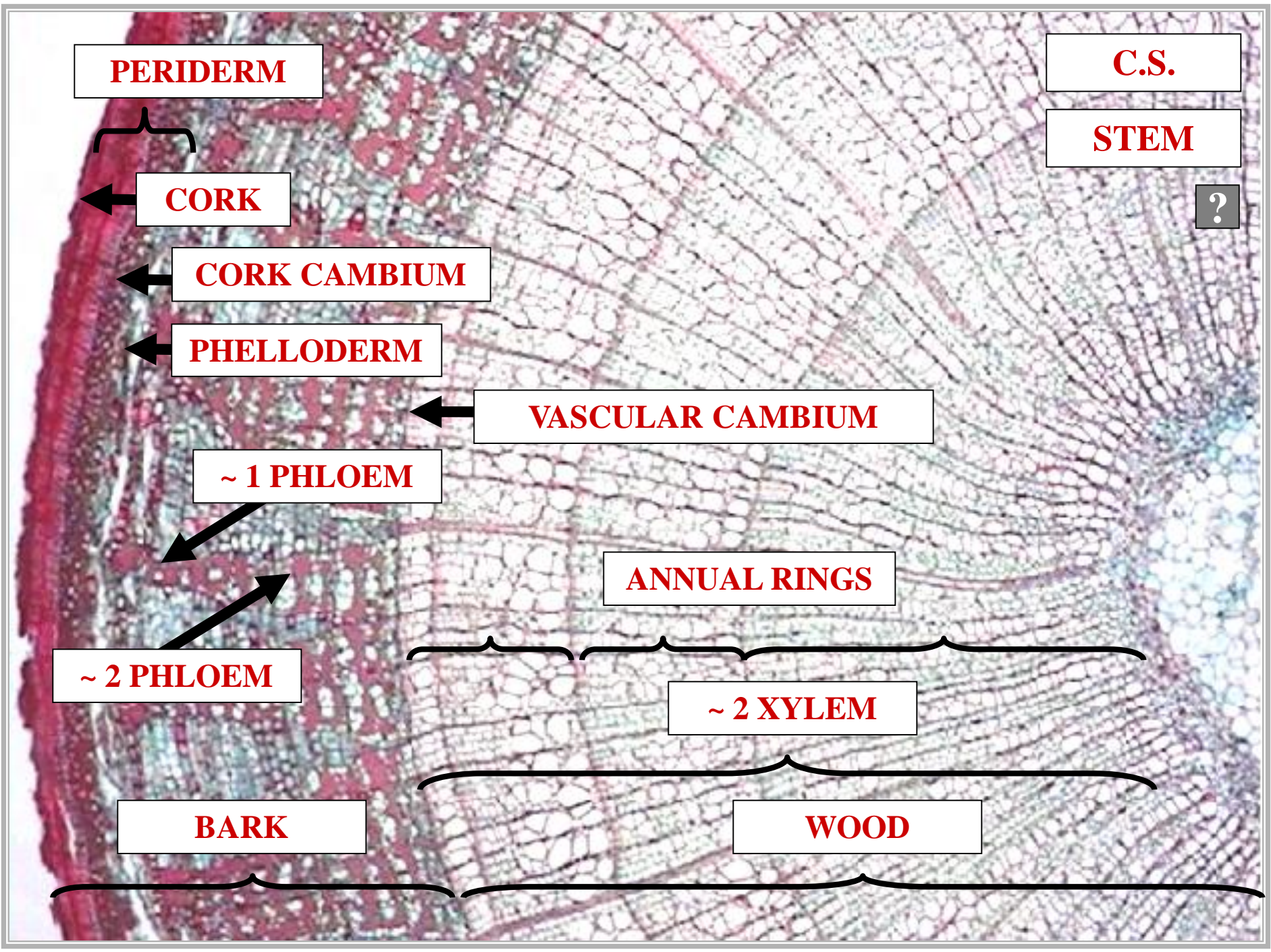
~ 2 PHLOEM

~ 2 XYLEM

~ 2 XYLEM

BARK

WOOD



PERIDERM

C.S.

STEM

?

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

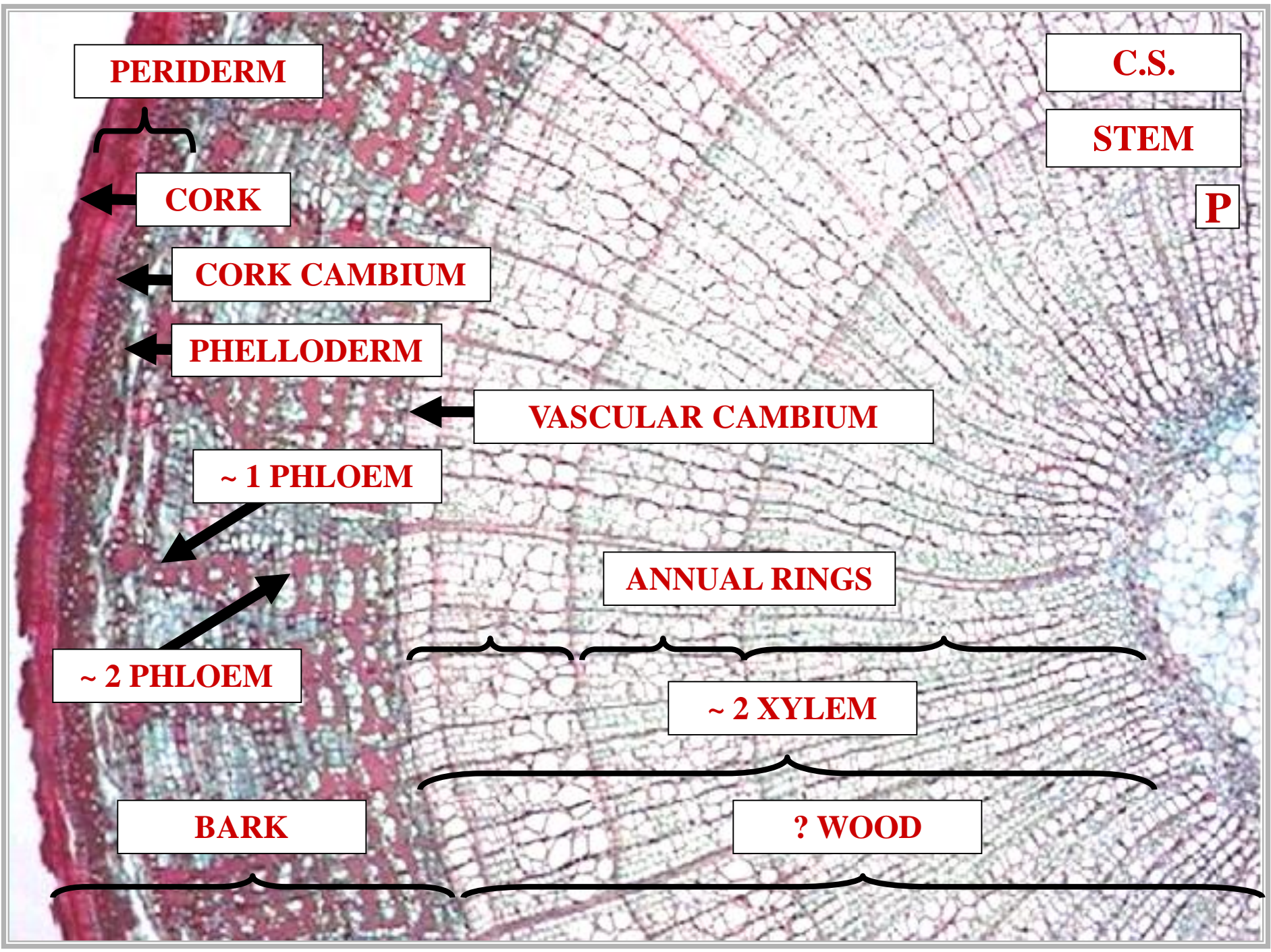
ANNUAL RINGS

~ 2 XYLEM

~ 2 PHLOEM

BARK

WOOD



PERIDERM

C.S.

STEM

P

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

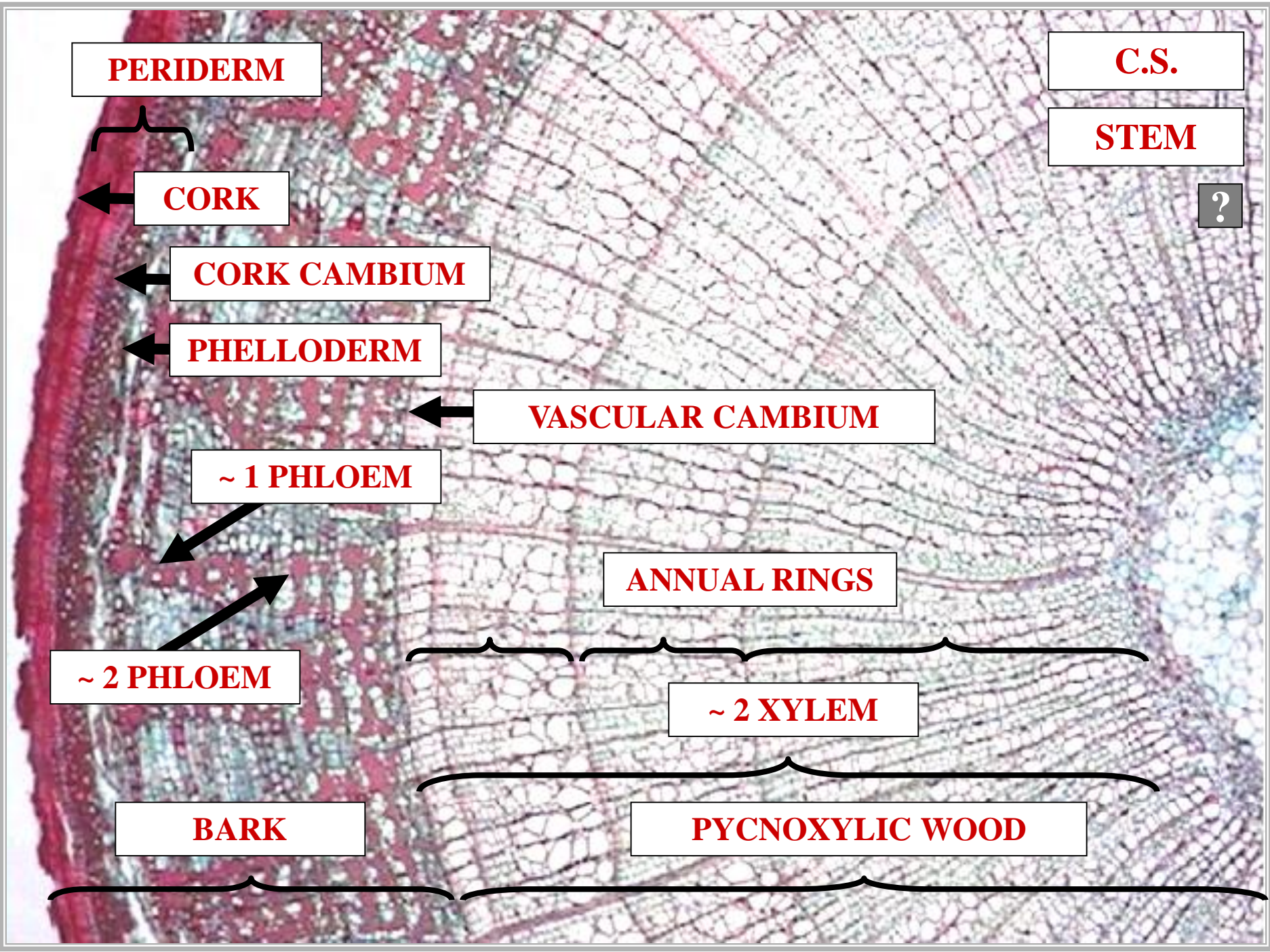
ANNUAL RINGS

~ 2 XYLEM

~ 2 PHLOEM

BARK

? WOOD



PERIDERM

C.S.

STEM

?

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

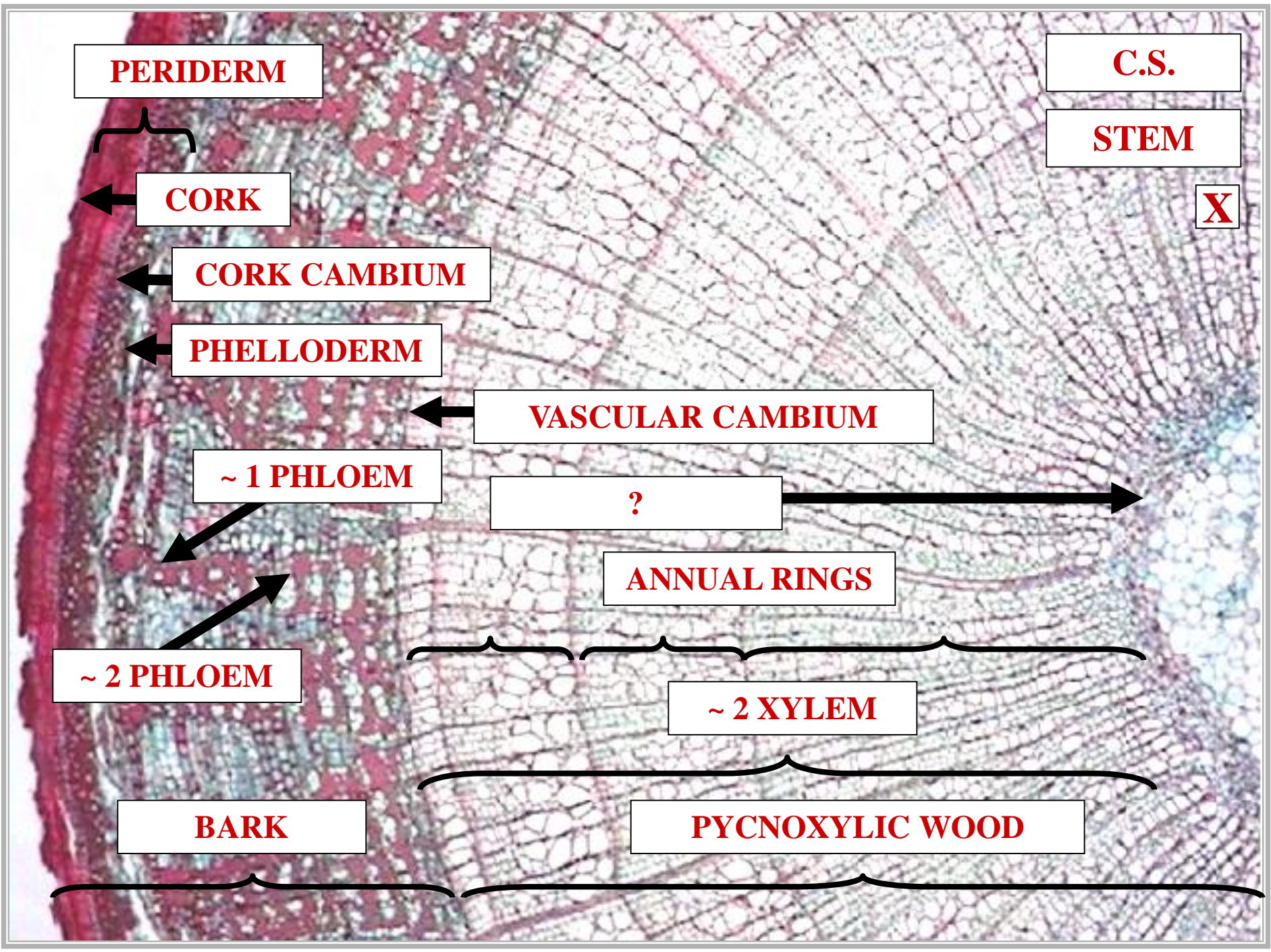
ANNUAL RINGS

~ 2 PHLOEM

~ 2 XYLEM

BARK

PYCNOXYLIC WOOD



PERIDERM

C.S.

