

EPIDERMIS

CORTEX



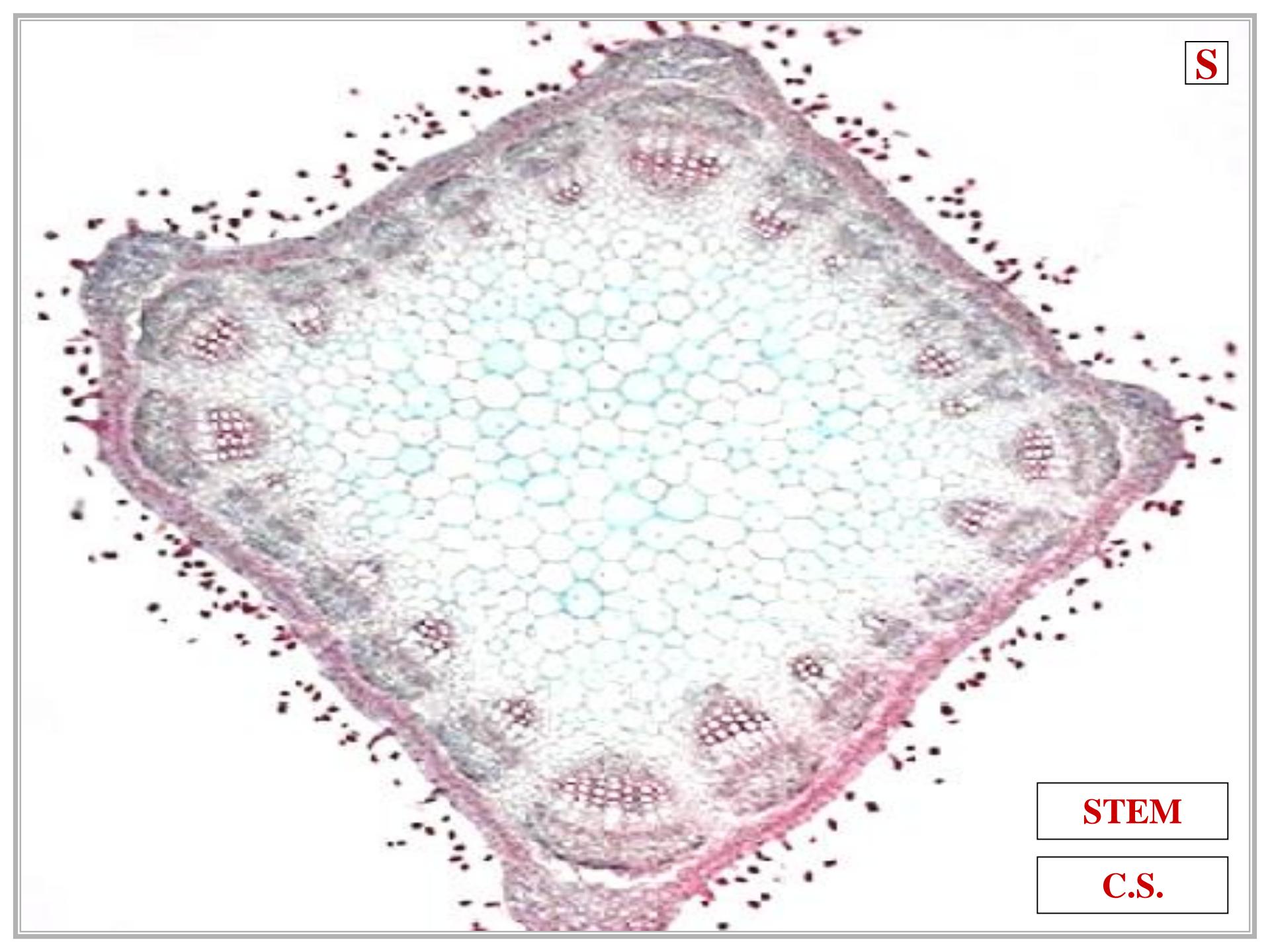
PITH

PITH RAY

STEM

C.S.

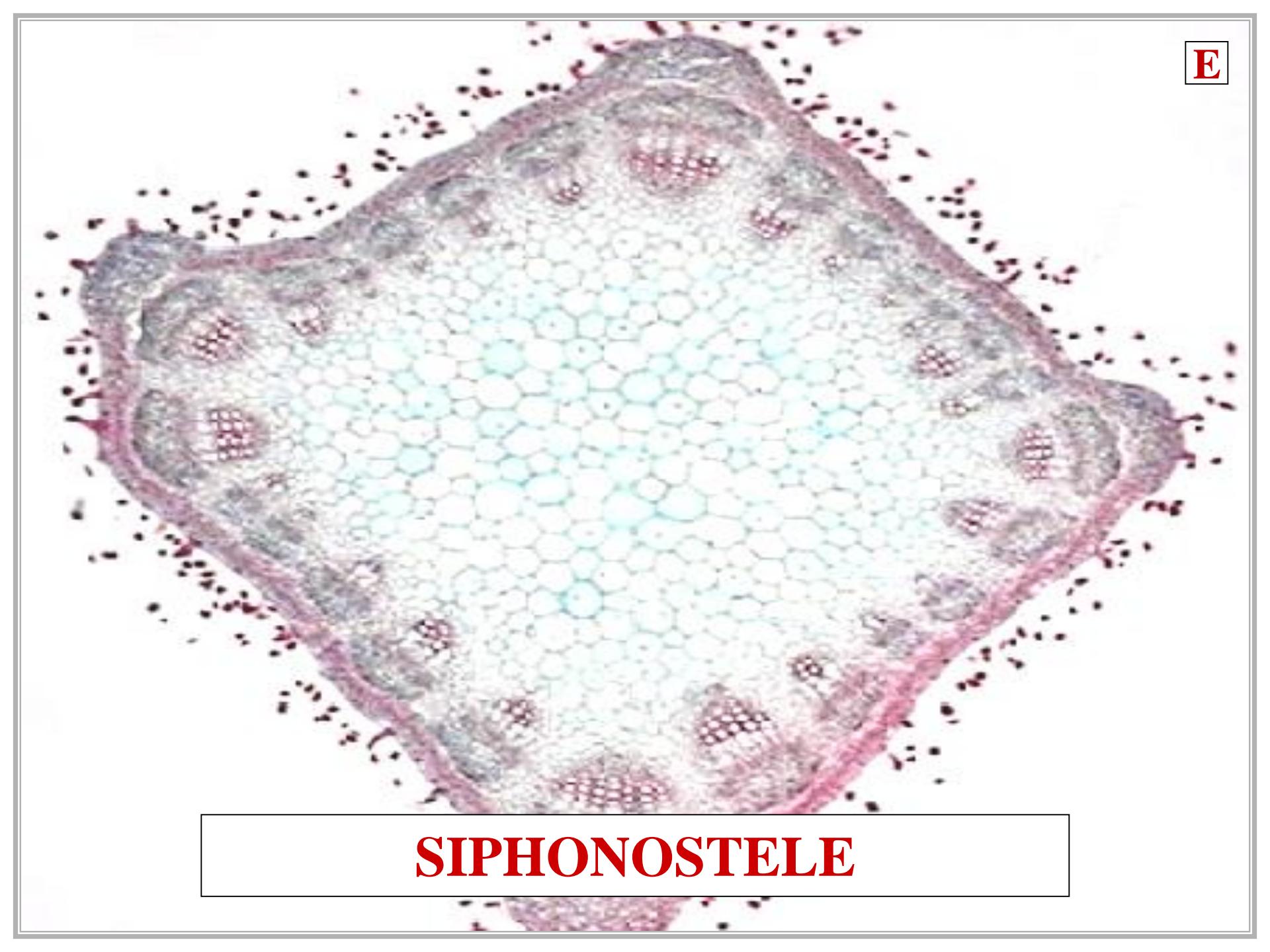
**CONCENTRIC
VASCULAR BUNDLES**



S

STEM

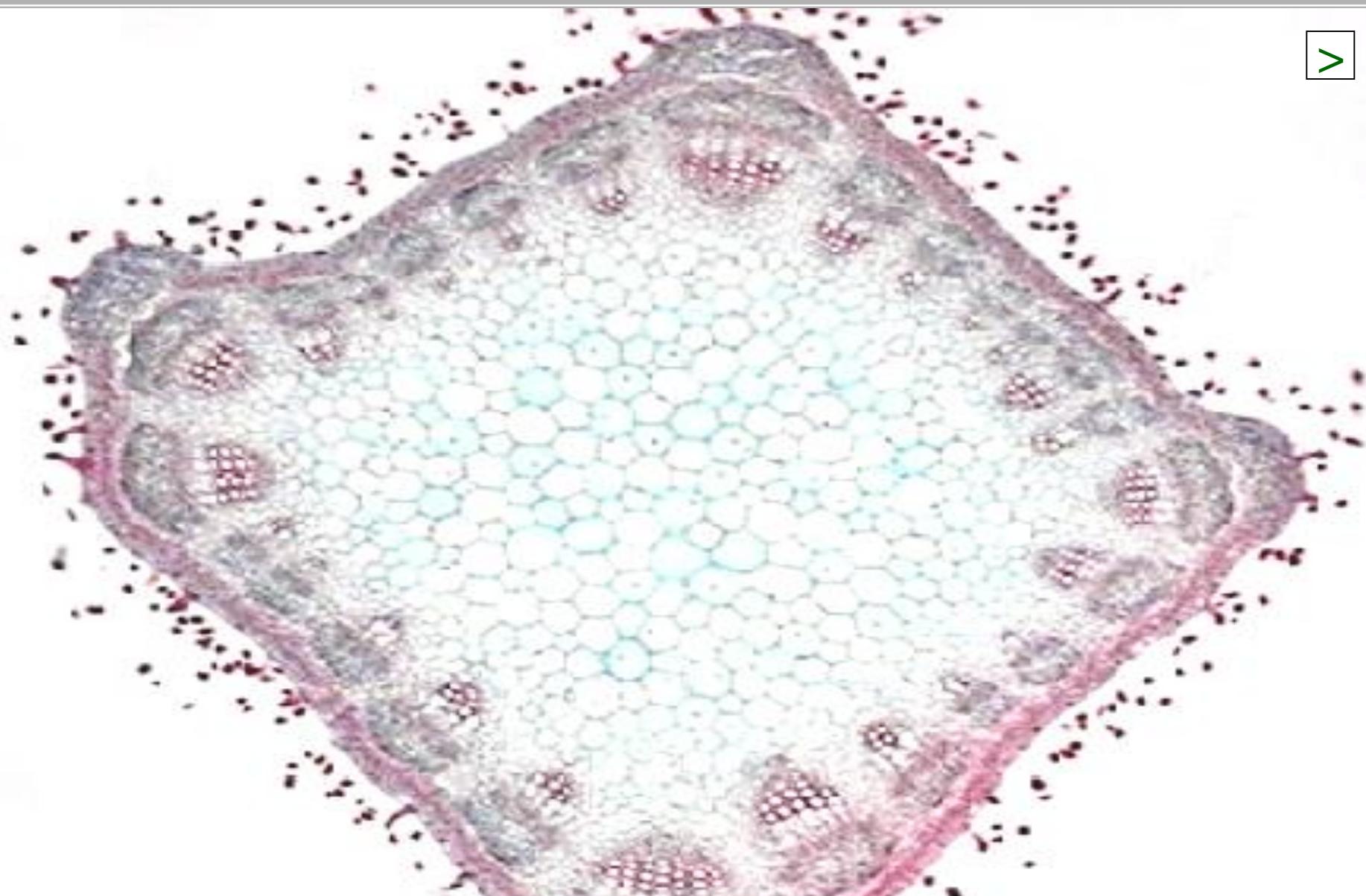
C.S.

A light micrograph showing a cross-section of a plant stem. The central vascular region is highlighted with a green color overlay, forming a hexagonal pattern of tissue. This central area is surrounded by a layer of pinkish-red tissue, which is further surrounded by a layer of white tissue. The outermost layer consists of dark, irregularly shaped cells. In the top right corner of the image, there is a small red square containing a white capital letter 'E'.

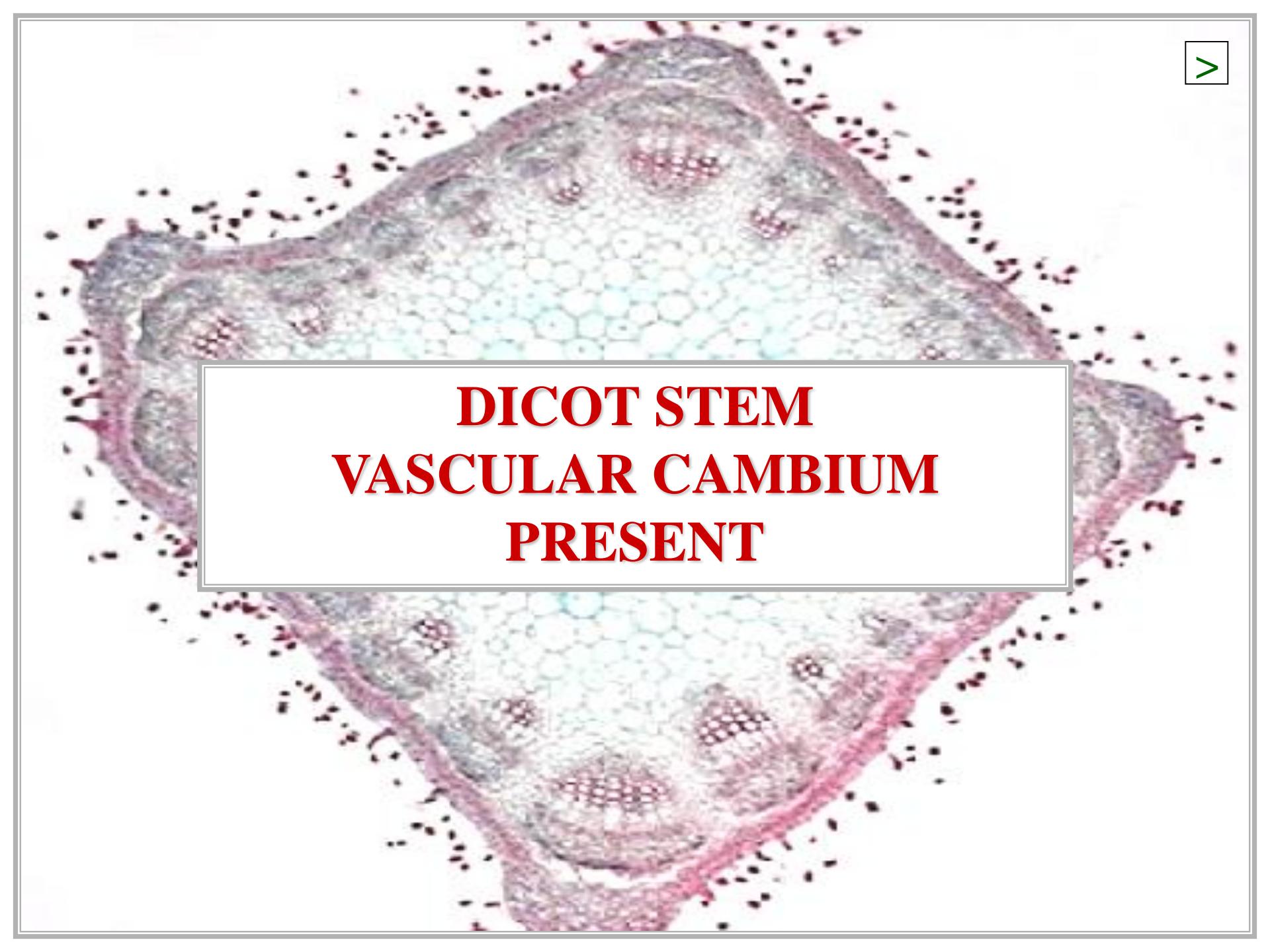
E

SIPHONOSTELE

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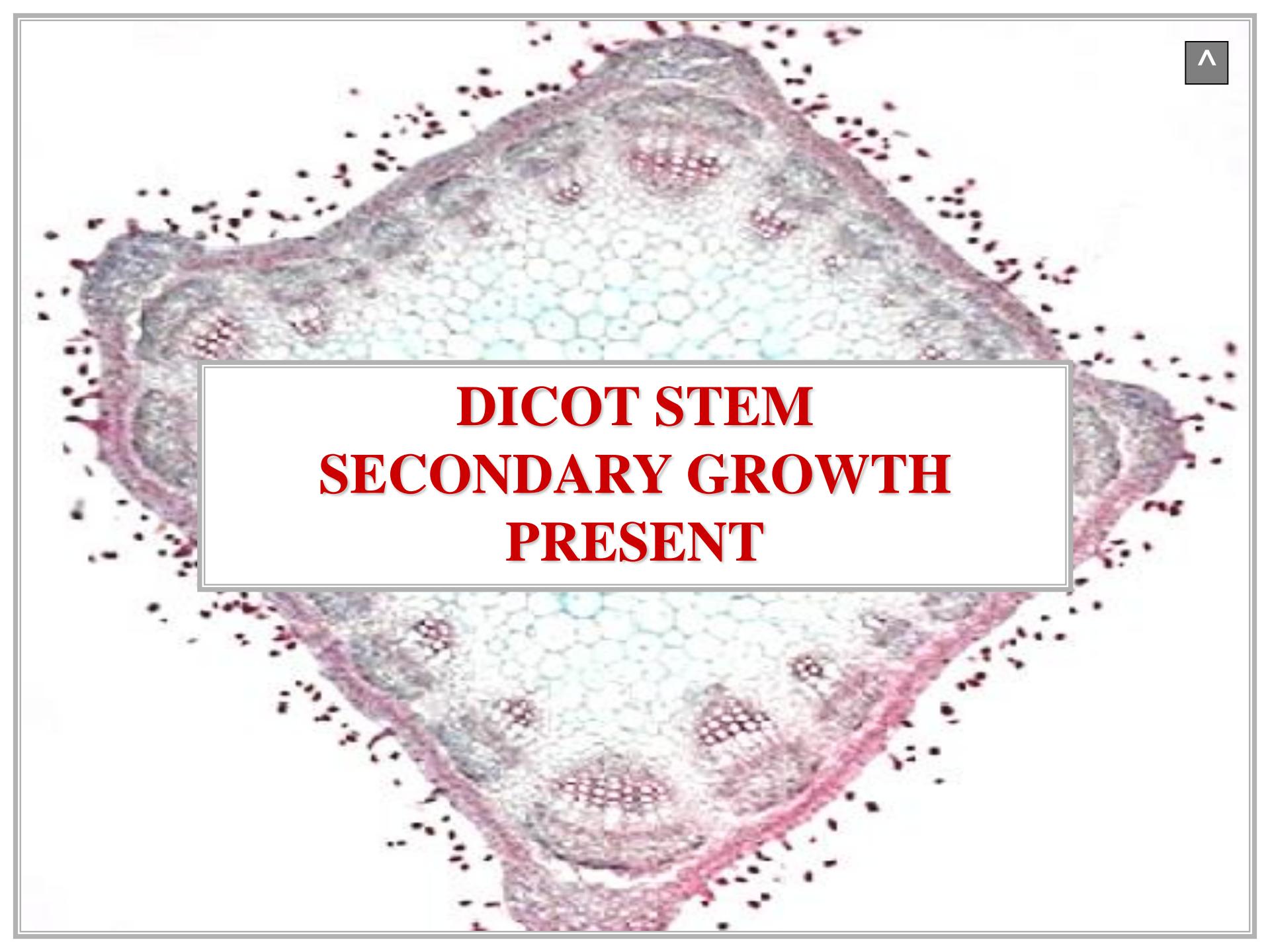


SIPHONOSTELE / EUSTELE



A detailed micrograph of a dicot stem cross-section. The image shows a central vascular cylinder composed of various tissue types, including xylem at the periphery and phloem towards the center. A prominent feature is the vascular cambium, a layer of meristematic tissue located between the xylem and phloem. This cambium is responsible for secondary growth, increasing the stem's girth over time. The surrounding tissue consists of large, thin-walled mesophyll cells, likely from a leaf or stem segment. The overall structure is characteristic of dicotyledonous plants.

**DICOT STEM
VASCULAR CAMBIUM
PRESENT**



A detailed micrograph of a dicot stem cross-section. The image shows a large, central vascular cylinder composed of various tissue types, including xylem and phloem. The stem is surrounded by a thick, pinkish layer of sclerenchyma fibers, which is part of the vascular cambium and pericycle. The outermost layer consists of a thin, dark, and somewhat irregular layer of cells, likely the epidermis or a layer of suberized cells. The overall structure is characteristic of a stem that has undergone secondary growth, where a ring of meristematic tissue produces new tissue layers between the primary xylem and the outer periphery.

**DICOT STEM
SECONDARY GROWTH
PRESENT**

!!!!!!!!!!!!!!

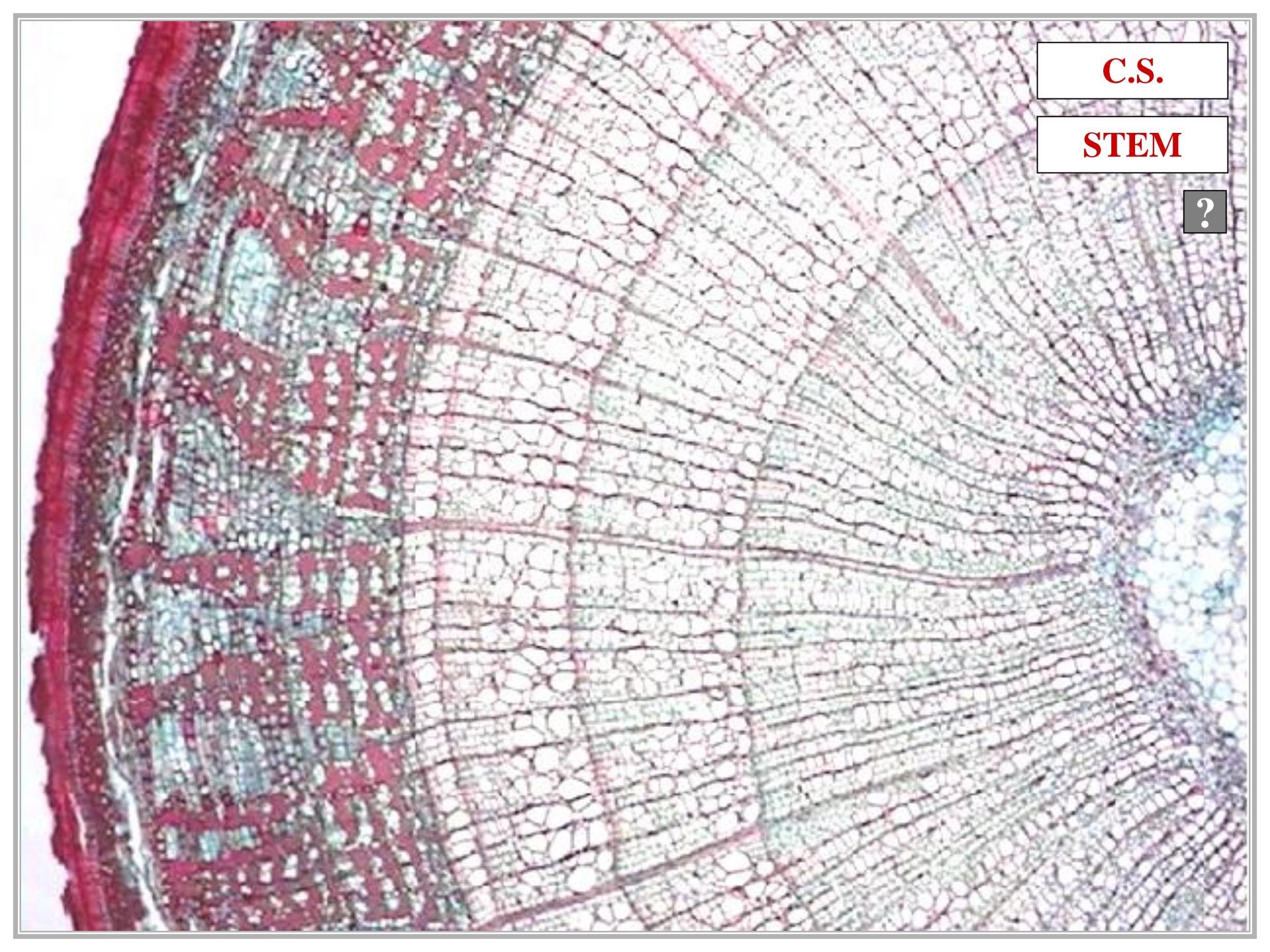
ATTENTION STUDENTS

!!!!!!!!!!!!!!

BIOLOGY 463
PLANT TAXONOMY
DR. MENAPACE
SPRING 2023



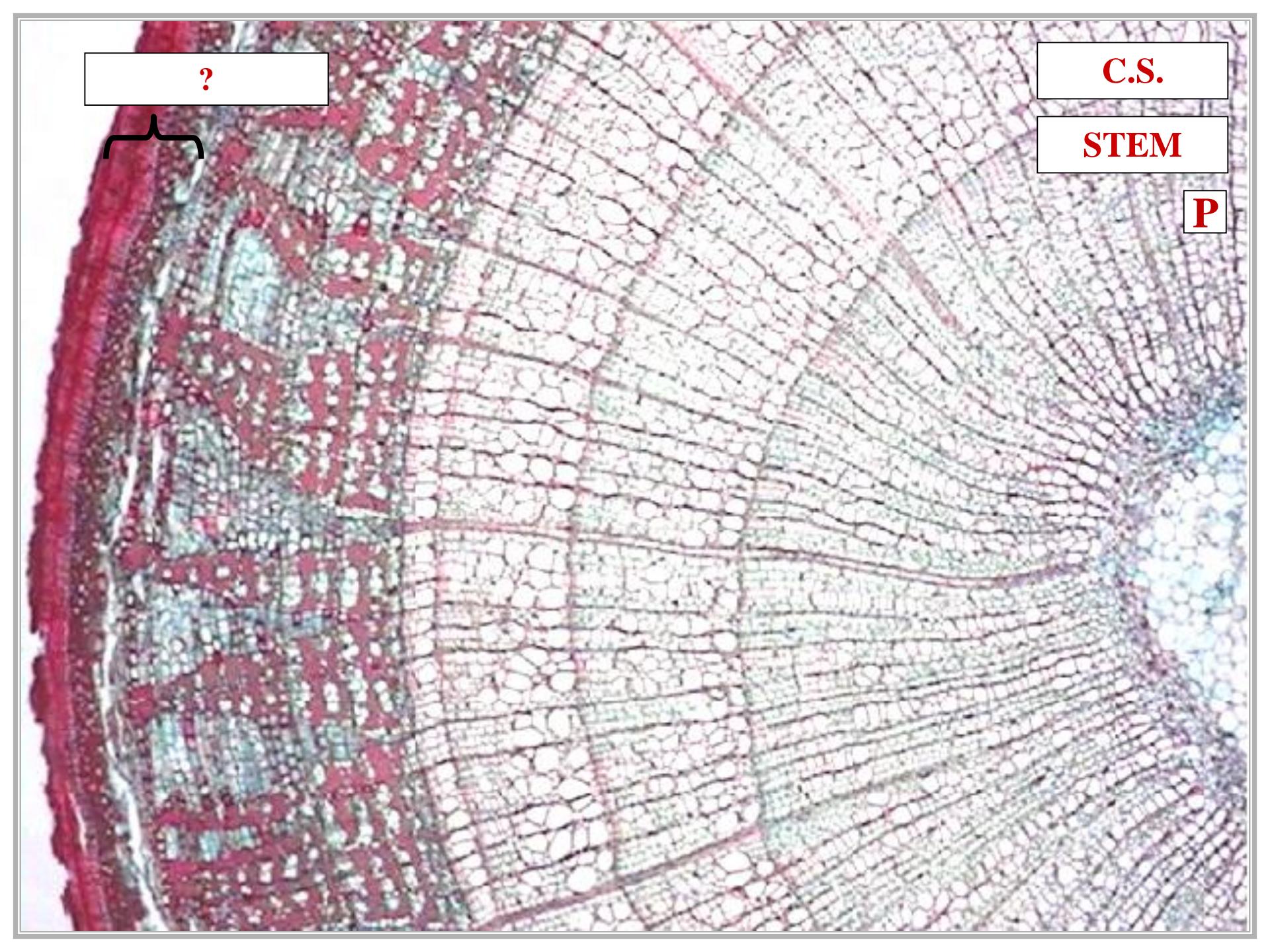
DICOT SECONDARY STEM ANATOMY



C.S.

STEM

?



?

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

C.S.

STEM

?

VASCULAR CAMBIUM

~ 1 PHLOEM

PERIDERM

C.S.

STEM

P

VASCULAR CAMBIUM

~ 1 PHLOEM

?

PERIDERM

C.S.

STEM

?

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM

PERIDERM

C.S.

STEM

B

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM

?

PERIDERM

C.S.

STEM

?

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

~ 2 PHLOEM

ANNUAL RINGS

~ 2 XYLEM

BARK

WOOD

PERIDERM

C.S.

STEM

?

