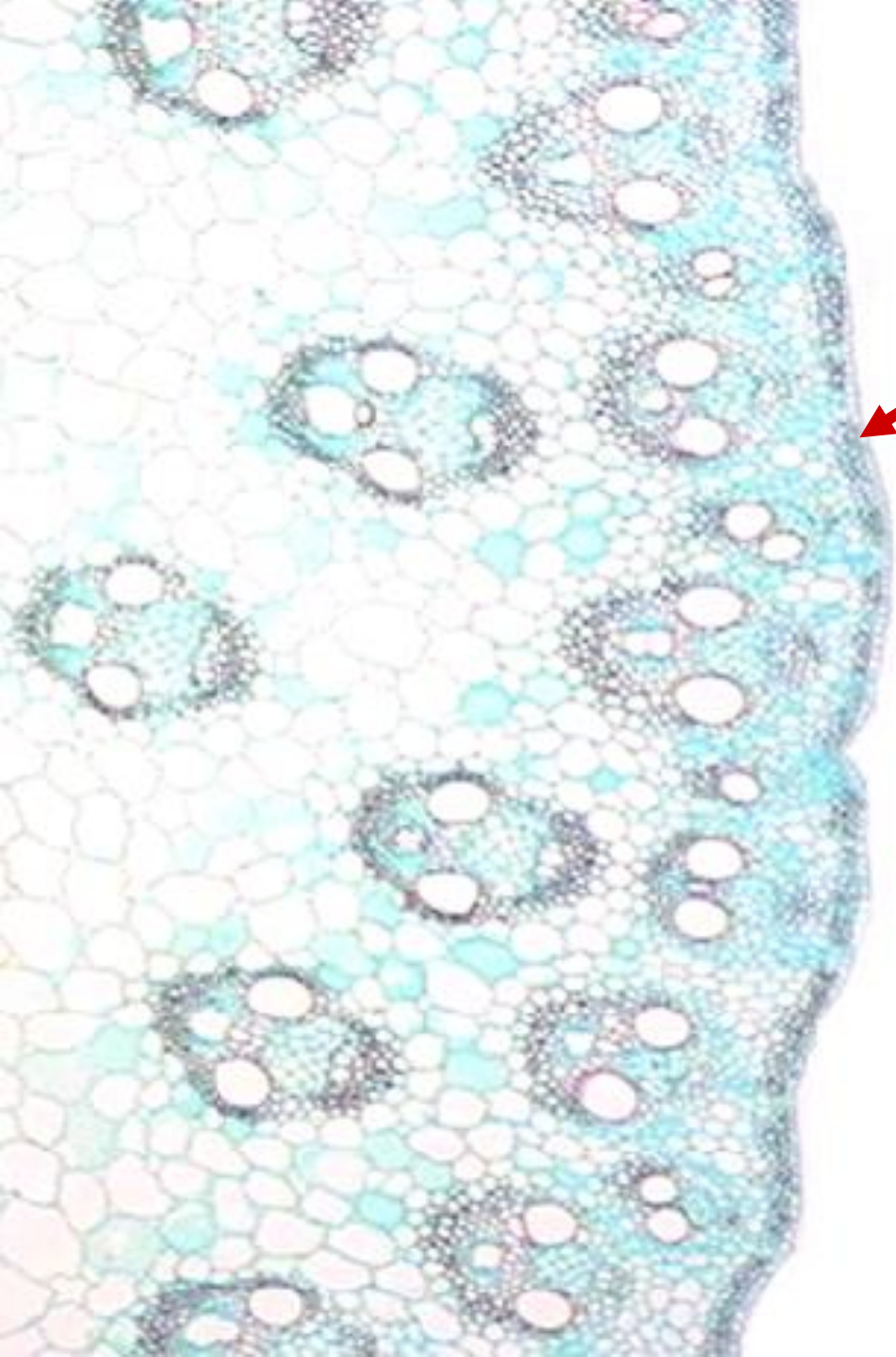


**C**

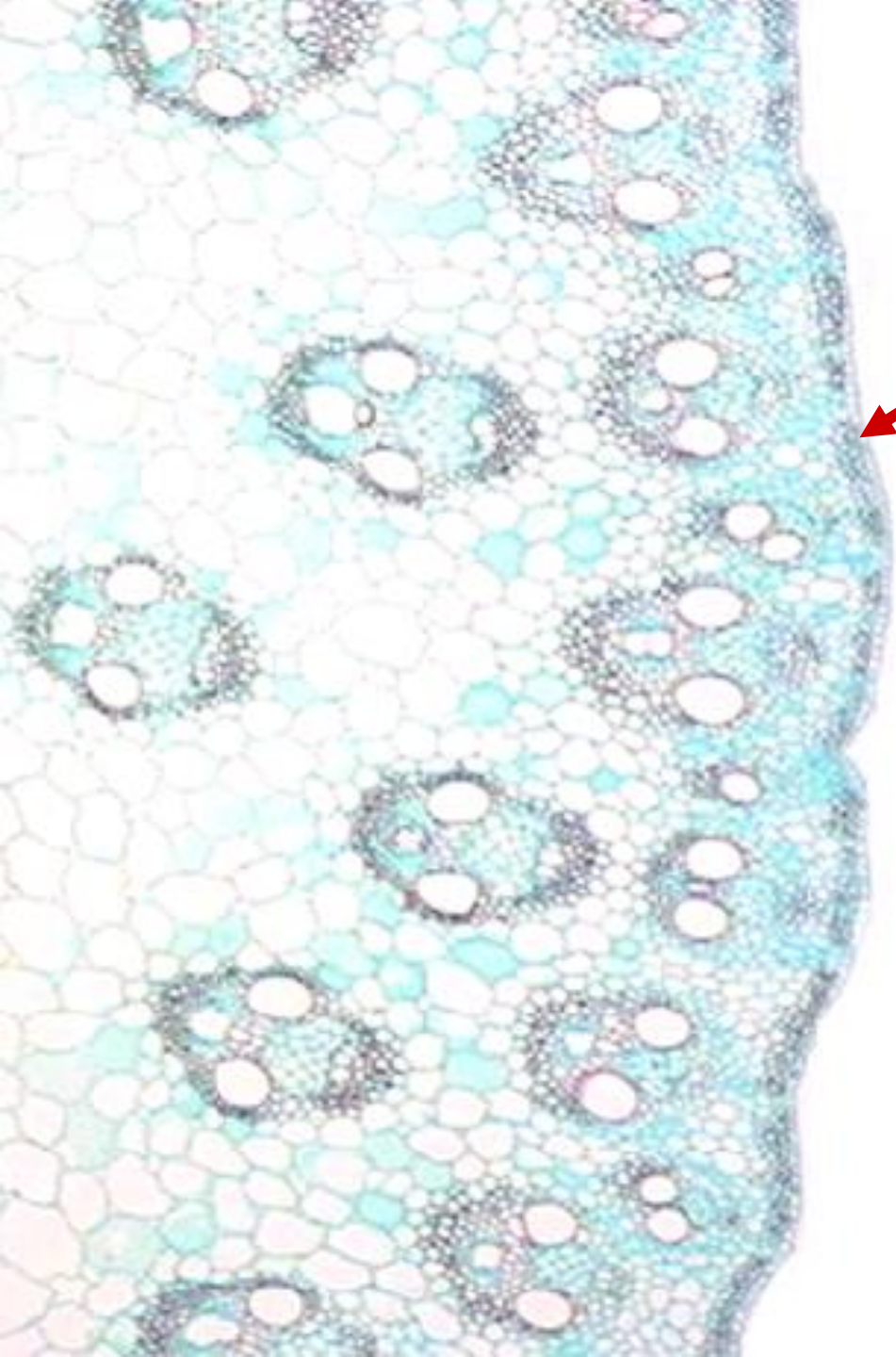


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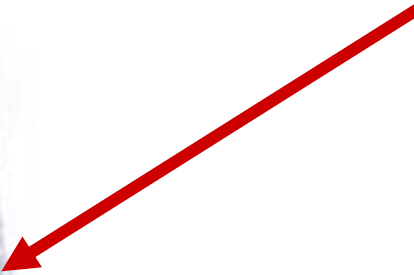