STEM

X

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

?

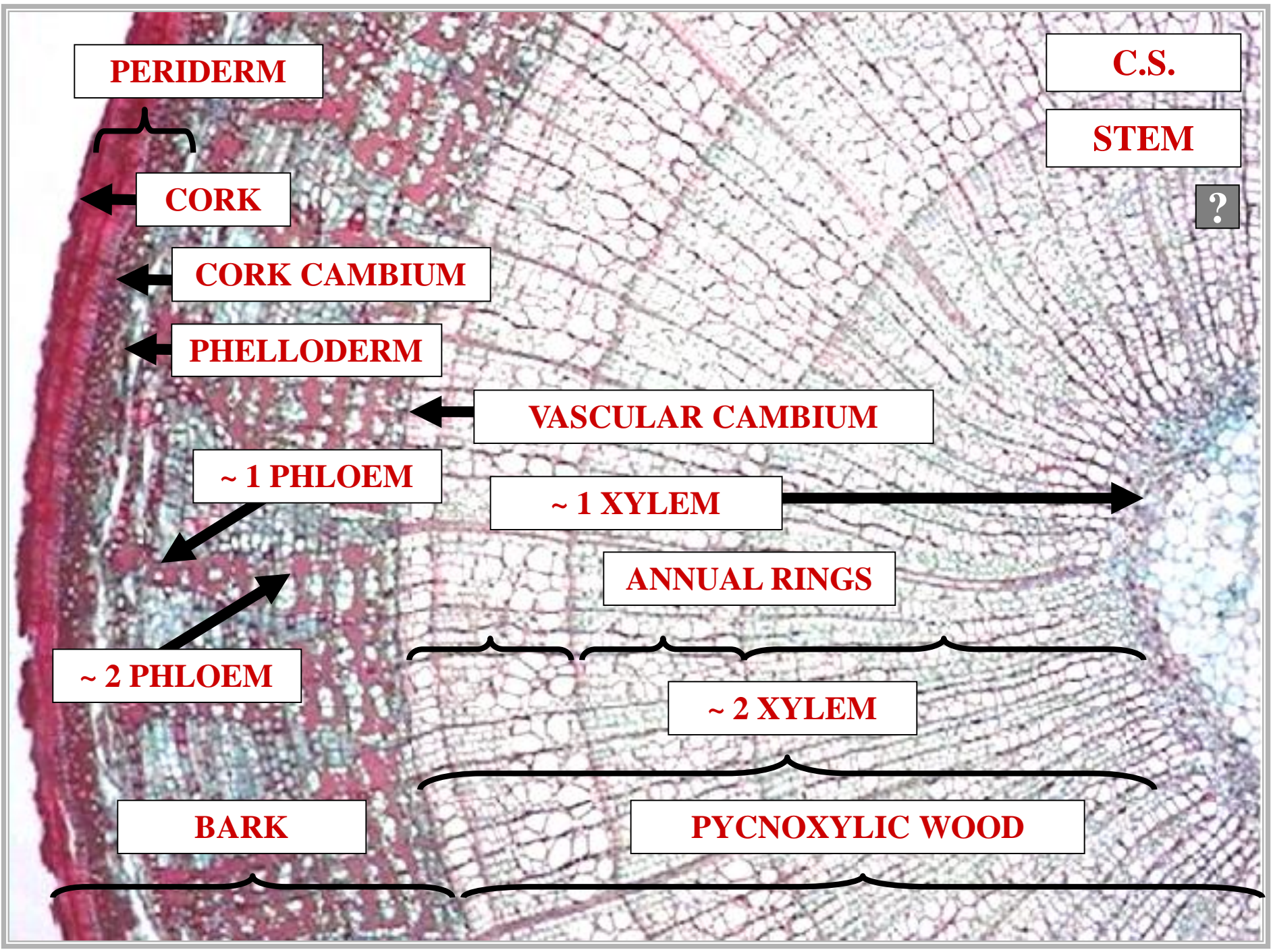
ANNUAL RINGS

~ 2 XYLEM

~ 2 PHLOEM

BARK

PYCNOXYLIC WOOD



PERIDERM

C.S.

STEM

?

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 1 XYLEM

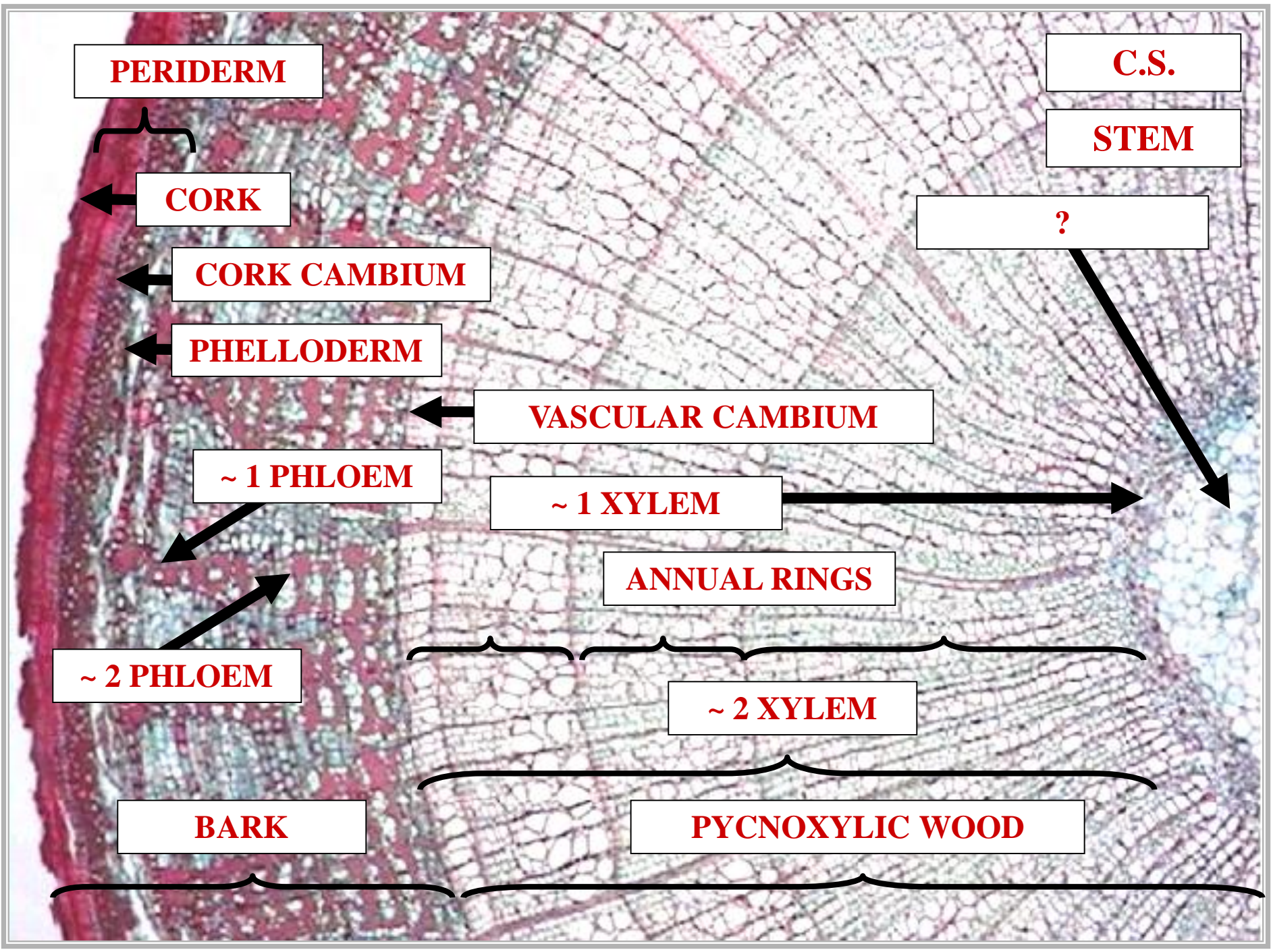
ANNUAL RINGS

~ 2 PHLOEM

~ 2 XYLEM

BARK

PYCNOXYLIC WOOD



PERIDERM

C.S.

STEM

?

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 1 XYLEM

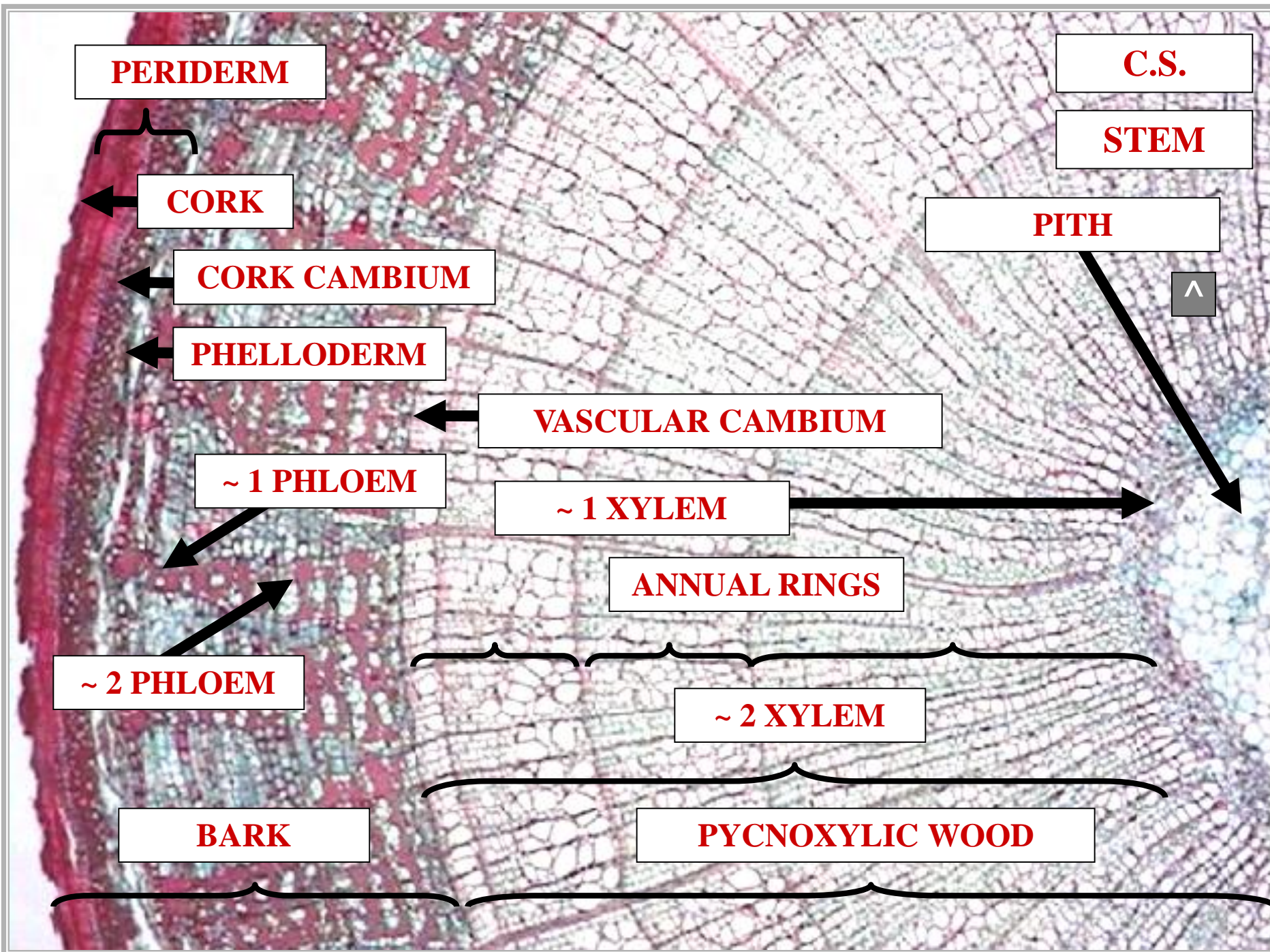
ANNUAL RINGS

~ 2 PHLOEM

~ 2 XYLEM

BARK

PYCNOXYLIC WOOD



PERIDERM

C.S.