VASCULAR CAMBIUM

~ 1 PHLOEM

~ 2 PHLOEM

ANNUAL RINGS

~ 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

~ 1 PHLOEM

VASCULAR CAMBIUM

~ 1 XYLEM

ANNUAL RINGS

~ 2 PHLOEM

~ 2 XYLEM

BARK

WOOD

ANNUAL RINGS

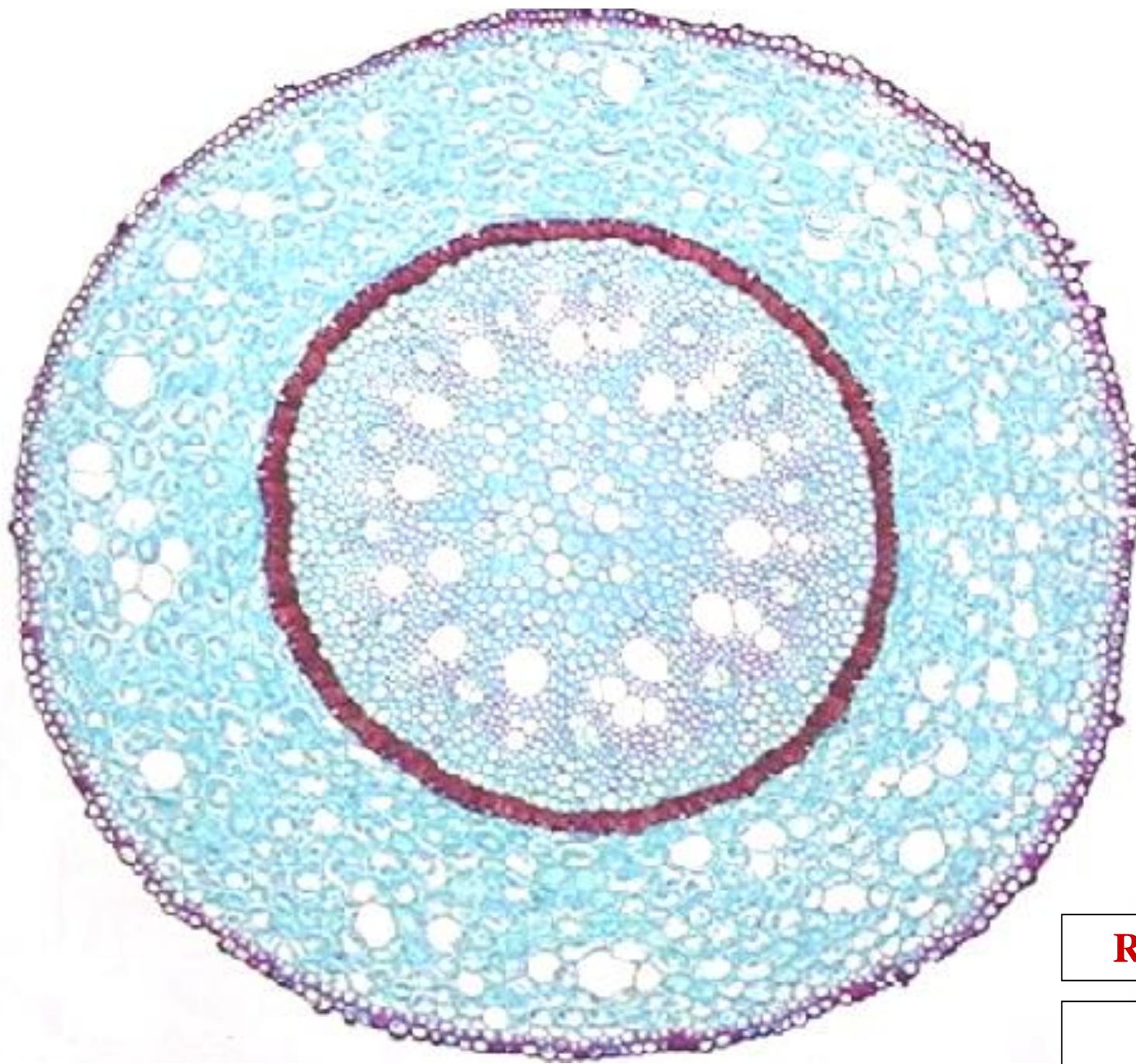


MONOCOT ANATOMY



MONOCOT ROOT ANATOMY

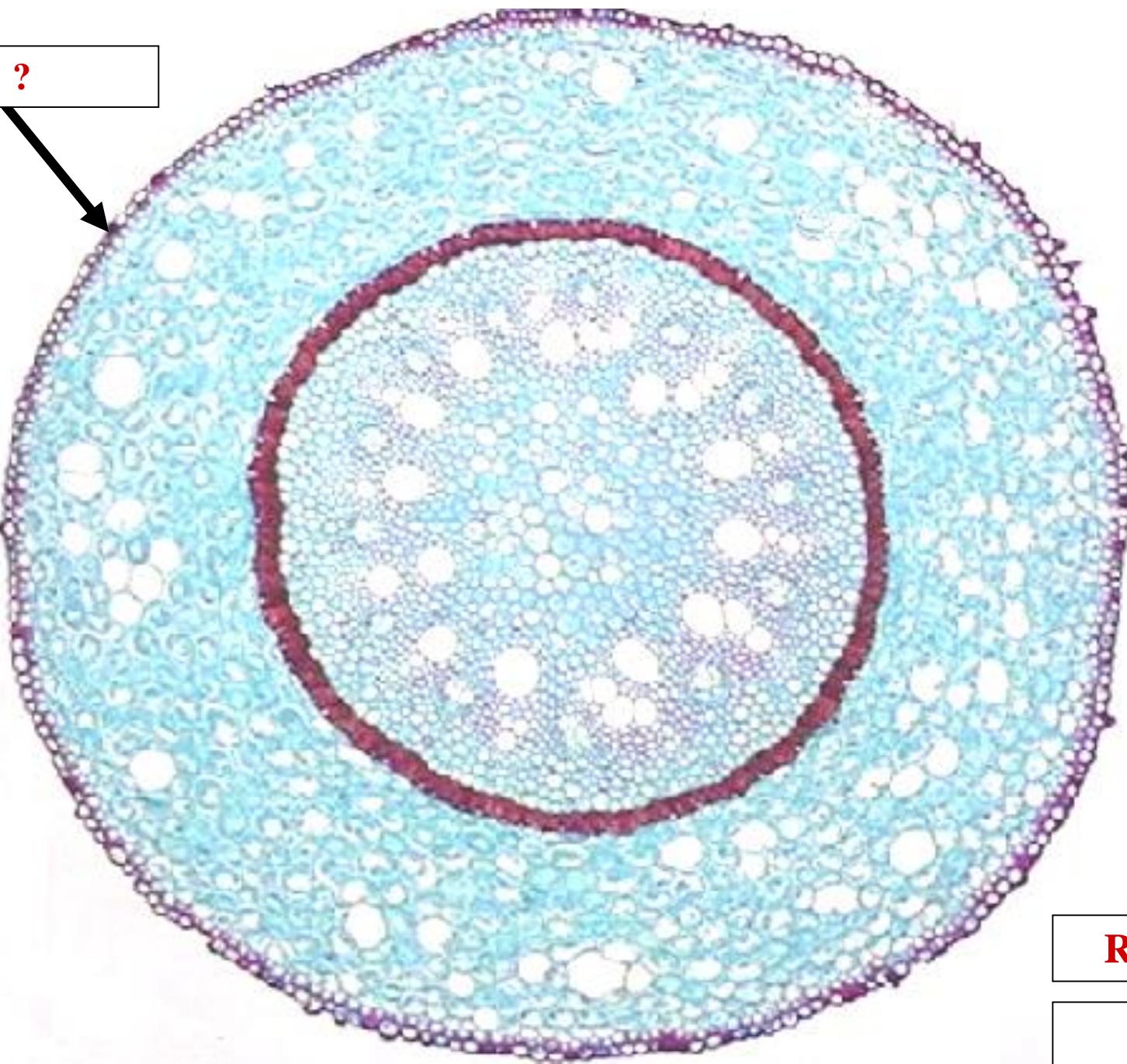
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ROOT

C.S.

E

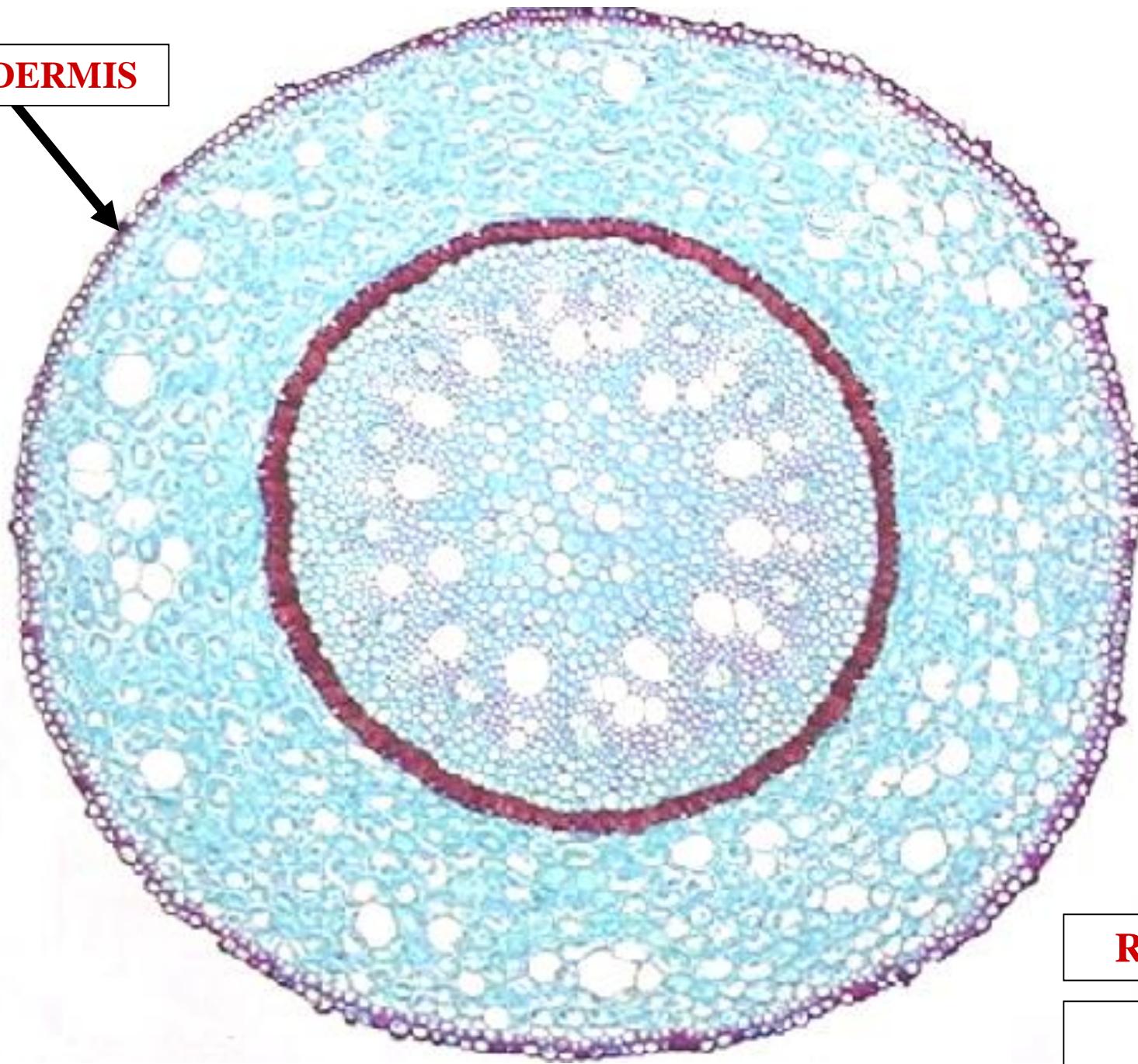


ROOT

C.S.

?

EPIDERMIS

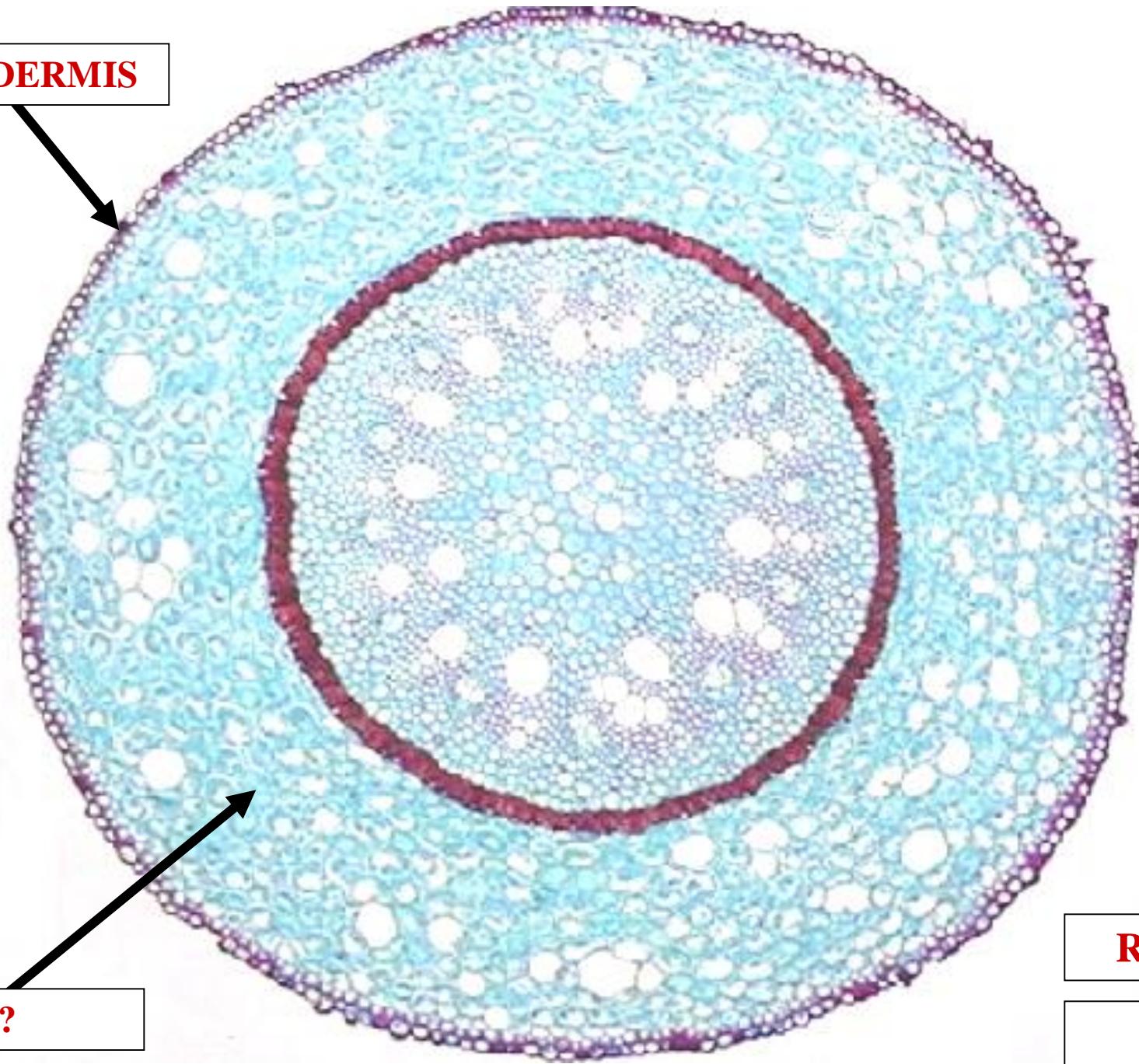


ROOT

C.S.

C

EPIDERMIS

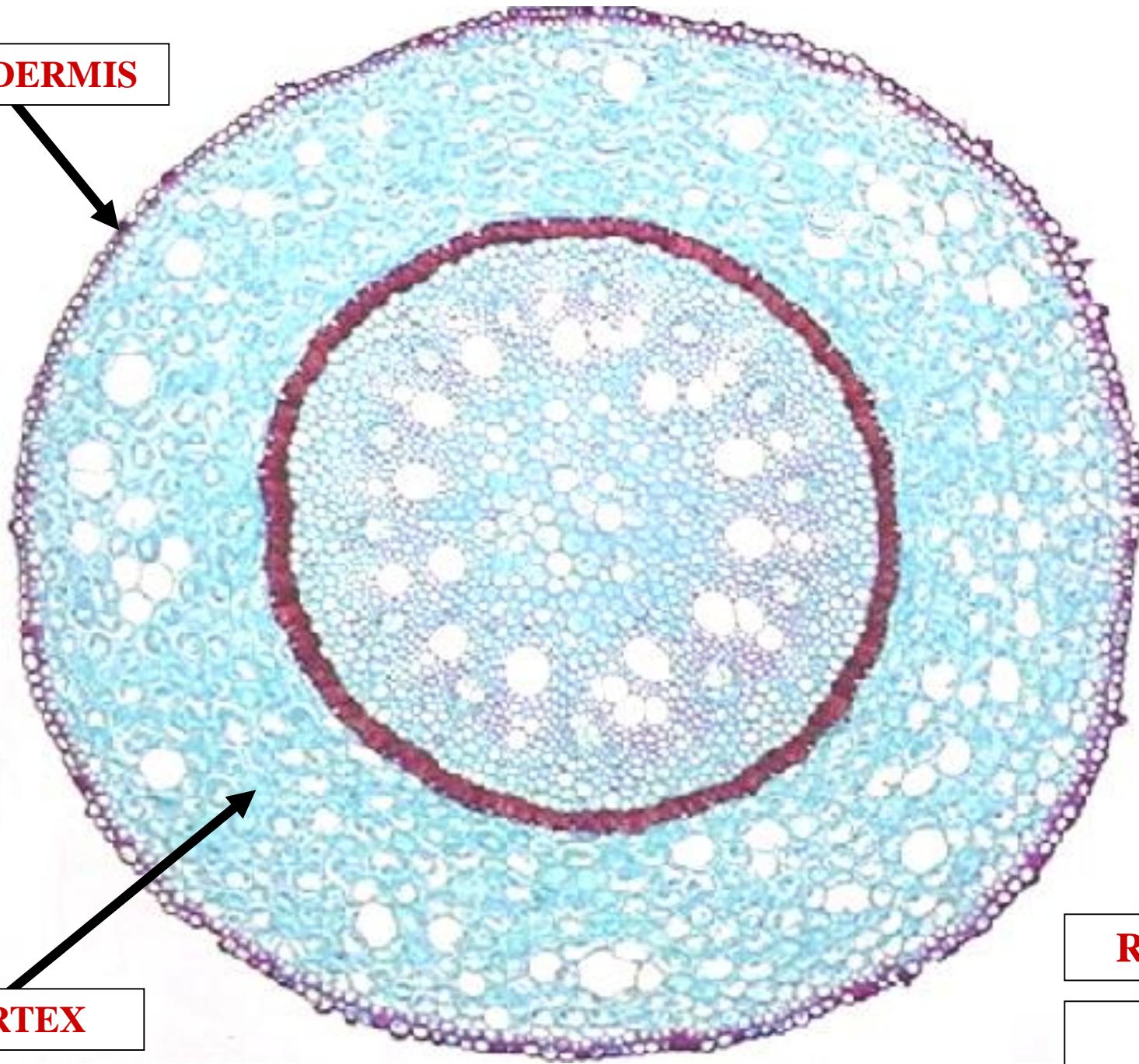


ROOT

C.S.

S

EPIDERMIS



CORTEX

ROOT

C.S.



?

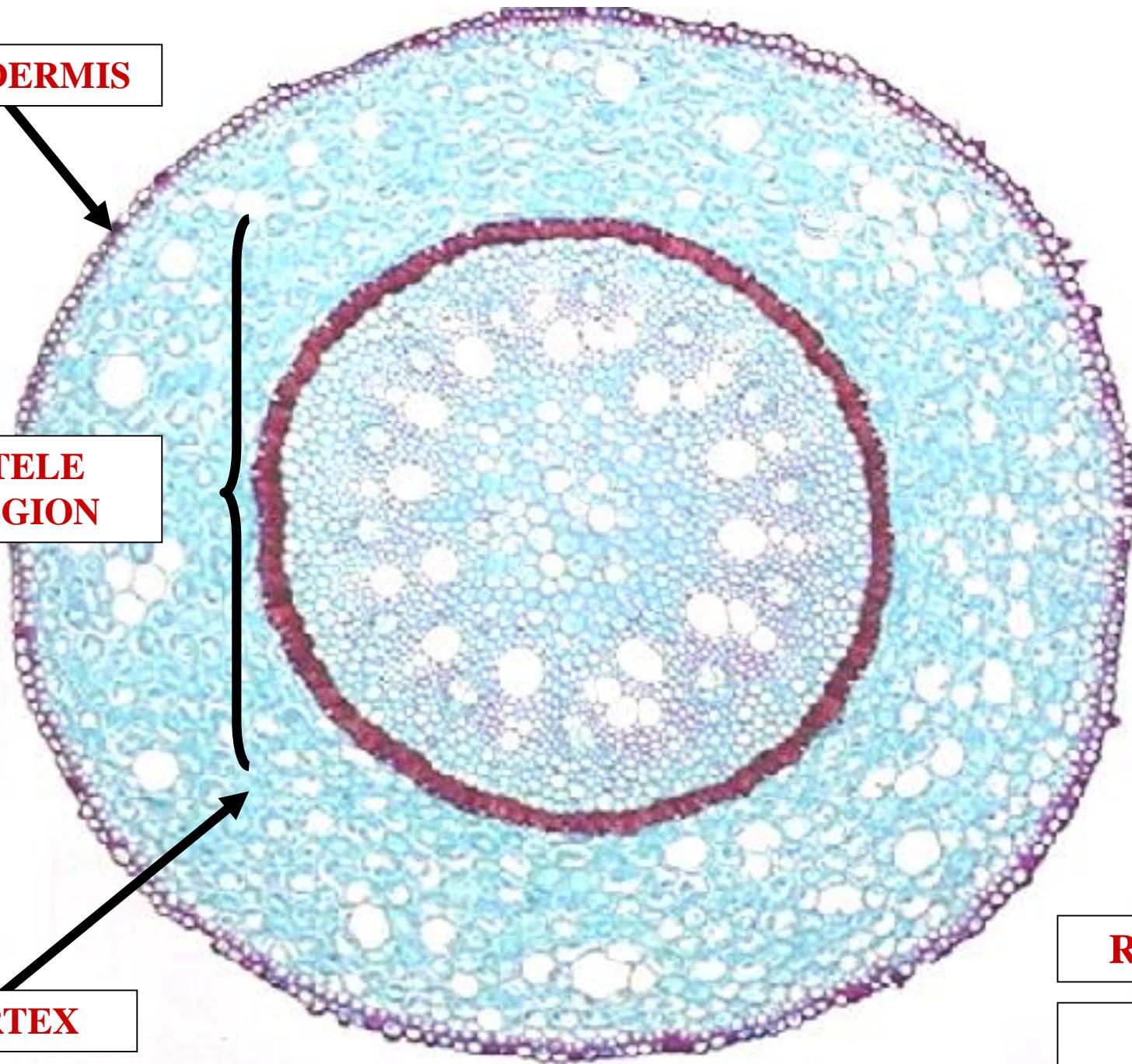
EPIDERMIS

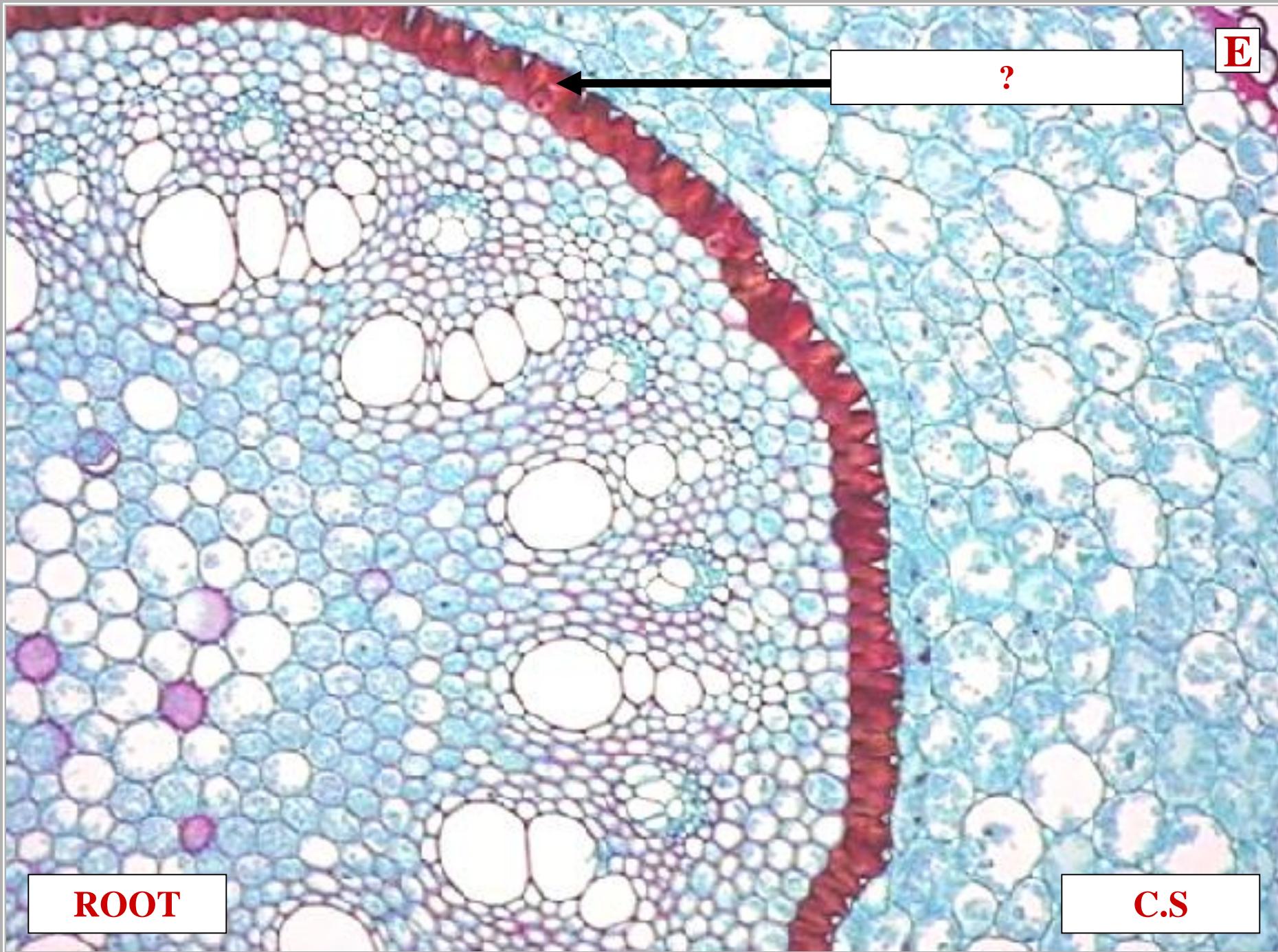
STELE
REGION

CORTEX

ROOT

C.S.



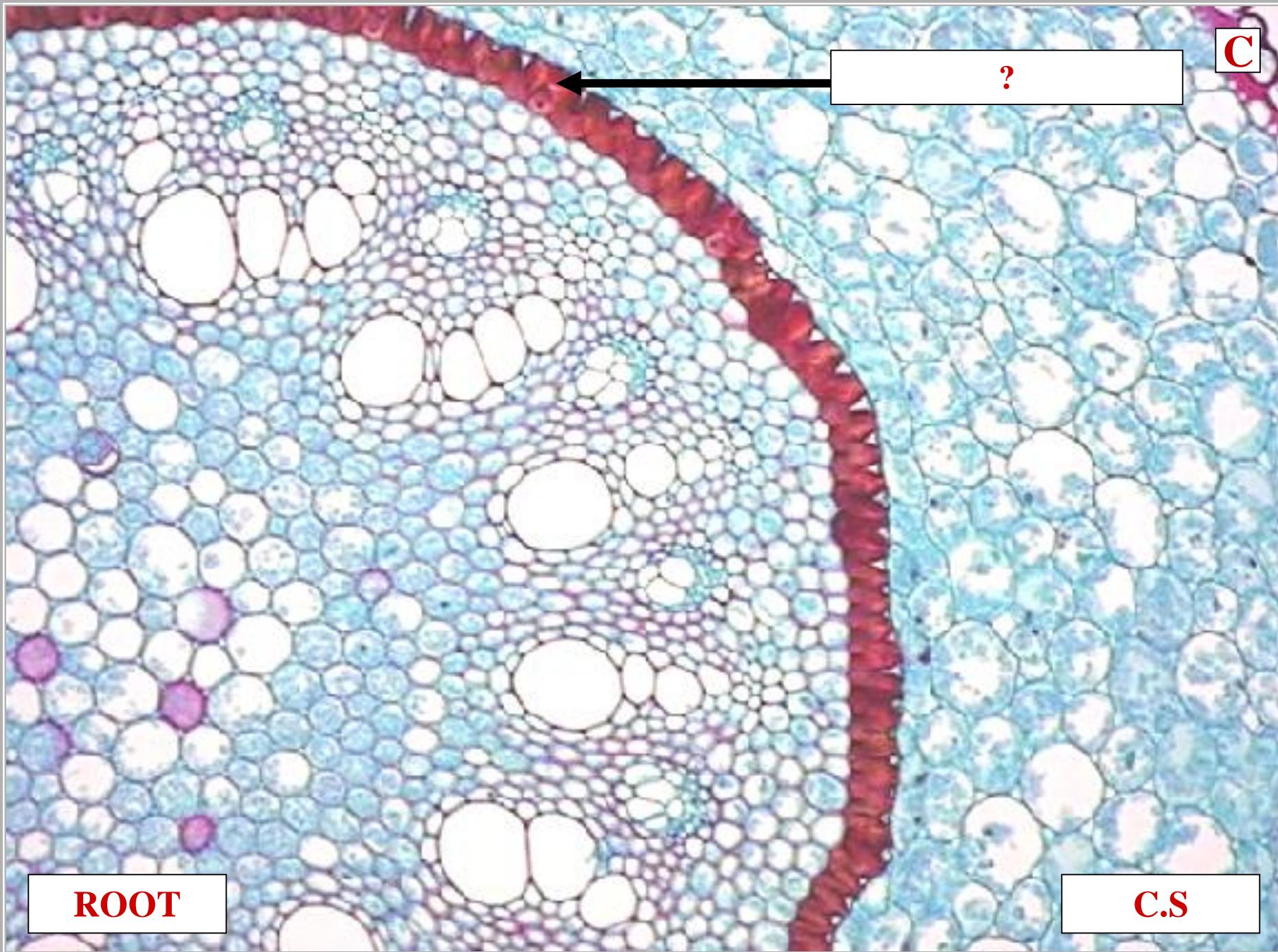


?

ENDODERMIS

ROOT

C.S



?

CASPARIAN STRIPS

ROOT

C.S

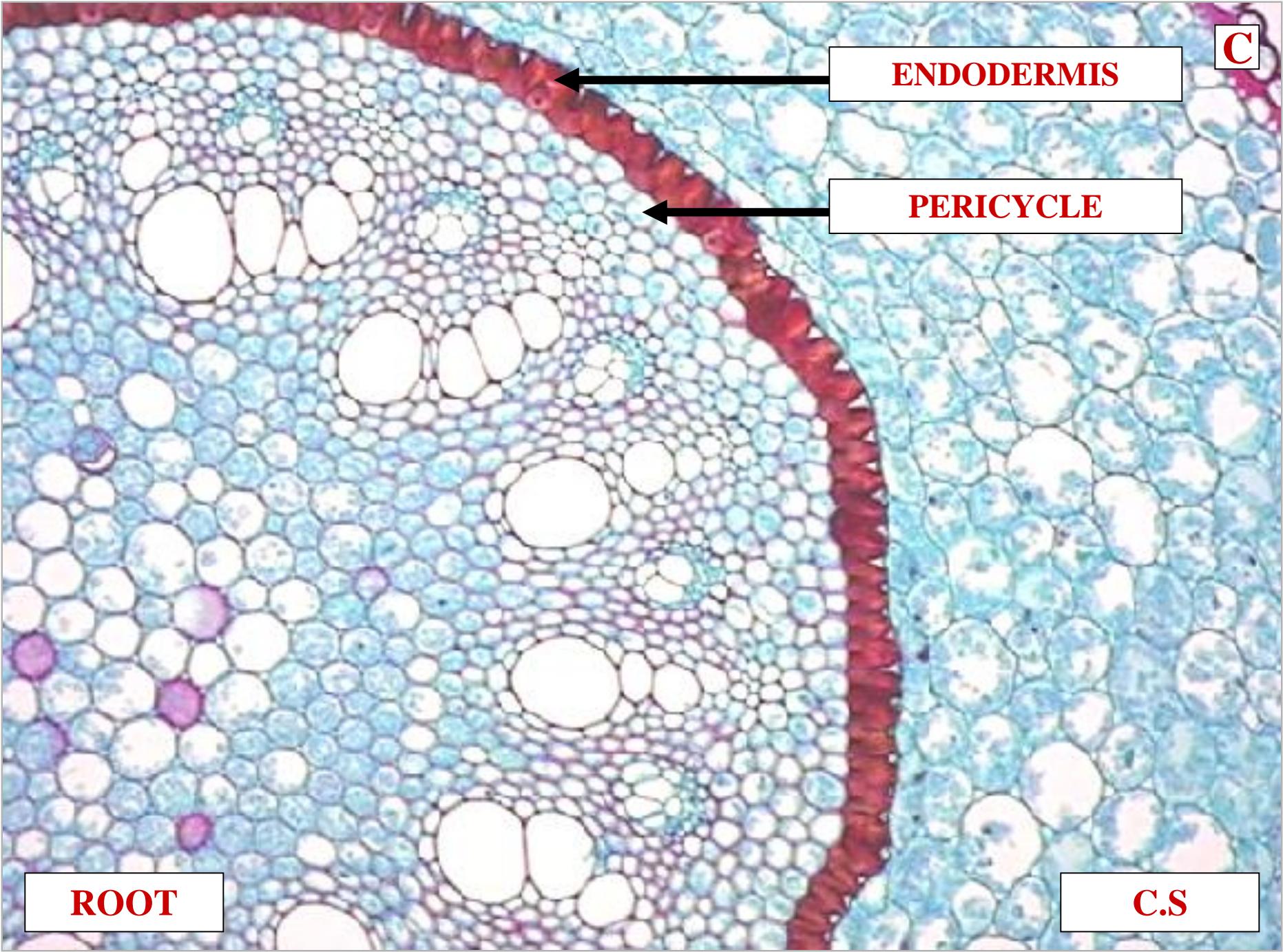
P

ENDODERMIS

?