**STEM**

**C.S.**

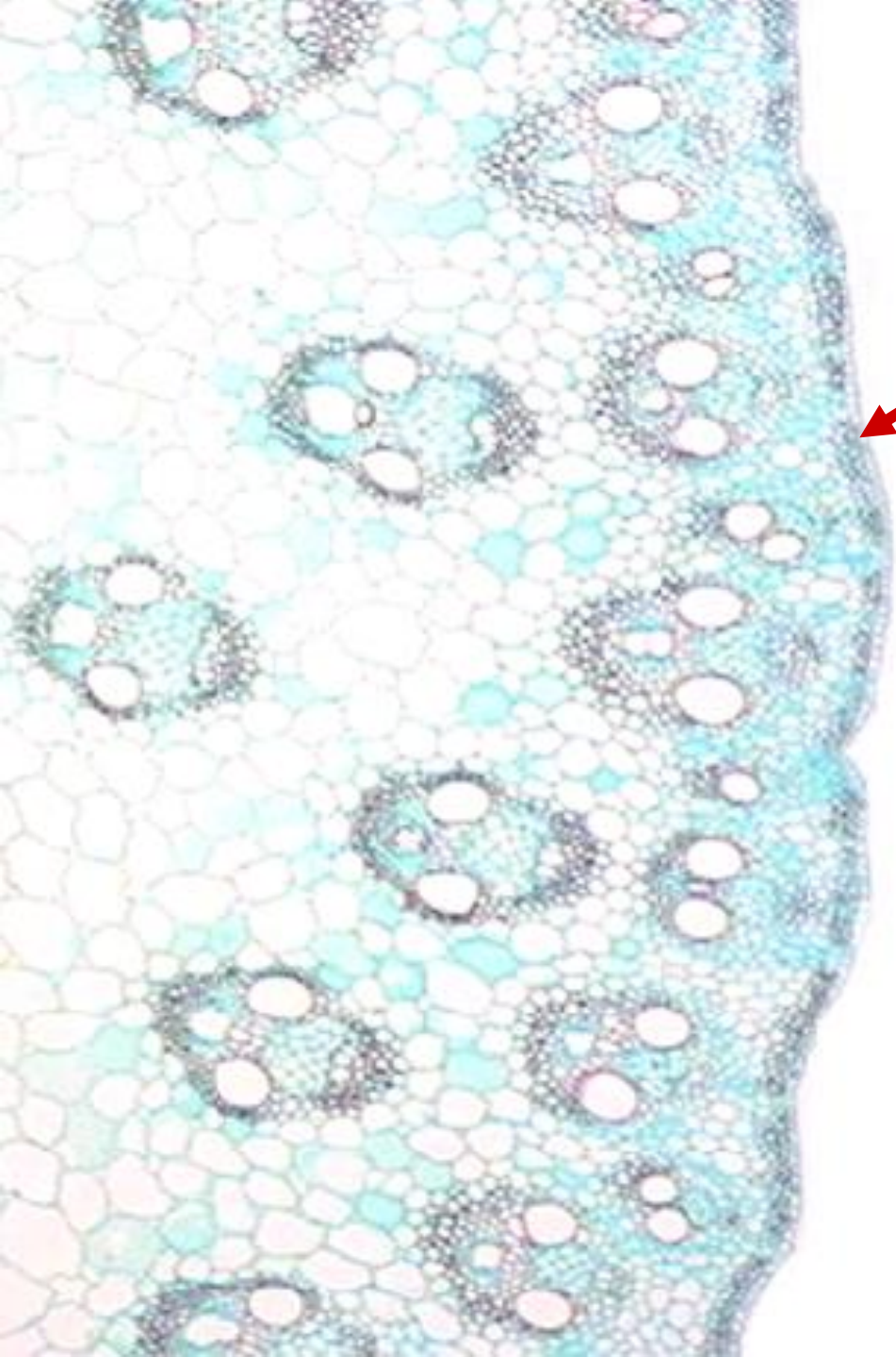


**CUTICLE**

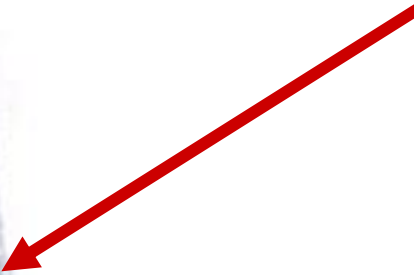


**STEM**

**C.S.**



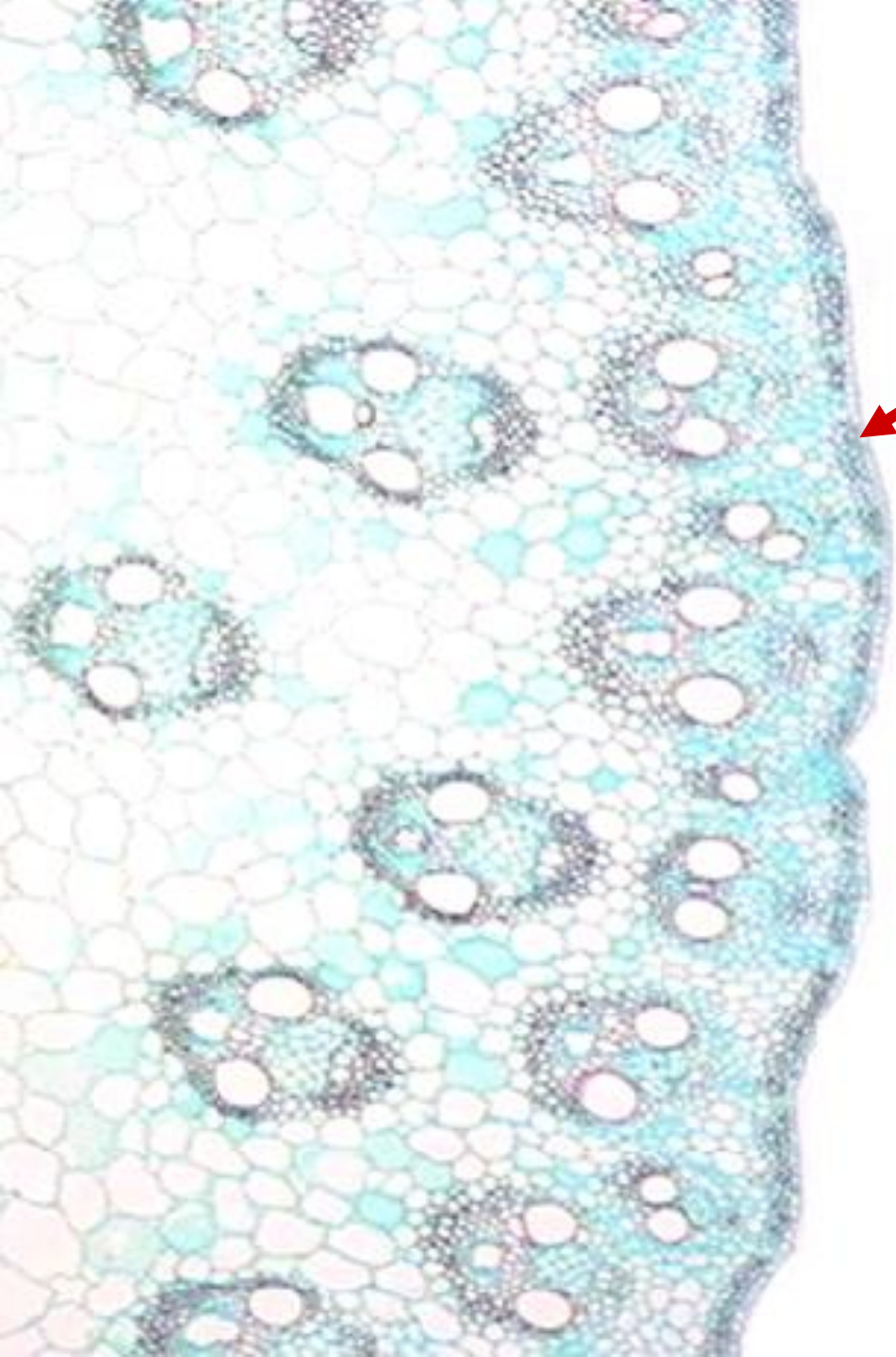
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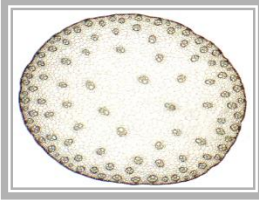
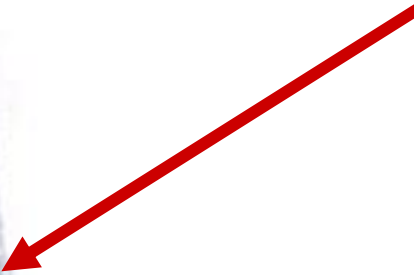
**STEM**