STEM

PITH

CORK

CORK CAMBIUM

PHELLODERM

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 1 XYLEM

ANNUAL RINGS

~ 2 XYLEM

~ 2 PHLOEM

BARK

PYCNOXYLIC WOOD

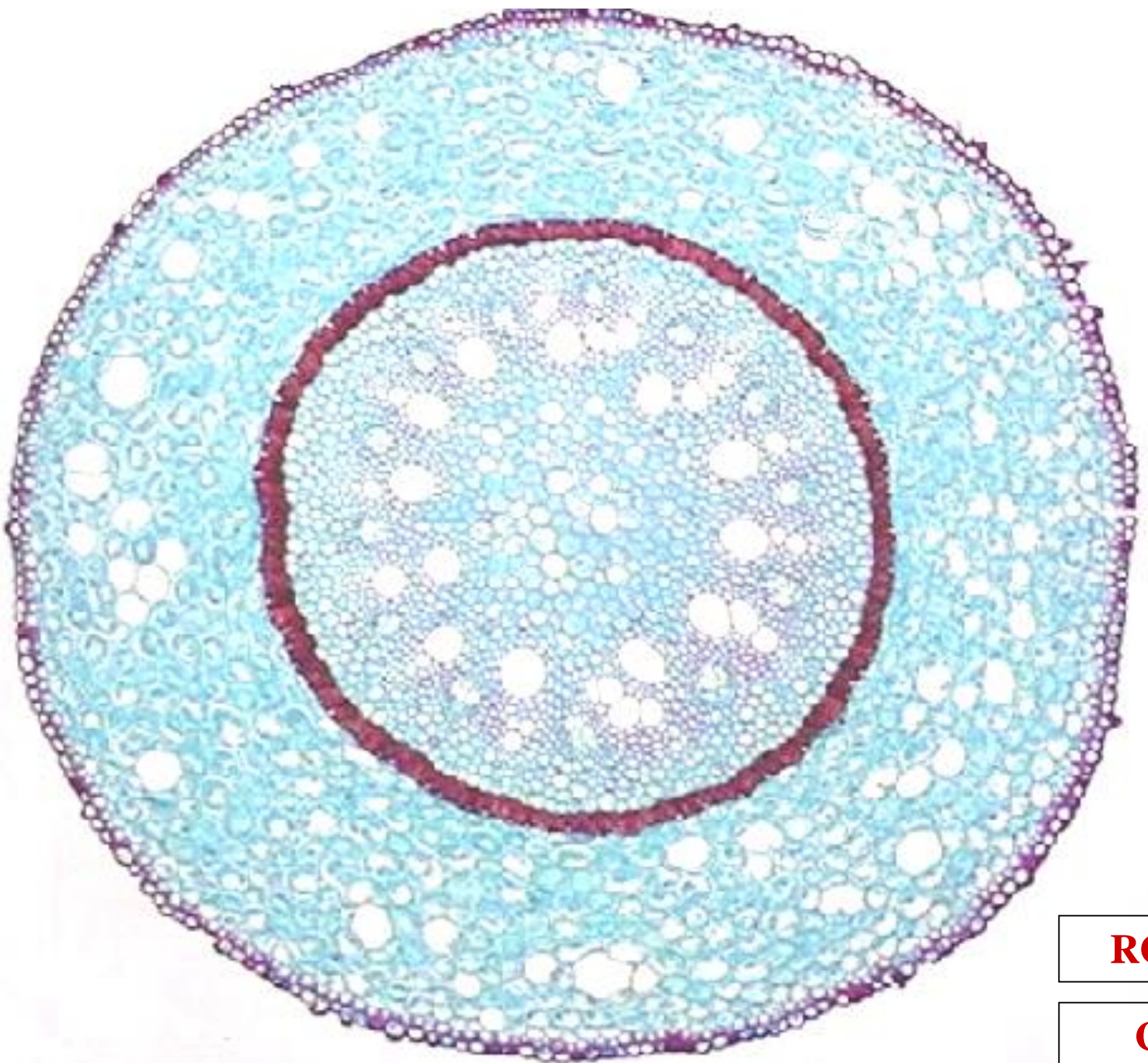




MONOCOT ANATOMY



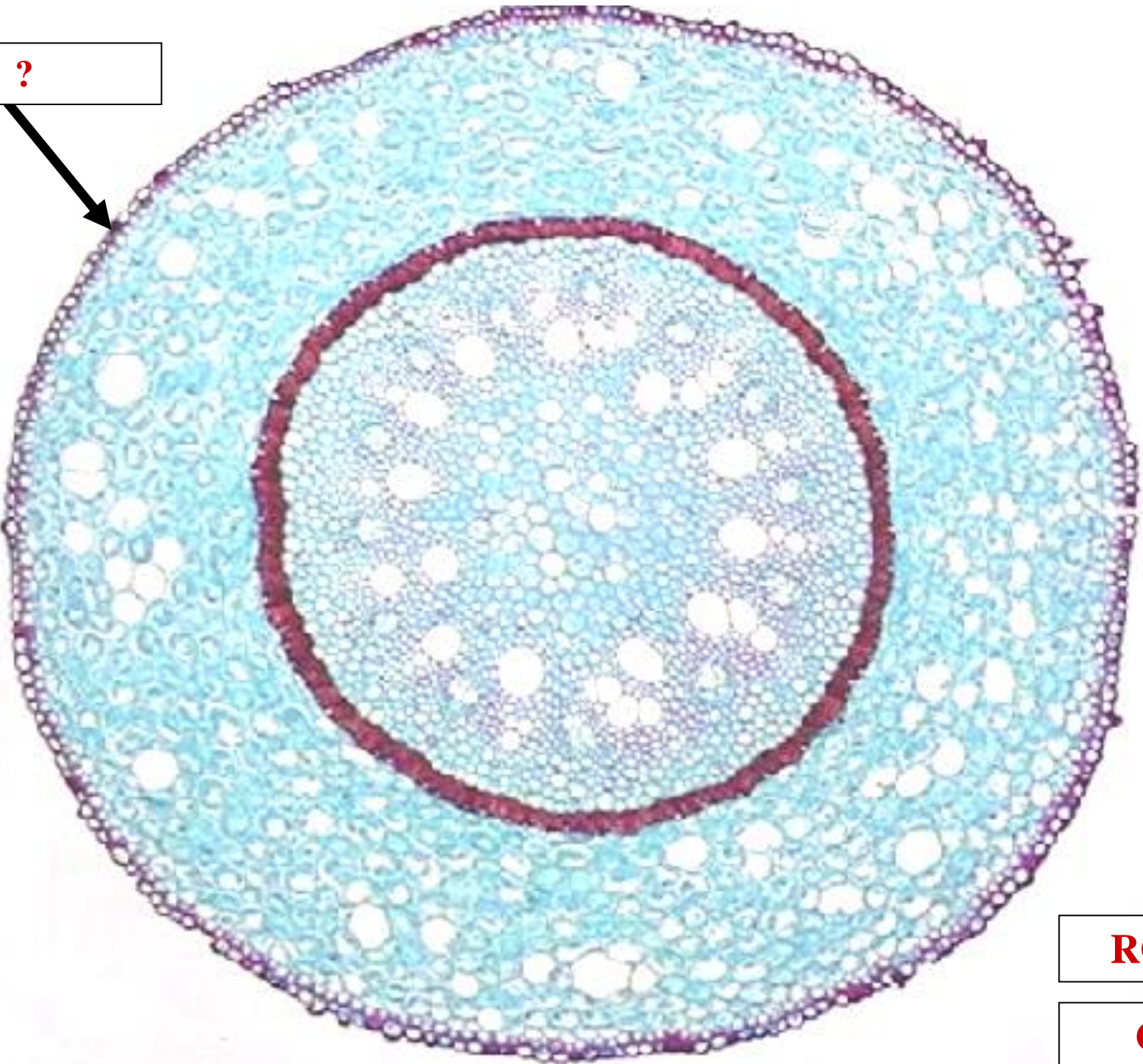
MONOCOT ROOT ANATOMY



ROOT

C.S.

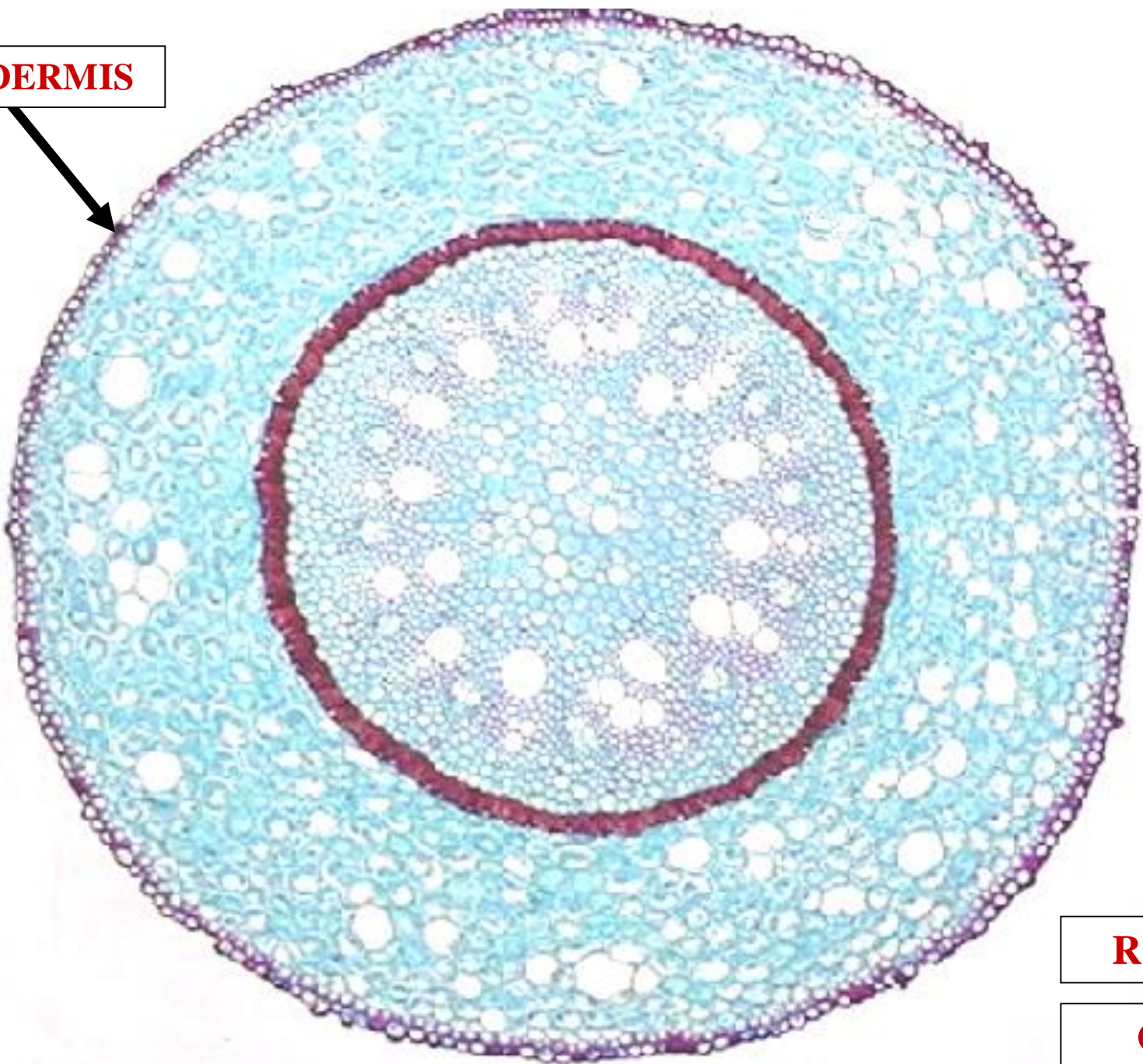
?



ROOT

C.S.

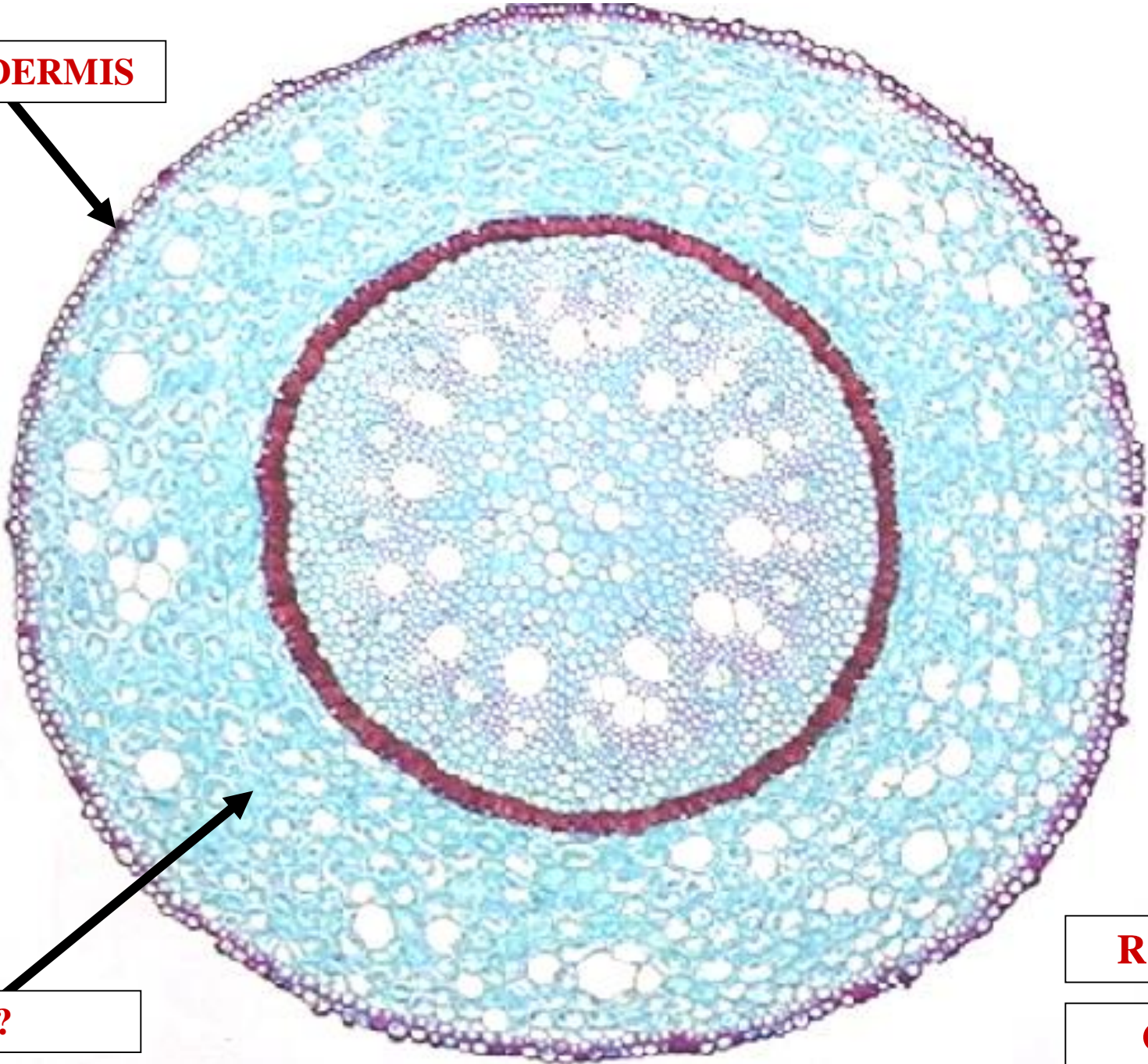
EPIDERMIS



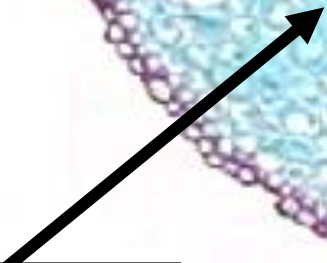
ROOT

C.S.