ROOT

C.S



C

ENDODERMIS

PERICYCLE

ROOT

C.S

?

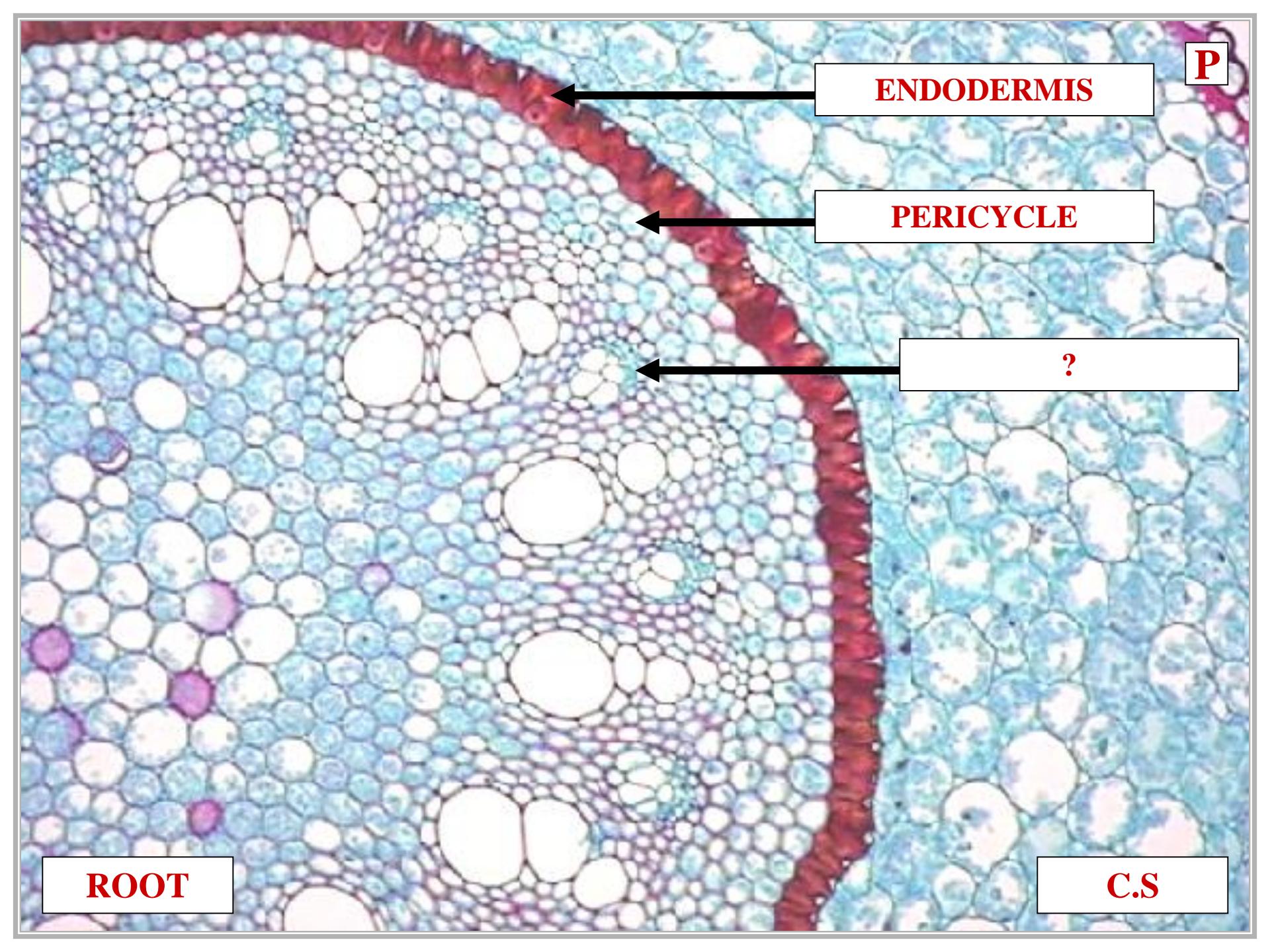
ENDODERMIS

PERICYCLE

CONCENTRIC
VASCULAR
BUNDLES

ROOT

C.S



P

ENDODERMIS

PERICYCLE

?

ROOT

C.S

?

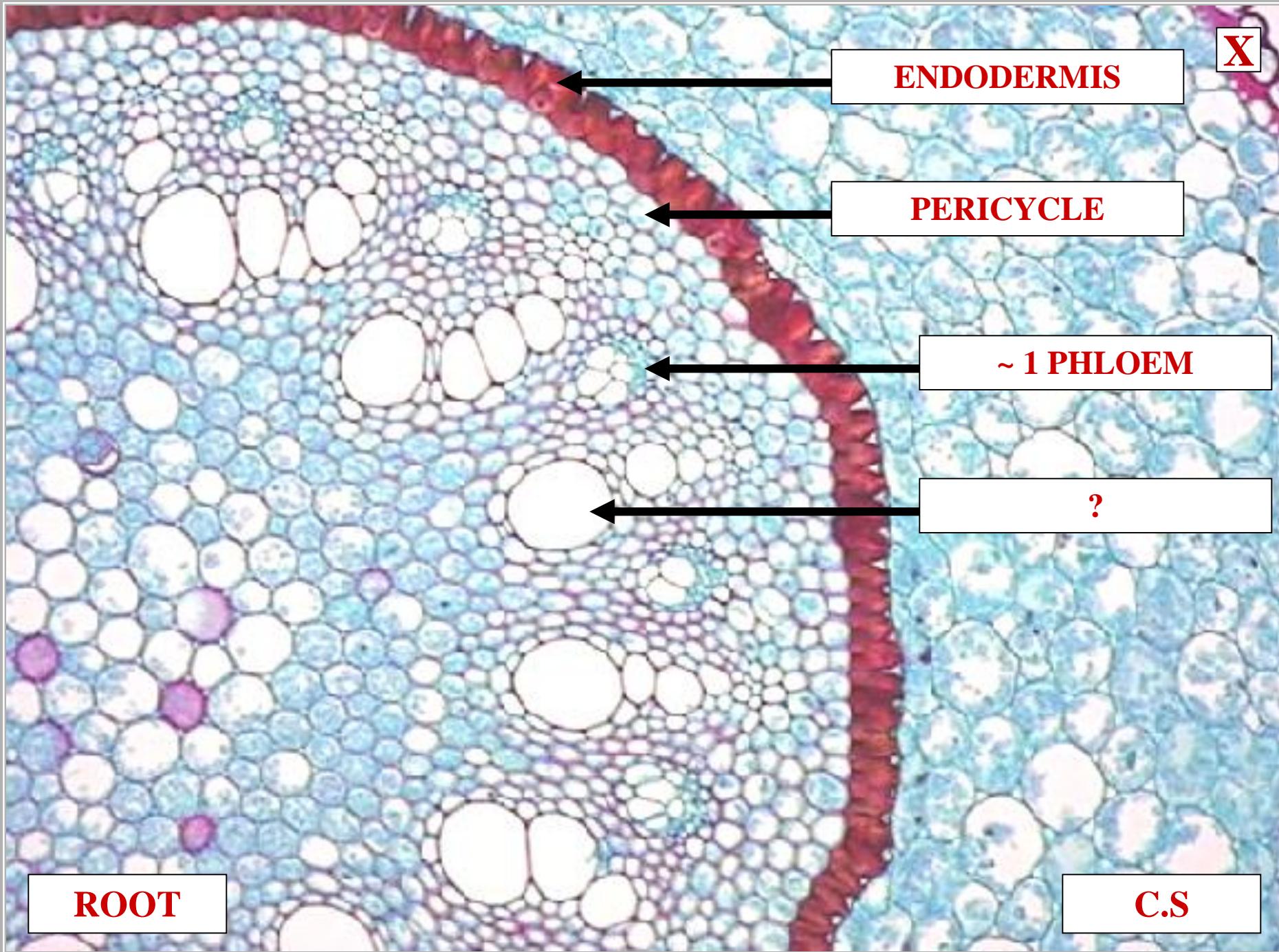
ENDODERMIS

PERICYCLE

~ 1 PHLOEM

ROOT

C.S



?

ENDODERMIS

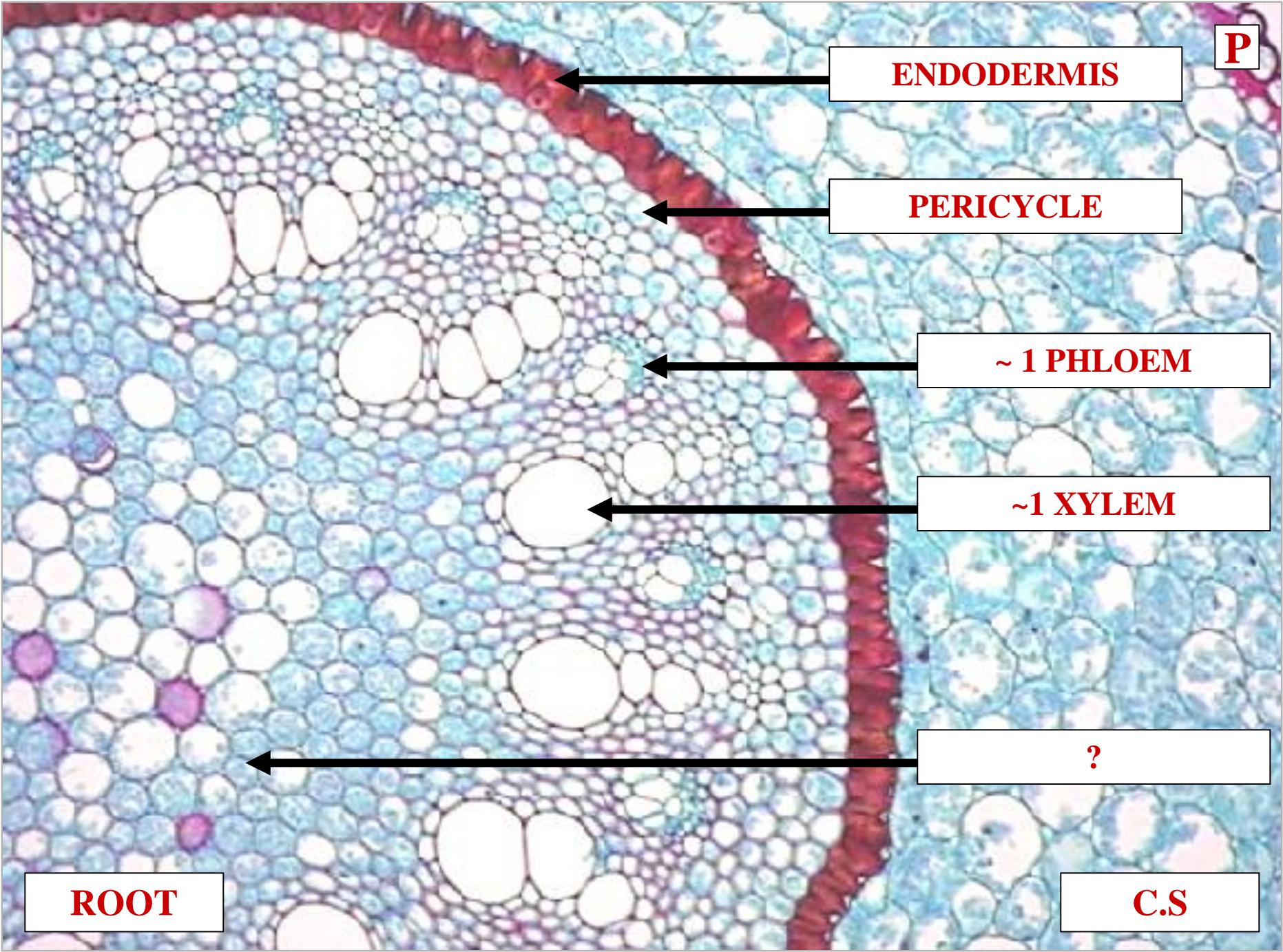
PERICYCLE

~ 1 PHLOEM

~1 XYLEM

ROOT

C.S



P

ENDODERMIS

PERICYCLE

~ 1 PHLOEM

~1 XYLEM

?

ROOT

C.S



ENDODERMIS

PERICYCLE

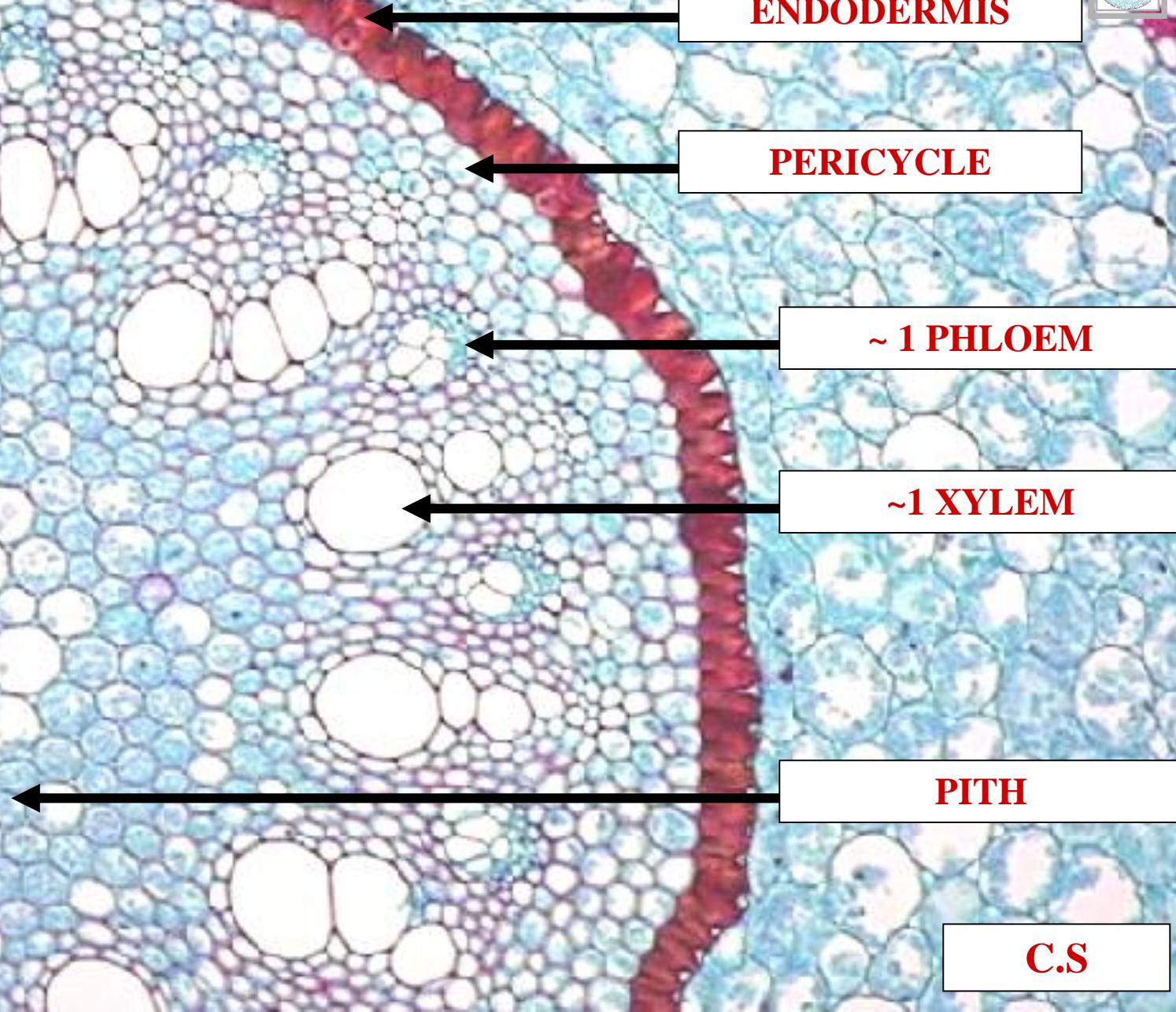
~ 1 PHLOEM

~1 XYLEM

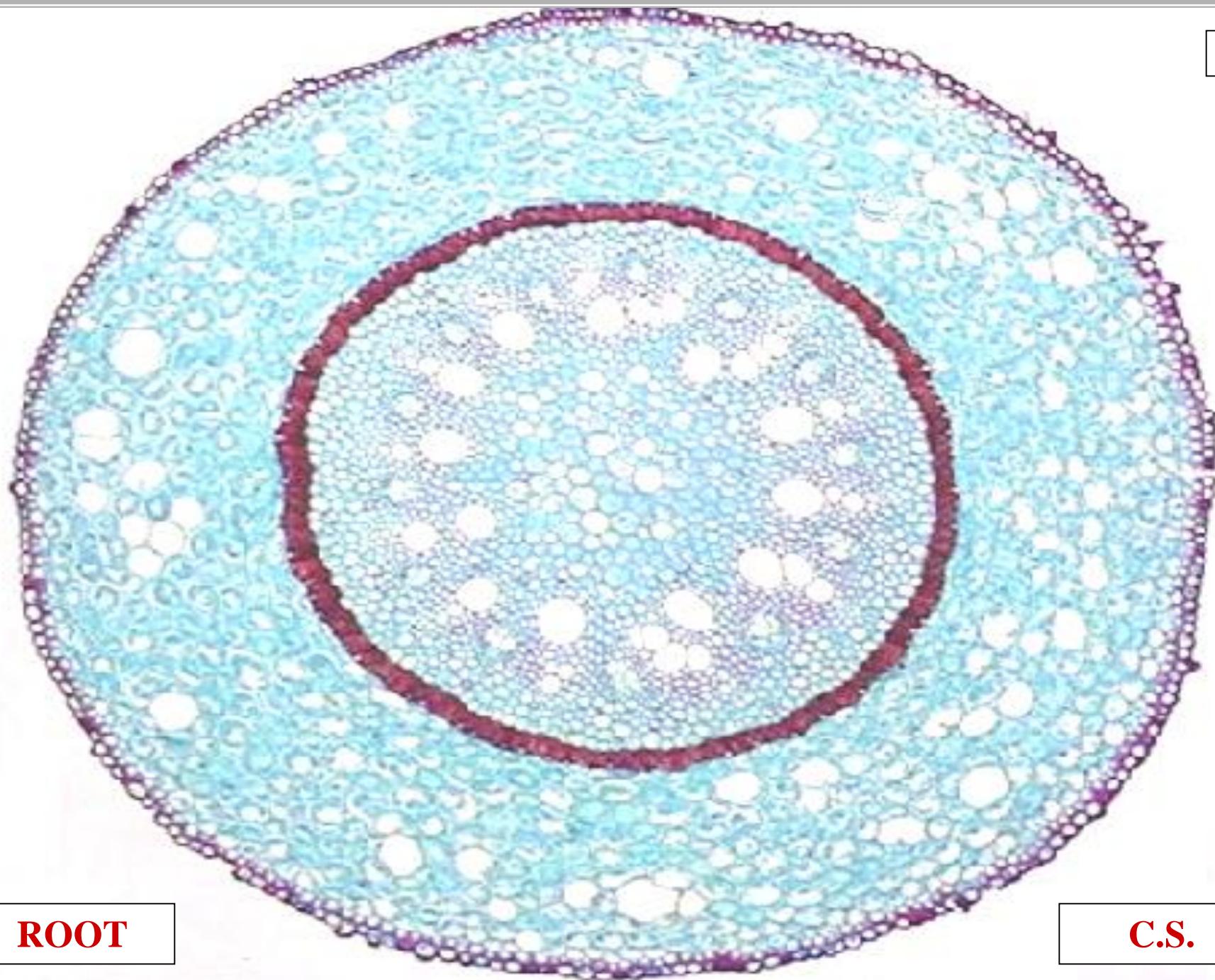
PITH

ROOT

C.S



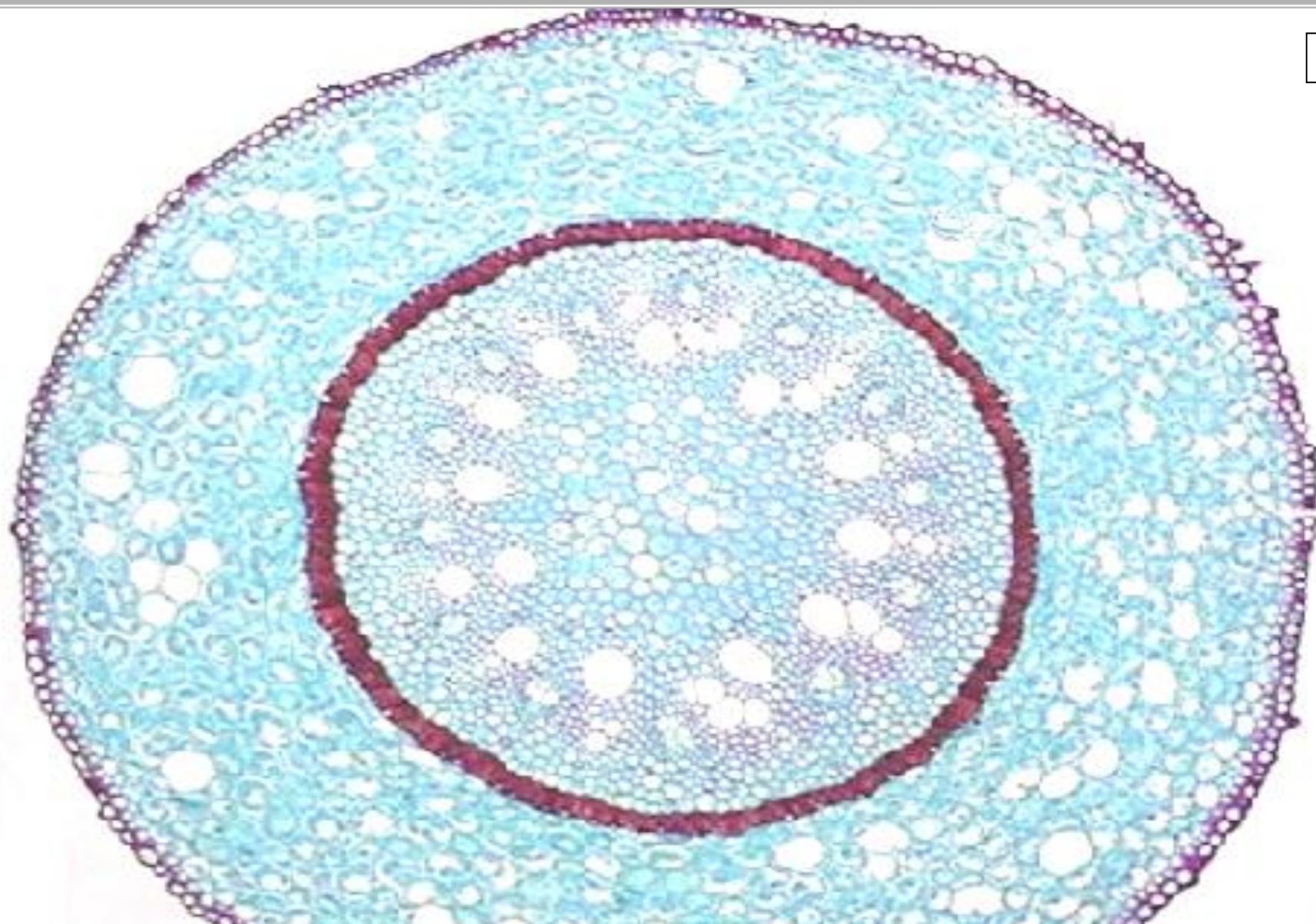
S



ROOT

C.S.

E

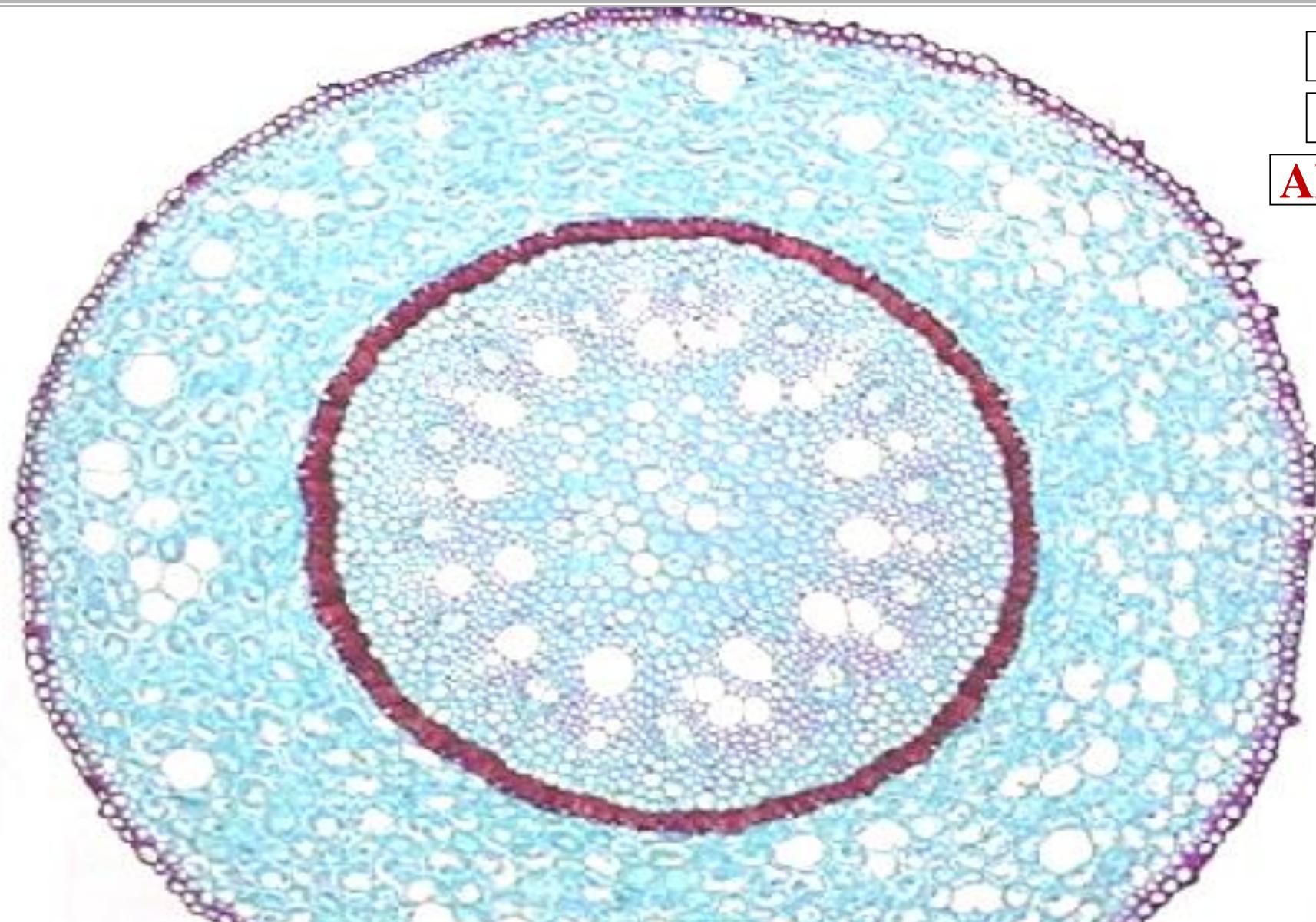


SIPHONOSTELE

?