**C.S.**



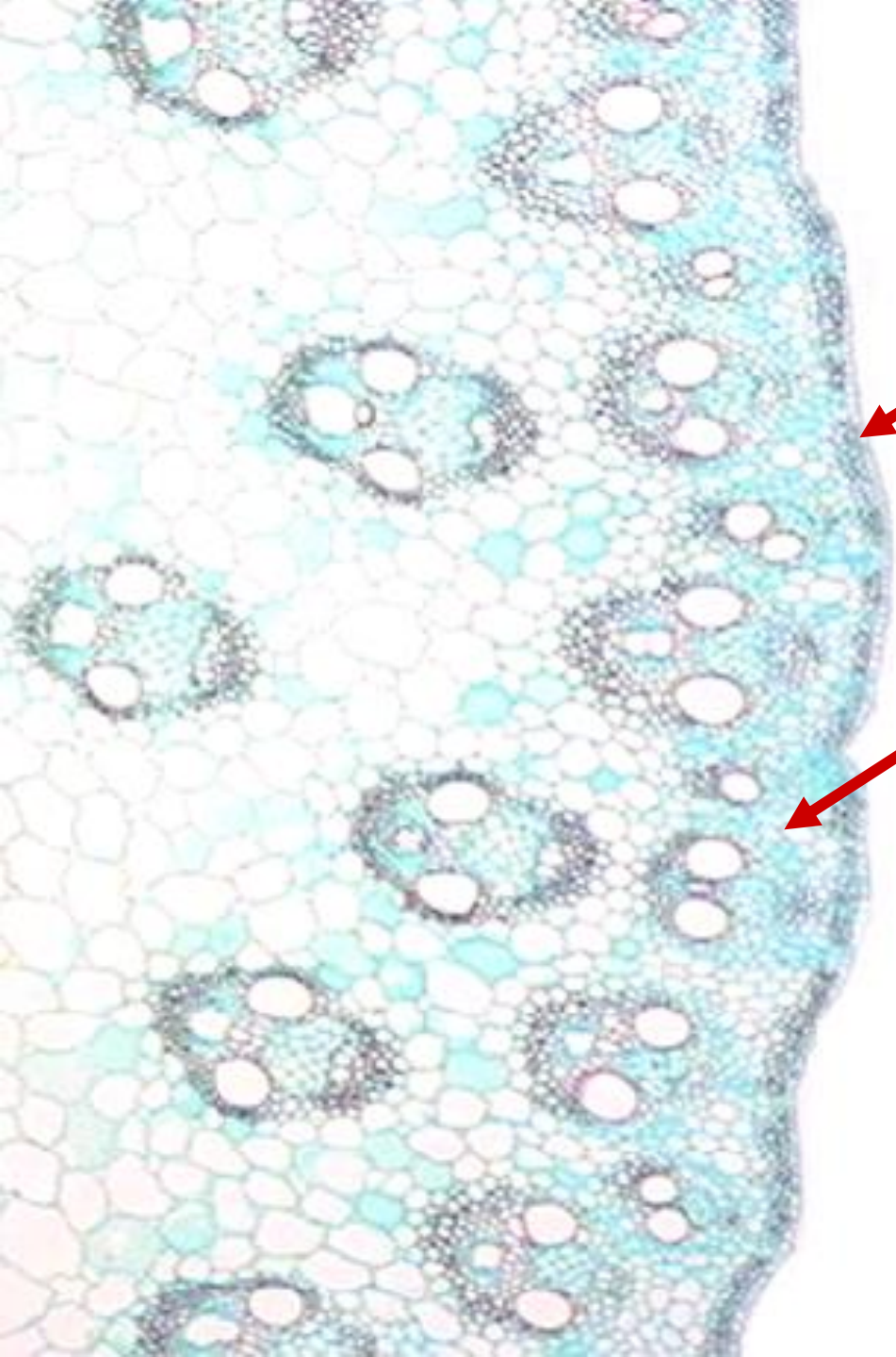


**EPIDERMIS**

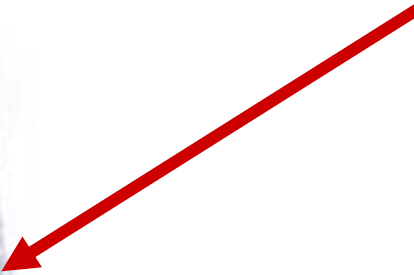


**STEM**

**C.S.**



**EPIDERMIS**

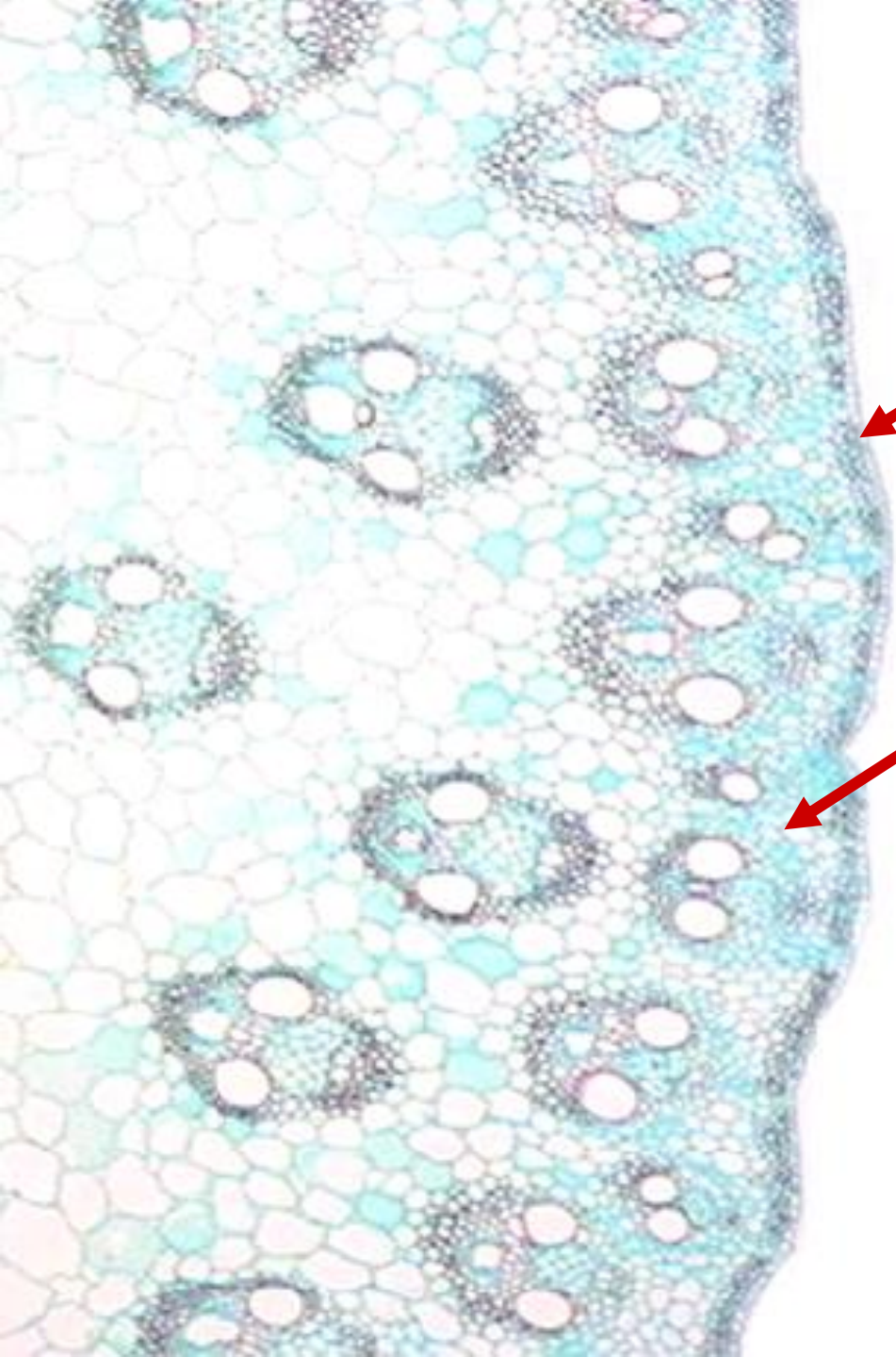


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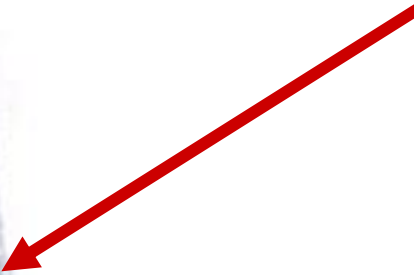