EPIDERMIS



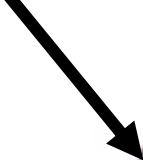
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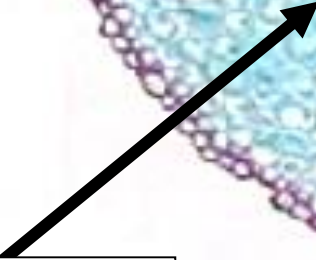
ROOT

C.S.

EPIDERMIS

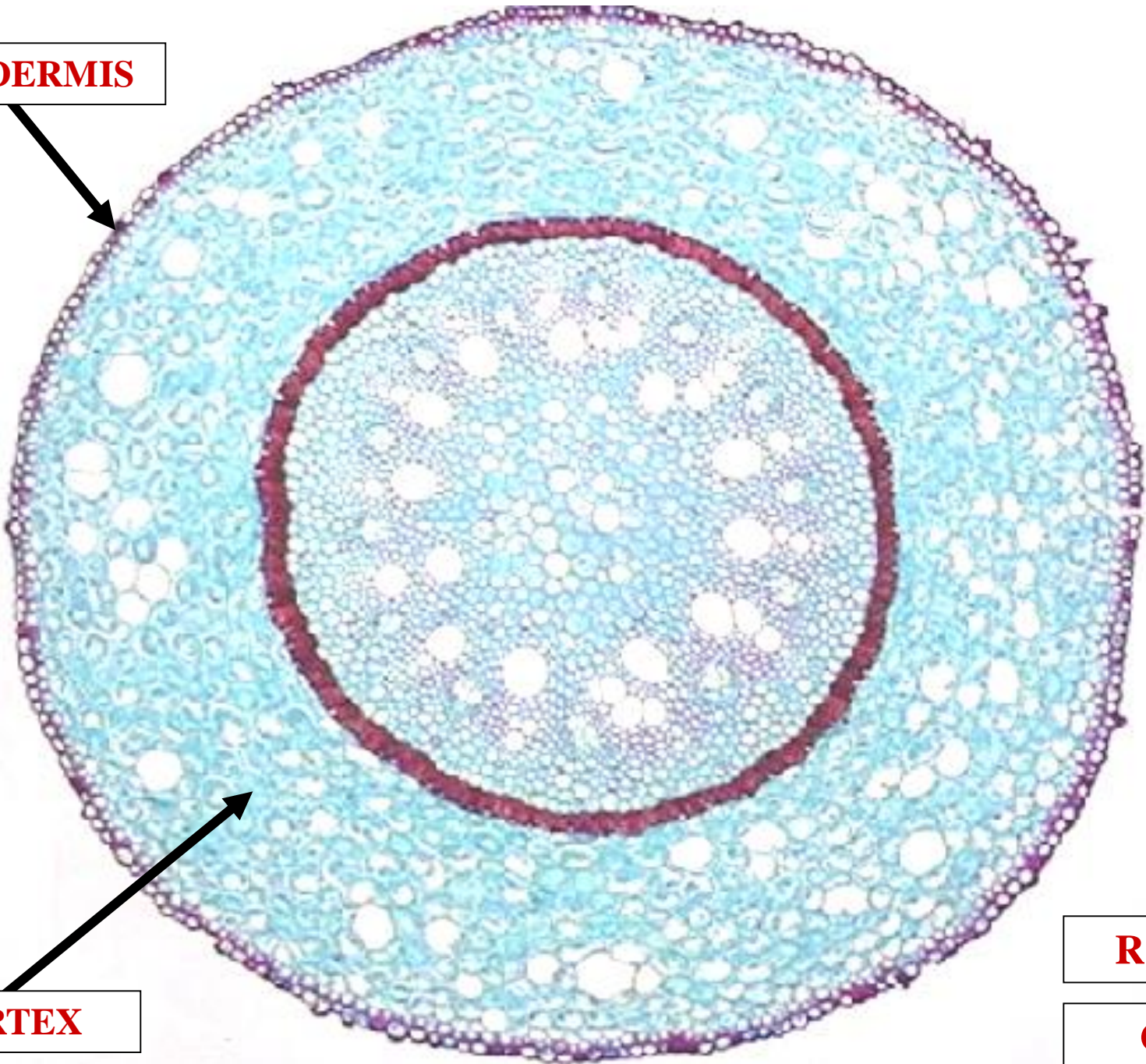


CORTEX



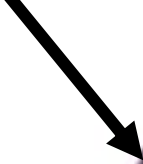
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C.S.





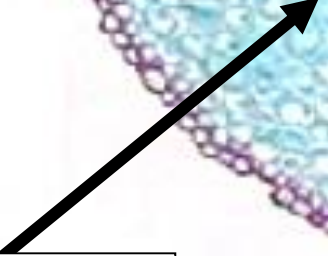
EPIDERMIS



**STELE
REGION**

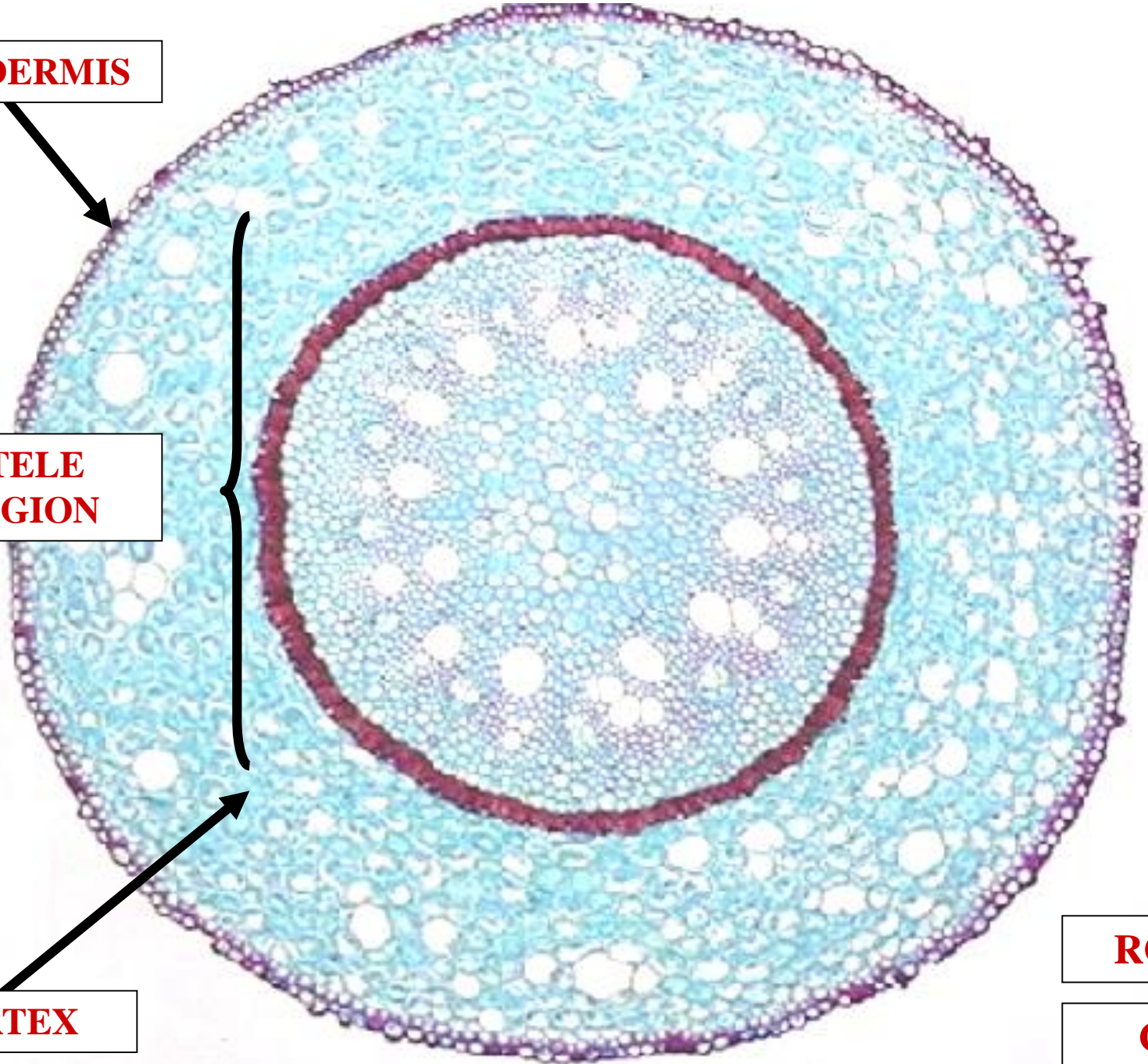


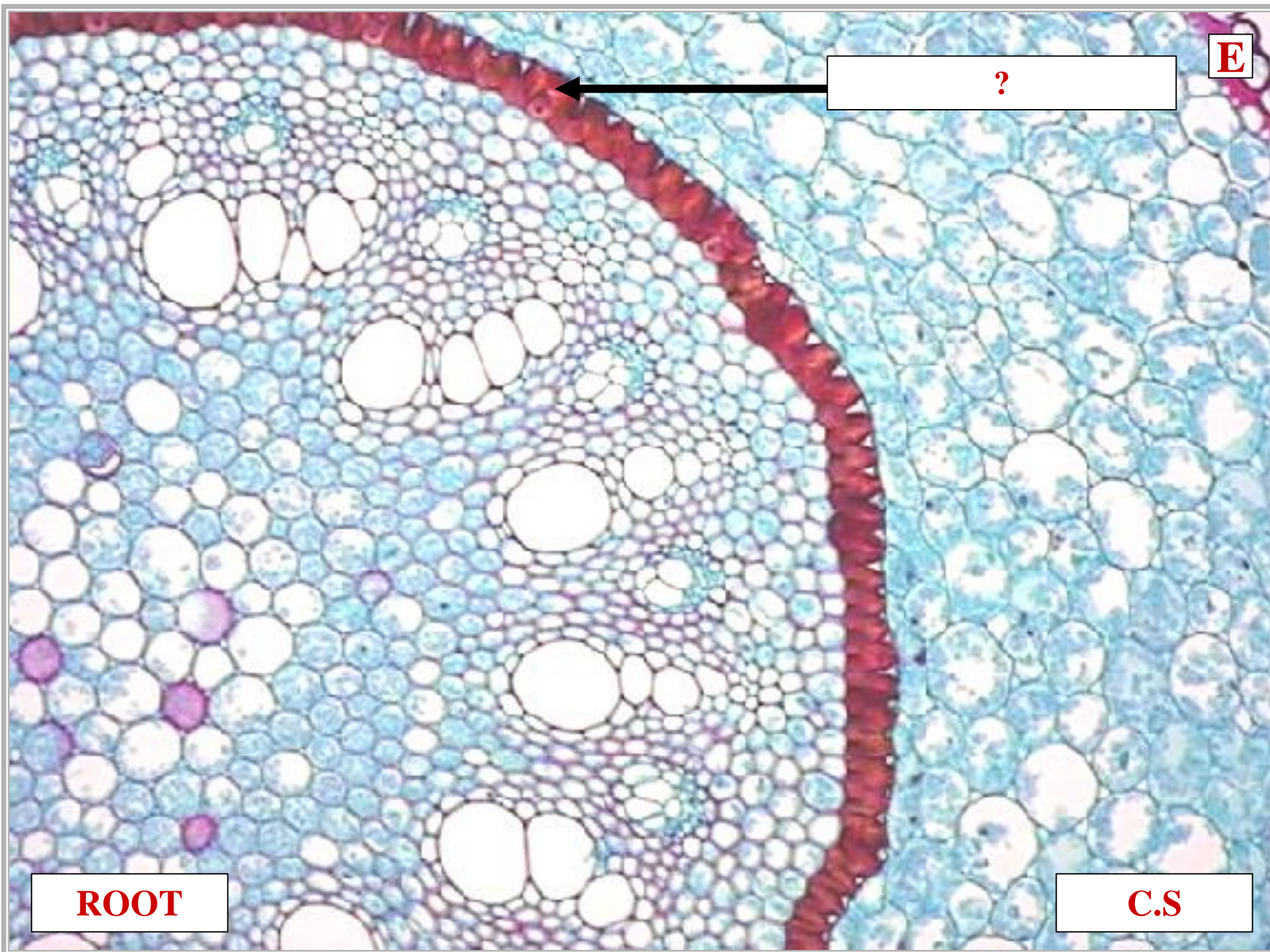
CORTEX



ROOT

C.S.