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AB



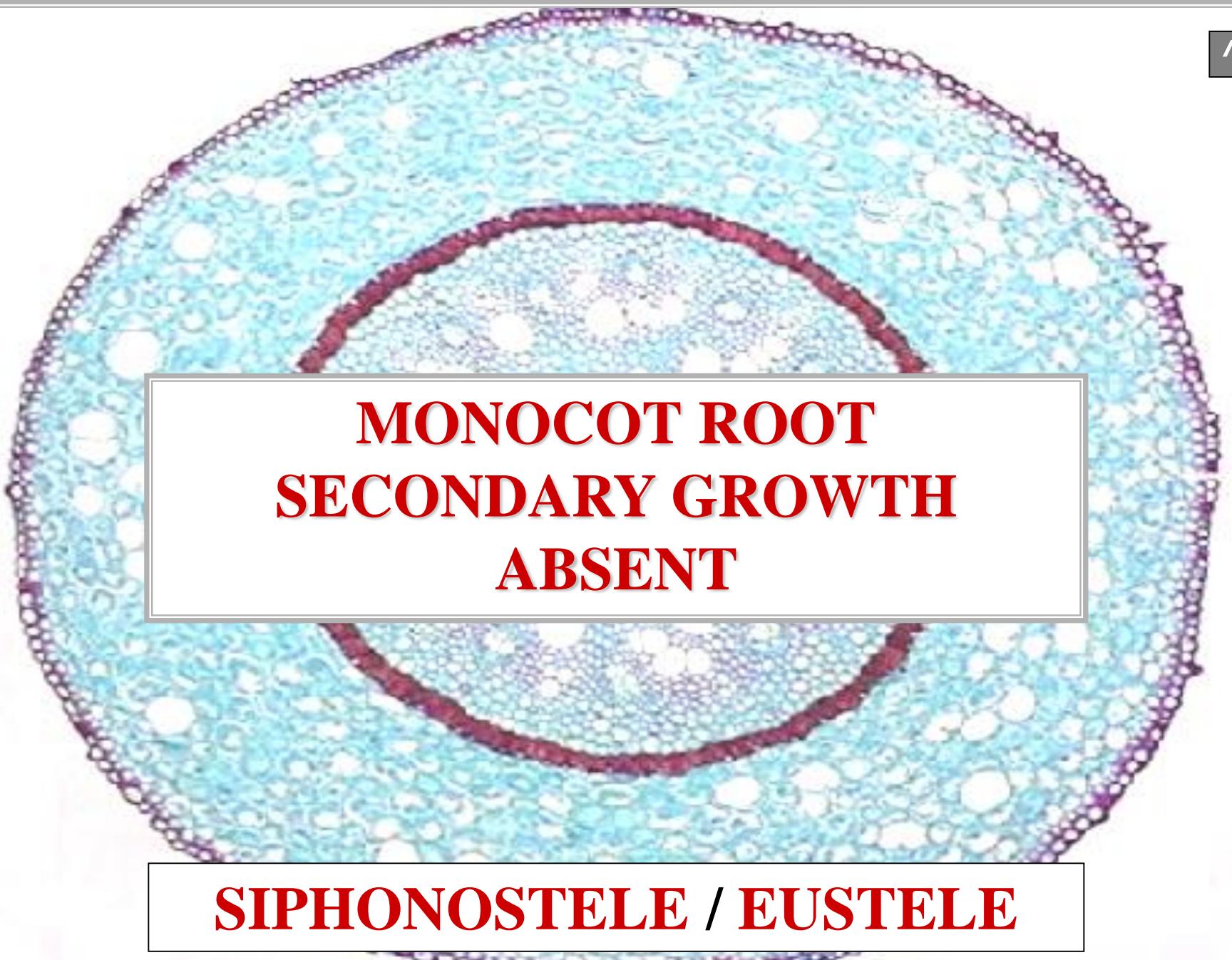
SIPHONOSTELE / EUSTELE

>

AB

**MONOCOT ROOT
VASCULAR CAMBIUM
ABSENT**

SIPHONOSTELE / EUSTELE



**MONOCOT ROOT
SECONDARY GROWTH
ABSENT**

SIPHONOSTELE / EUSTELE



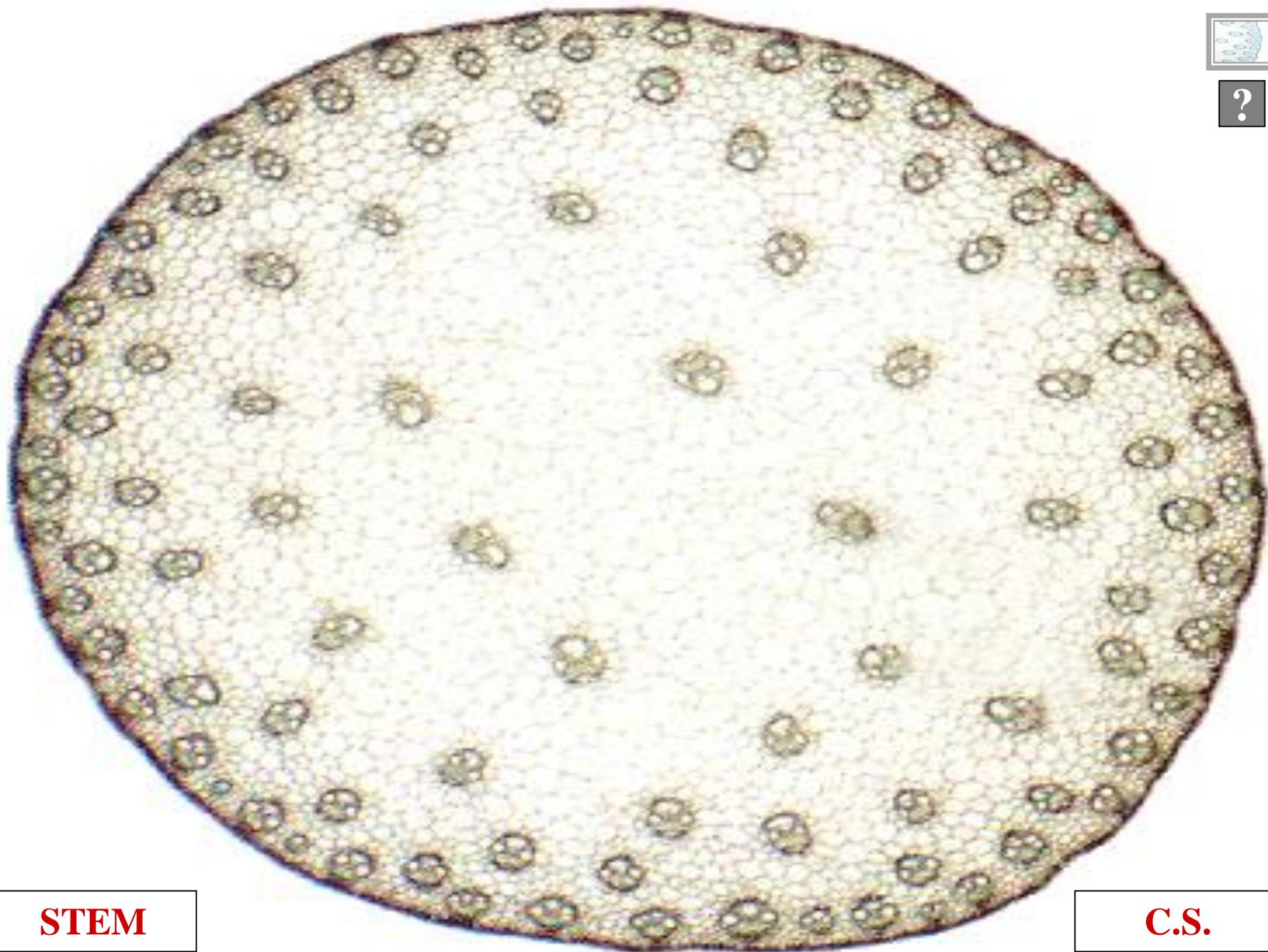
MONOCOT

STEM

ANATOMY



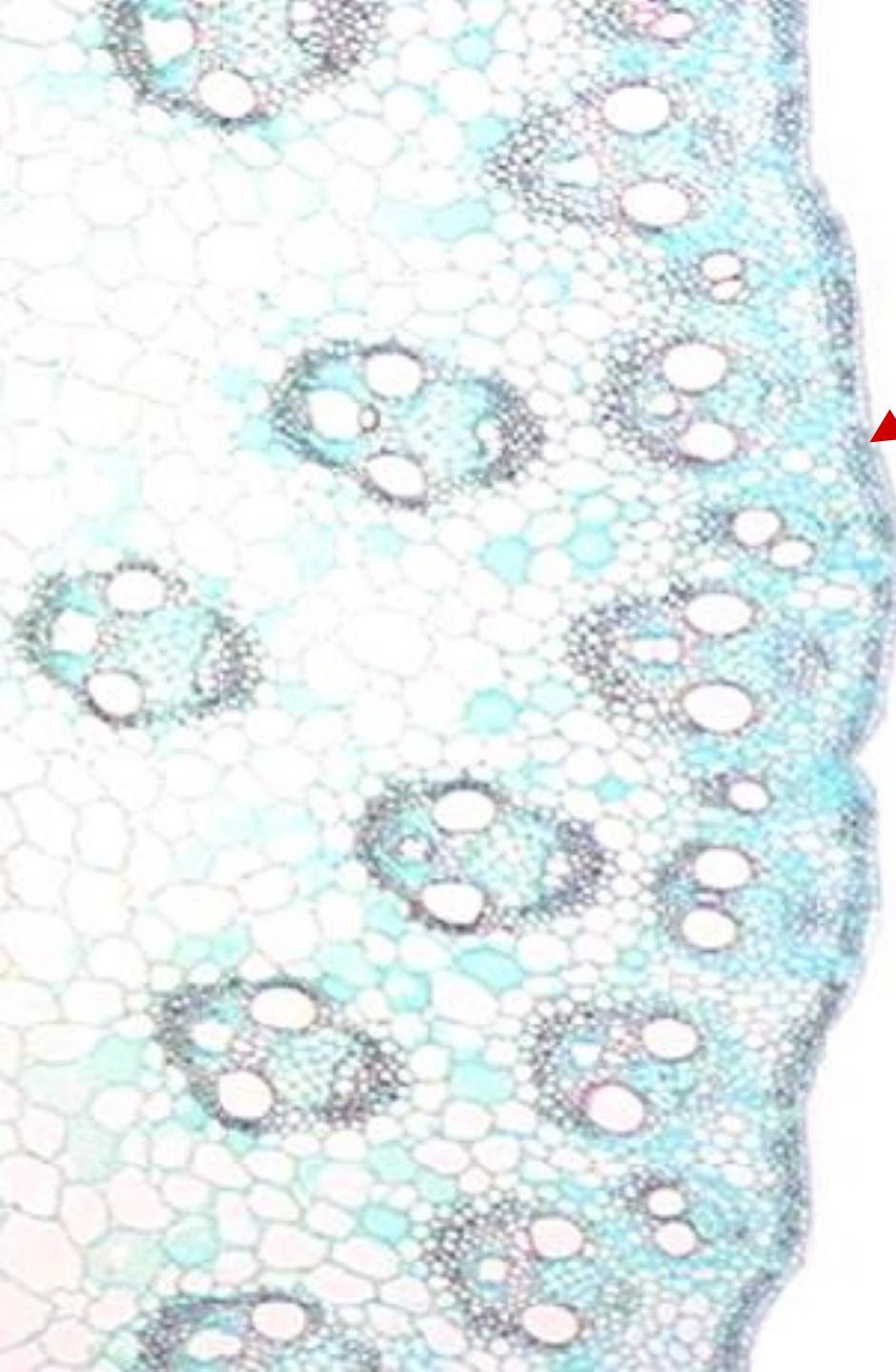
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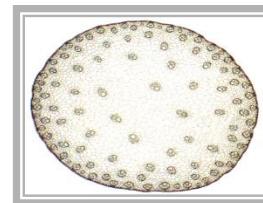
STEM

C.S.

C



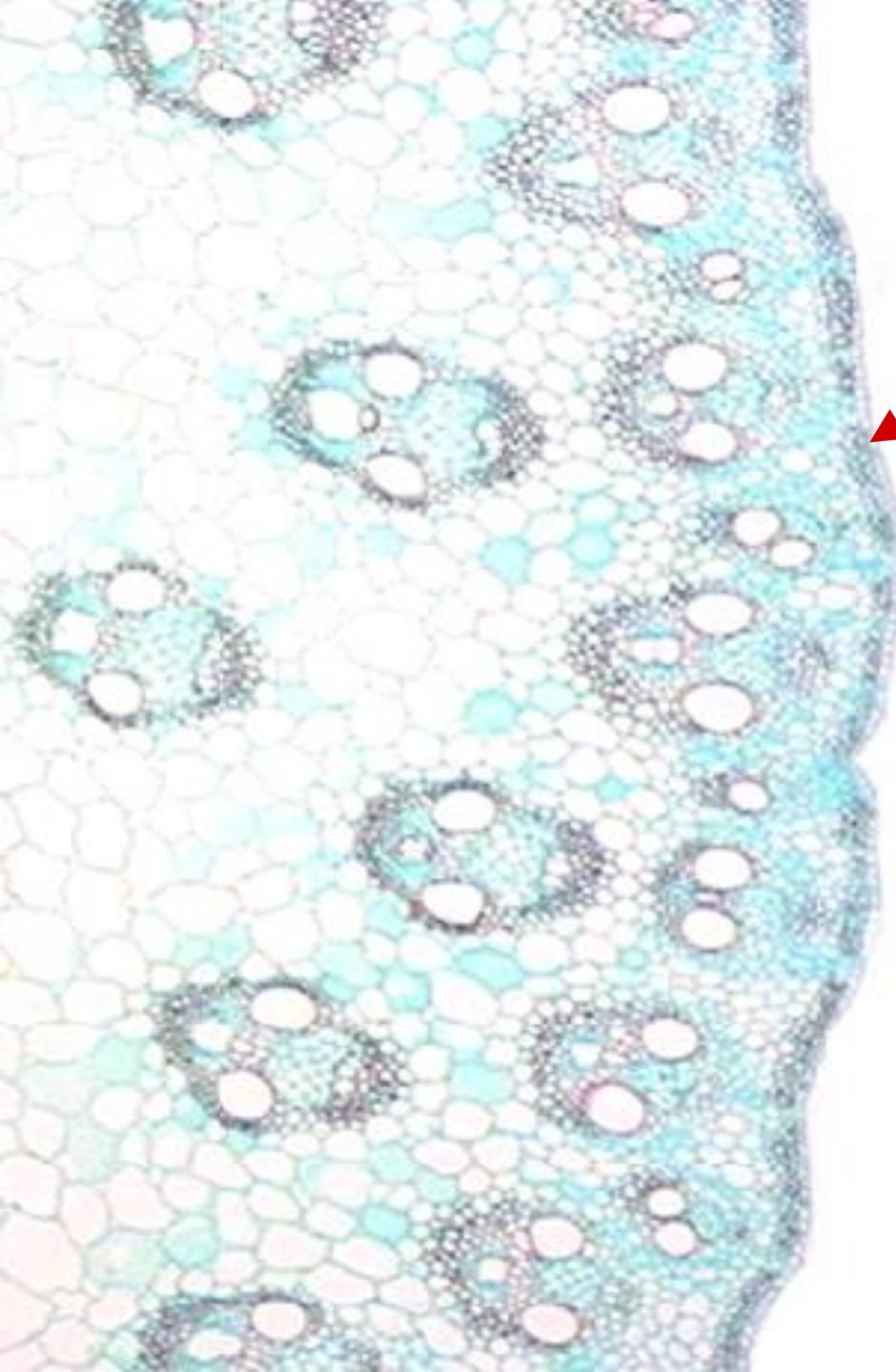
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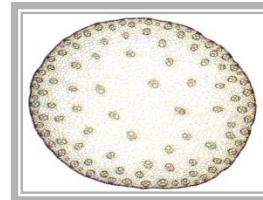
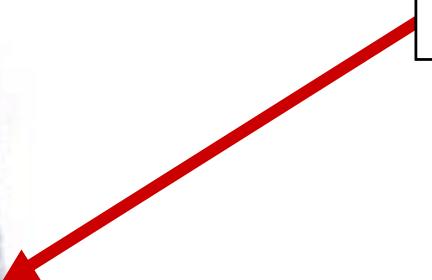
STEM

C.S.

?



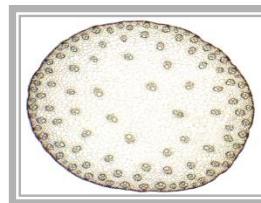
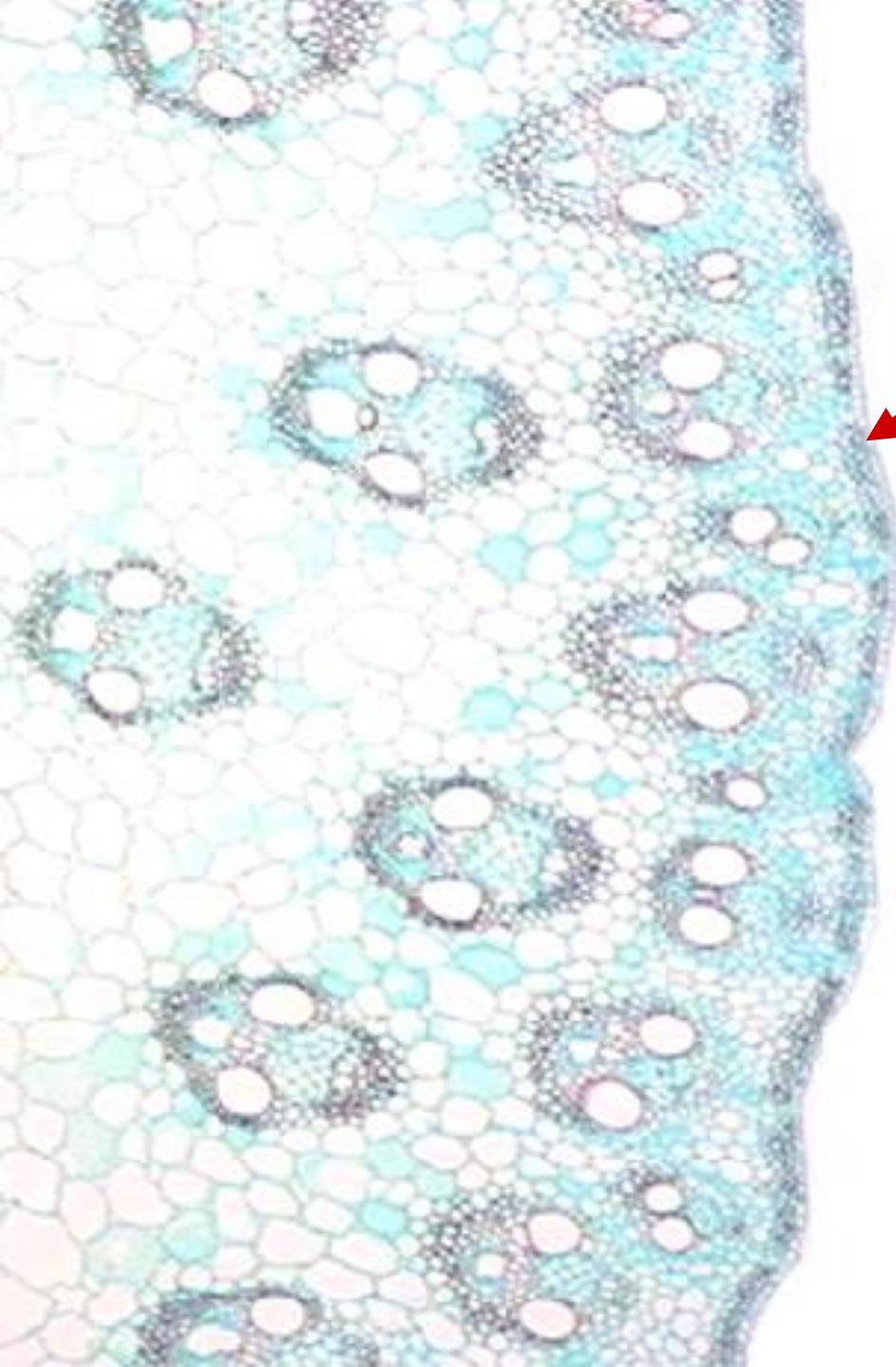
CUTICLE



STEM

C.S.

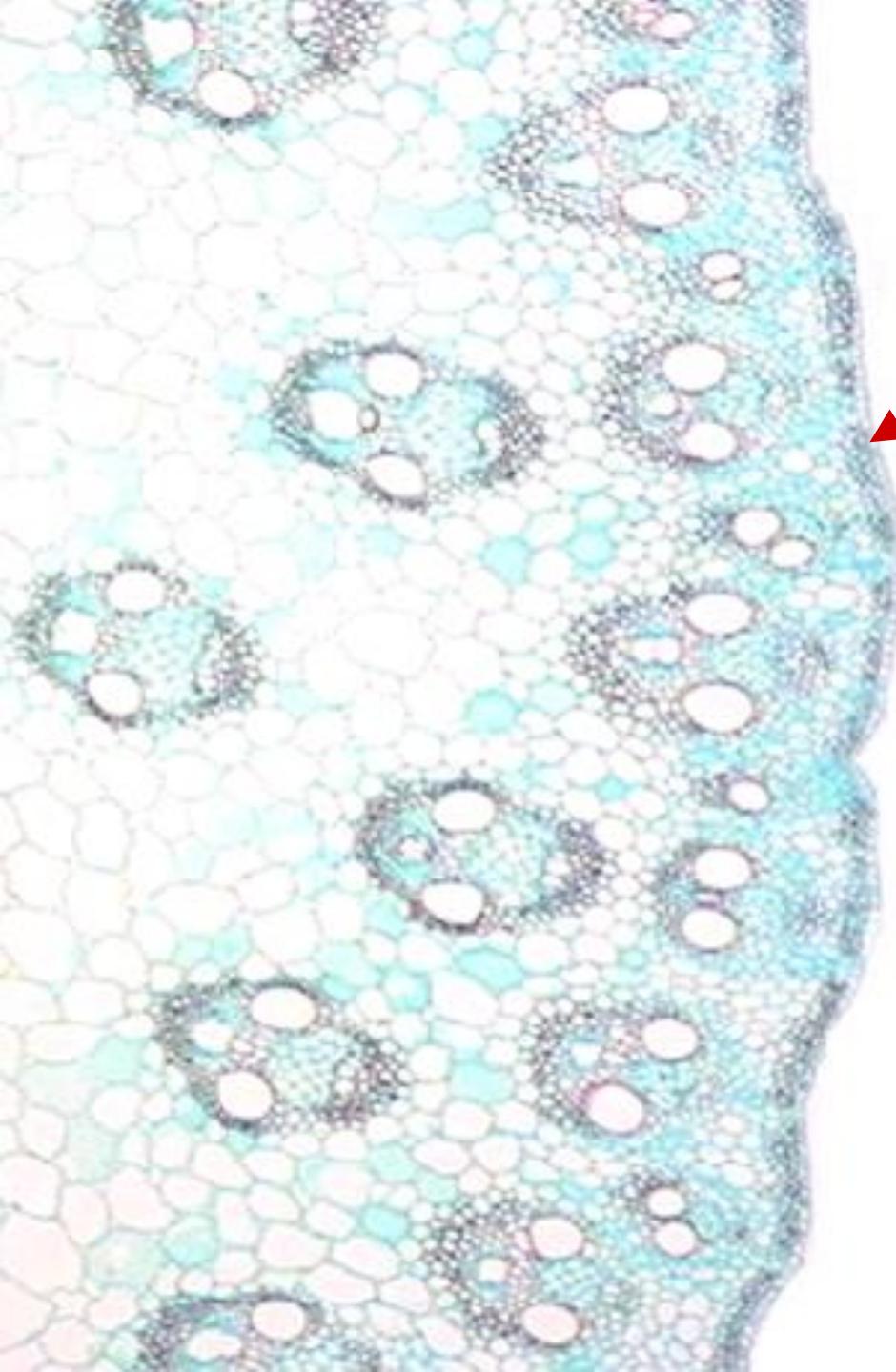
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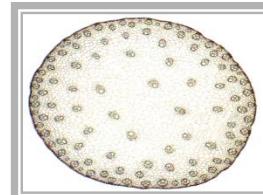
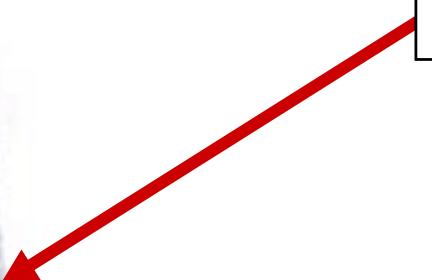
STEM

C.S.

?



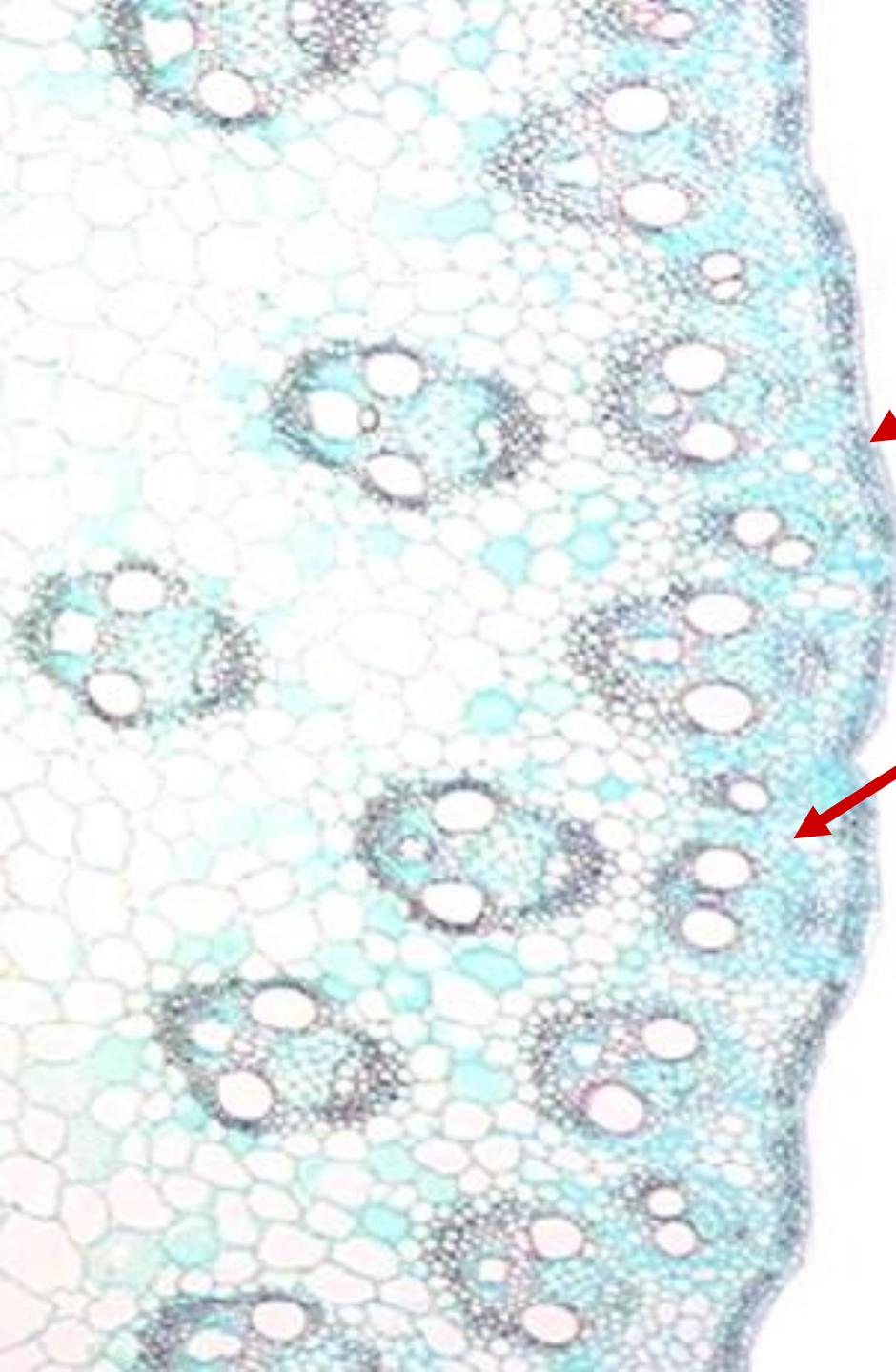
EPIDERMIS



STEM

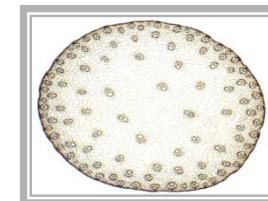
C.S.

C



EPIDERMIS

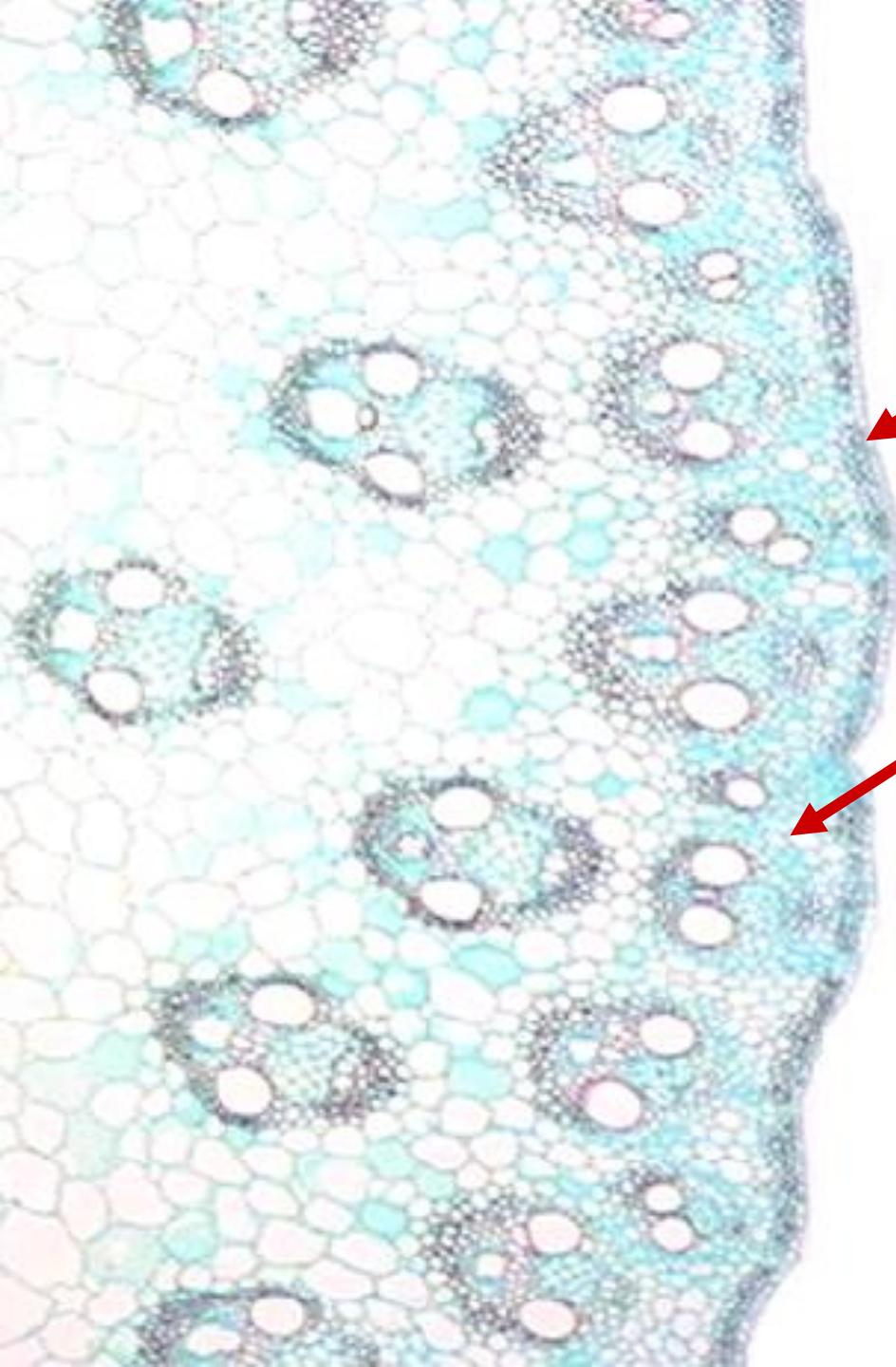
?



STEM

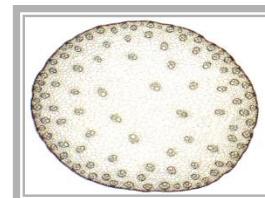
C.S.