**STEM**

**C.S.**



**EPIDERMIS**



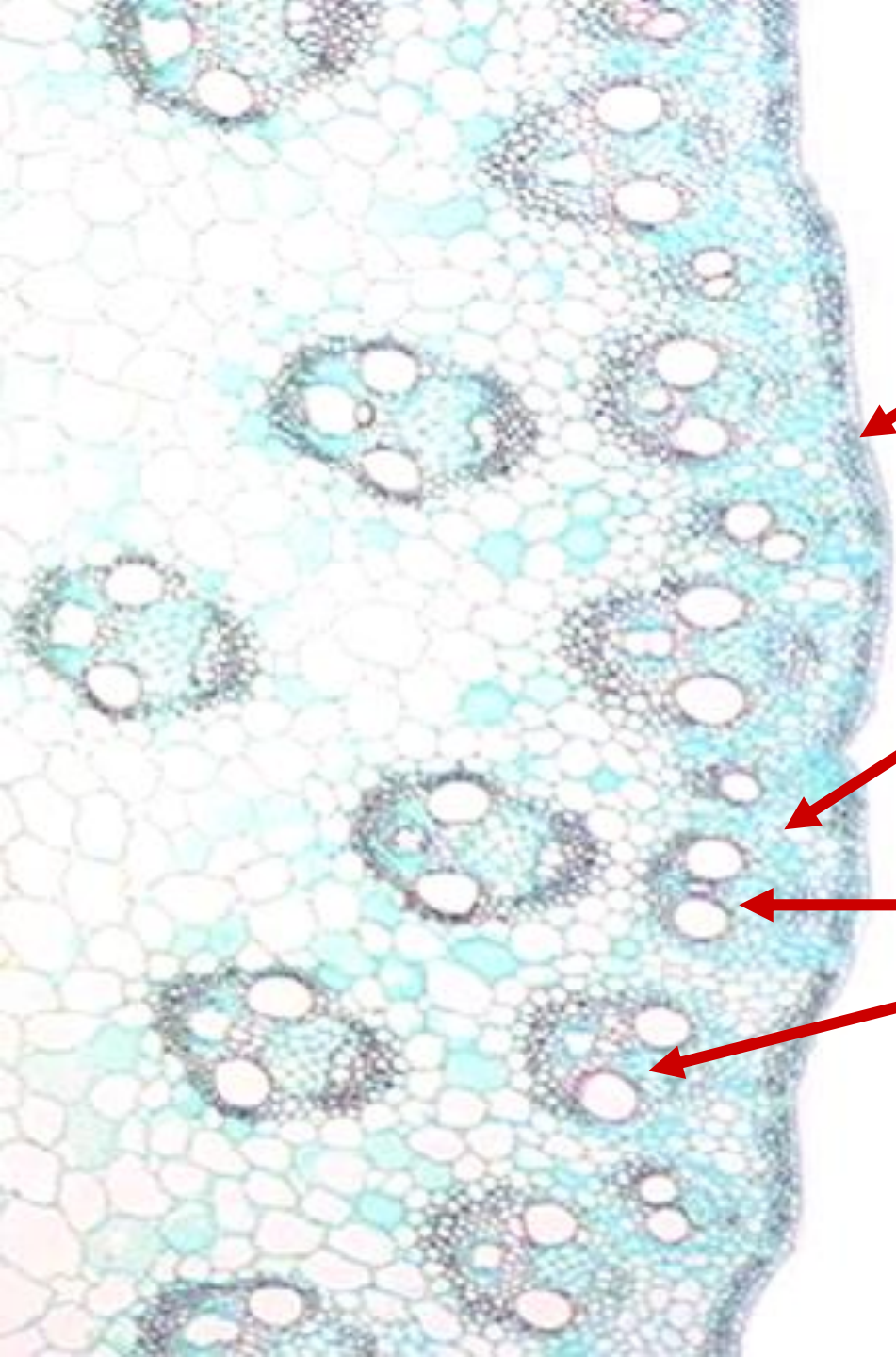
**CORTEX**



**STEM**

**C.S.**





**EPIDERMIS**

**CORTEX**

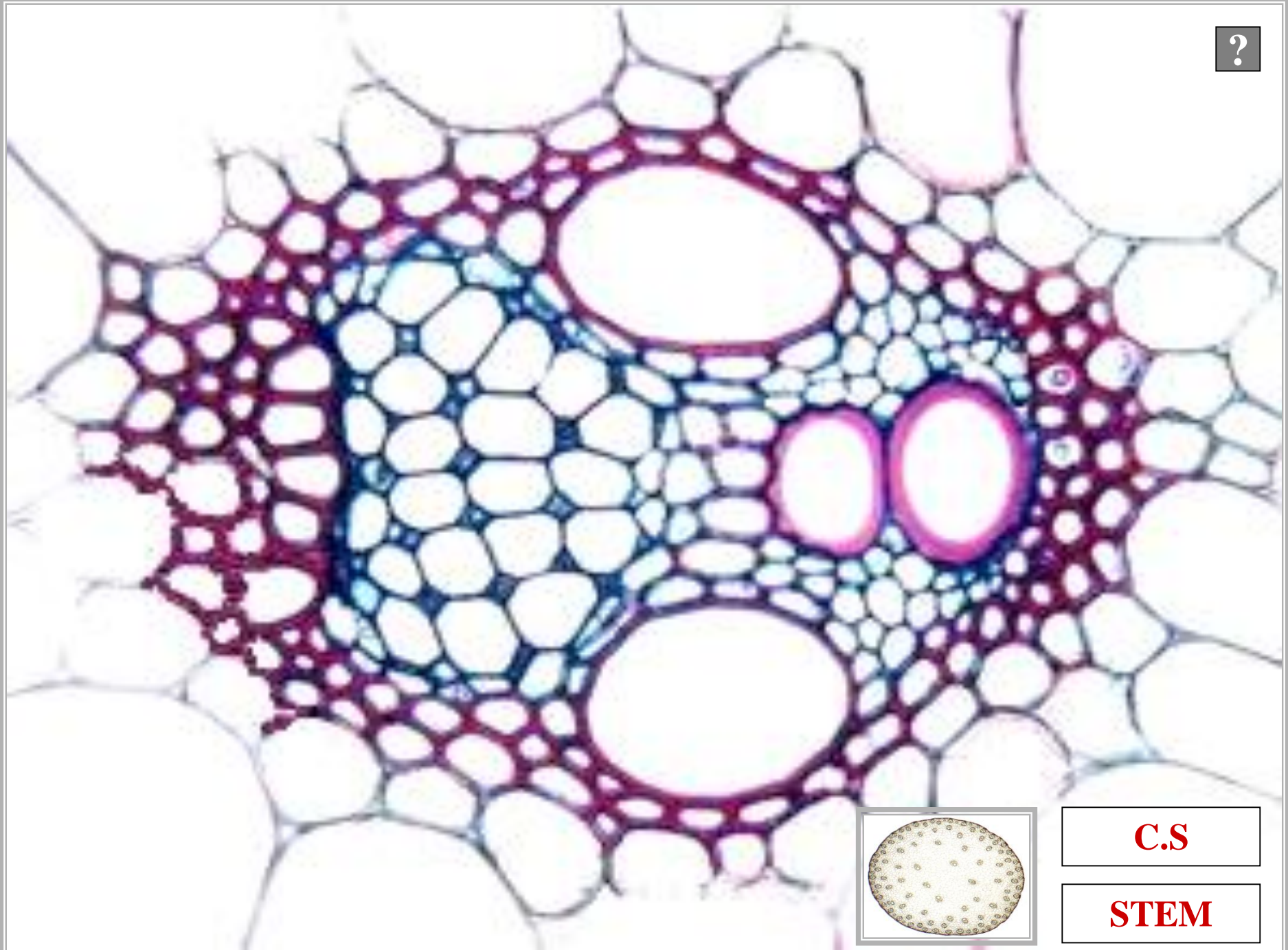
**SCATTERED  
VASCULAR  
BUNDLES**



**STEM**

**C.S.**

?

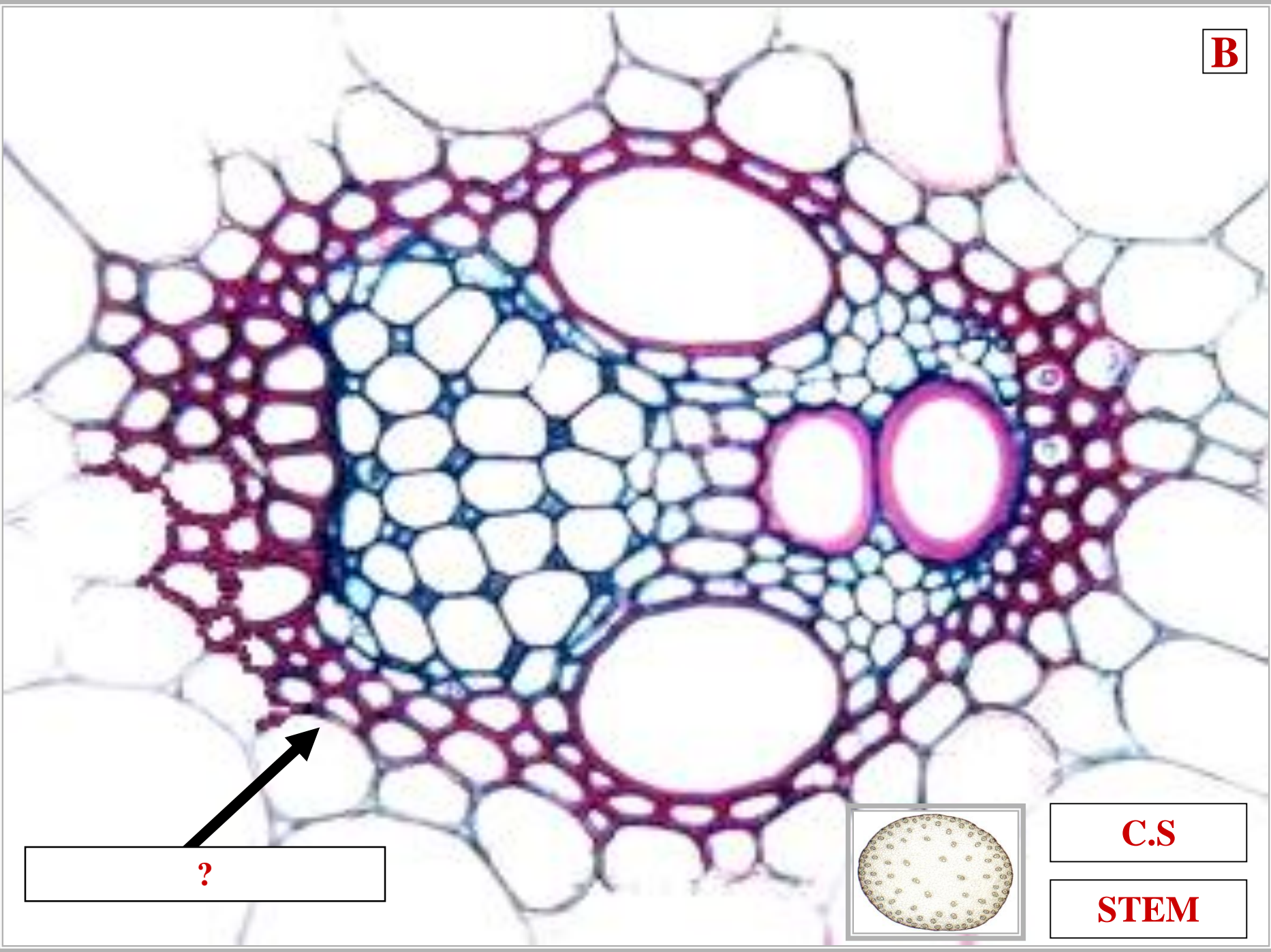


**C.S**

**STEM**



**B**



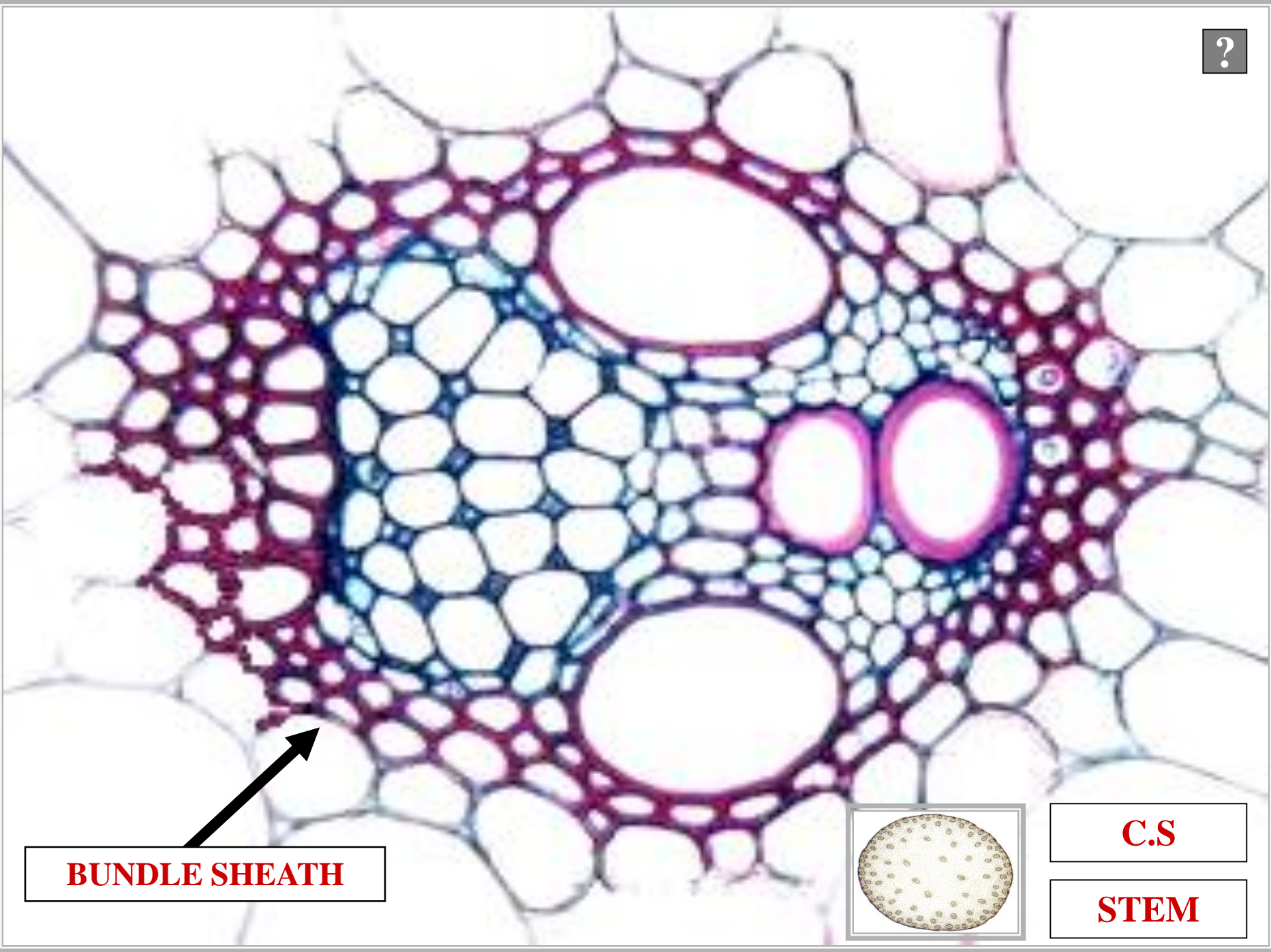
?