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ROOT

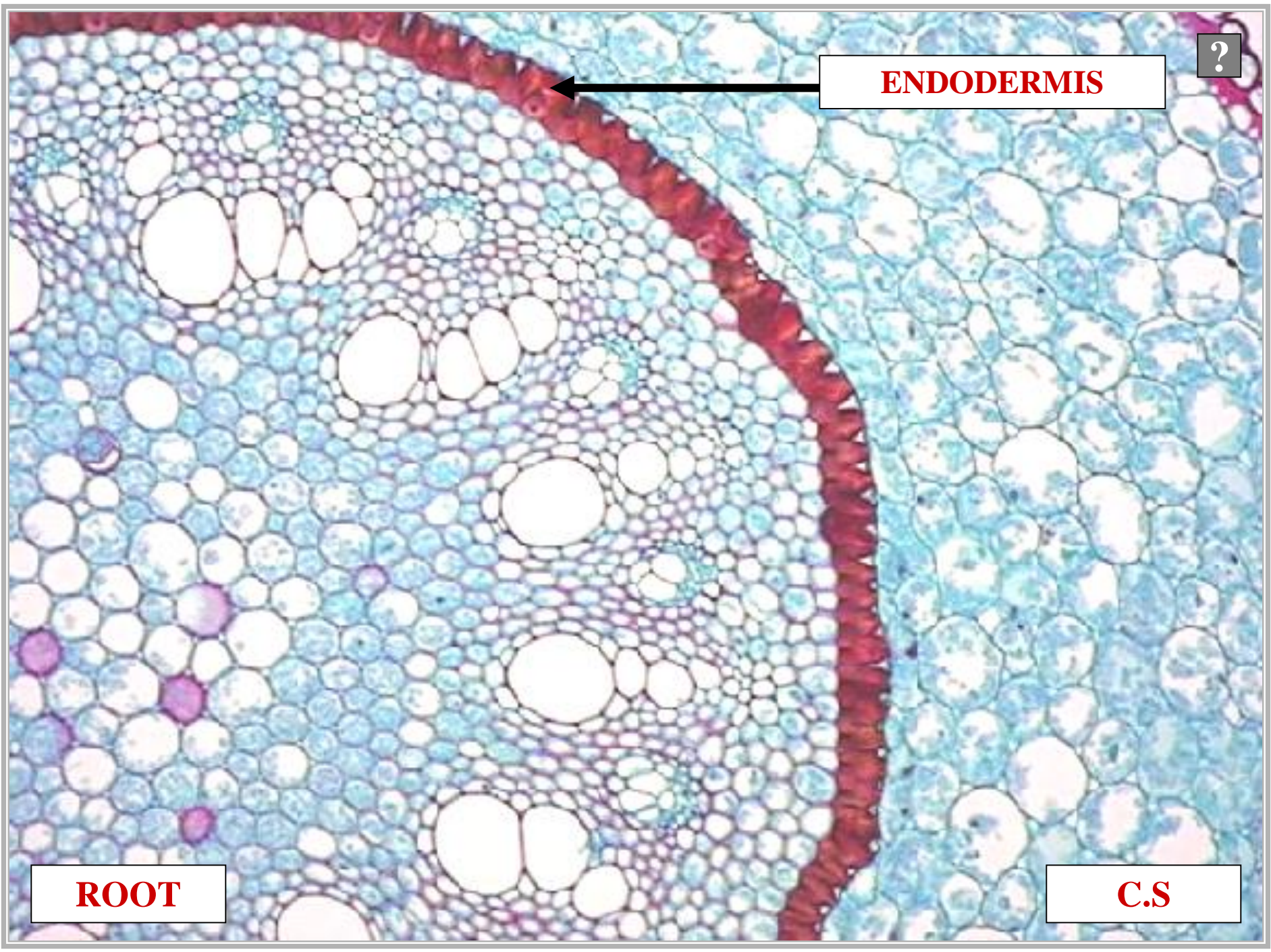
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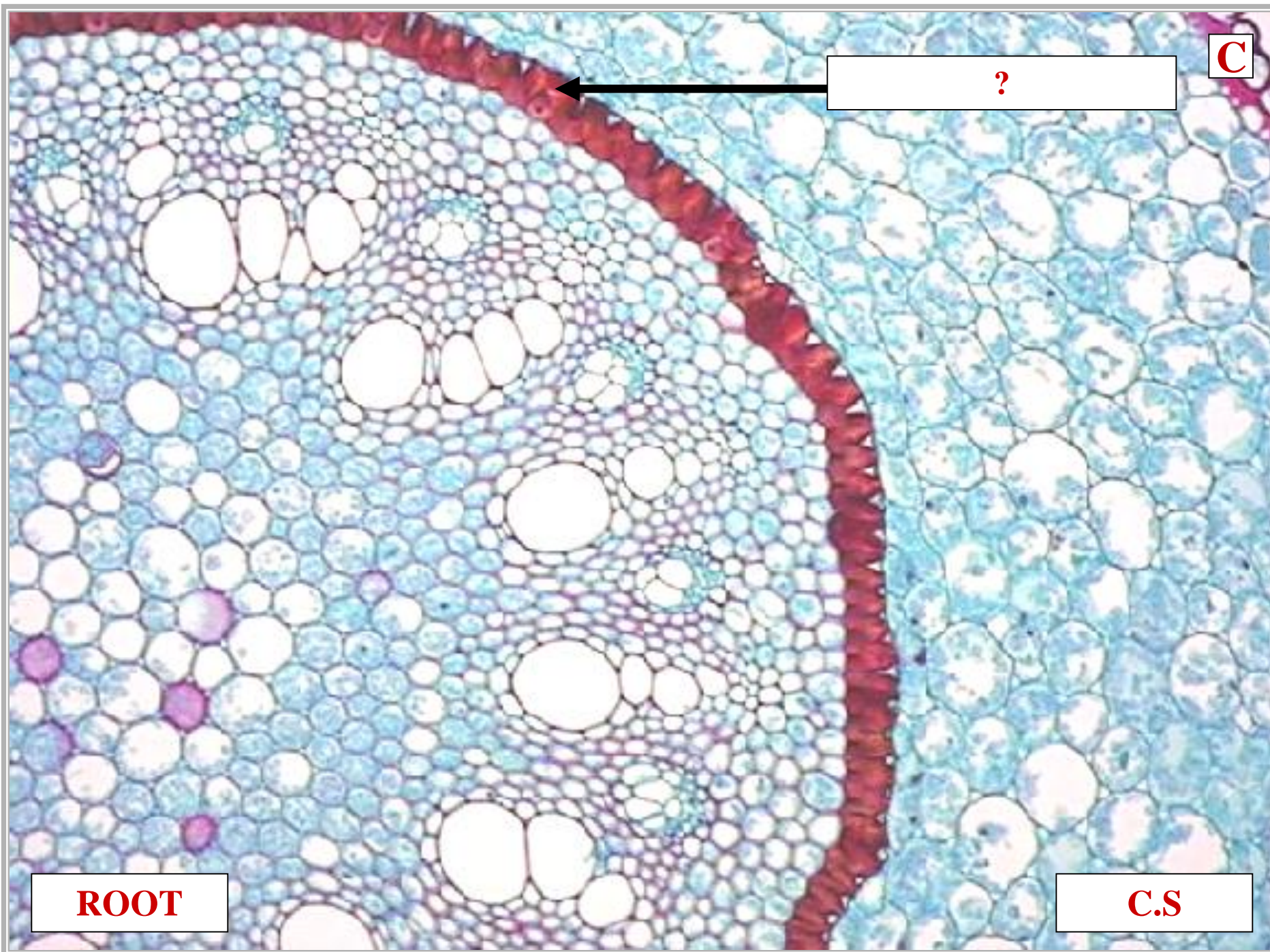
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ENDODERMIS

ROOT

C.S





C

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ROOT

C.S

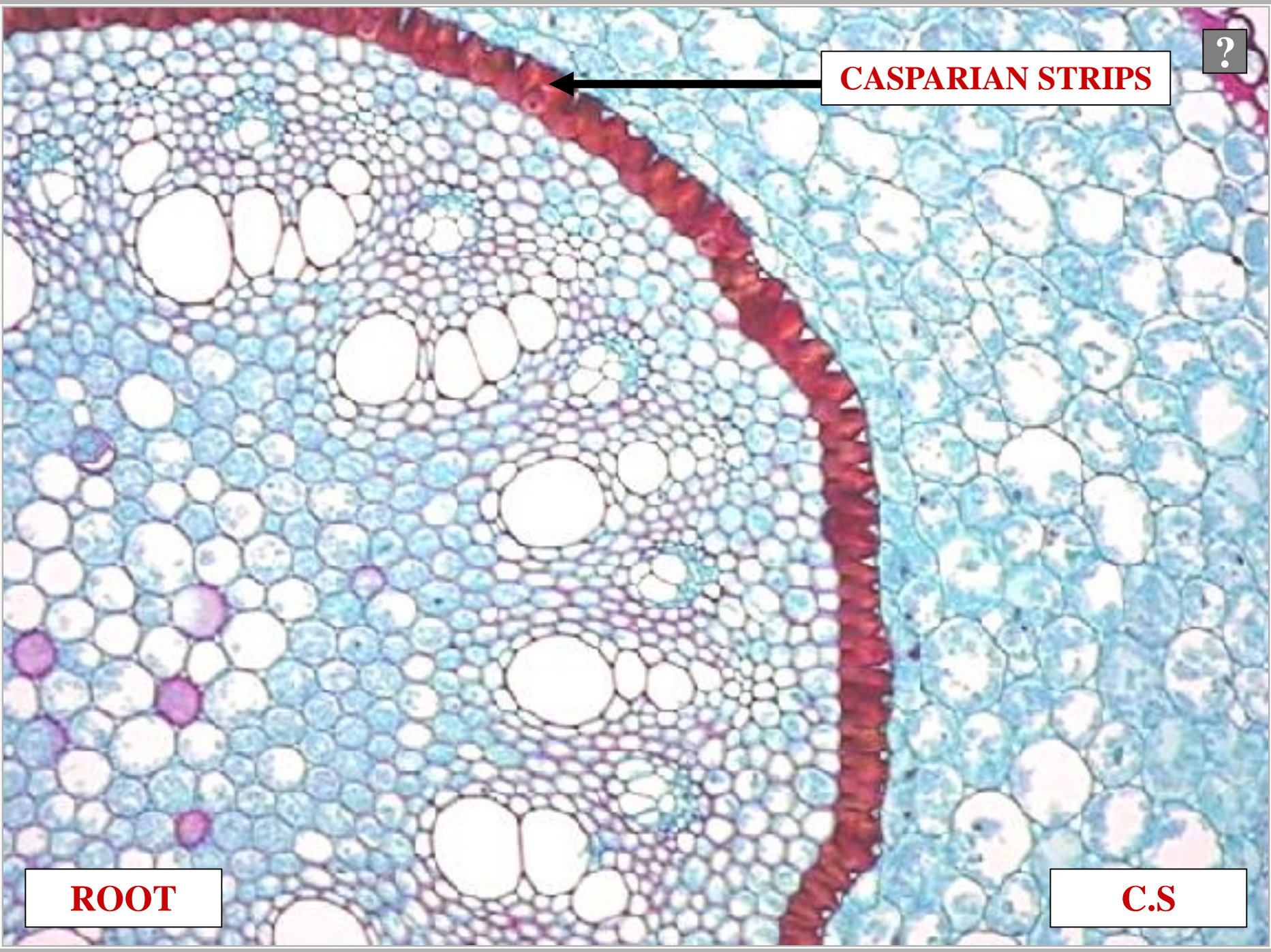
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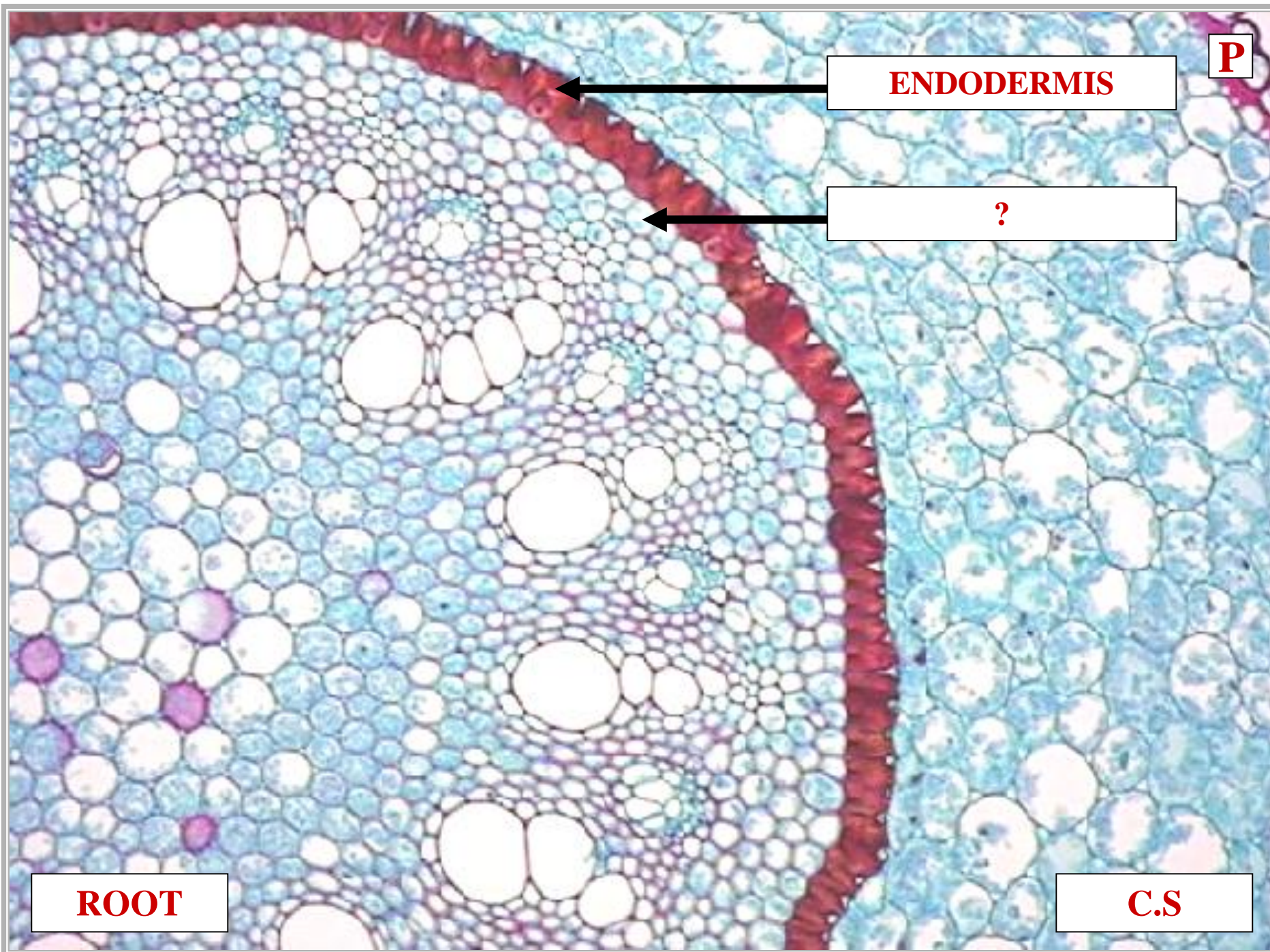
CASPARIAN STRIPS