S



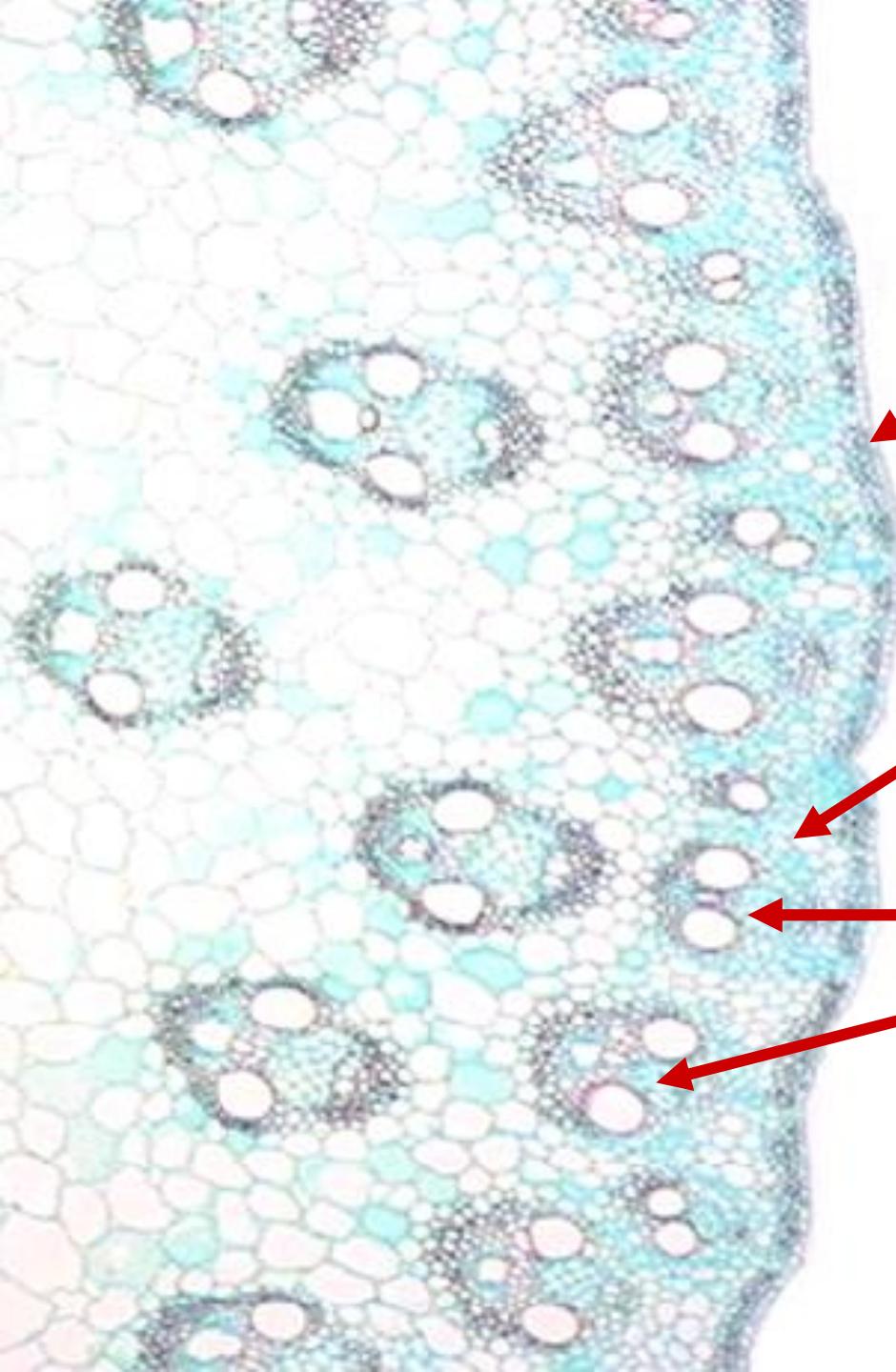
EPIDERMIS

CORTEX



STEM

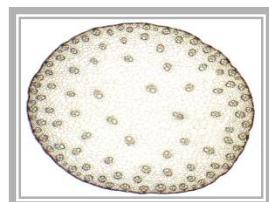
C.S.



EPIDERMIS

CORTEX

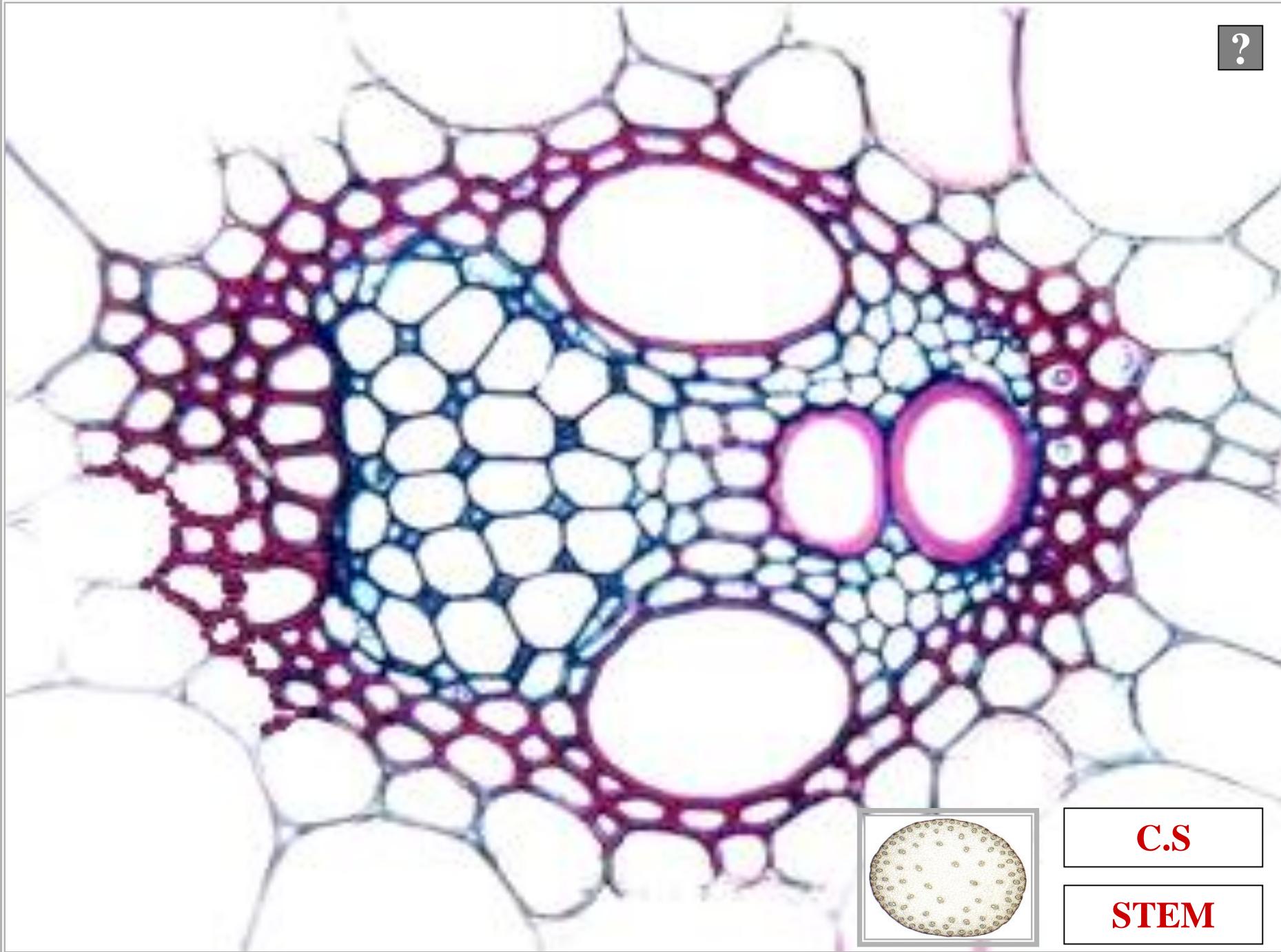
**SCATTERED
VASCULAR
BUNDLES**



STEM

C.S.

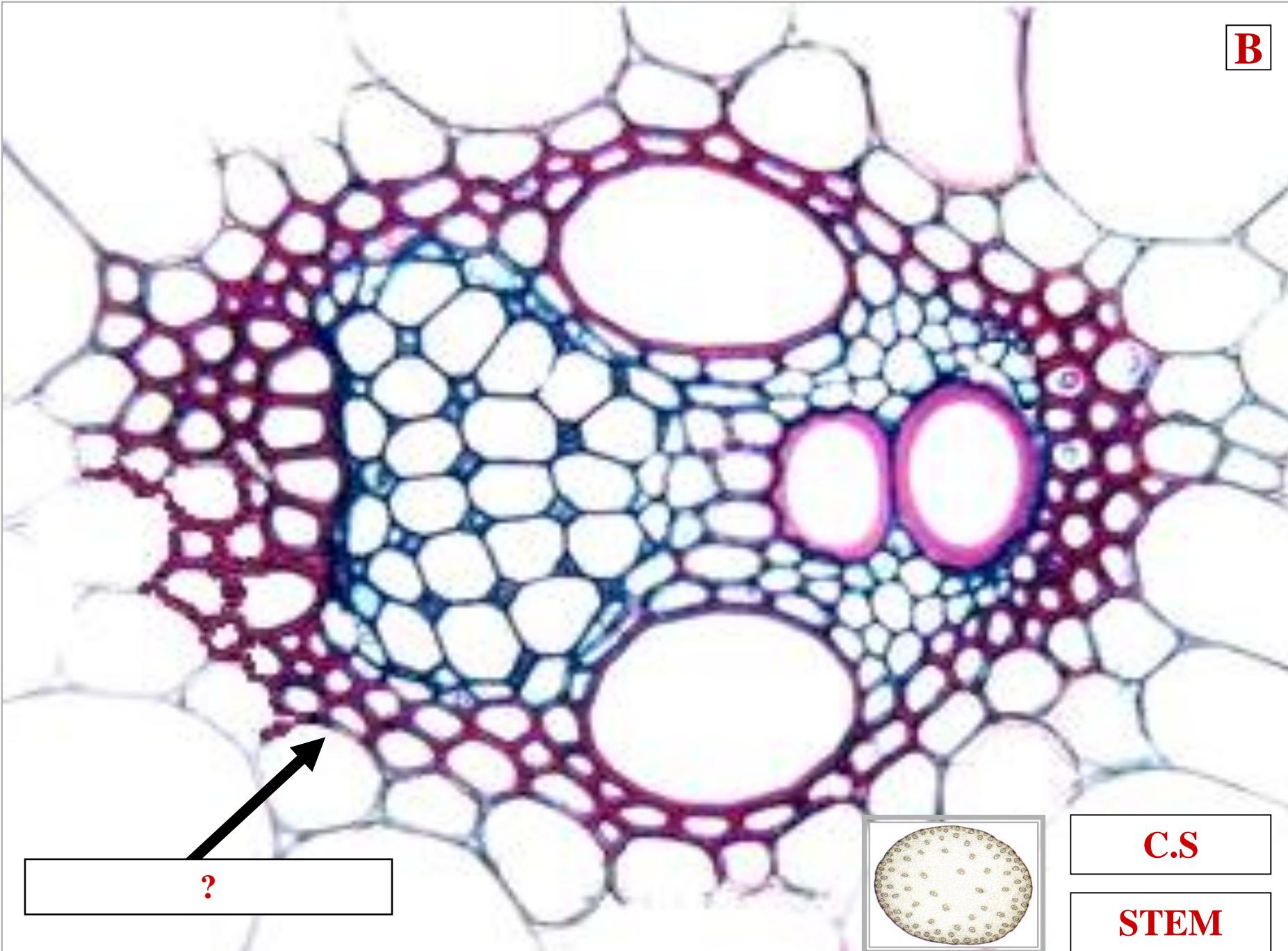
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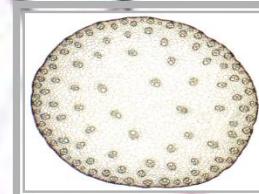
C.S

STEM

B



?



C.S

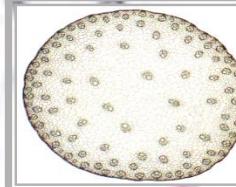
STEM

?

BUNDLE SHEATH

C.S

STEM

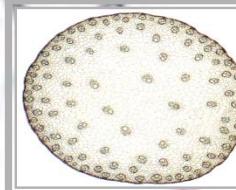


P

?



BUNDLE SHEATH

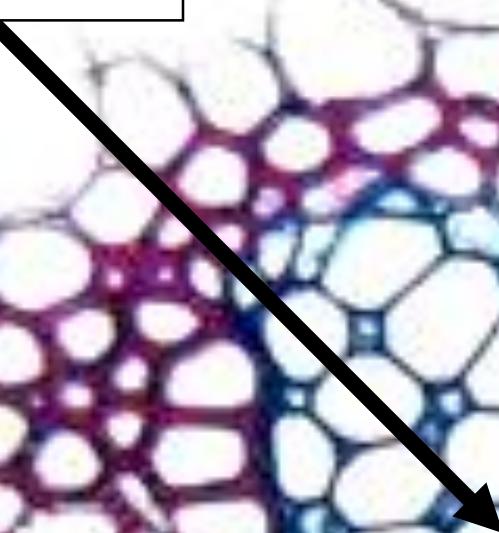


C.S

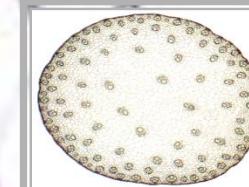
STEM

?

~1 PHLOEM



BUNDLE SHEATH



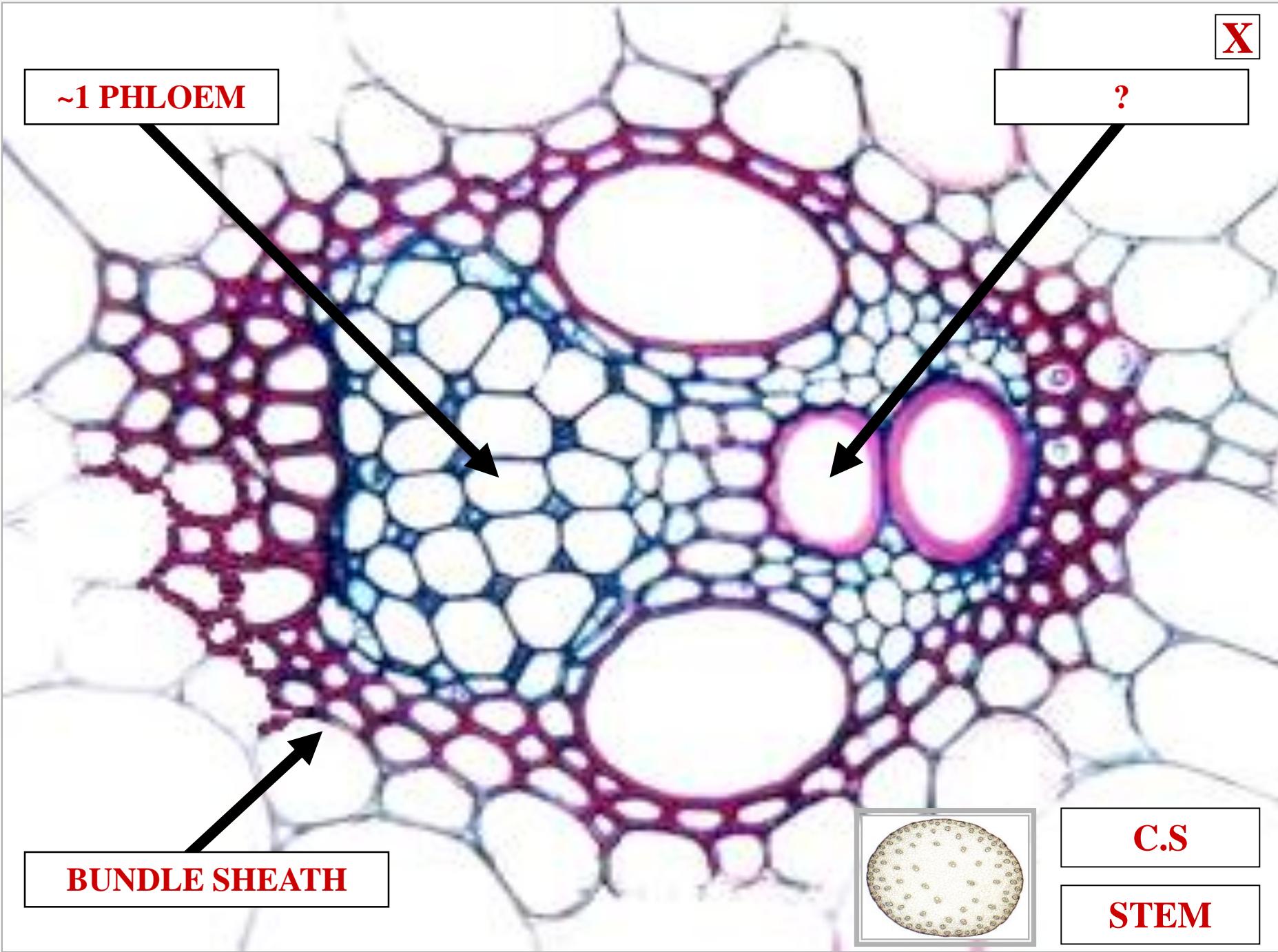
C.S

STEM

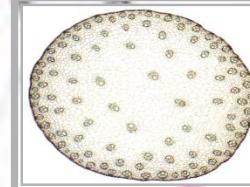
X

~1 PHLOEM

?



BUNDLE SHEATH



C.S

STEM



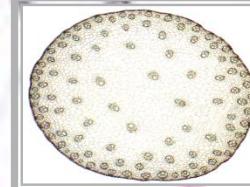
~1 PHLOEM

~1 XYLEM

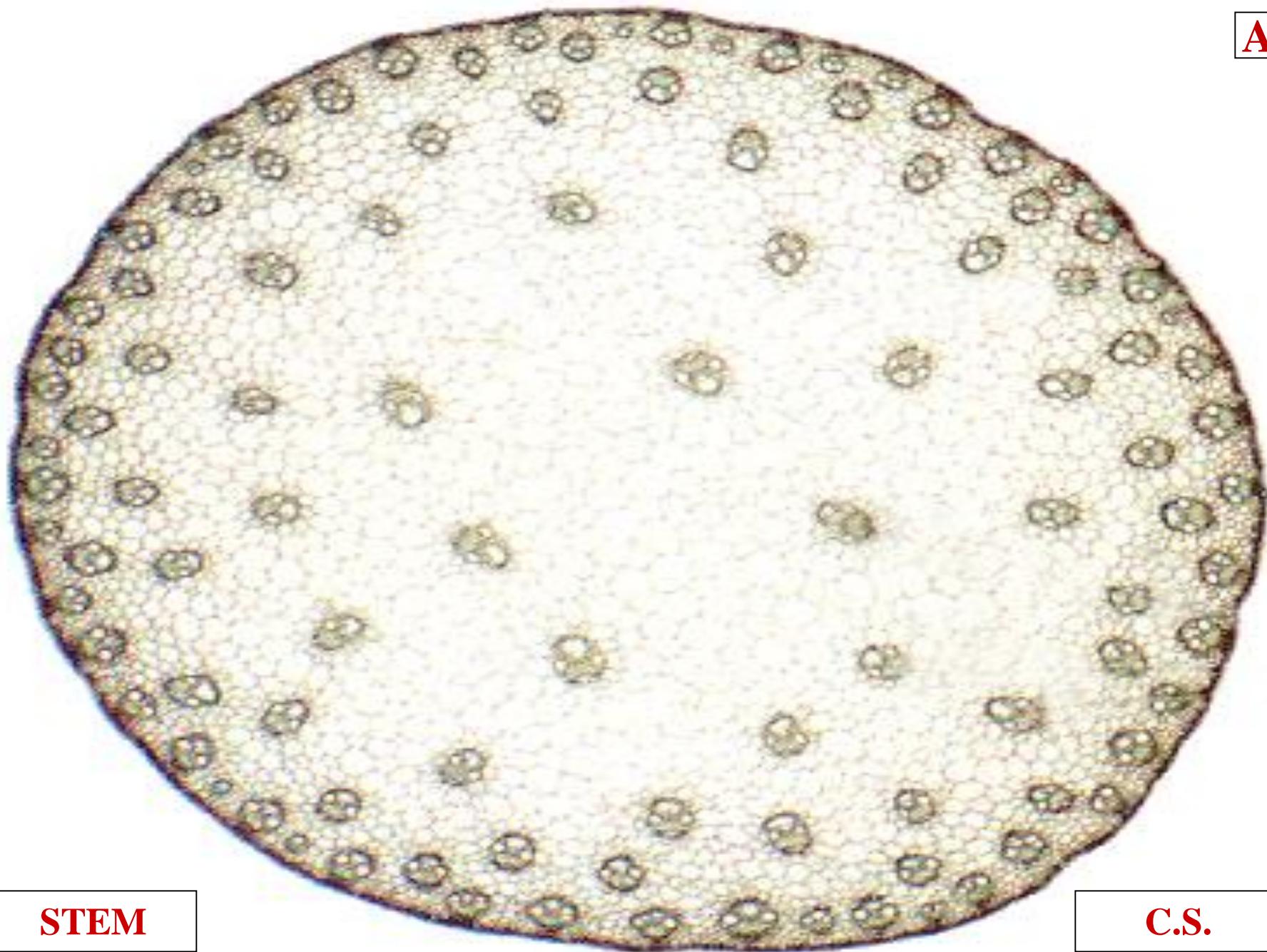
BUNDLE SHEATH

C.S

STEM



A



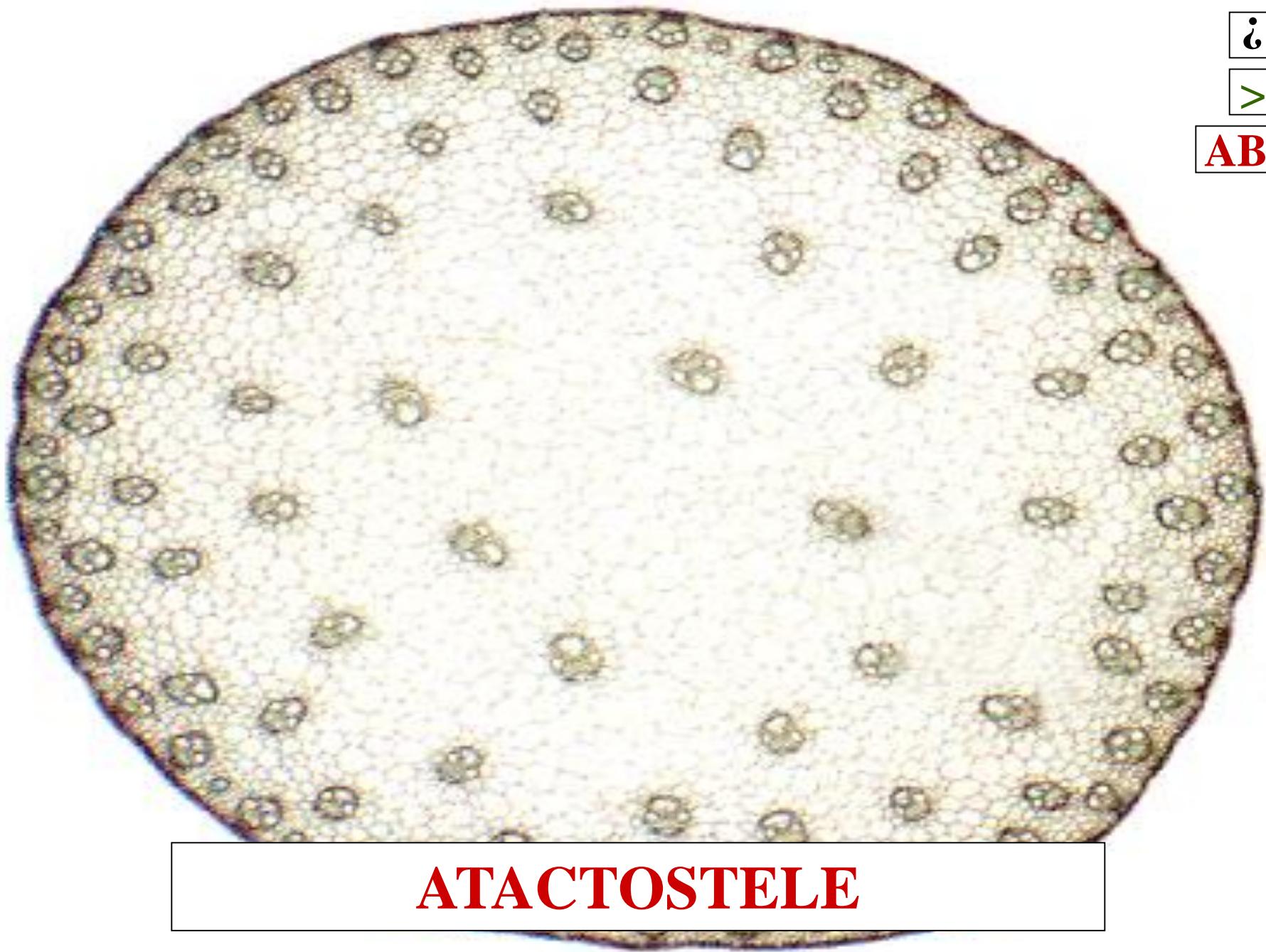
STEM

C.S.

?

>

AB



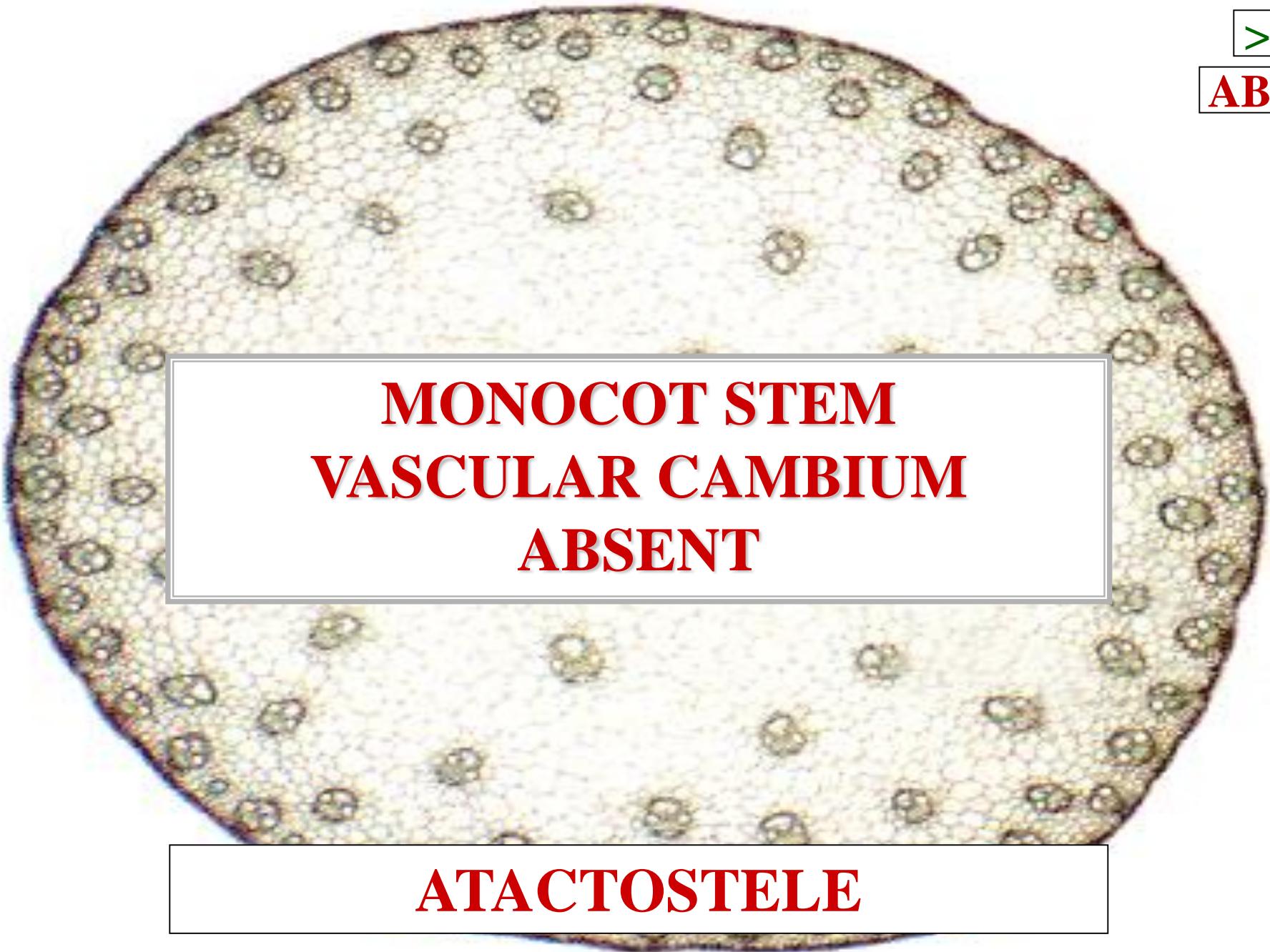
ATACTOSTELE

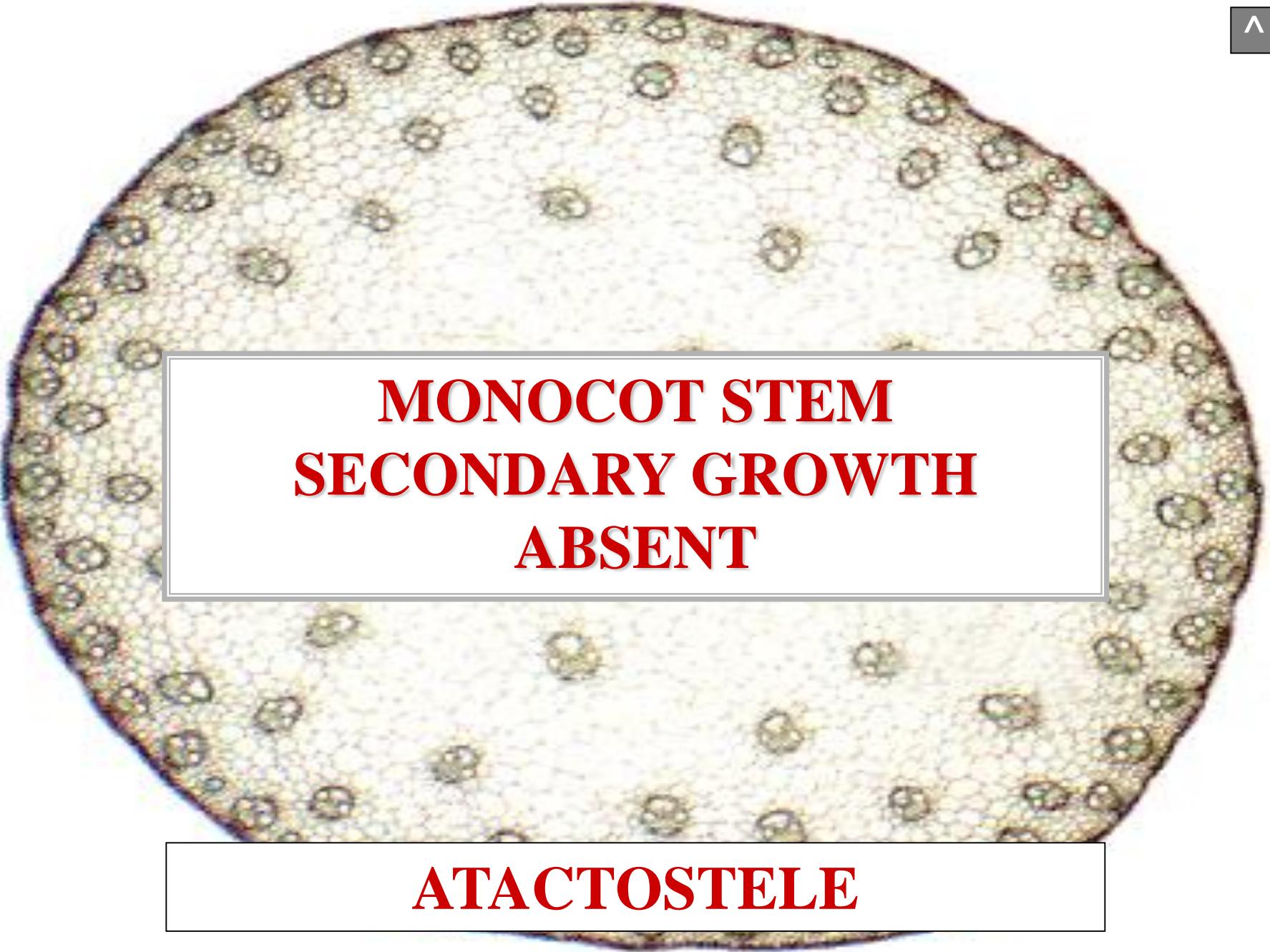
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AB