**C.S**

**STEM**

?



**BUNDLE SHEATH**



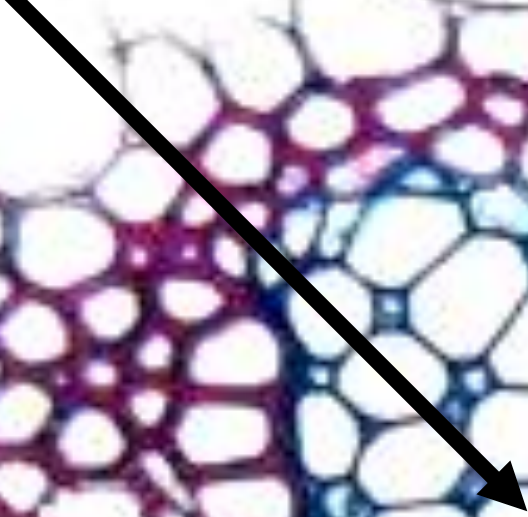
**C.S**

**STEM**



**P**

**?**



**BUNDLE SHEATH**

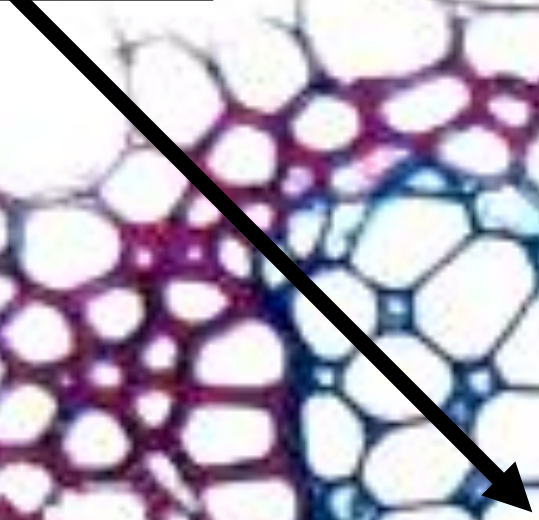


**C.S**

**STEM**

?

**~1 PHLOEM**



**BUNDLE SHEATH**



**C.S**

**STEM**



X

~1 PHLOEM

?