ROOT

C.S





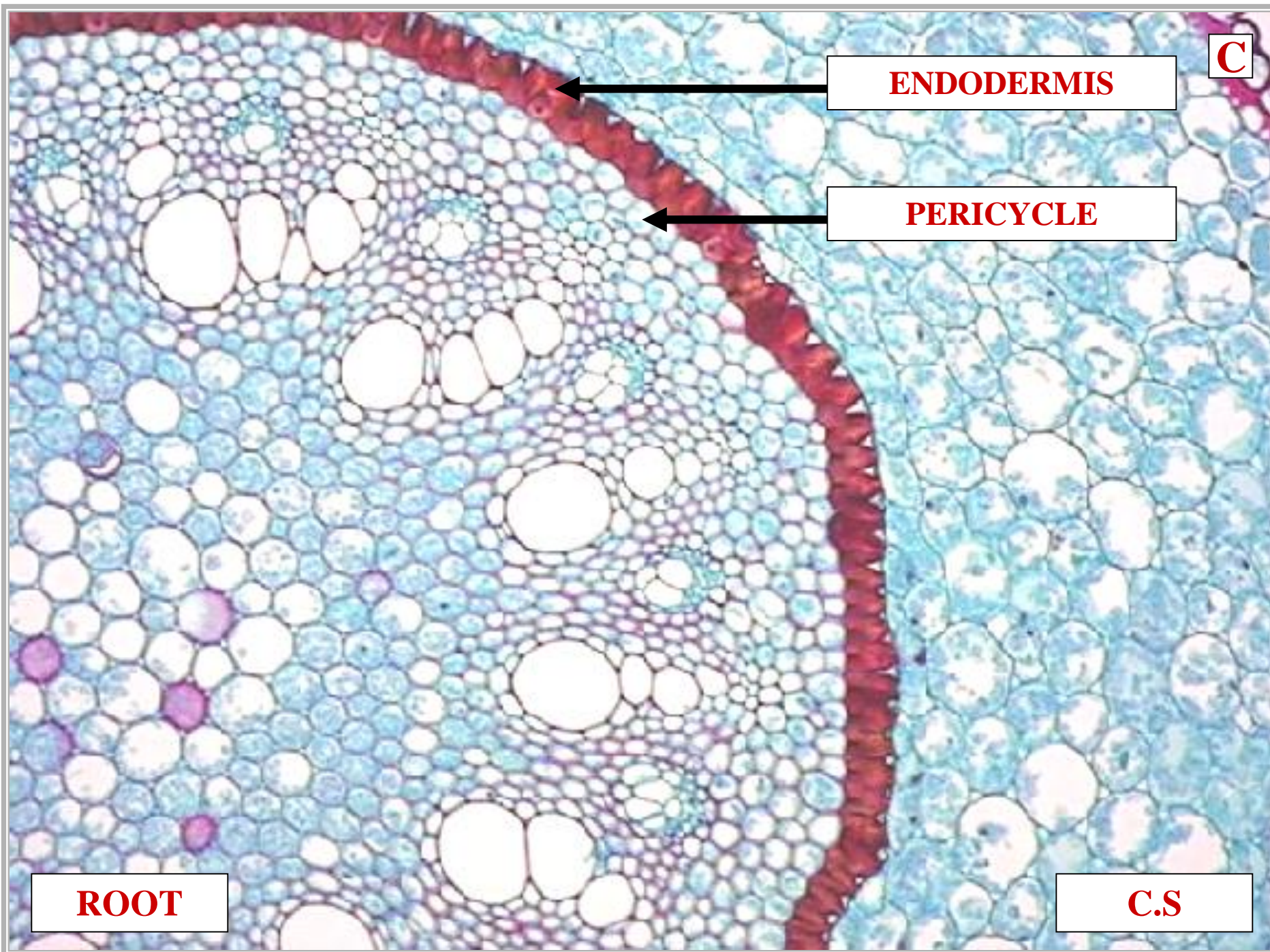
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ENDODERMIS

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ROOT

C.S



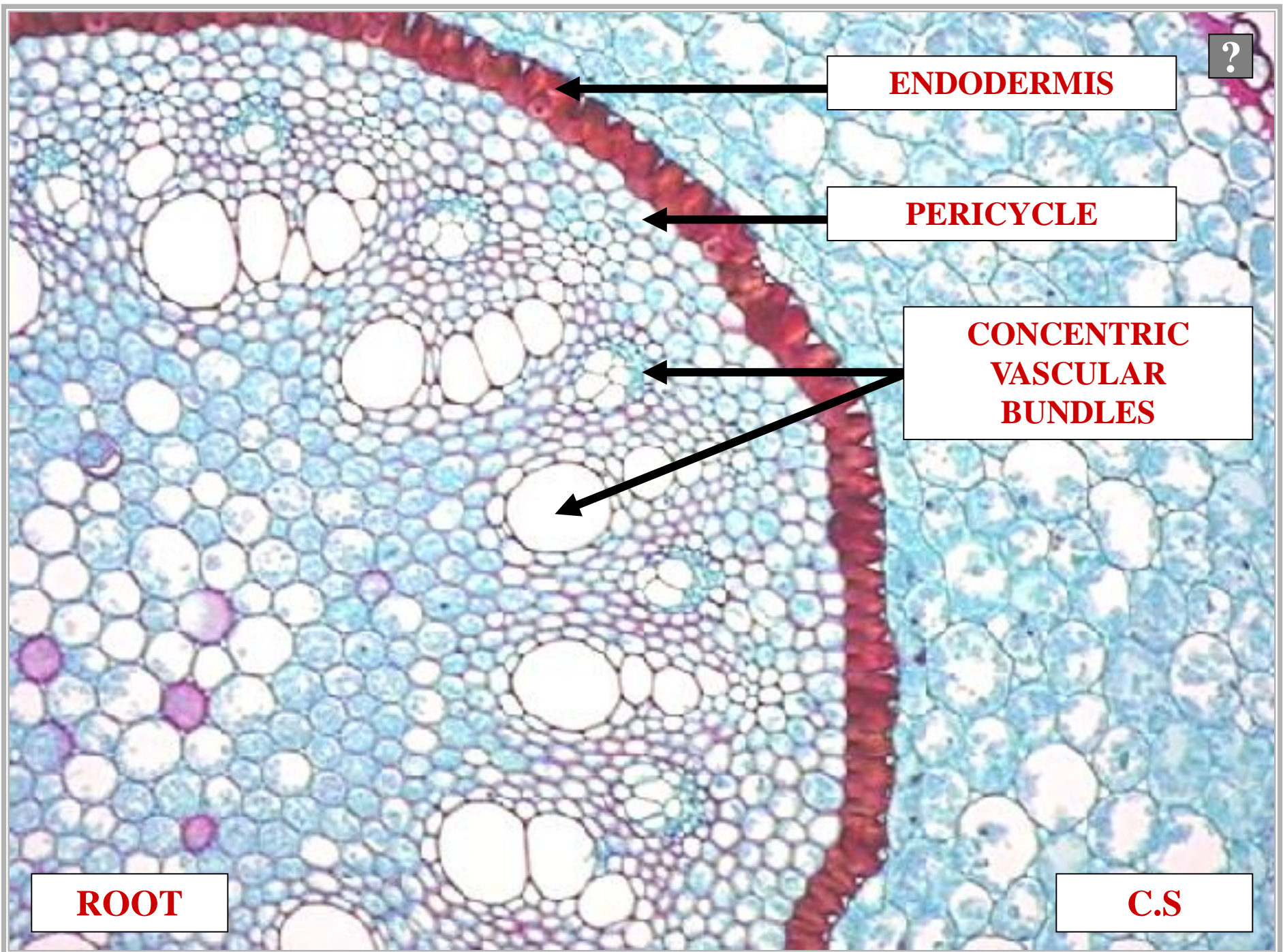
C

ENDODERMIS

PERICYCLE

ROOT

C.S



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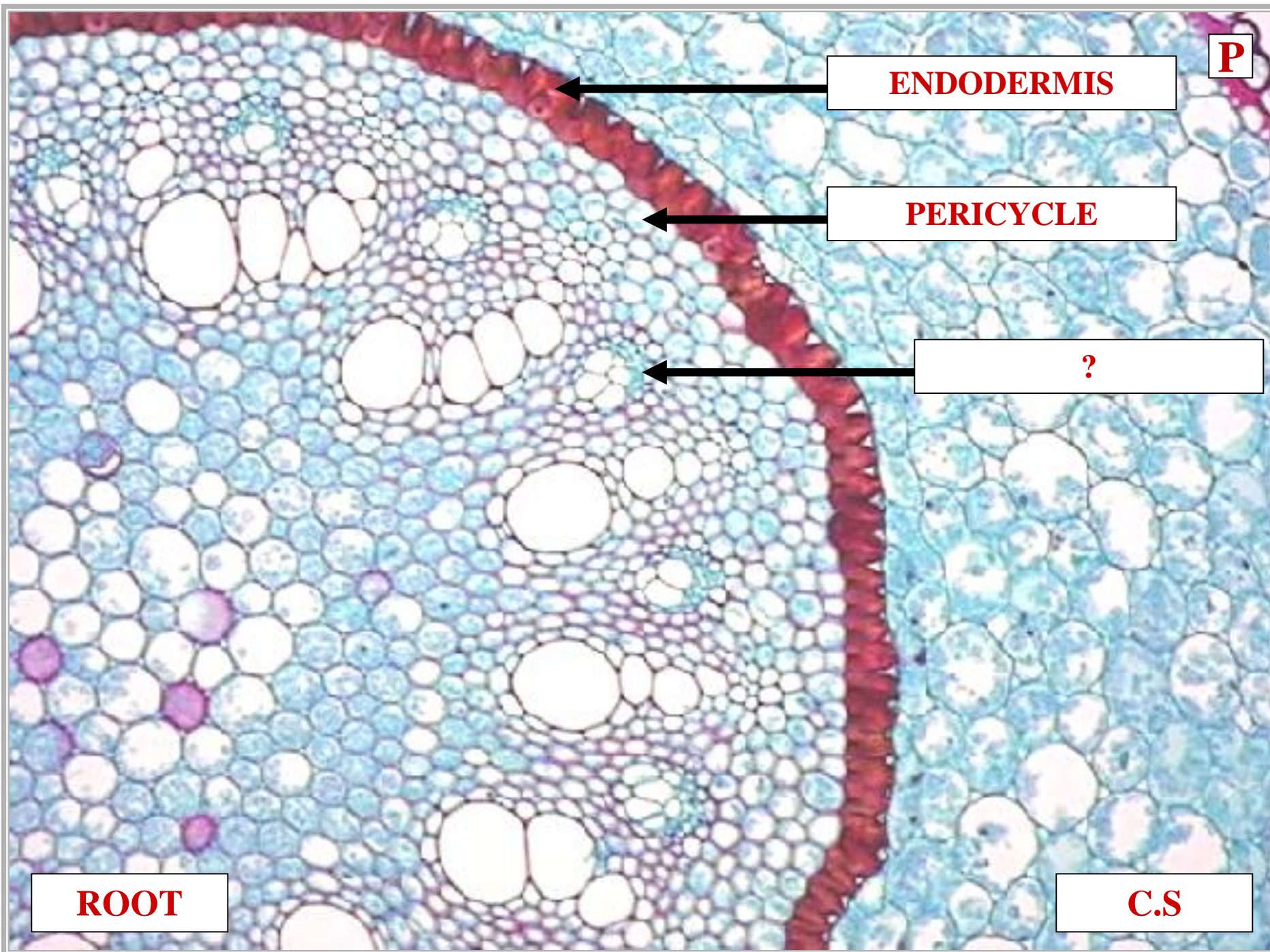
ENDODERMIS