**MONOCOT STEM
VASCULAR CAMBIUM
ABSENT**

ATACTOSTELE





**MONOCOT STEM
SECONDARY GROWTH
ABSENT**

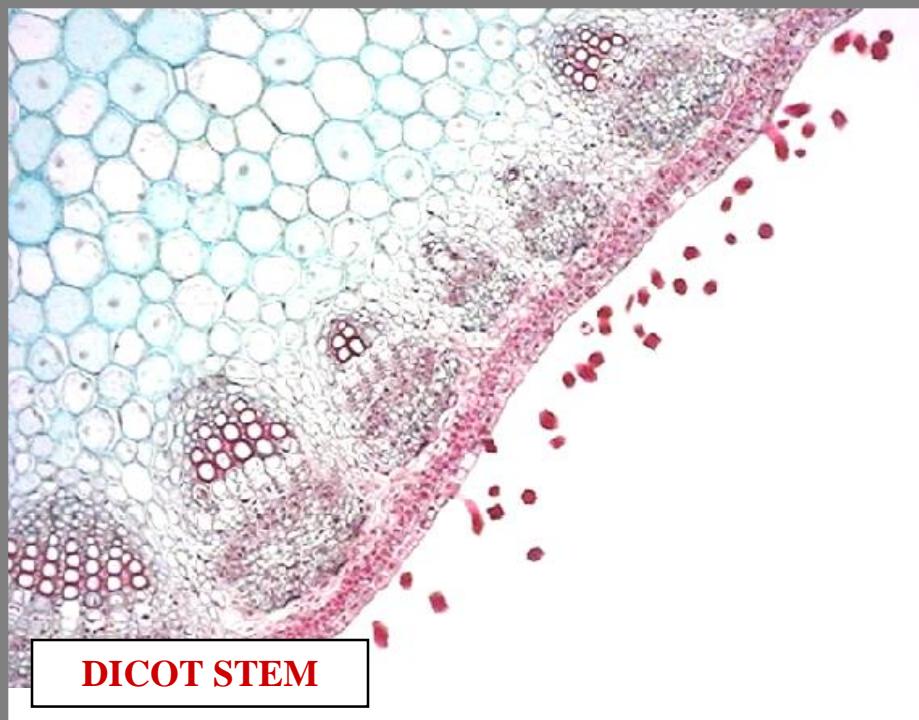
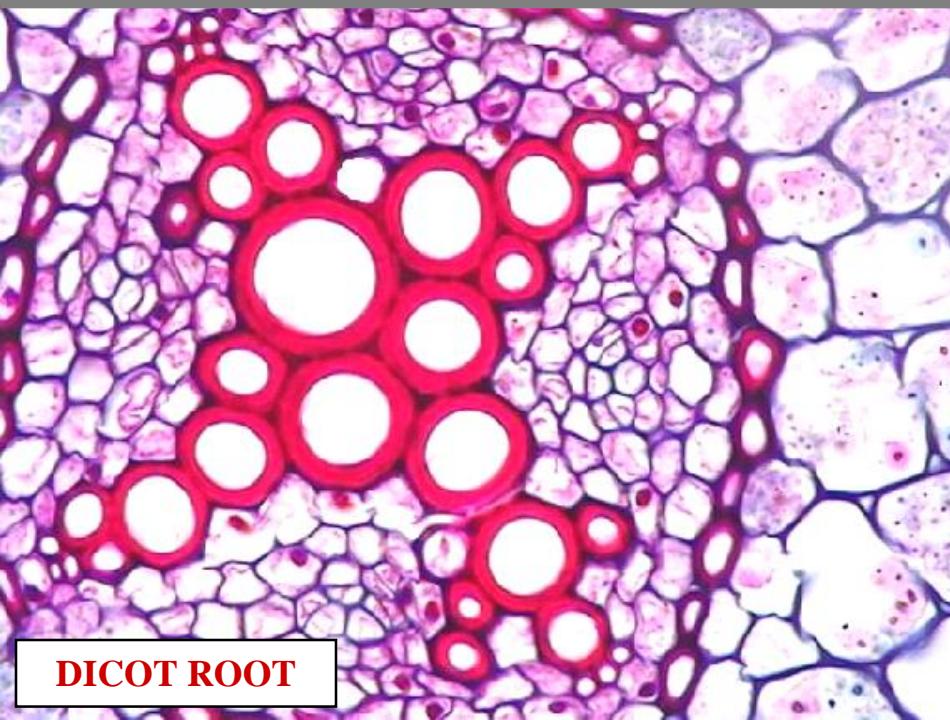
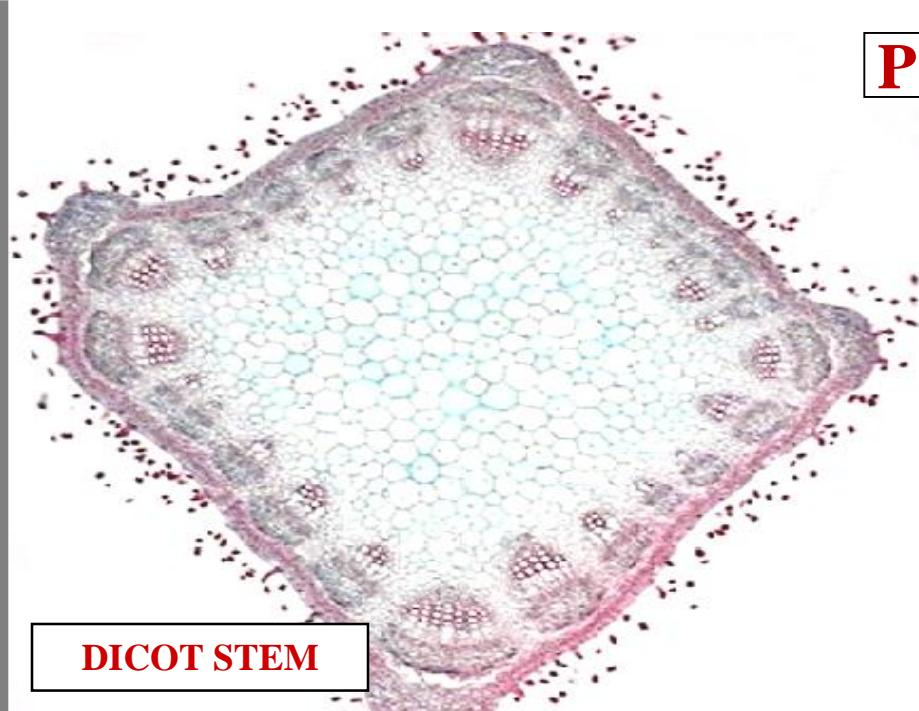
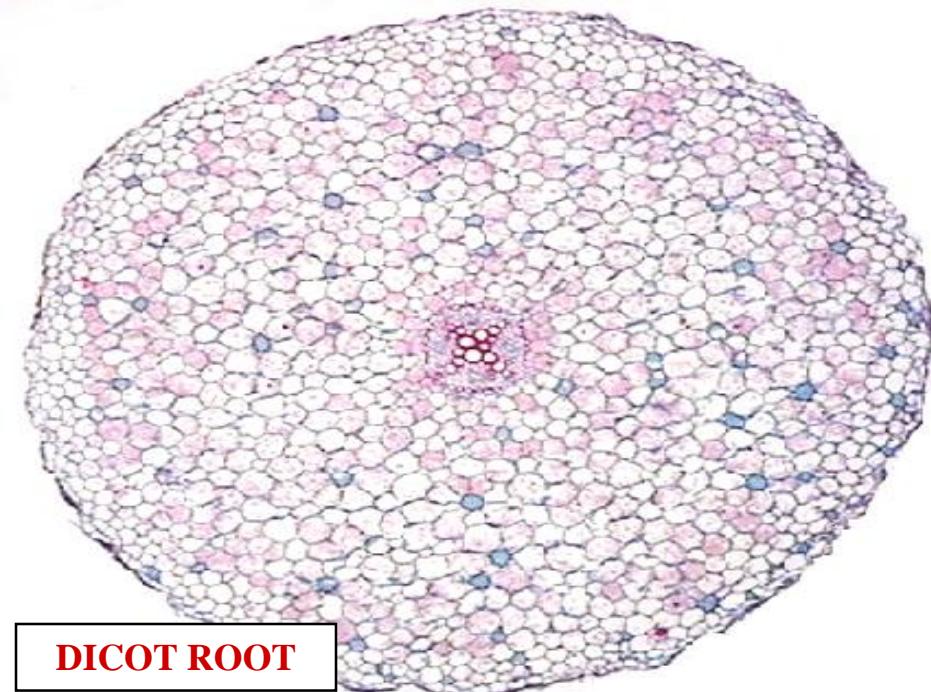
ATACTOSTELE

STELE SUMMARY

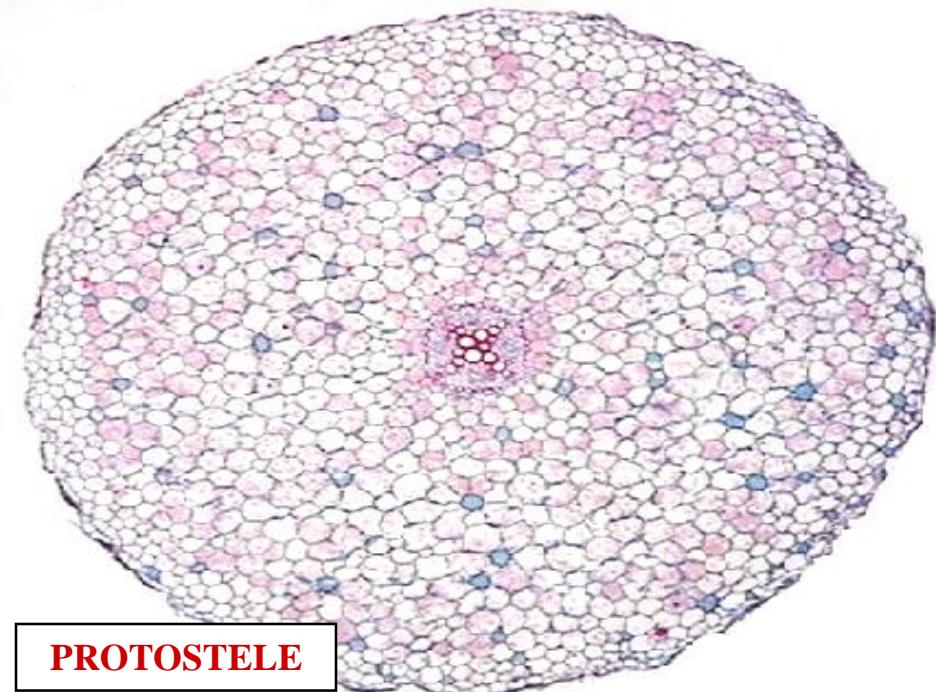


STELE SUMMARY DICOTS

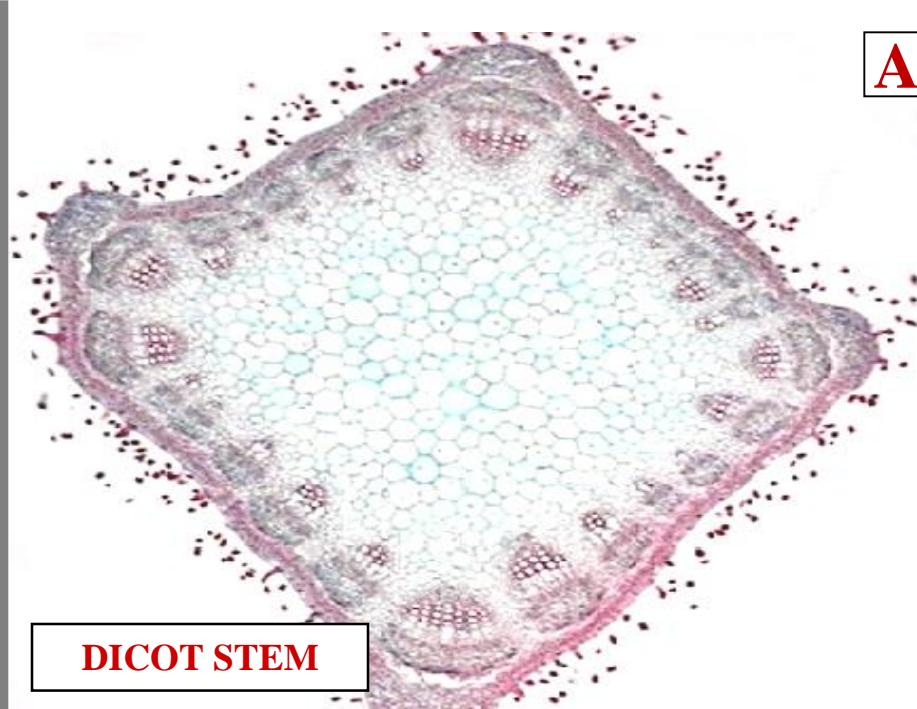
P



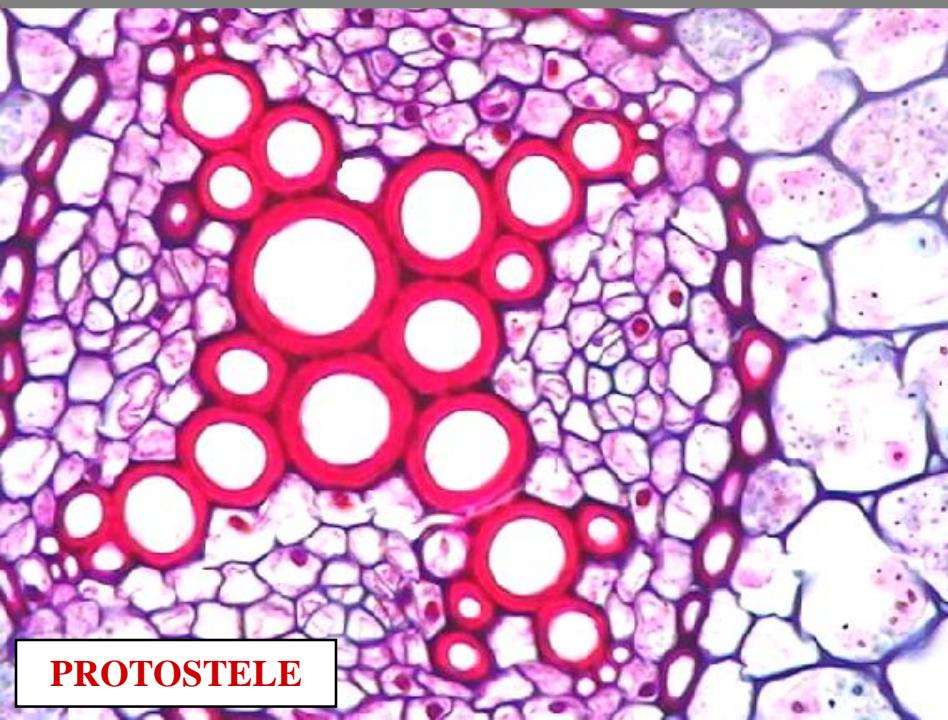
A



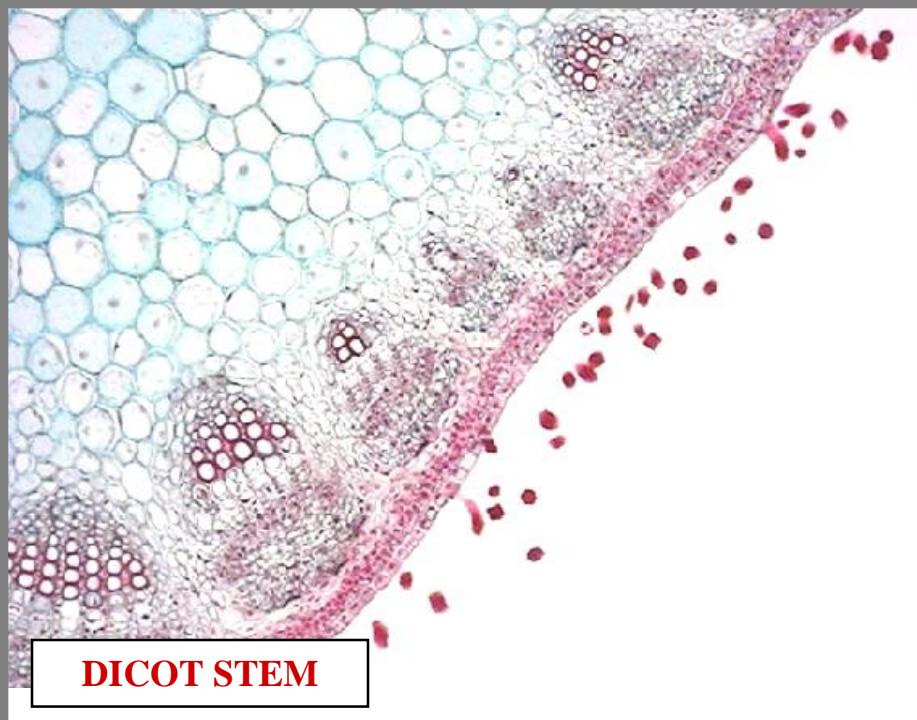
PROTOSTELE



DICOT STEM

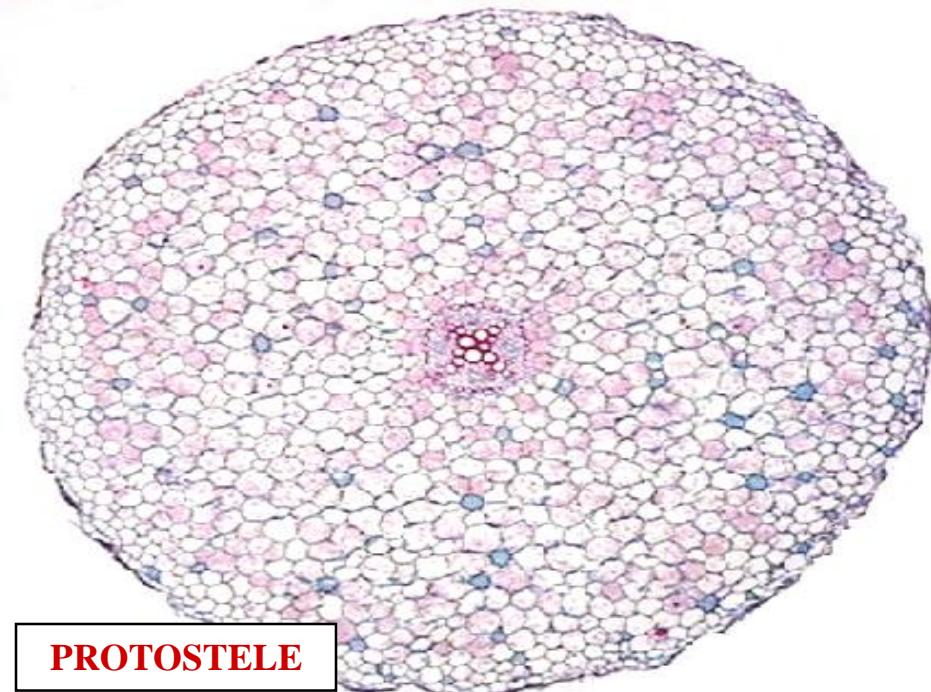


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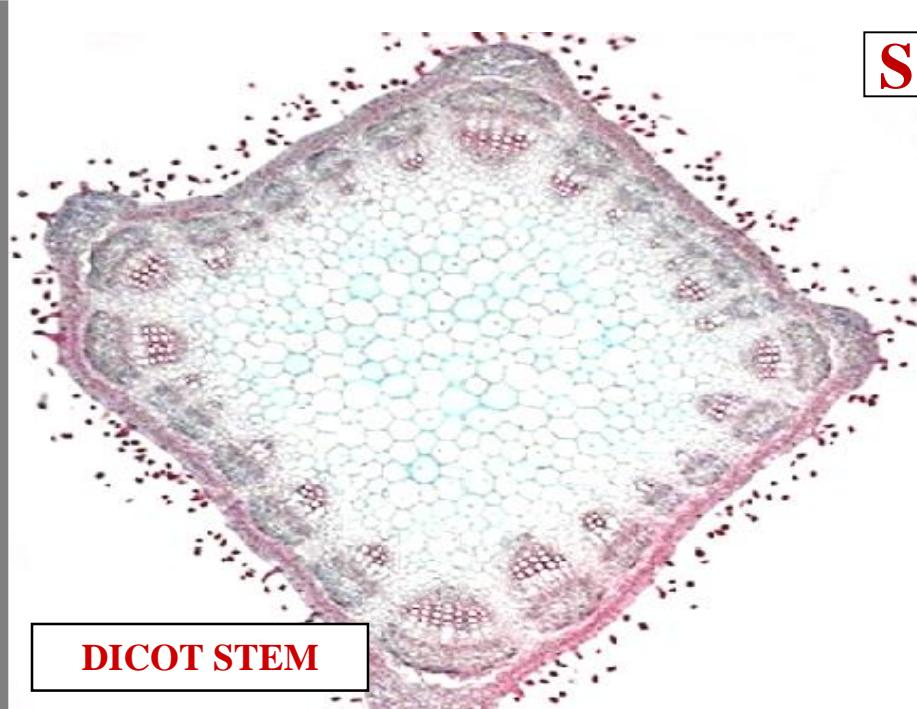


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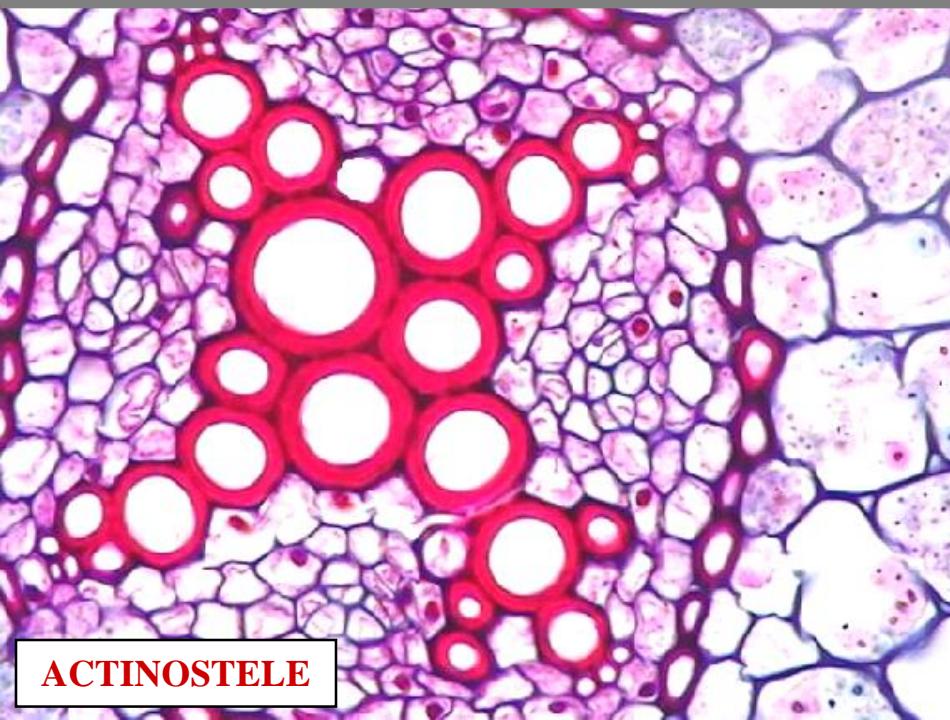
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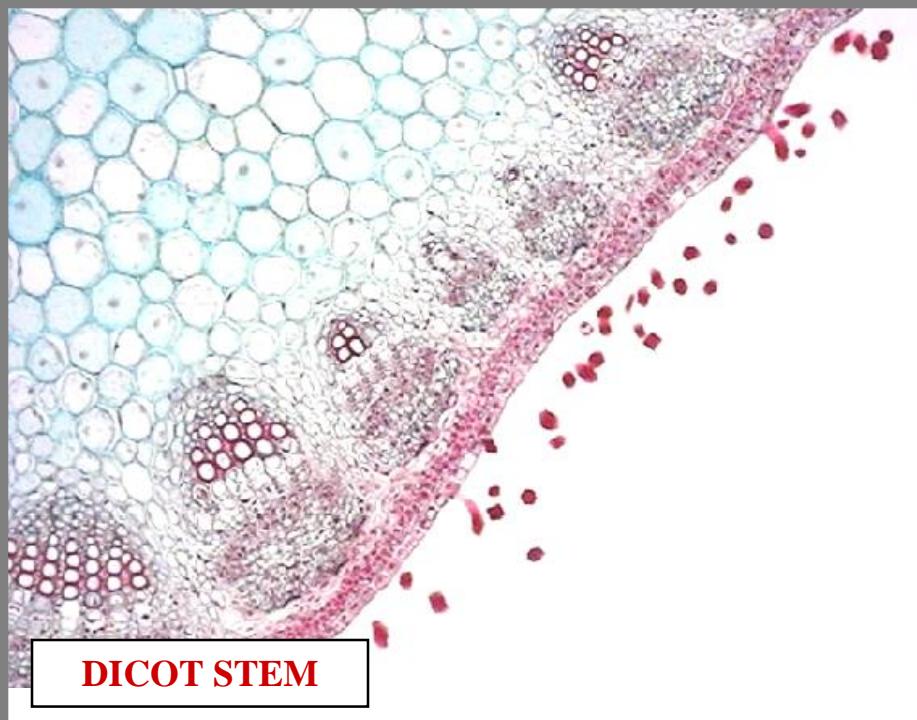
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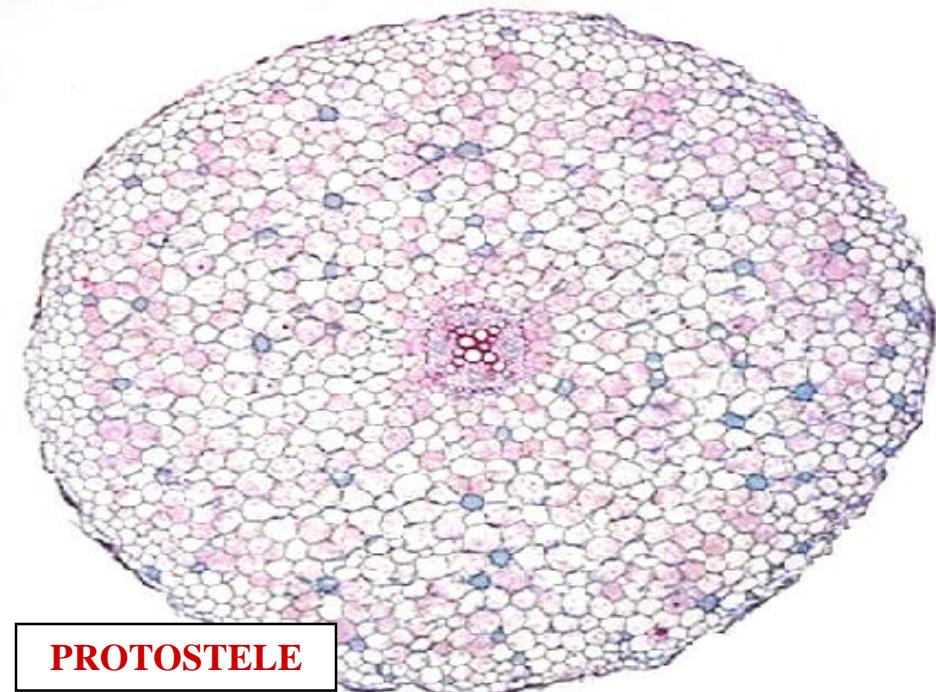


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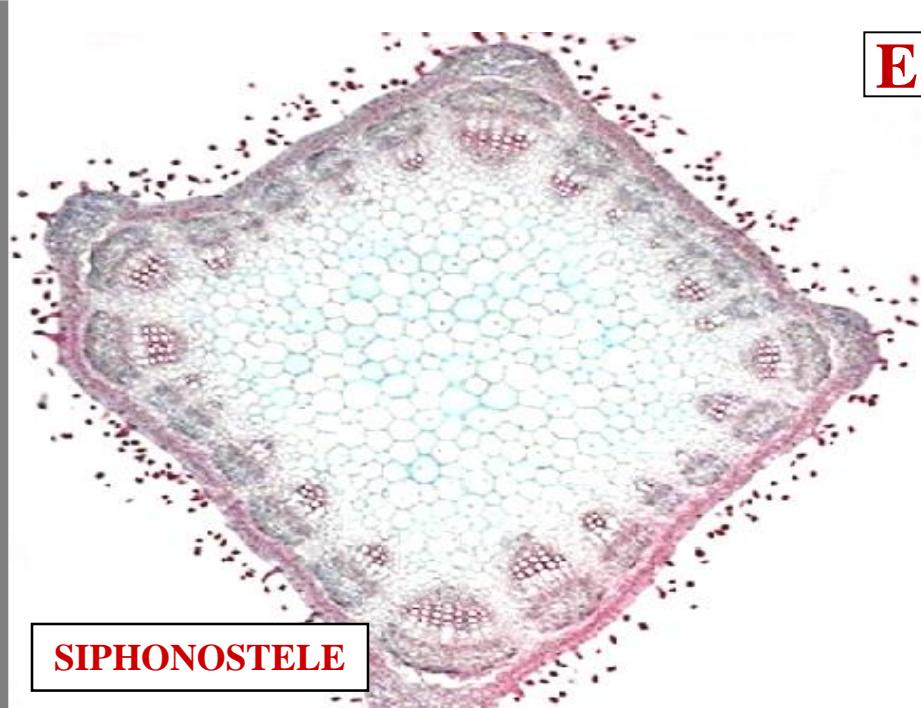