BUNDLE SHEATH

C.S

STEM





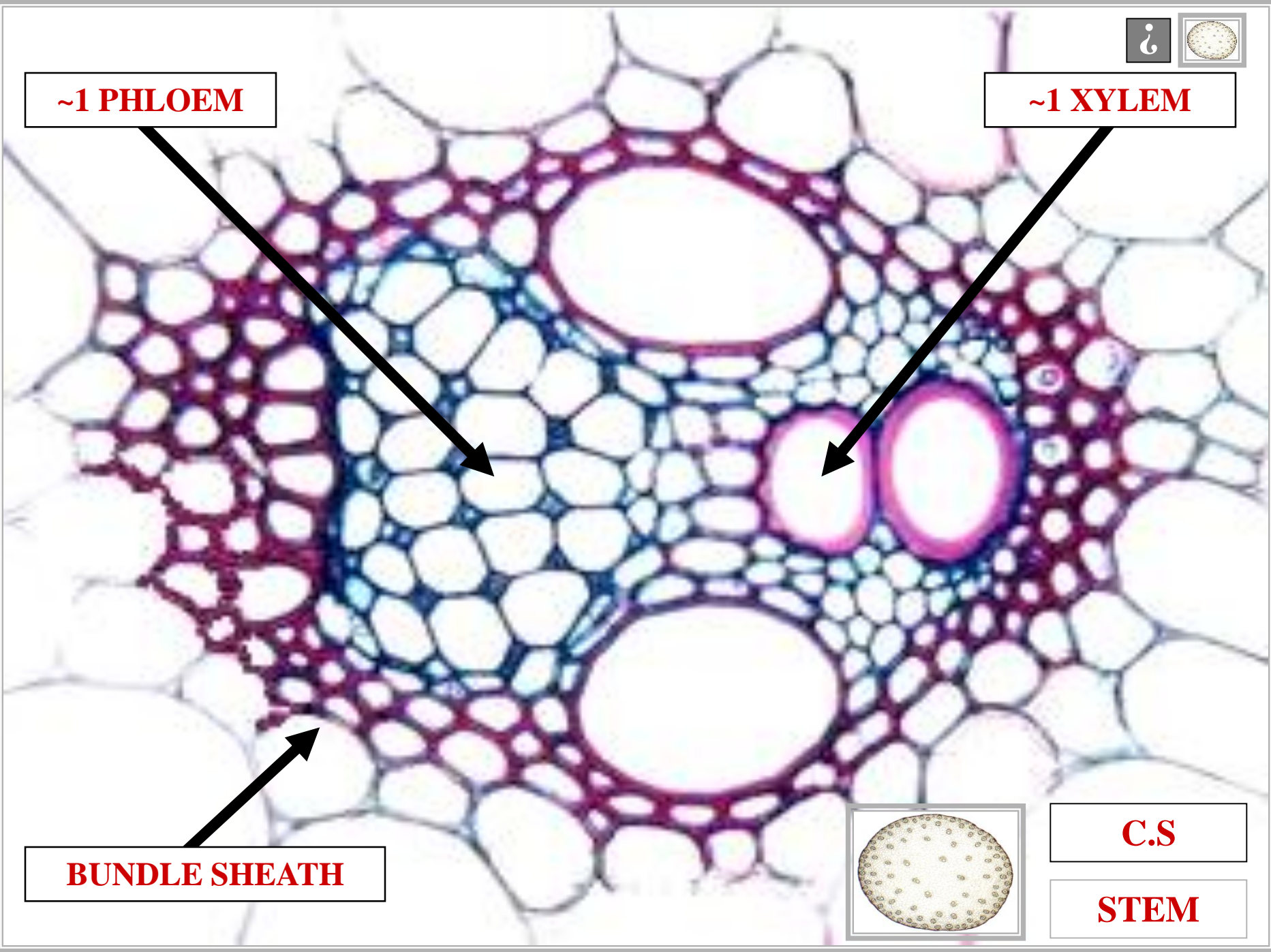
**~1 PHLOEM**

**~1 XYLEM**

**BUNDLE SHEATH**

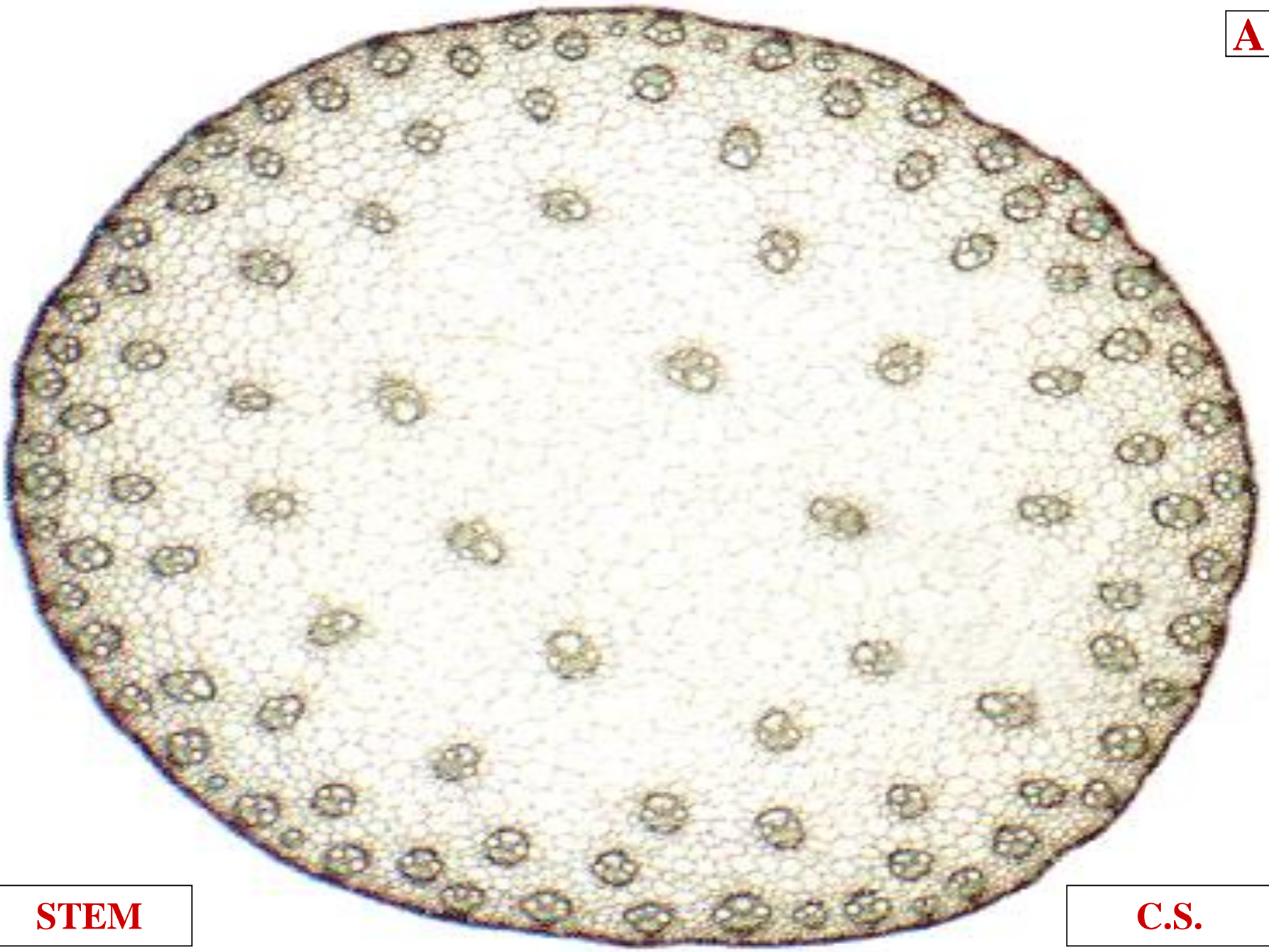
**C.S**

**STEM**





**A**

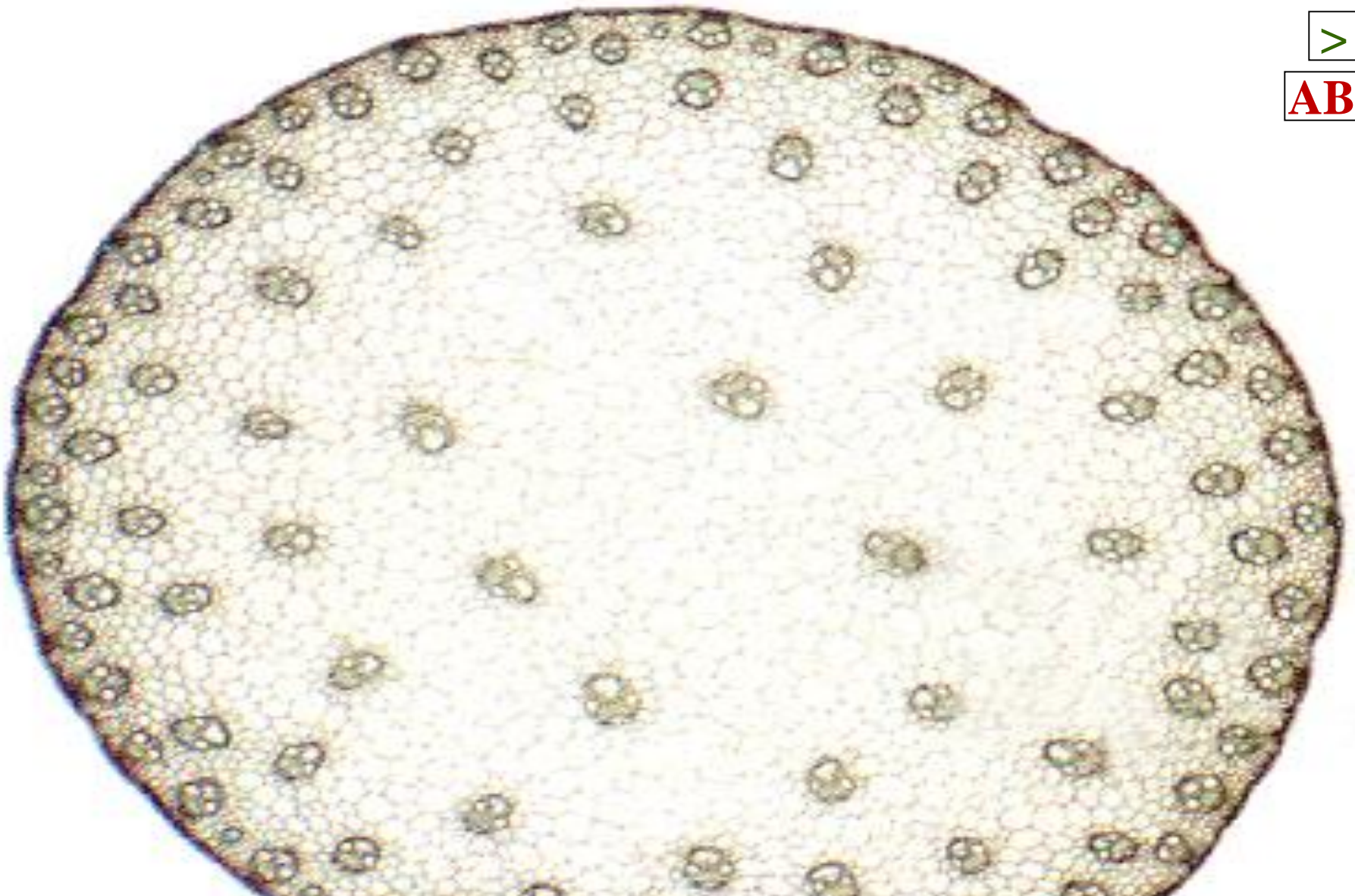


**STEM**

**C.S.**



**AB**



**ATACTOSTELE**





**AB**



**MONOCOT STEM  
VASCULAR CAMBIUM  
ABSENT**

**ATACTOSTELE**

A detailed micrograph of a monocot stem cross-section. The stem is roughly circular and shows a scattered, irregular arrangement of vascular bundles throughout its entire cross-section. Each vascular bundle is clearly visible as a distinct circular or oval structure with a central pith cell and surrounding sclerenchyma sheath. The ground tissue consists of a dense network of small, thin-walled cells. The overall appearance is that of a primary growth stem without secondary growth.