PERICYCLE

**CONCENTRIC
VASCULAR
BUNDLES**

ROOT

C.S



P

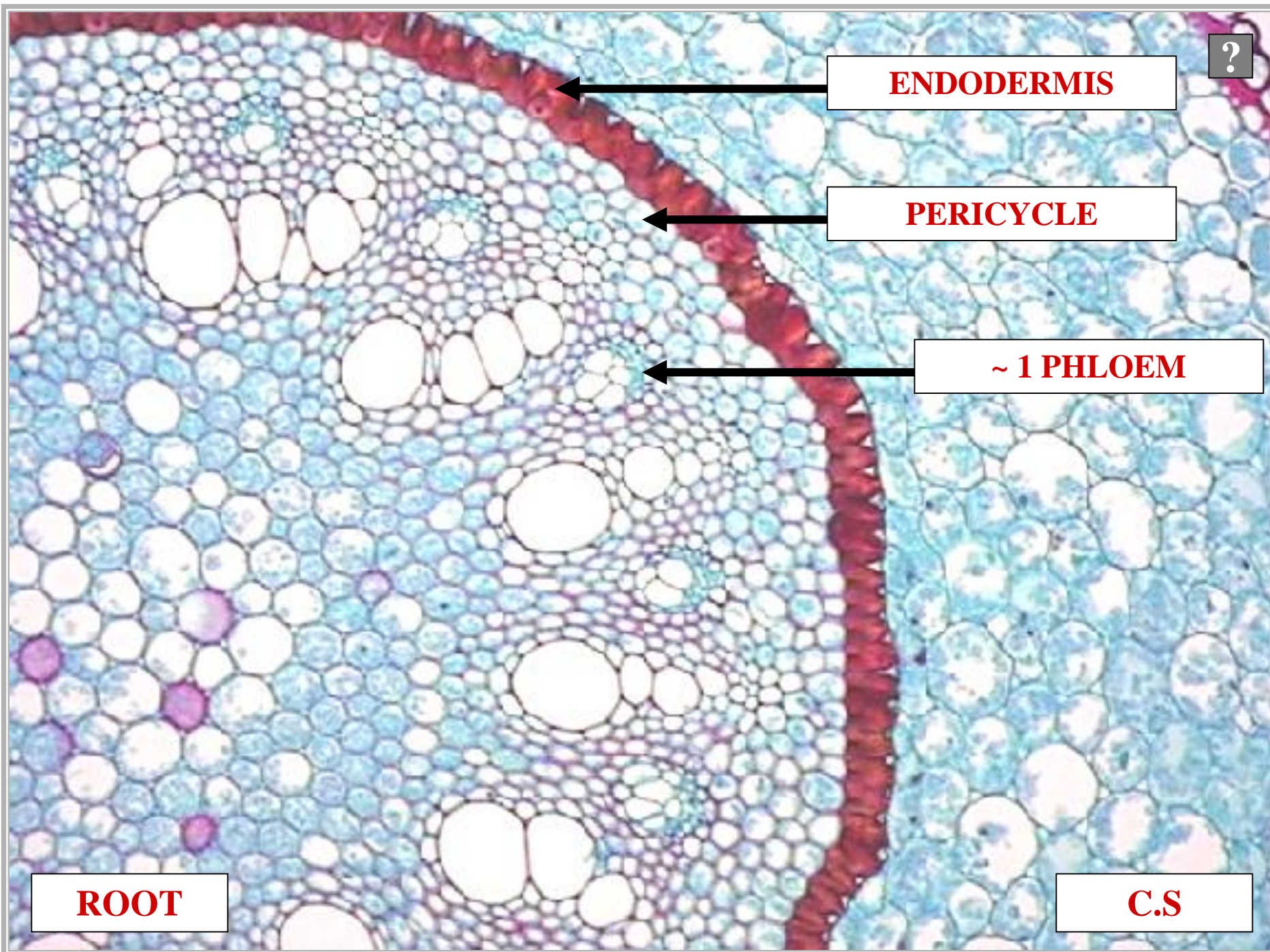
ENDODERMIS

PERICYCLE

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ROOT

C.S



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ENDODERMIS

PERICYCLE

~ 1 PHLOEM

ROOT

C.S

X

ENDODERMIS

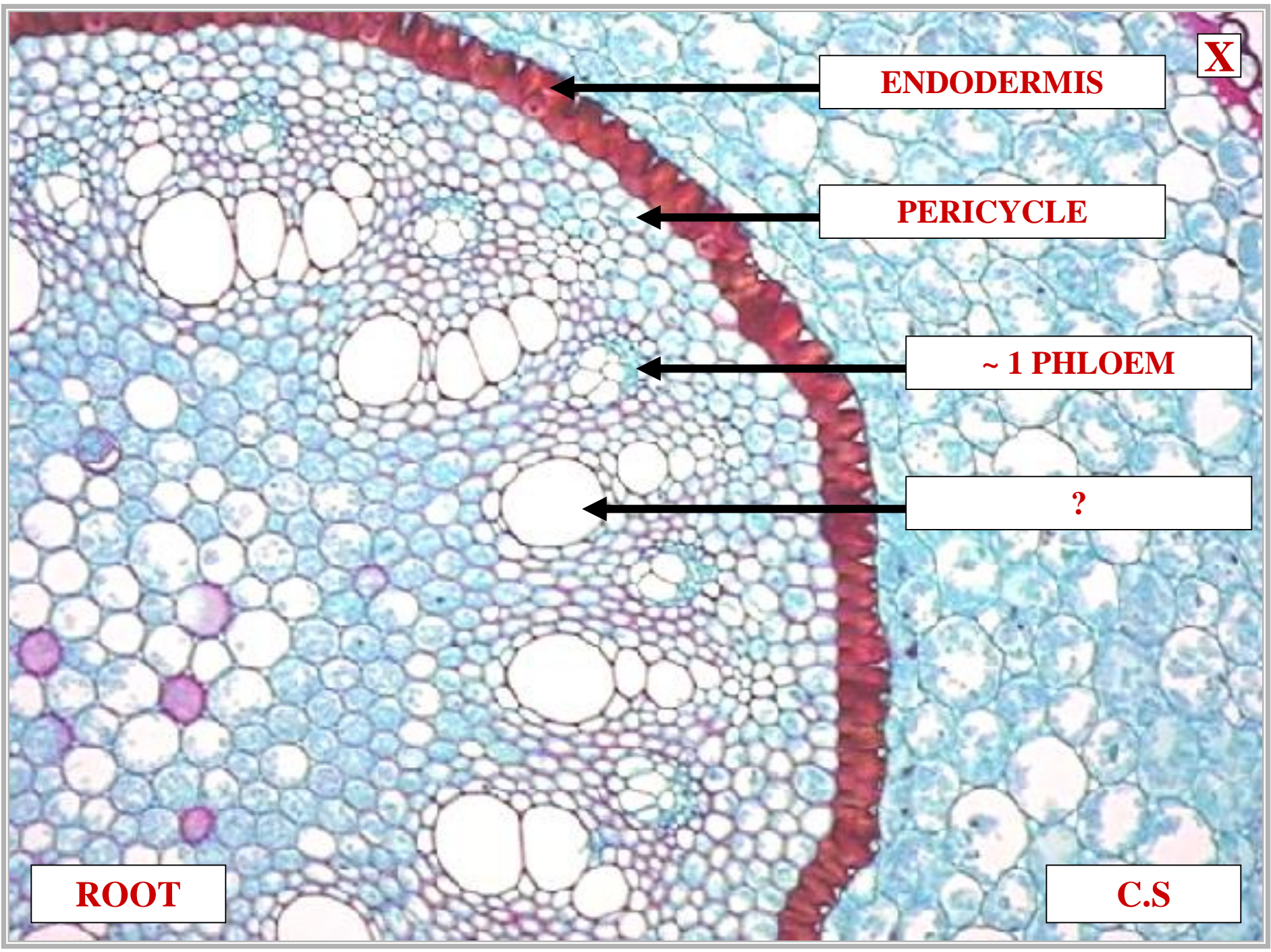
PERICYCLE

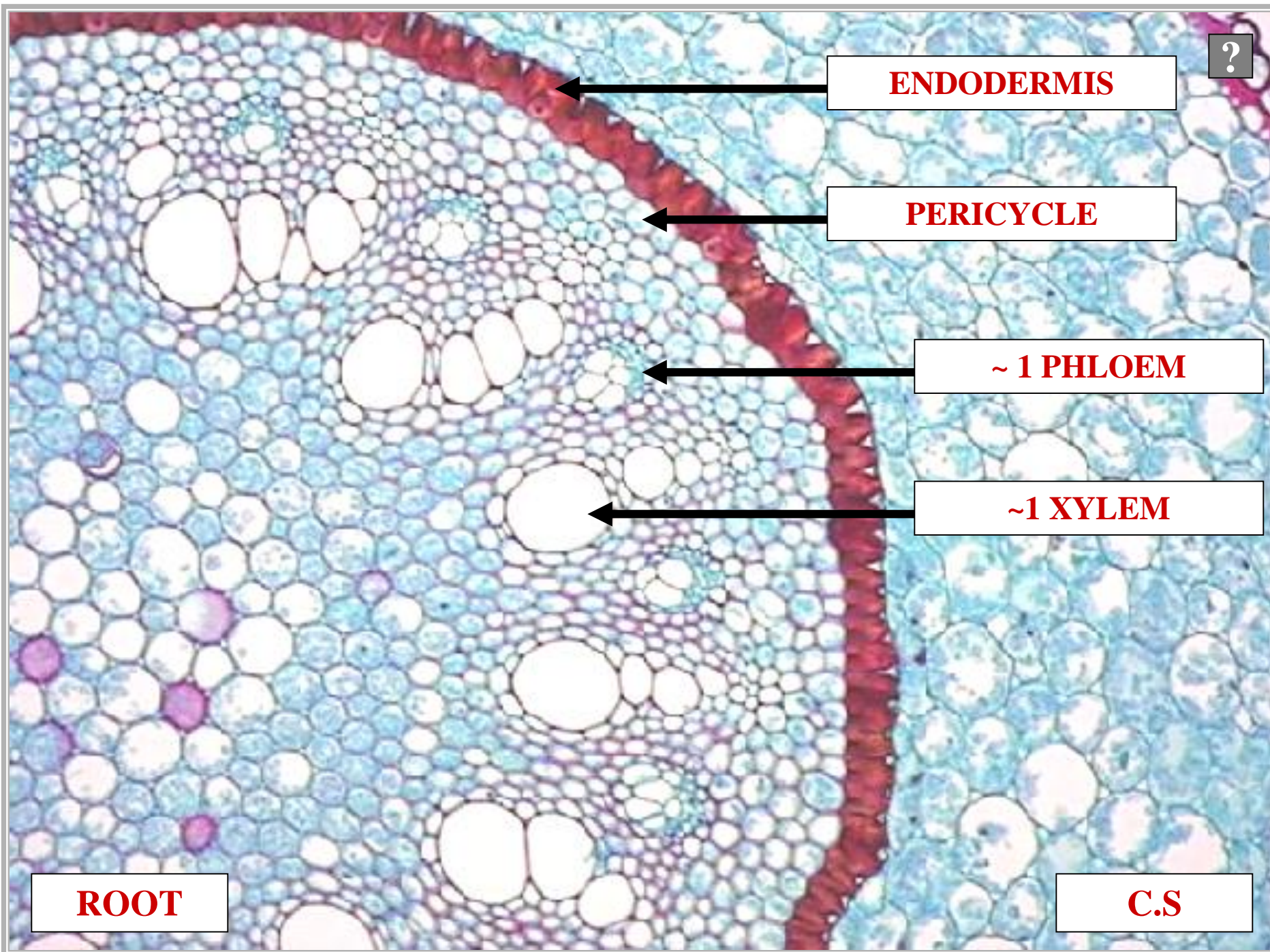
~ 1 PHLOEM

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ROOT

C.S





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ENDODERMIS

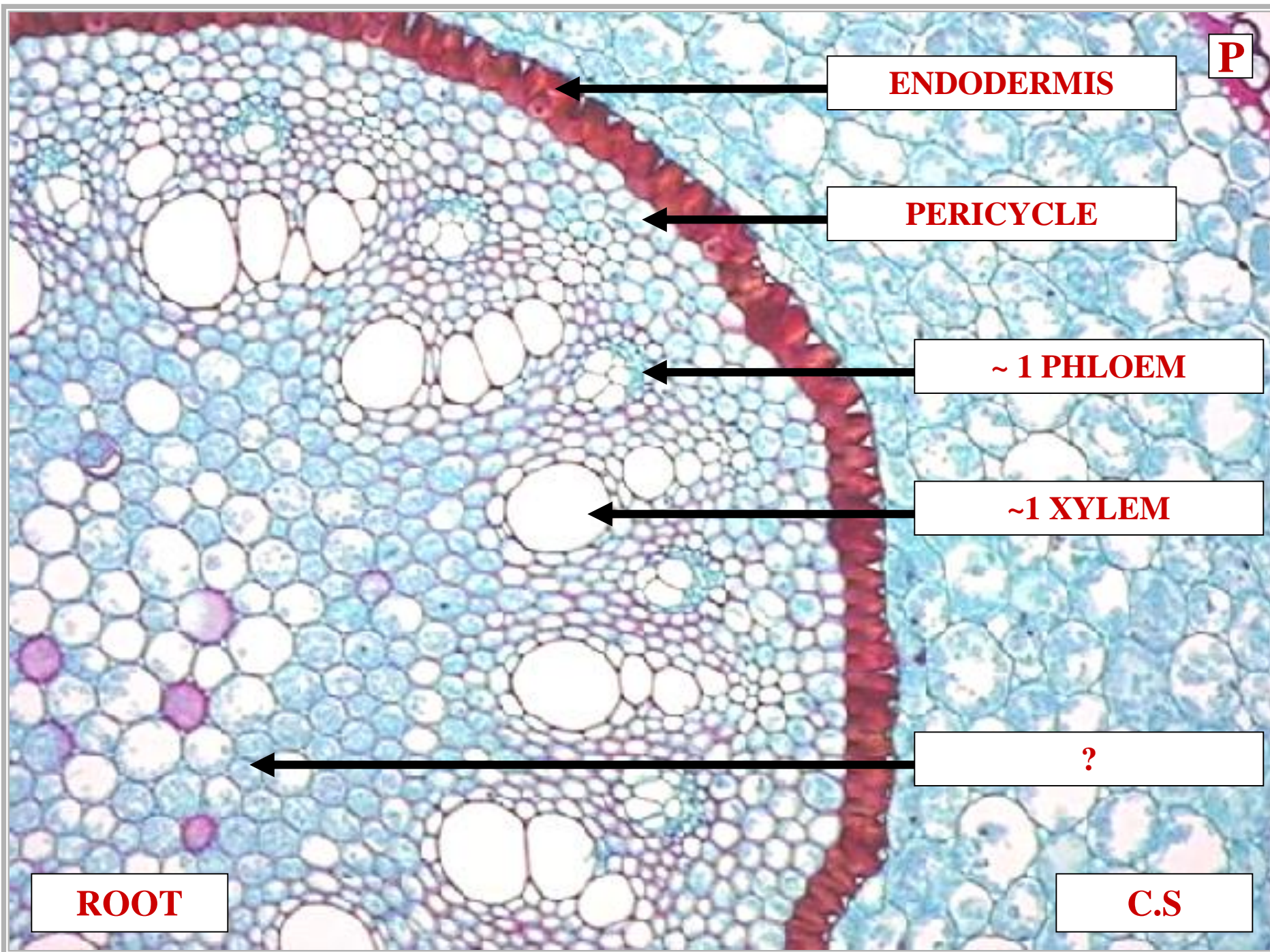