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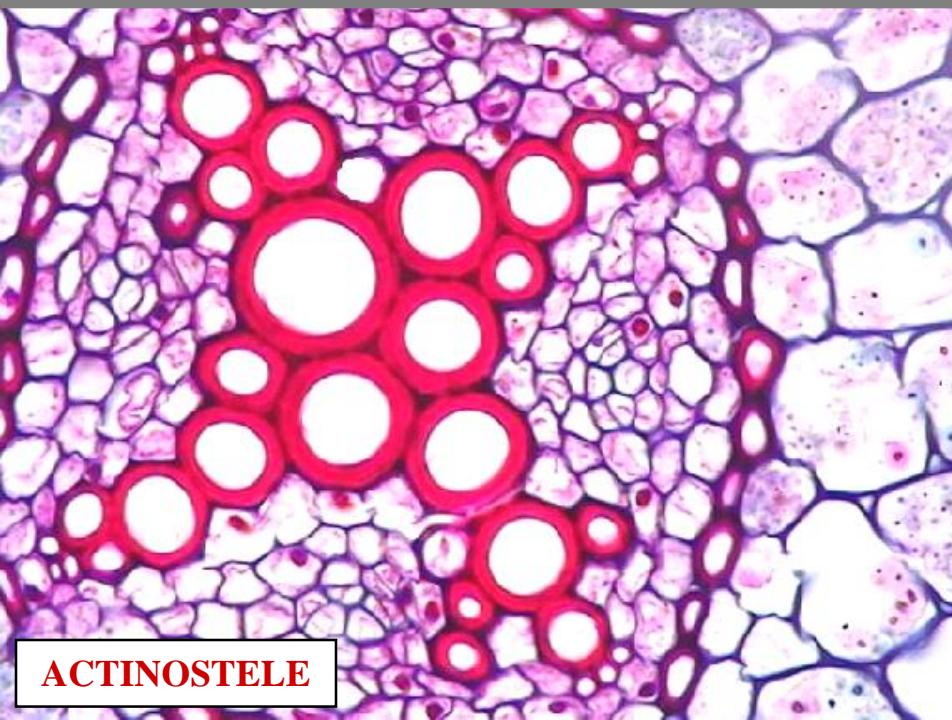
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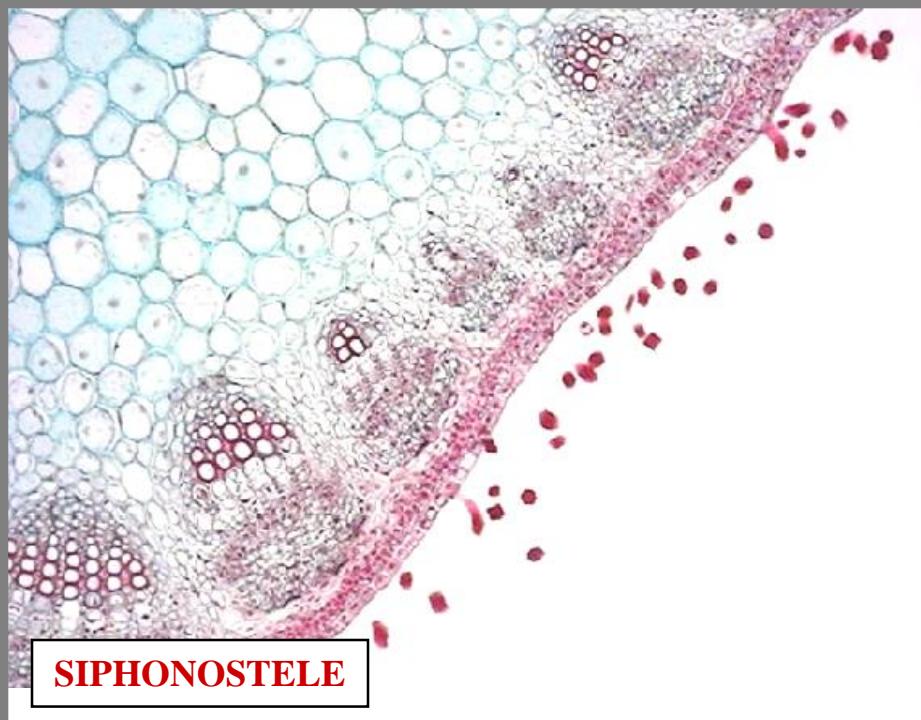
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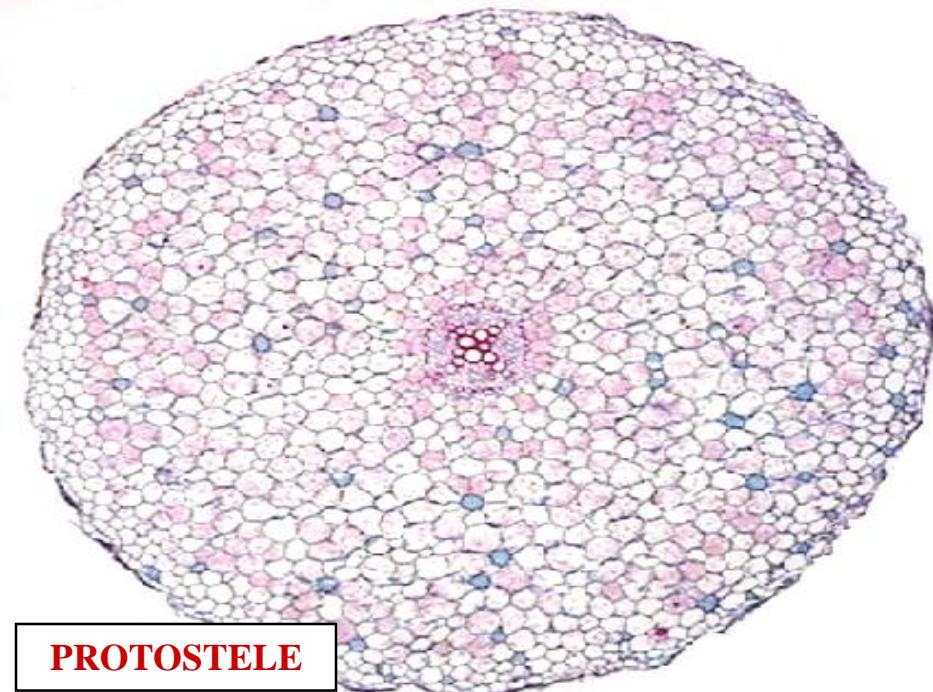
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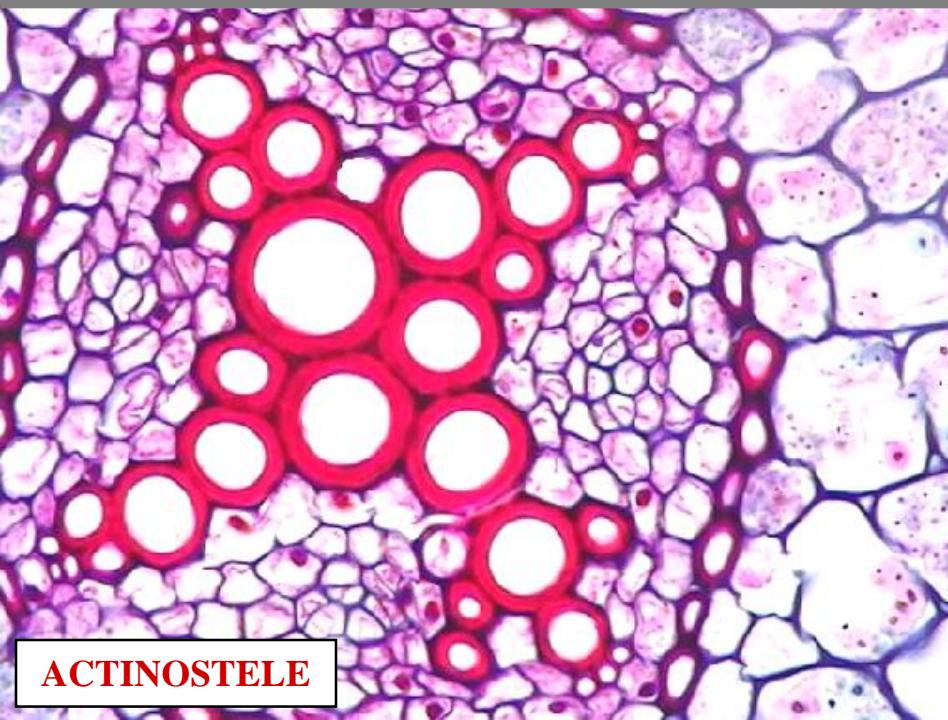
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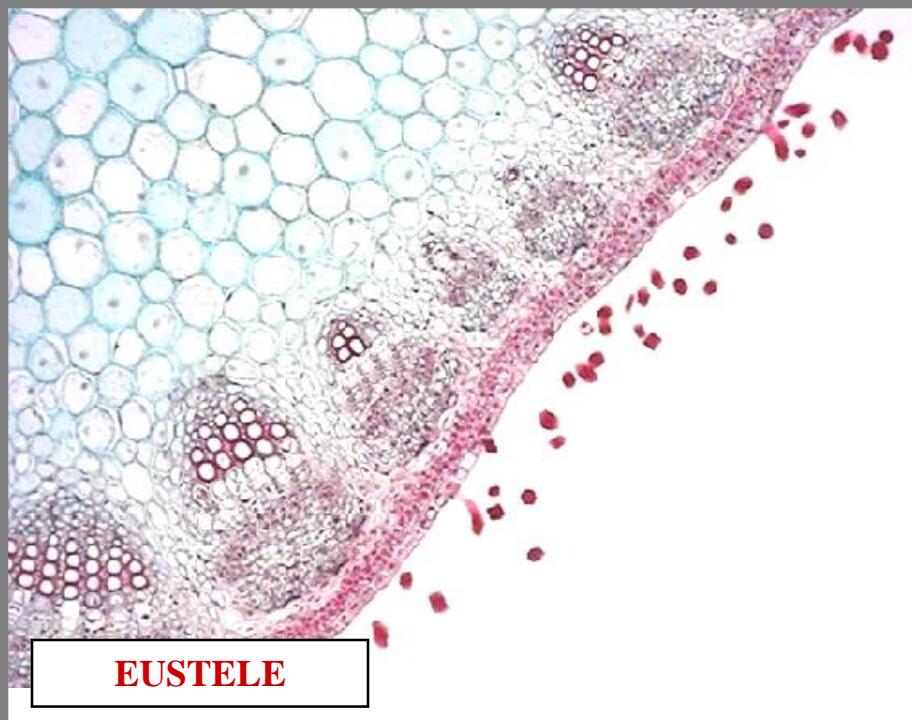
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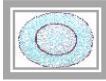
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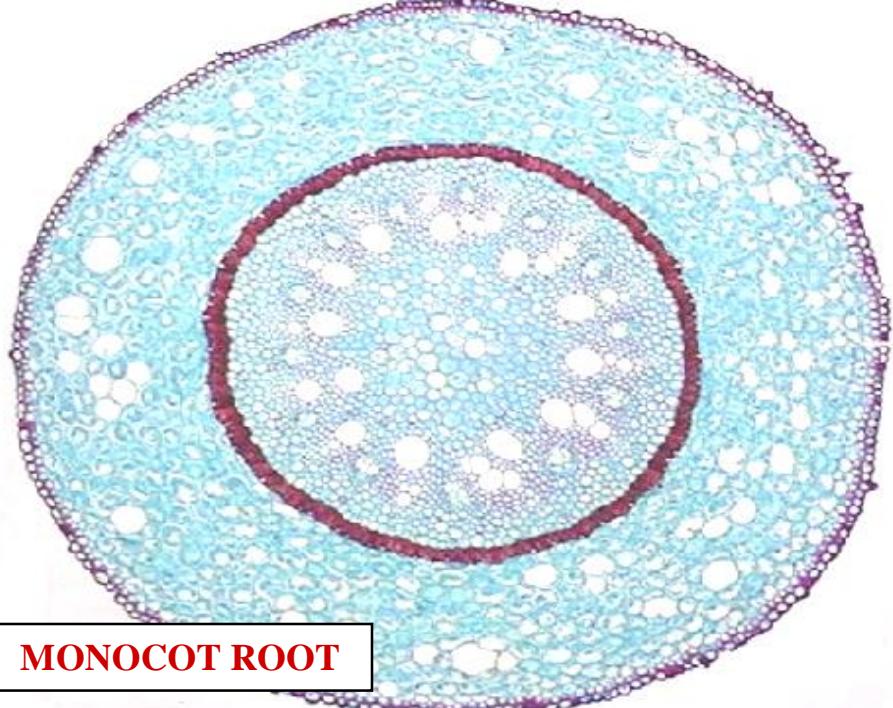
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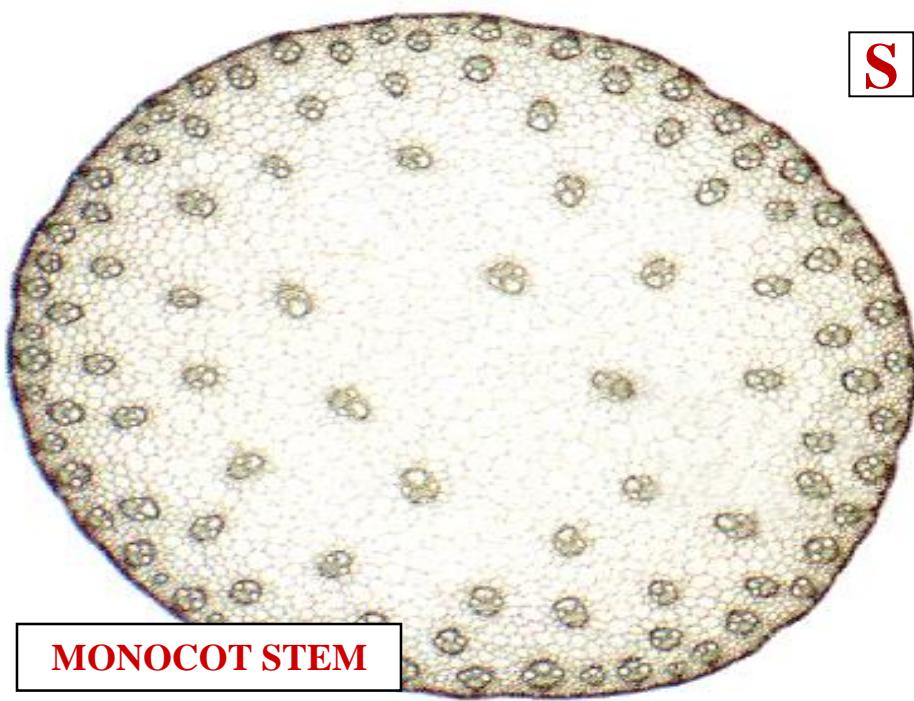
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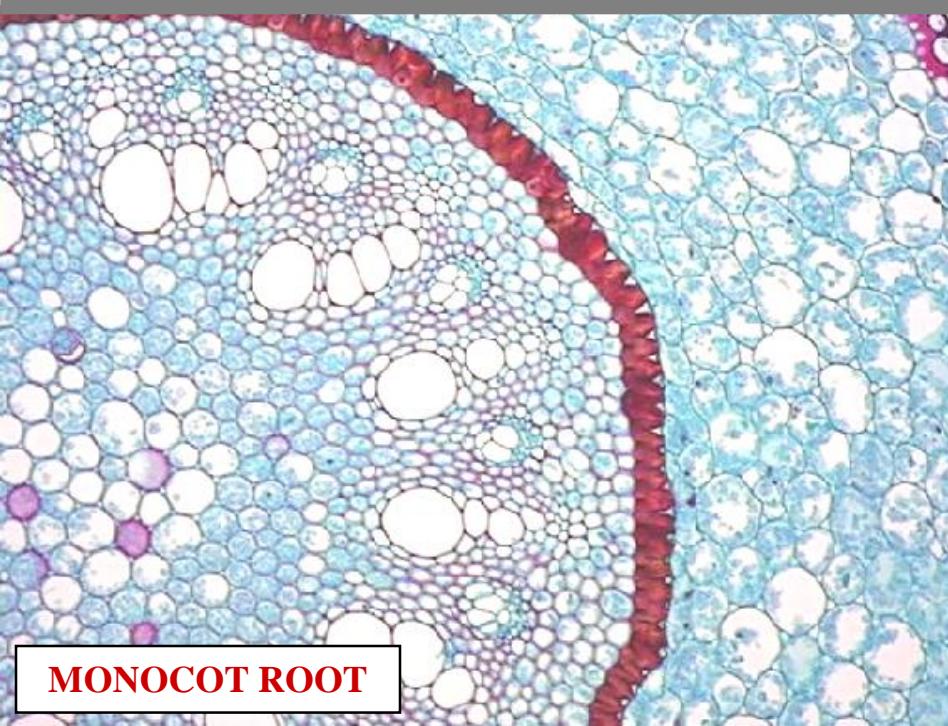
STELE SUMMARY MONOCOTS



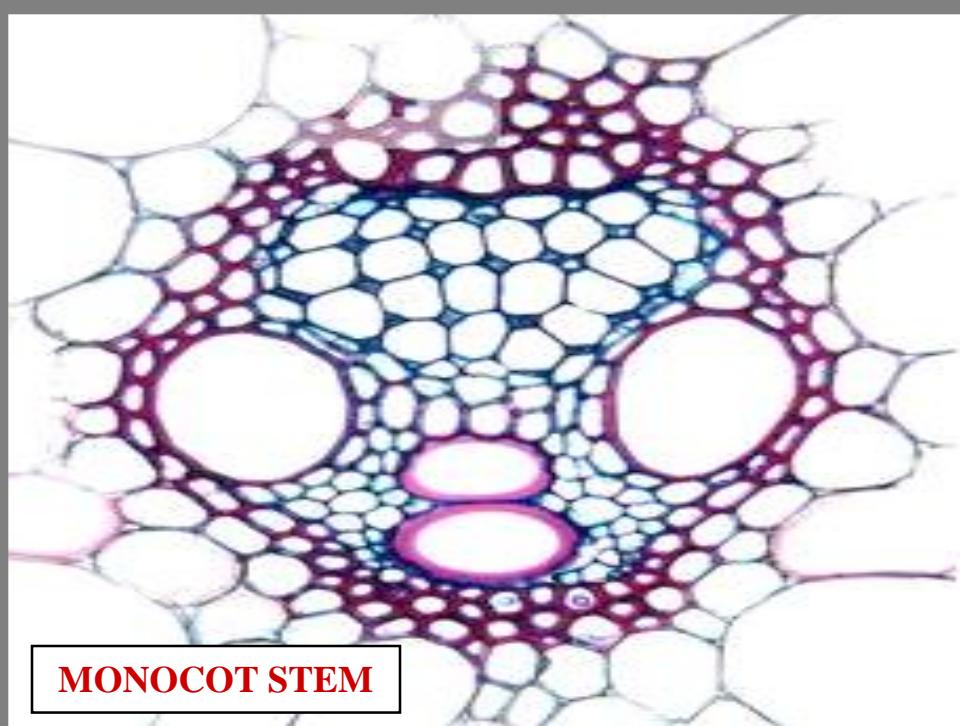
MONOCOT ROOT



MONOCOT STEM



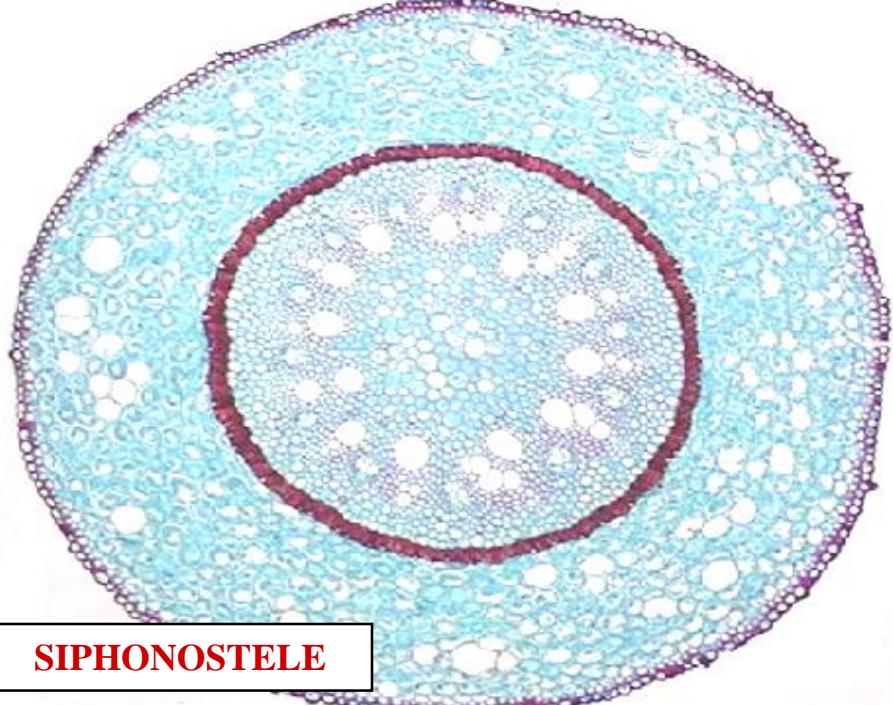
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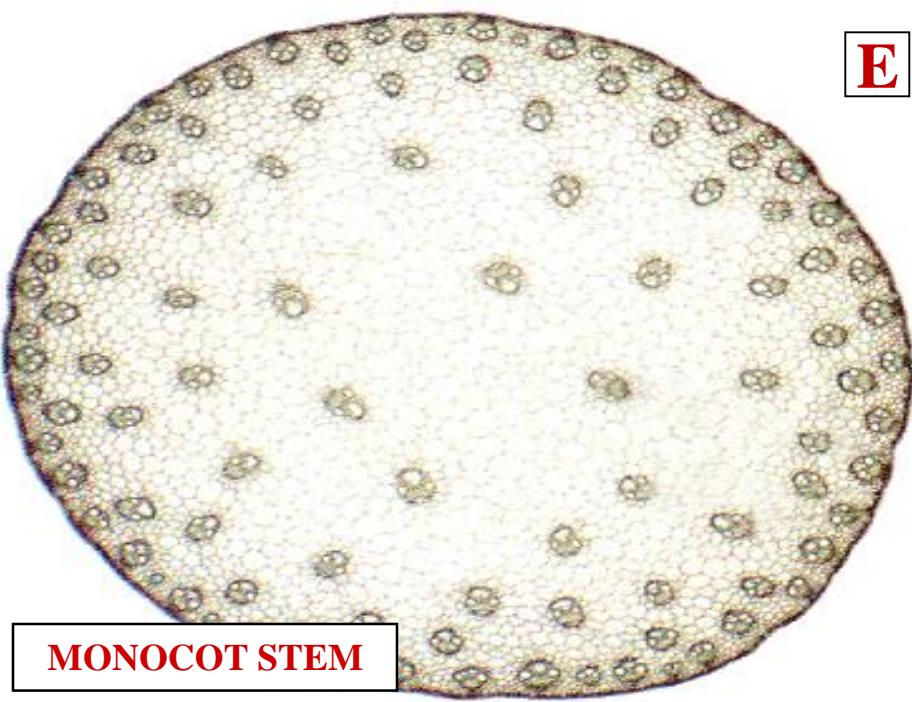
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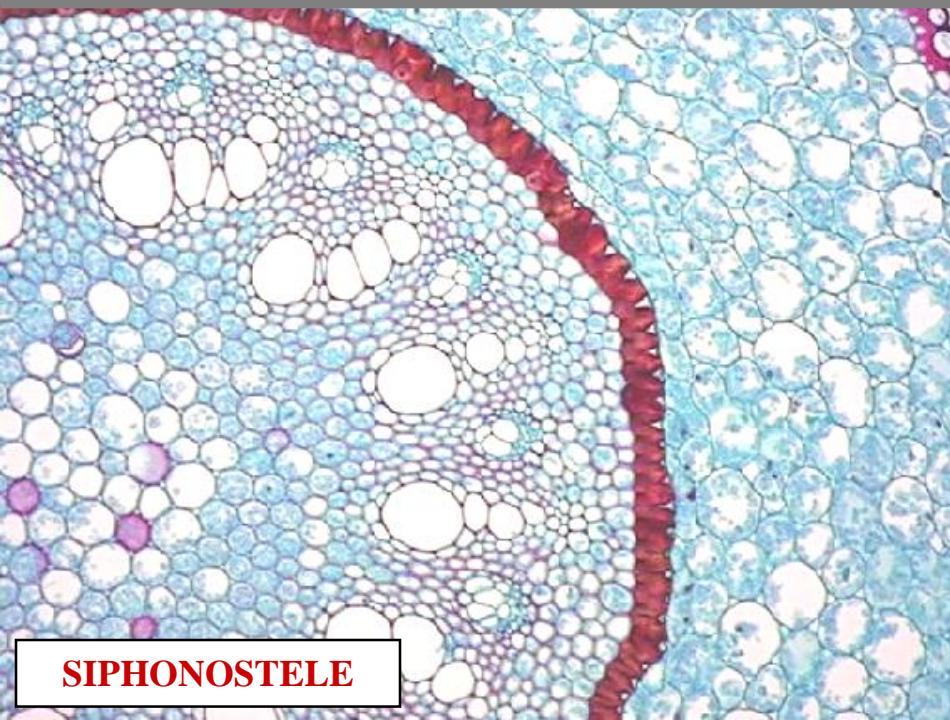
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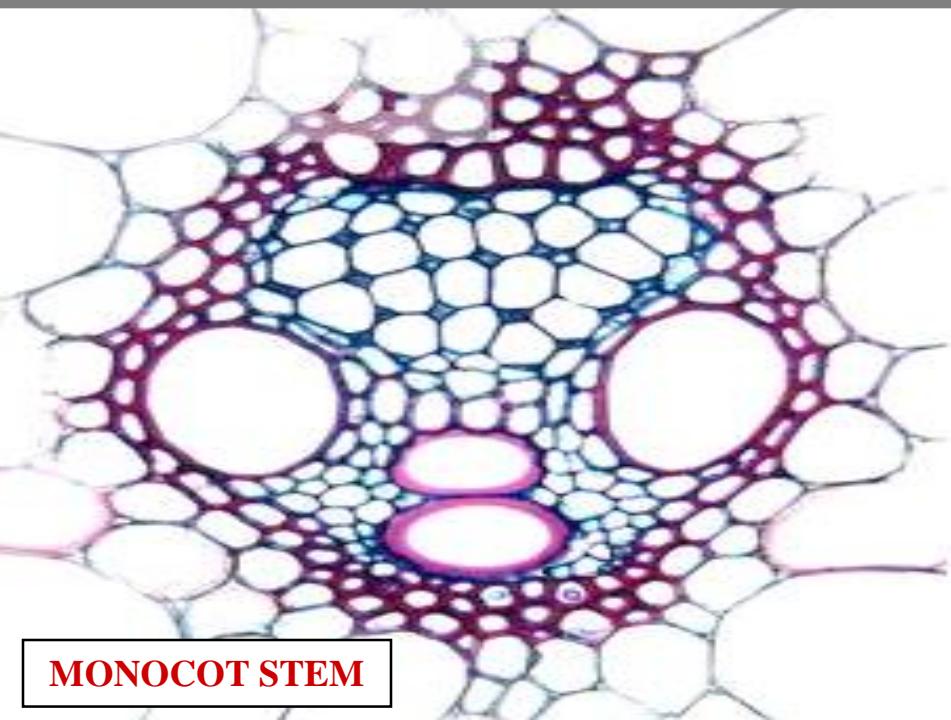
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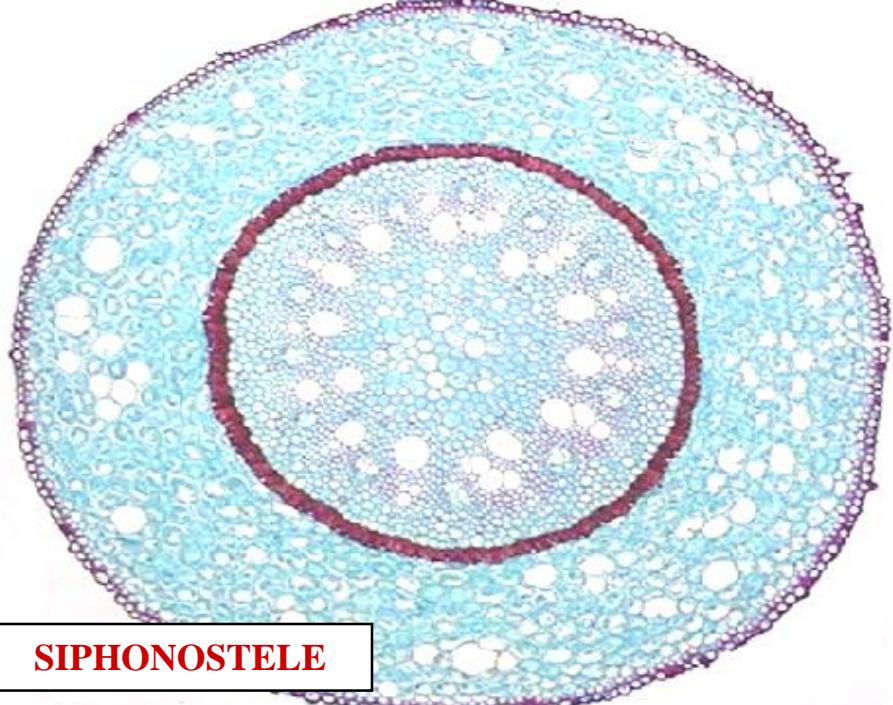


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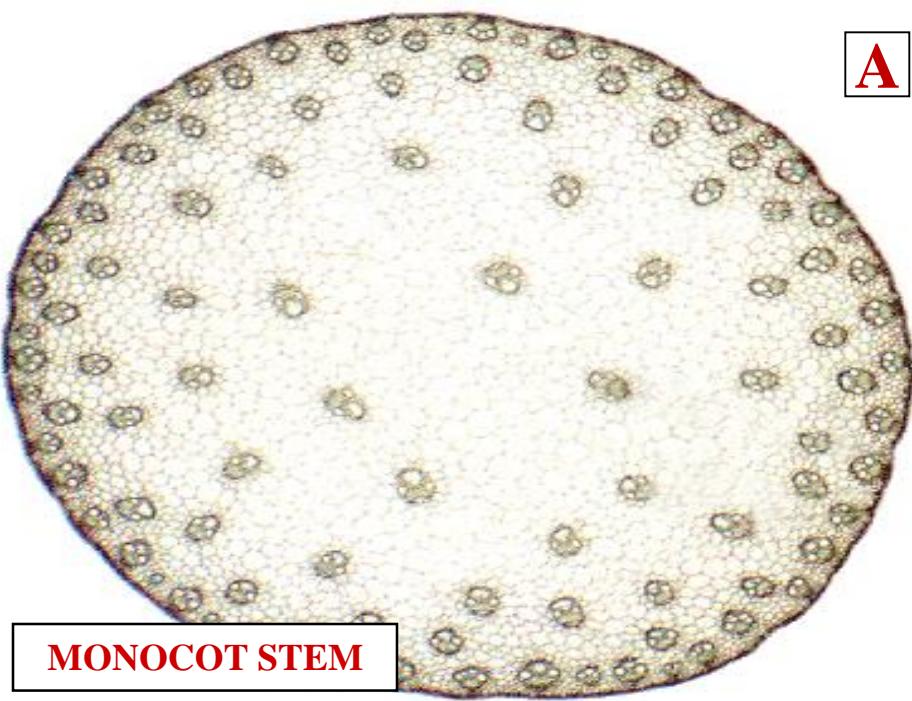