**MONOCOT STEM  
SECONDARY GROWTH  
ABSENT**

**ATACTOSTELE**



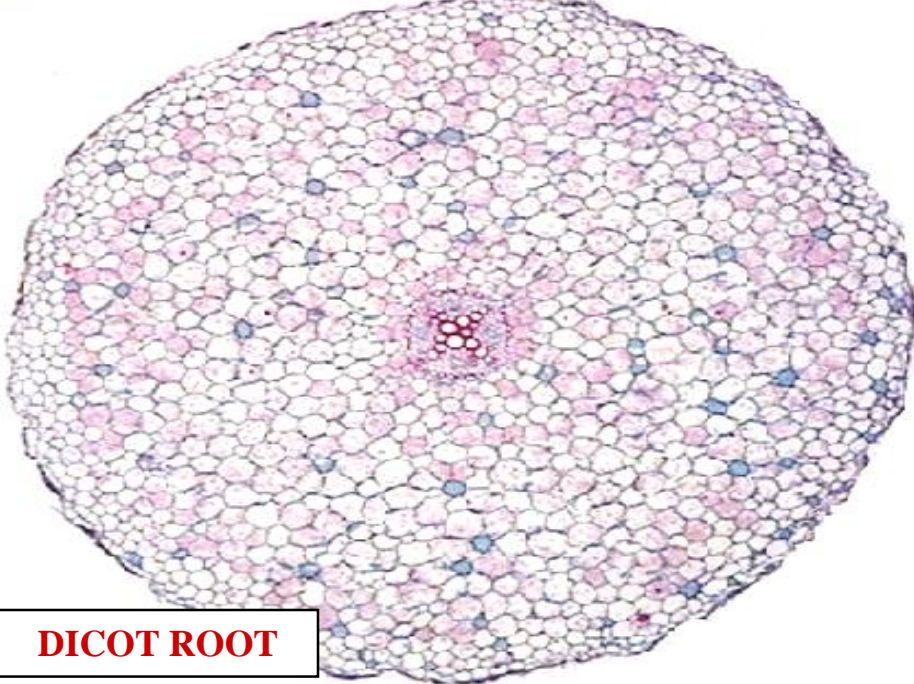


# STELE SUMMARY

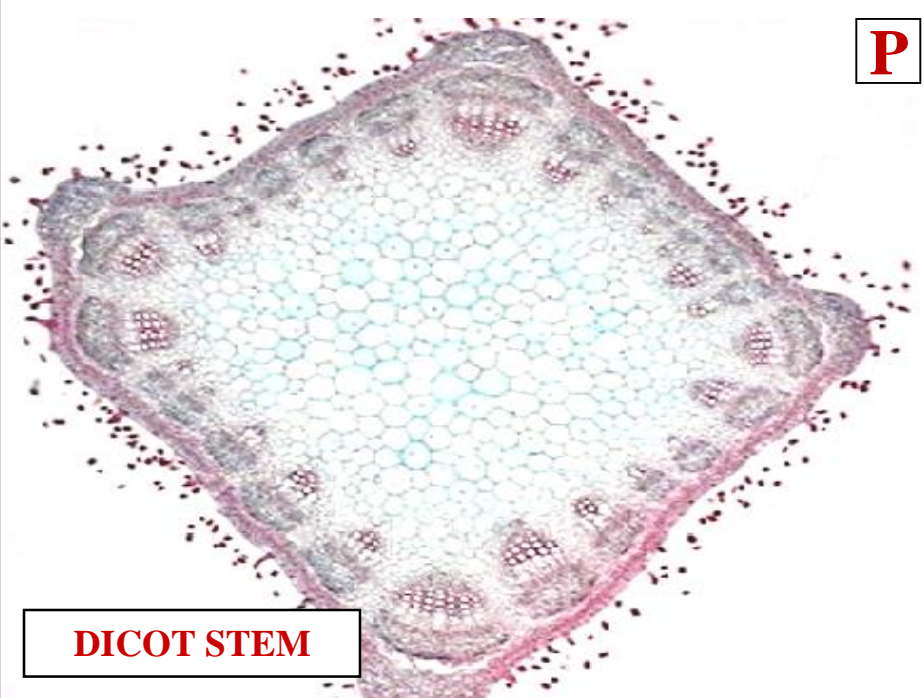


# STELE SUMMARY DICOTS

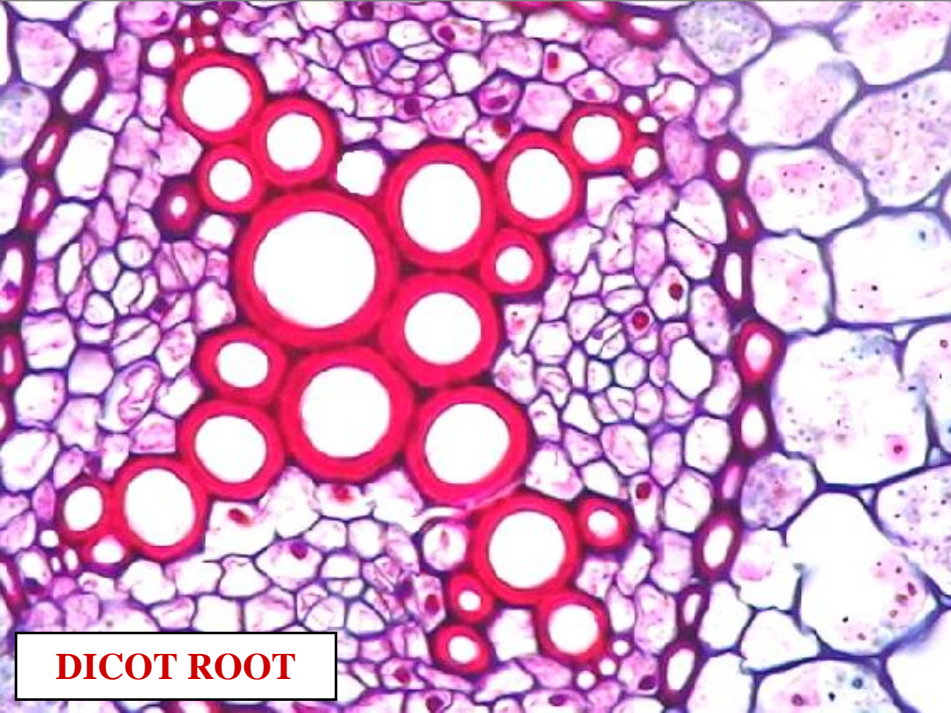




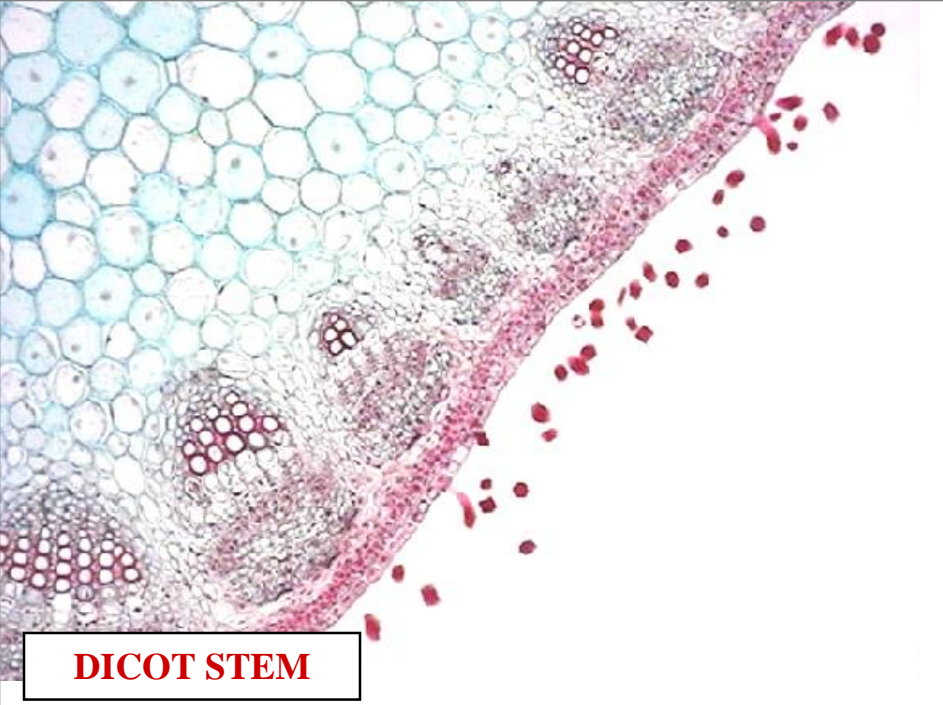
**DICOT ROOT**



**DICOT STEM**



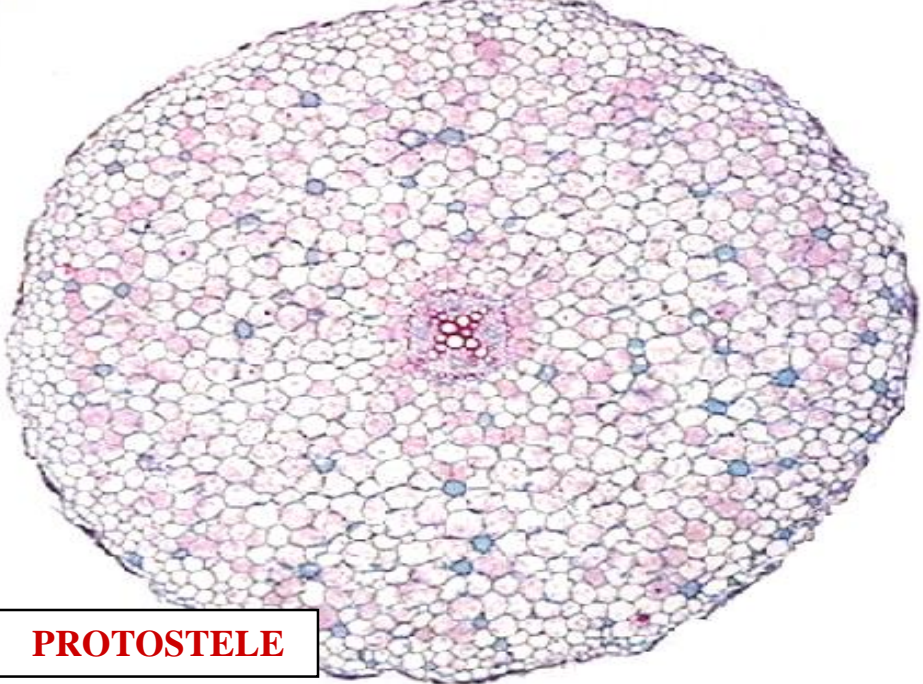