PERICYCLE

~ 1 PHLOEM

~1 XYLEM

ROOT

C.S



P

ENDODERMIS

PERICYCLE

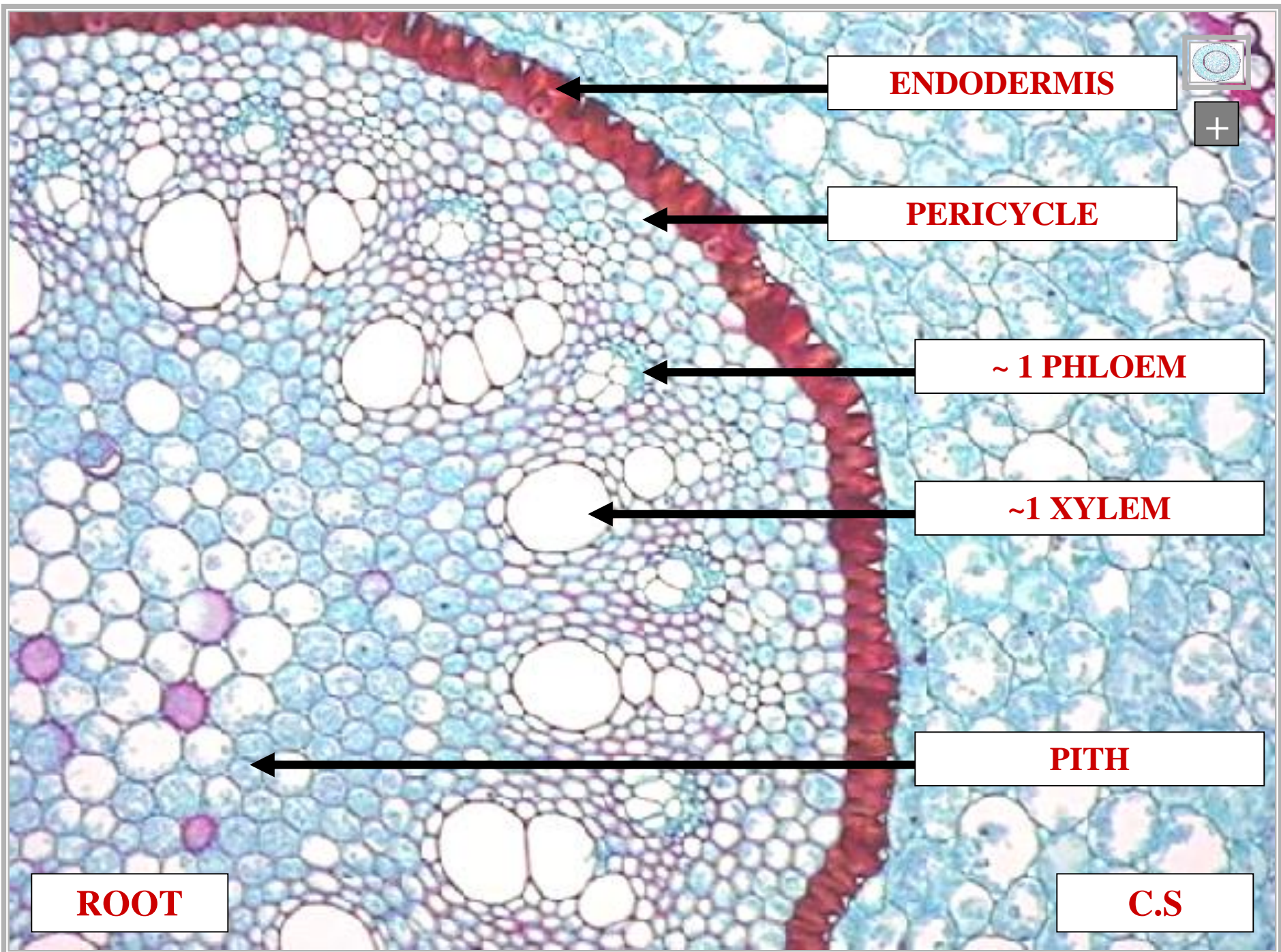
~ 1 PHLOEM

~ 1 XYLEM

?

ROOT

C.S



ENDODERMIS

PERICYCLE

~ 1 PHLOEM

~1 XYLEM

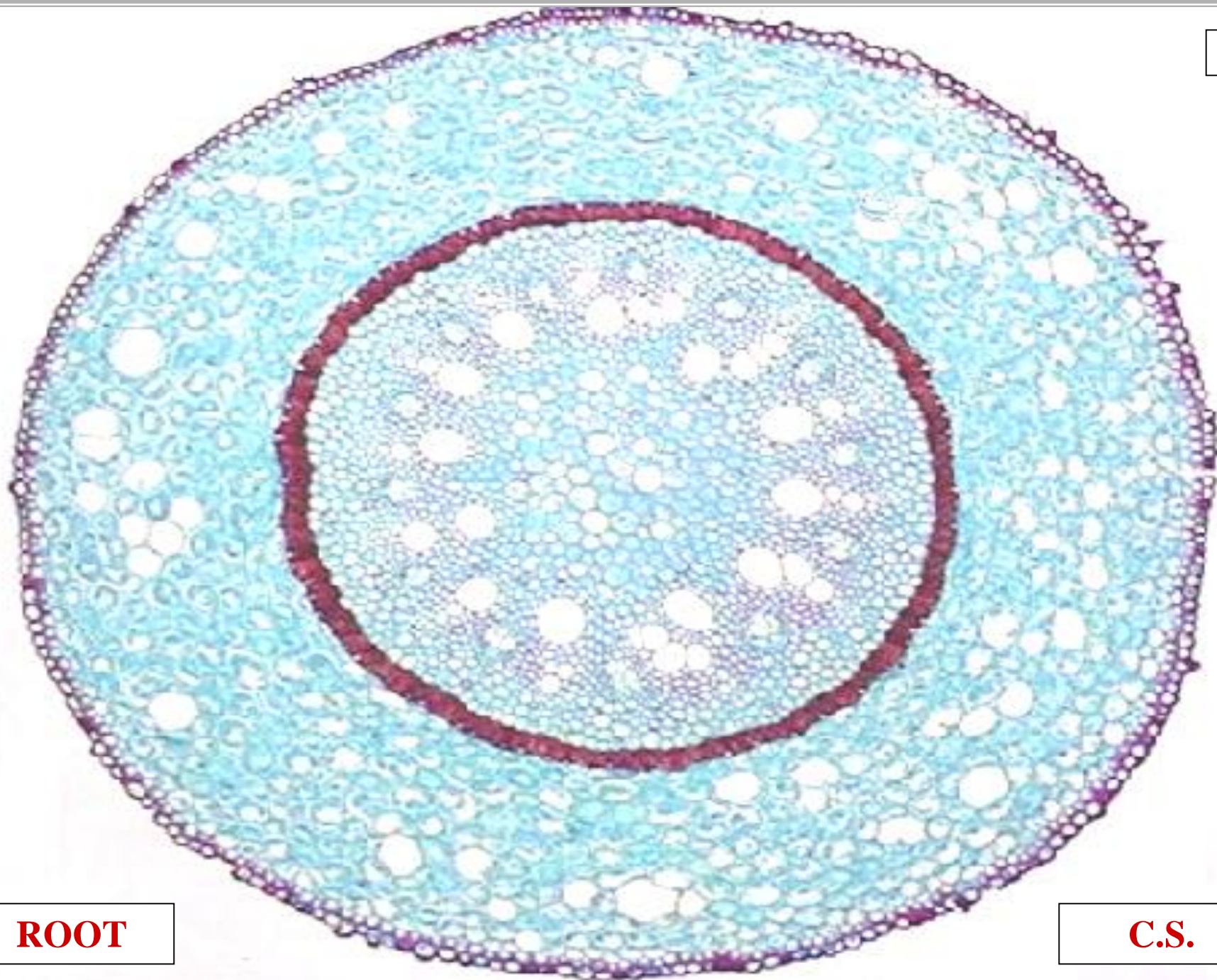
PITH

ROOT

C.S



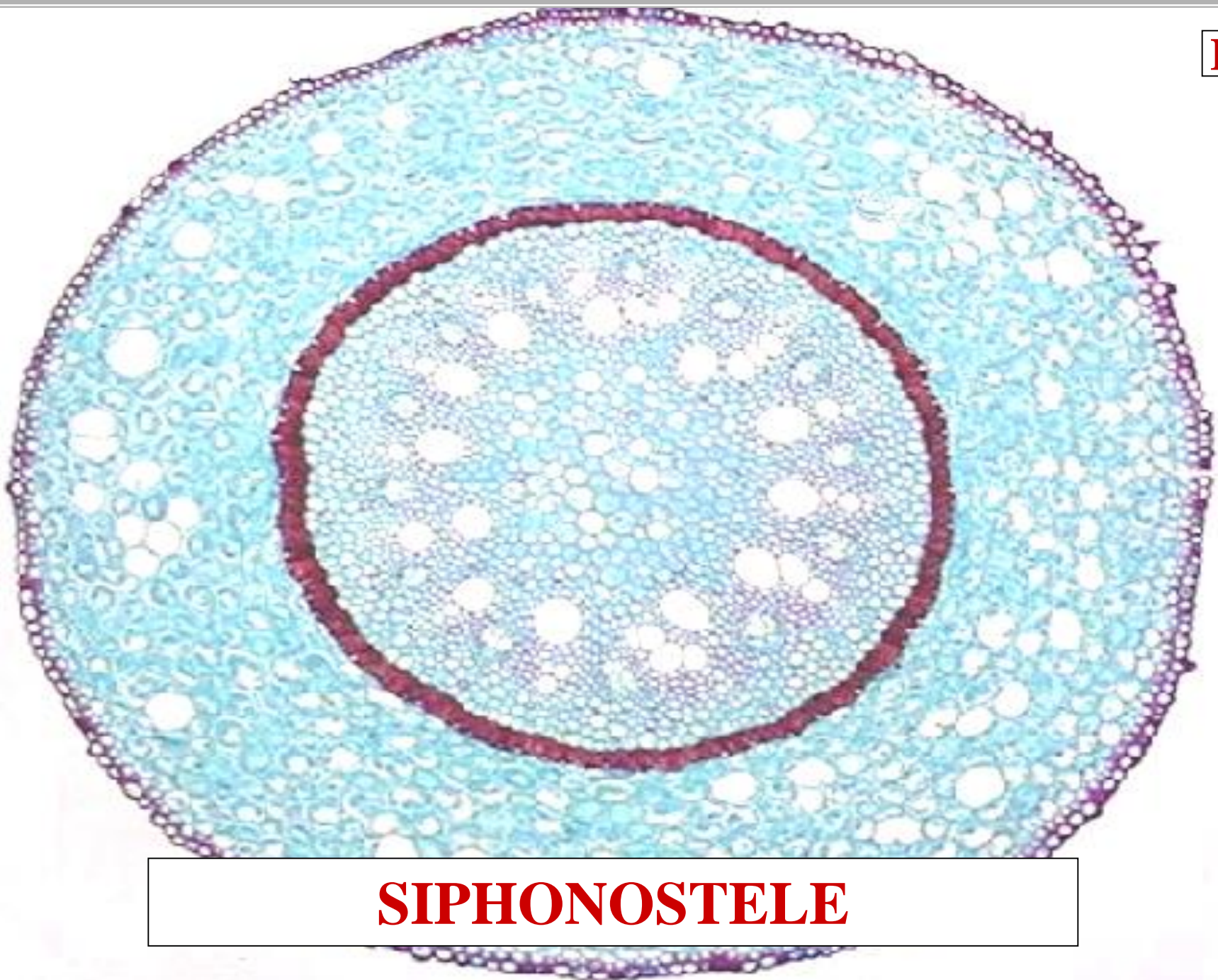
S



ROOT

C.S.

E



SIPHONOSTELE



AB



SIPHONOSTELE / EUSTELE



AB



**MONOCOT ROOT
VASCULAR CAMBIUM
ABSENT**

SIPHONOSTELE / EUSTELE

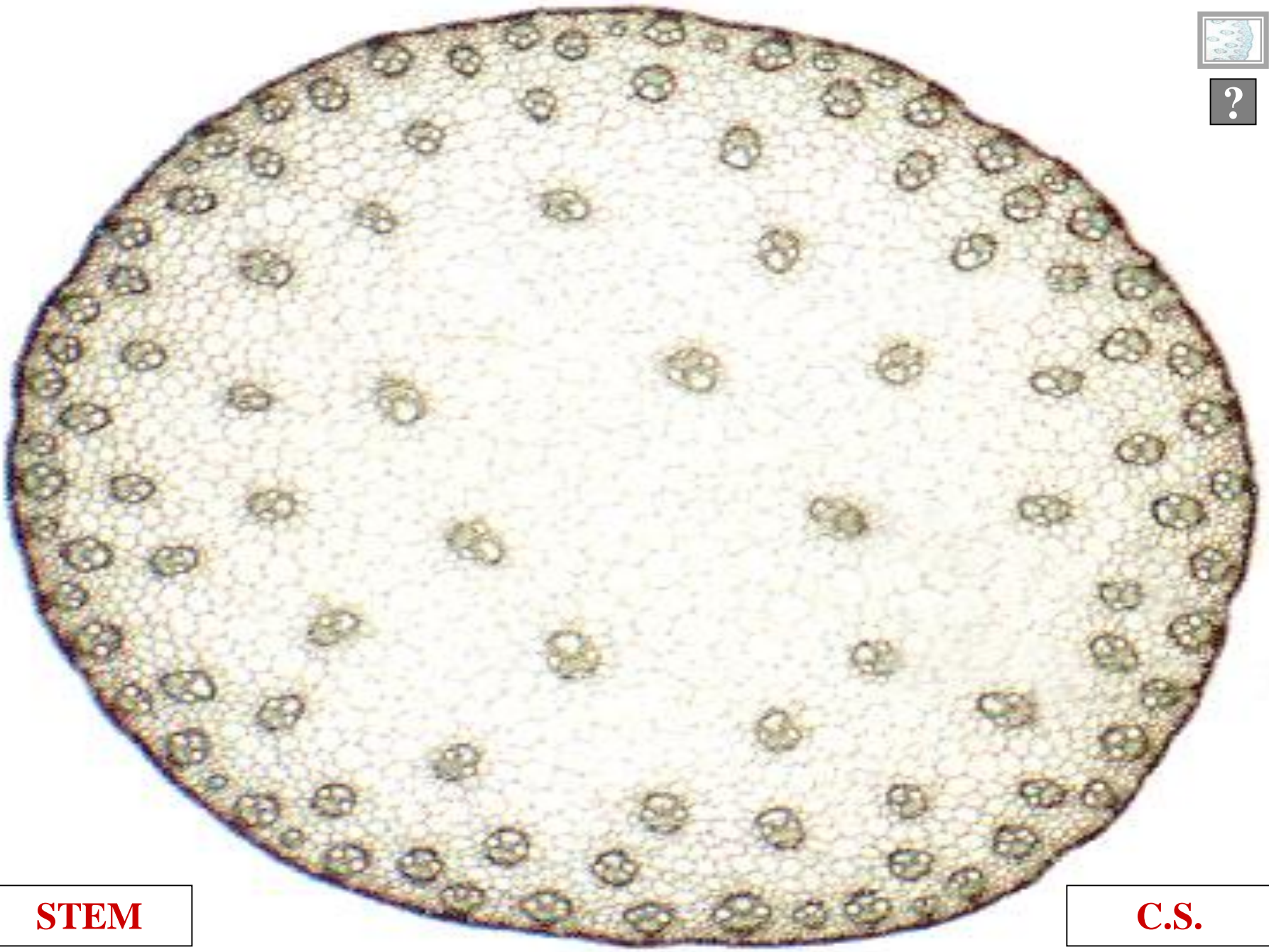


**MONOCOT ROOT
SECONDARY GROWTH
ABSENT**

SIPHONOSTELE / EUSTELE



MONOCOT STEM ANATOMY



?

STEM

C.S.