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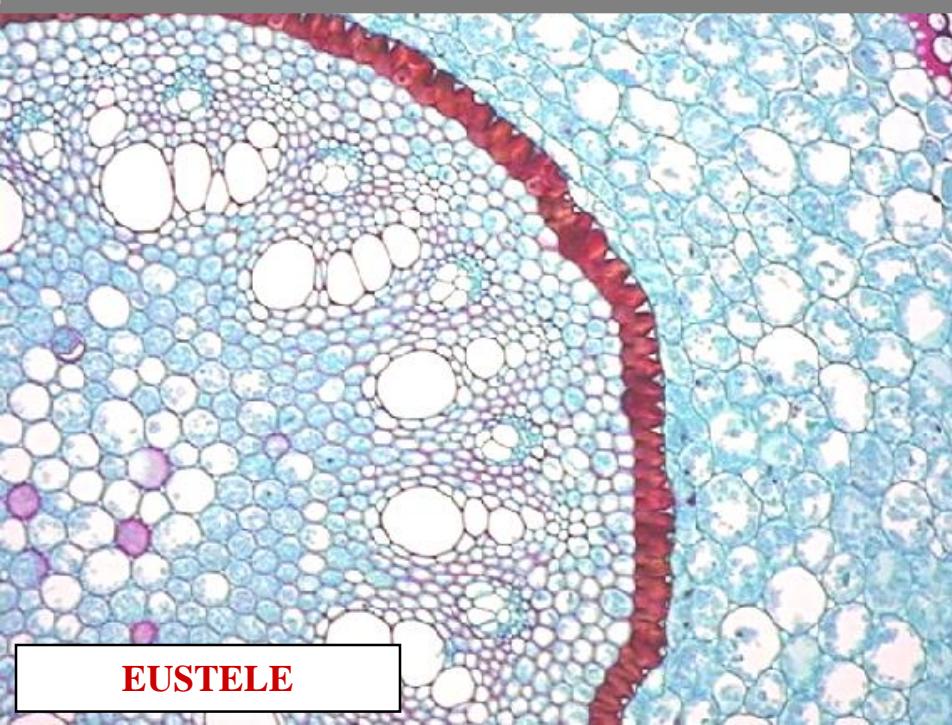
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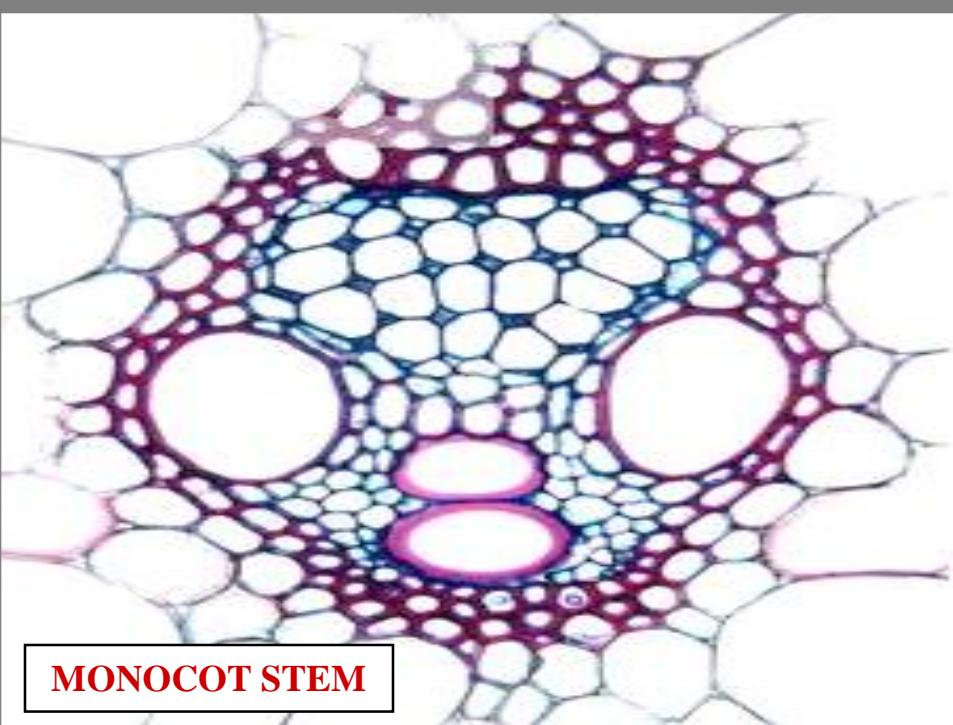
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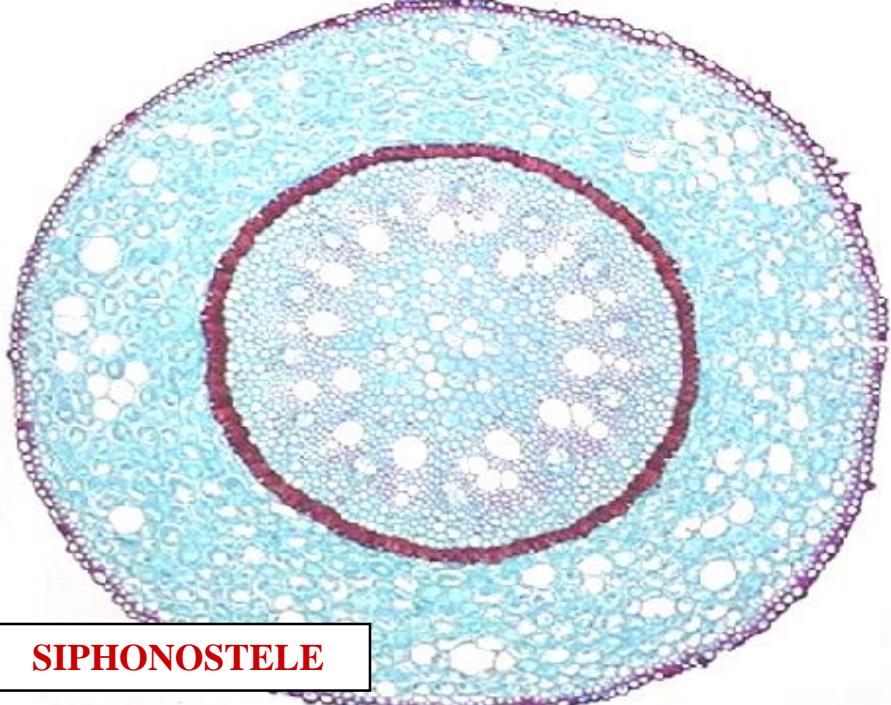
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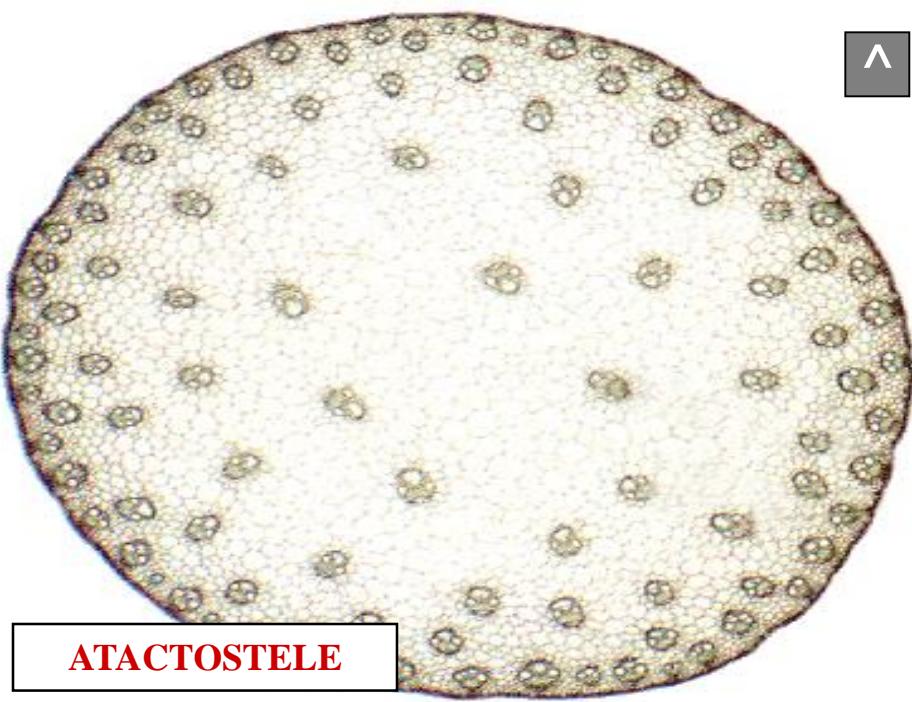
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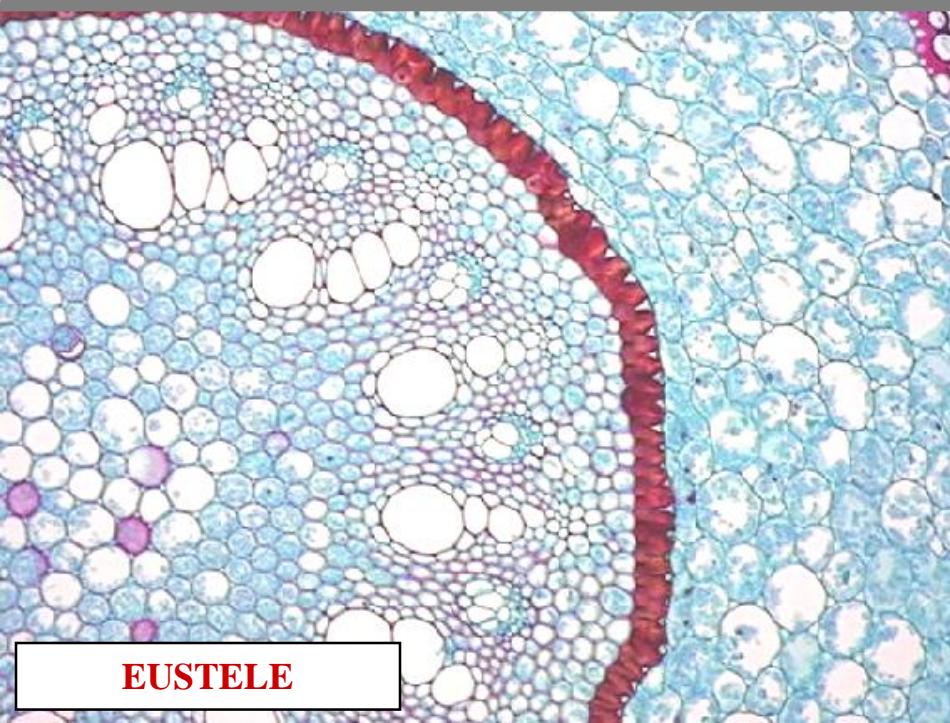
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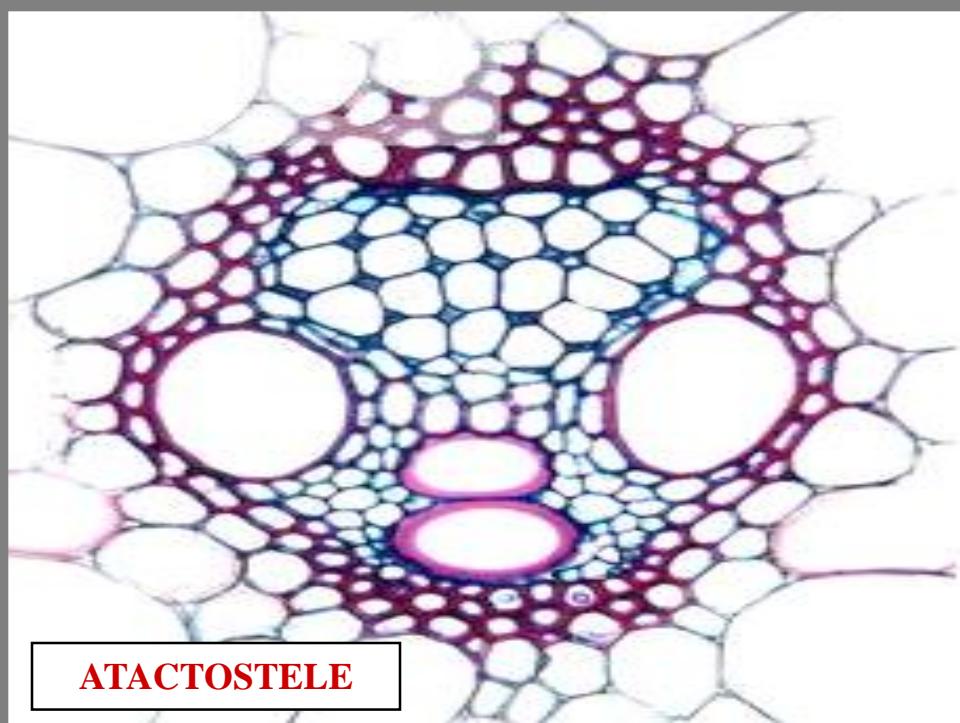
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ATACTOSTELE



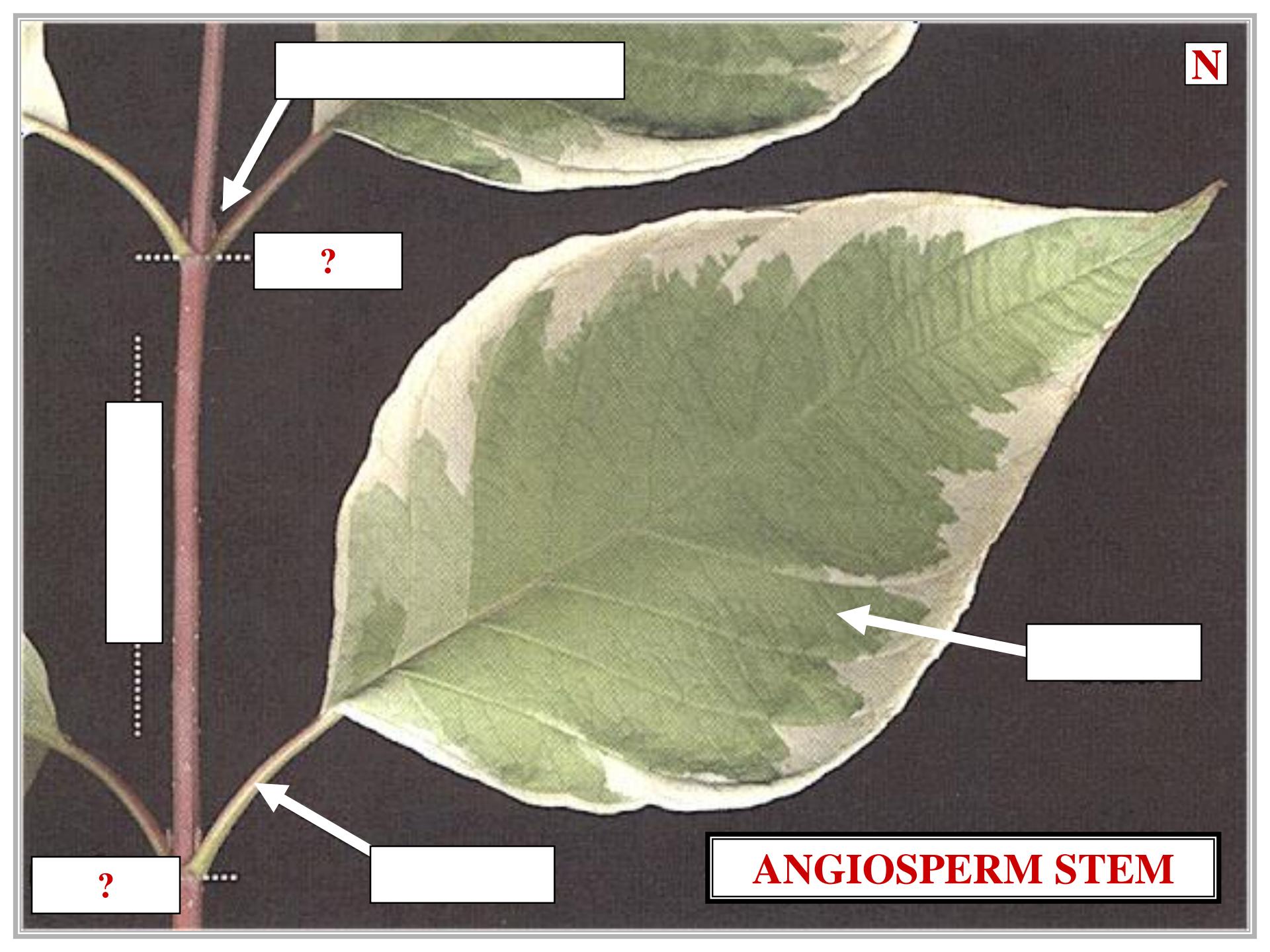
EUSTELE



ATACTOSTELE



STEM MORPHOLOGY



N

ANGIOSPERM STEM

?

NODE

NODE

ANGIOSPERM STEM

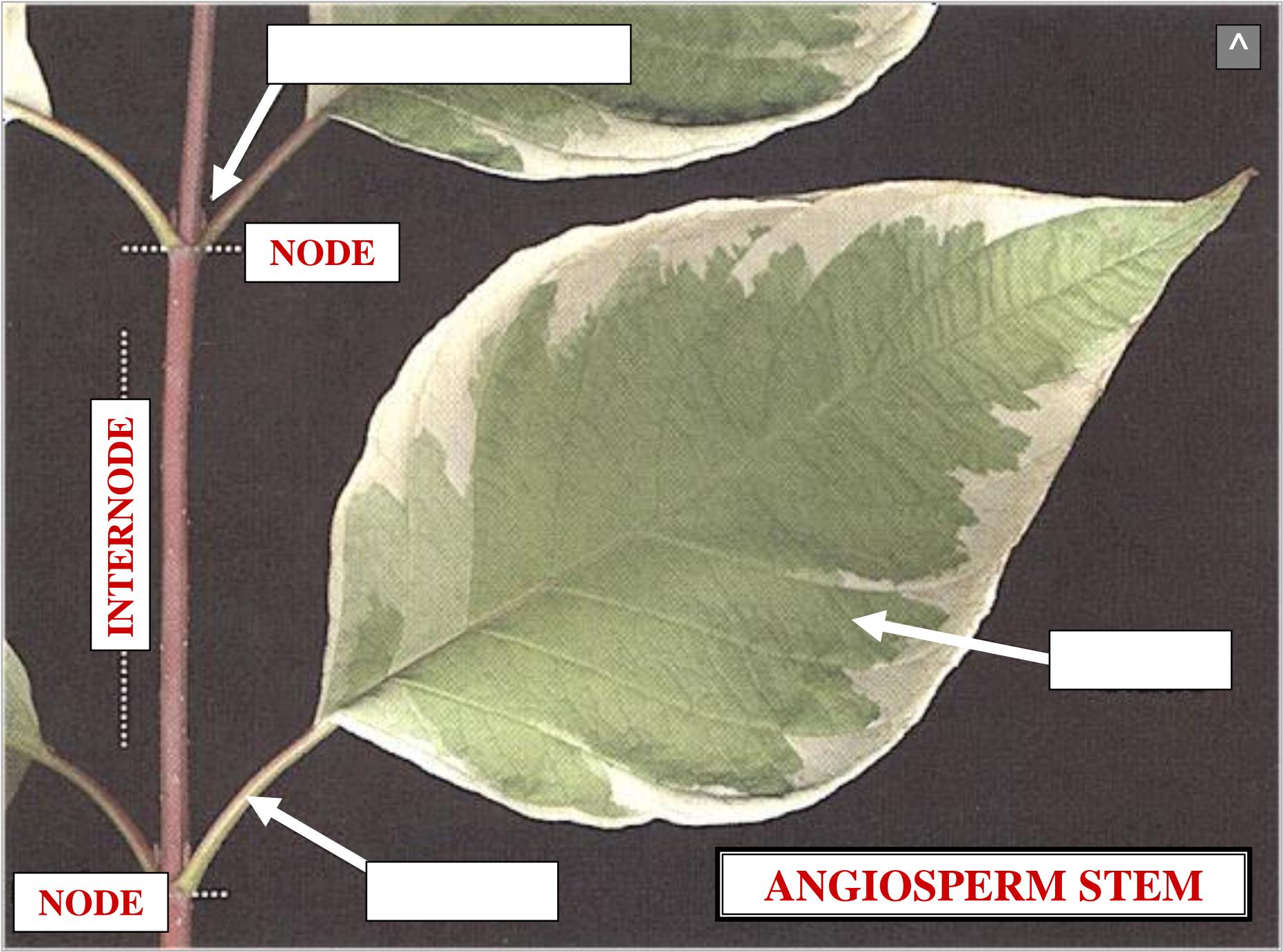
I

NODE

?

NODE

ANGIOSPERM STEM

A close-up photograph of a plant stem, likely from an angiosperm, showing several large, ovate leaves with serrated edges. The stem is a reddish-brown color. White arrows point to specific points on the stem: one arrow points to a node where a leaf is attached, another arrow points to a section of the stem between nodes labeled 'INTERNODE', and a third arrow points to the stem itself labeled 'ANGIOSPERM STEM'. Red text labels with black outlines identify these features. A small white box with a black outline and an upward-pointing arrow is located in the top right corner.

^

NODE

INTERNODE

ANGIOSPERM STEM

?

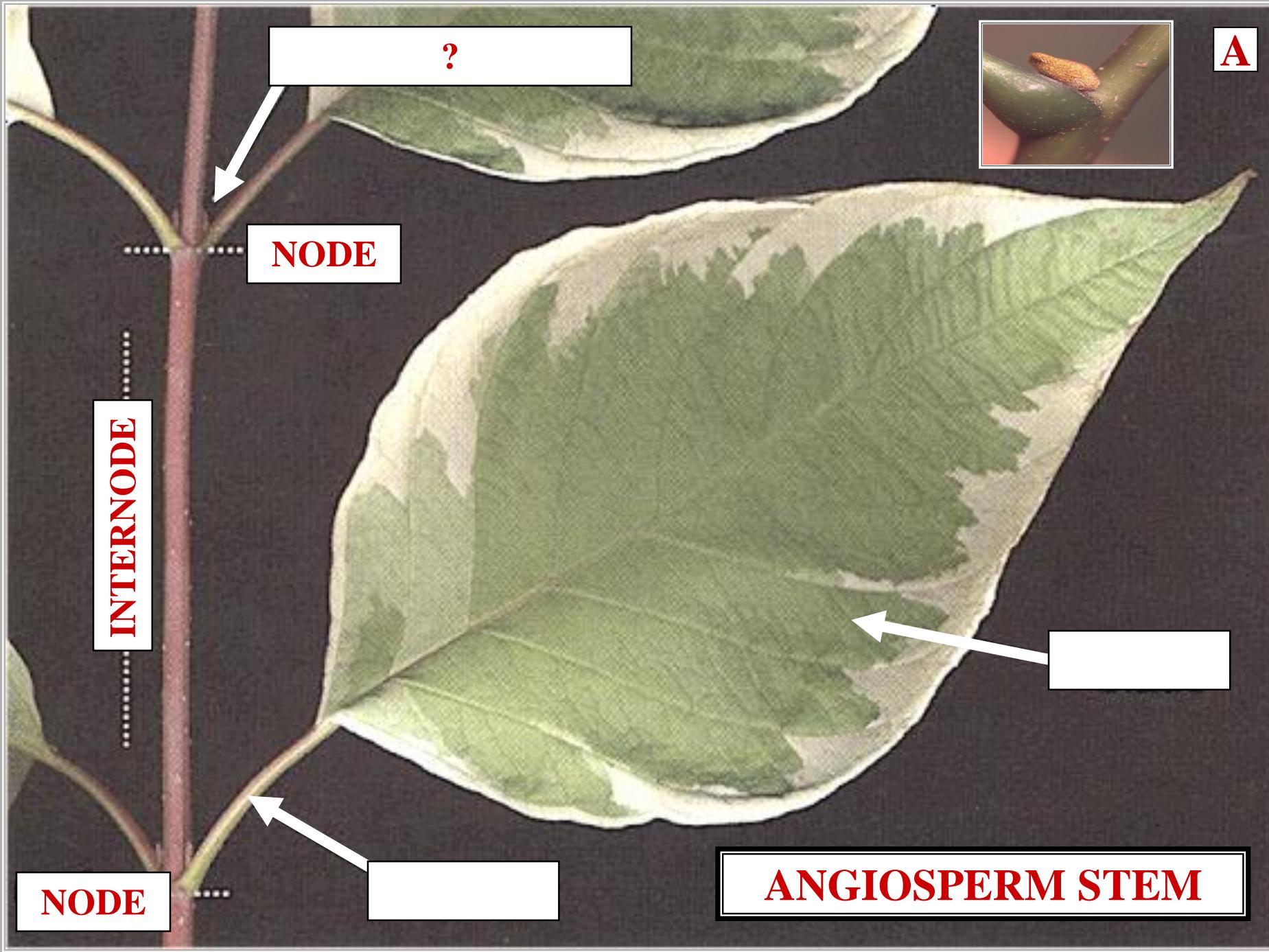
LEAF

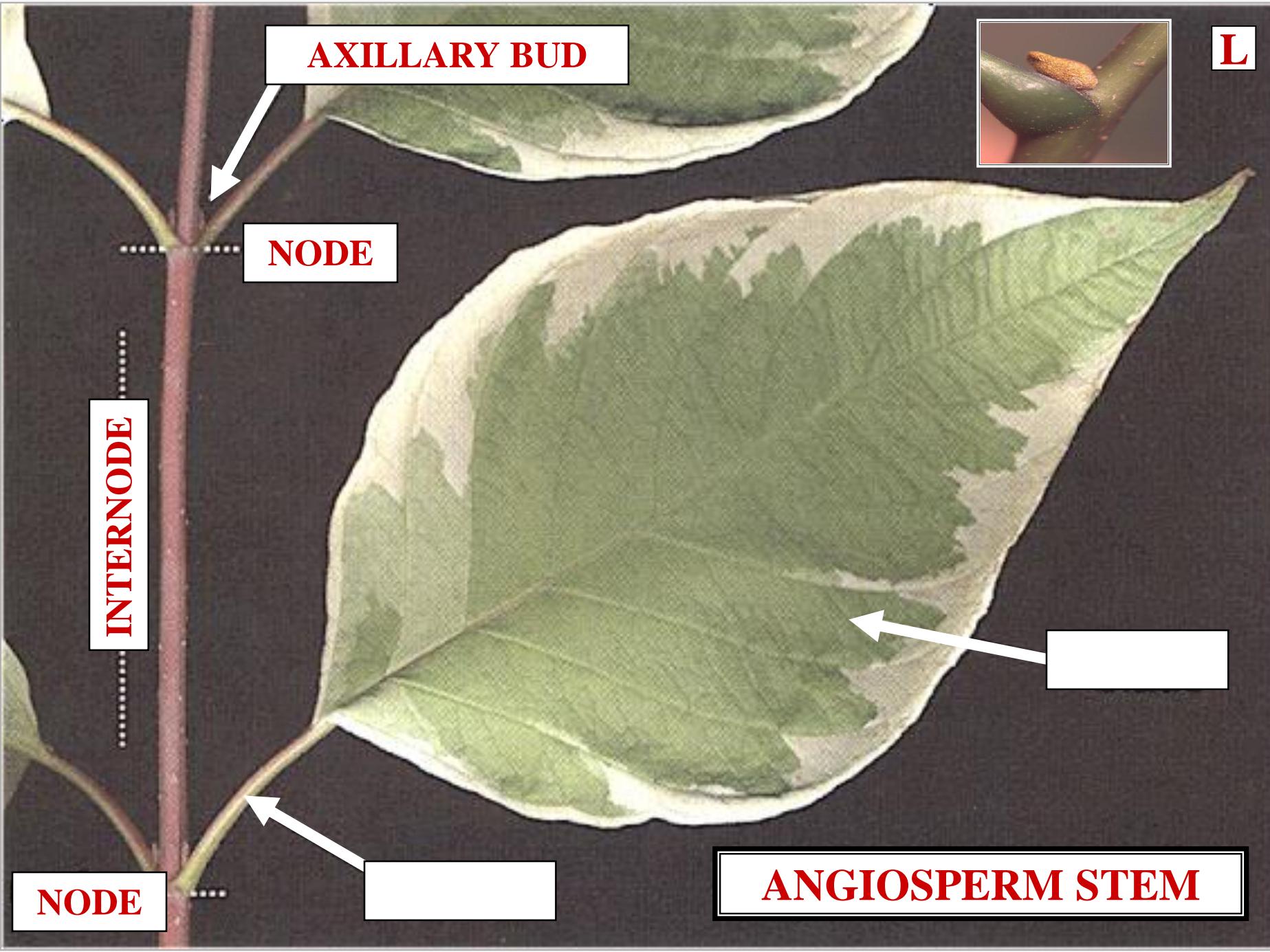


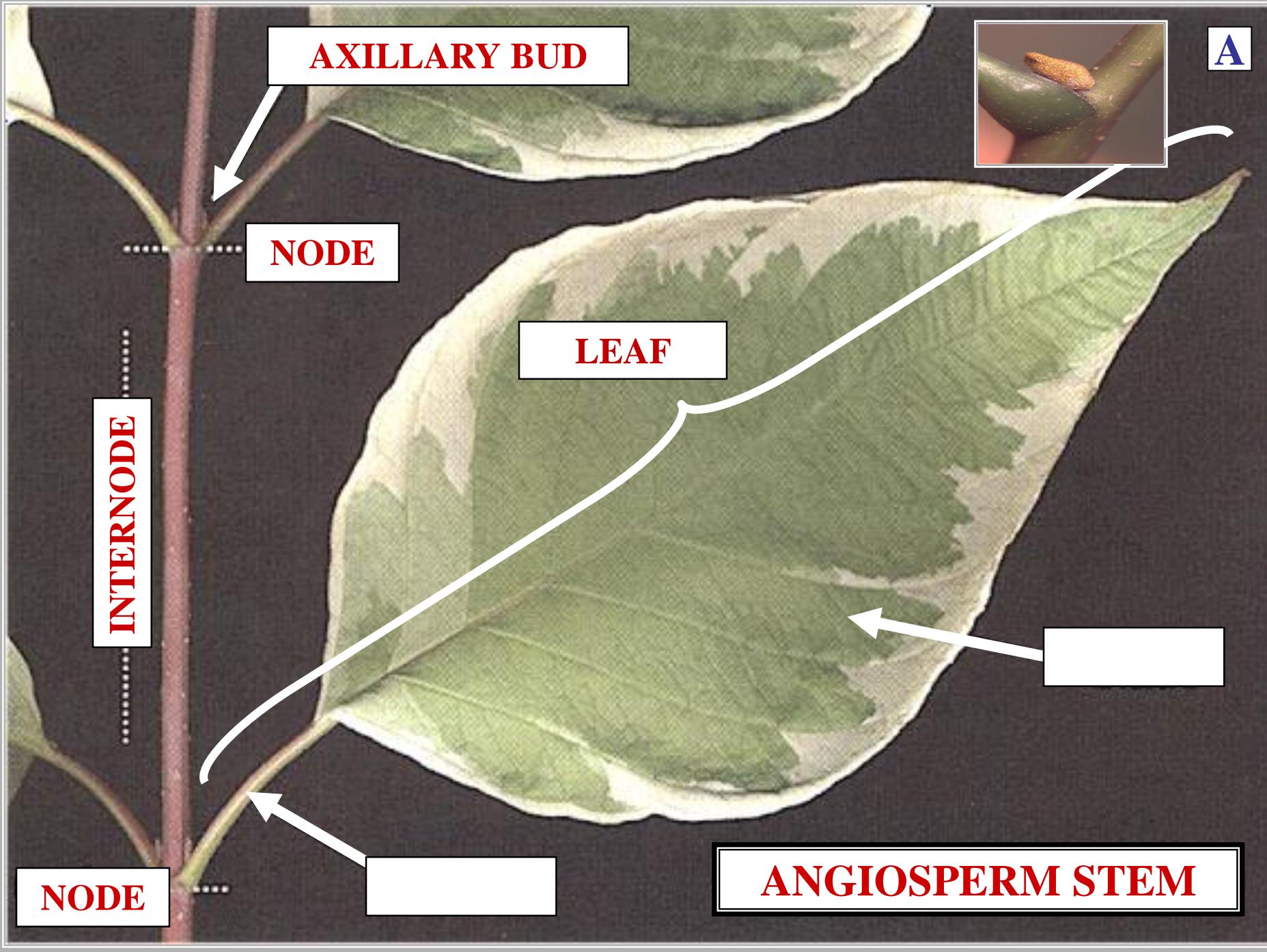
QUESTION

HOW IS A LEAF LOCATED UPON A STEM?

QUESTION







ANSWER

**LOCATE
AXILLARY BUD**

ANSWER

LEAF PHYLLOTAXY