**DICOT ROOT**



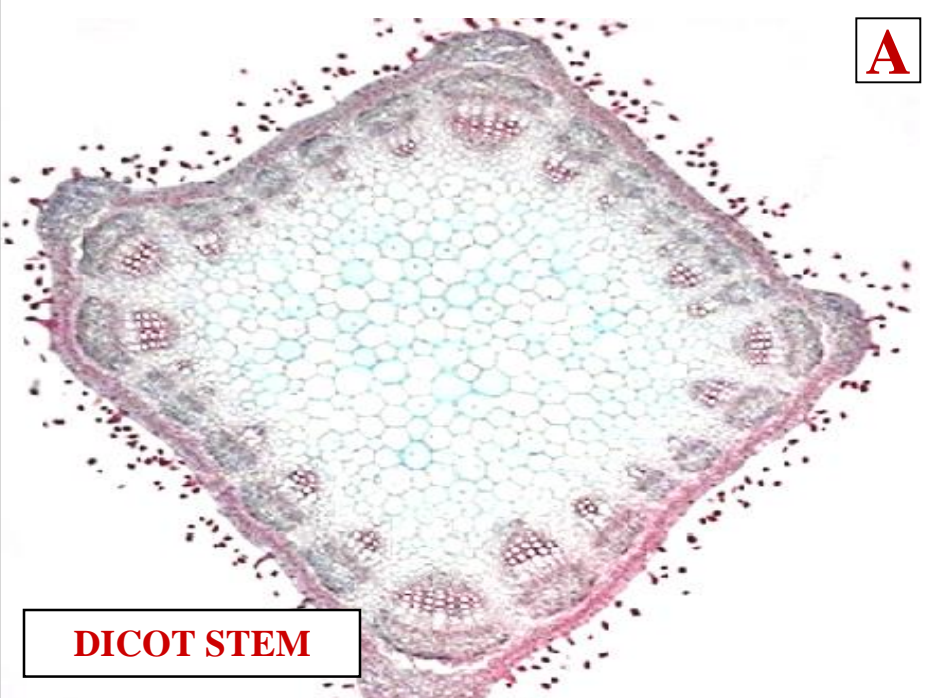
**DICOT STEM**



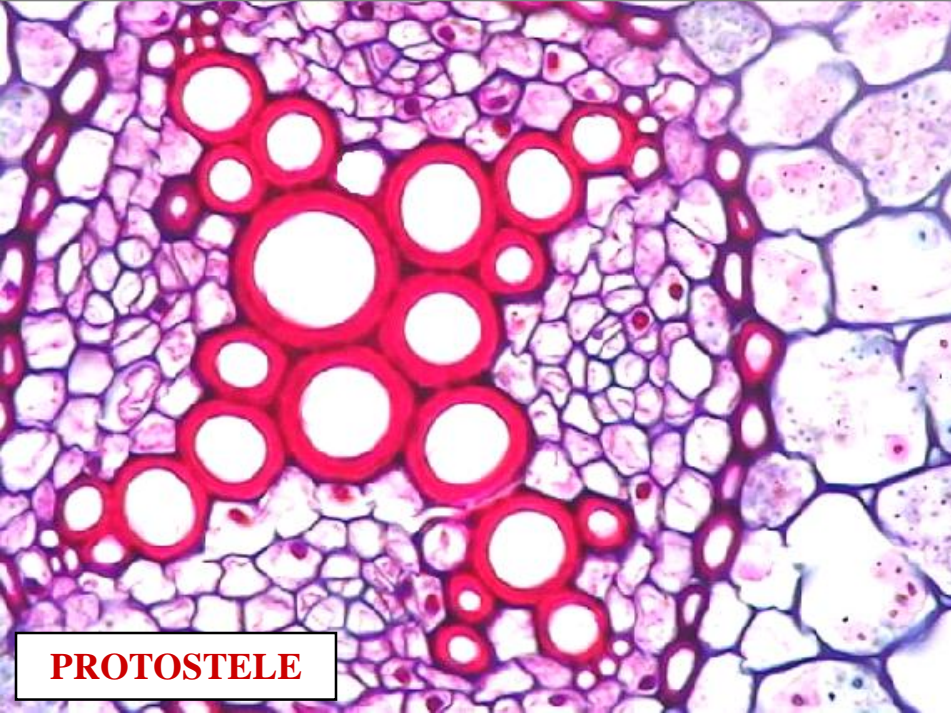
A



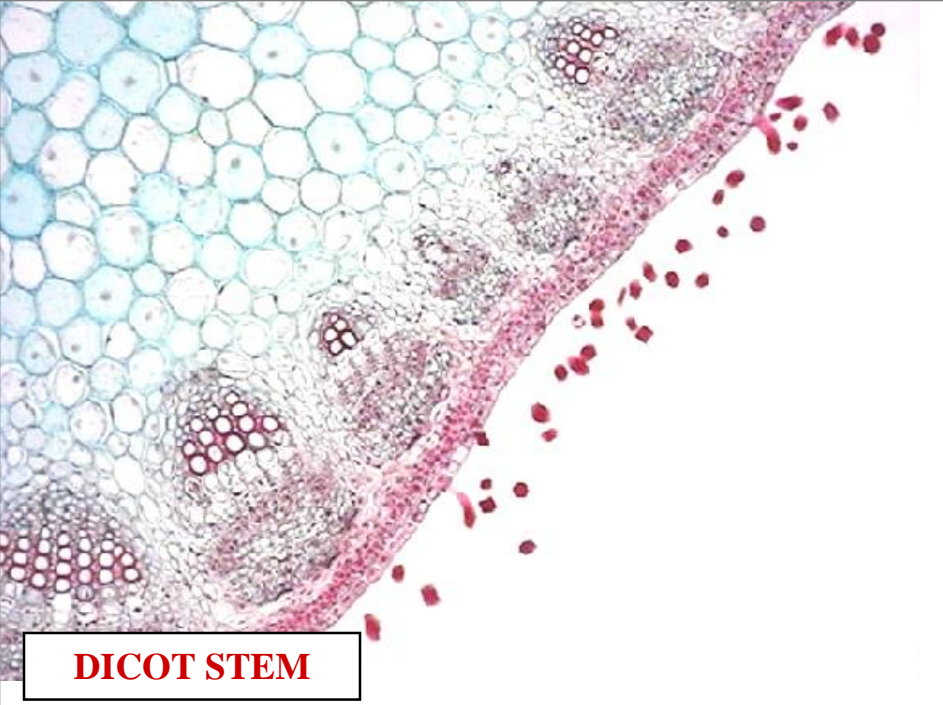
**PROTOSTELE**



**DICOT STEM**

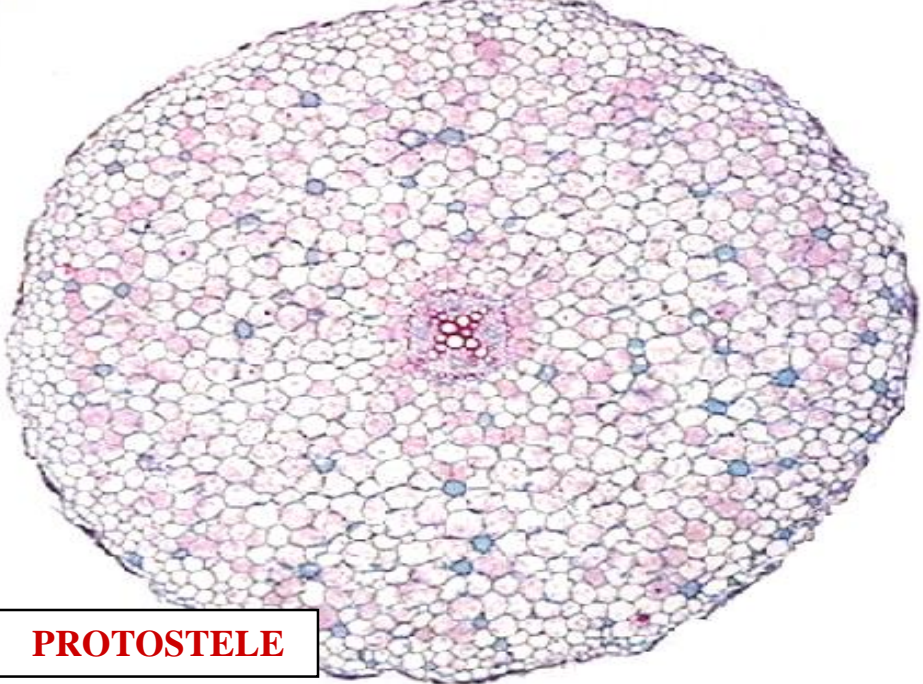


**PROTOSTELE**

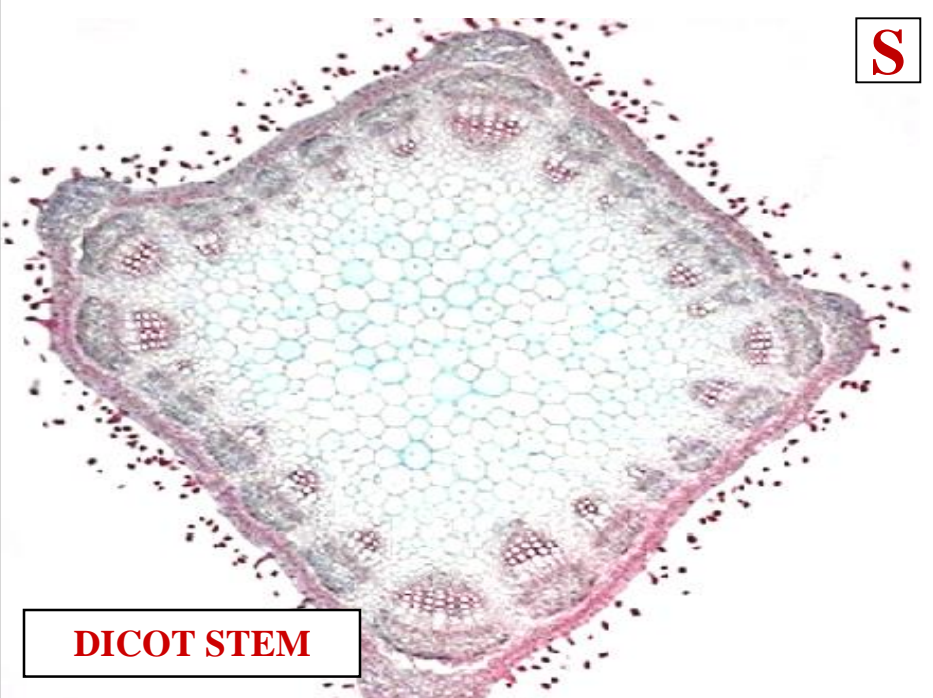


**DICOT STEM**

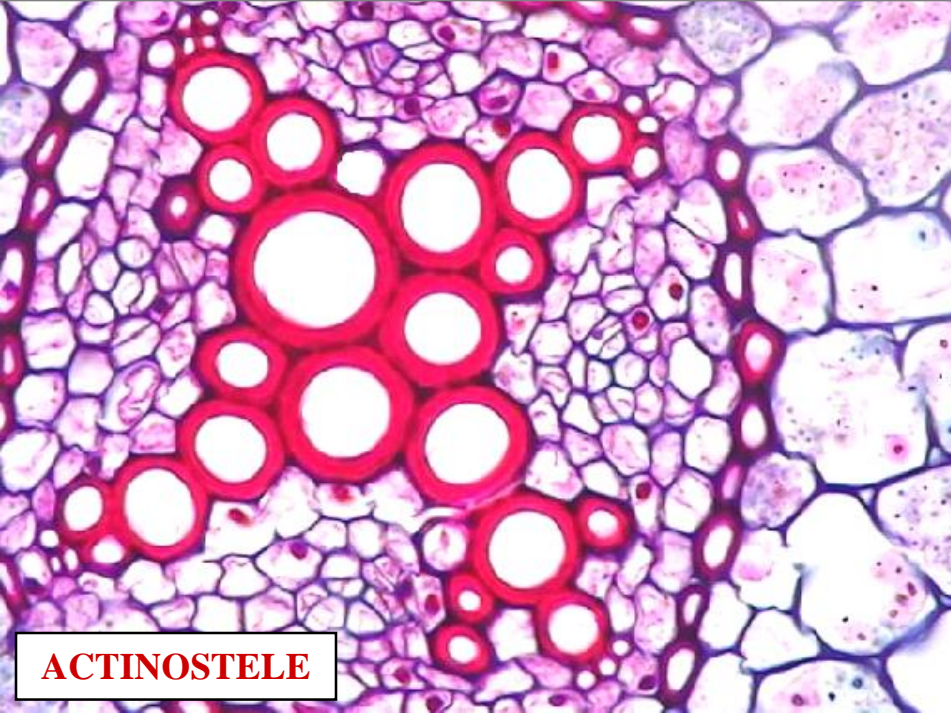




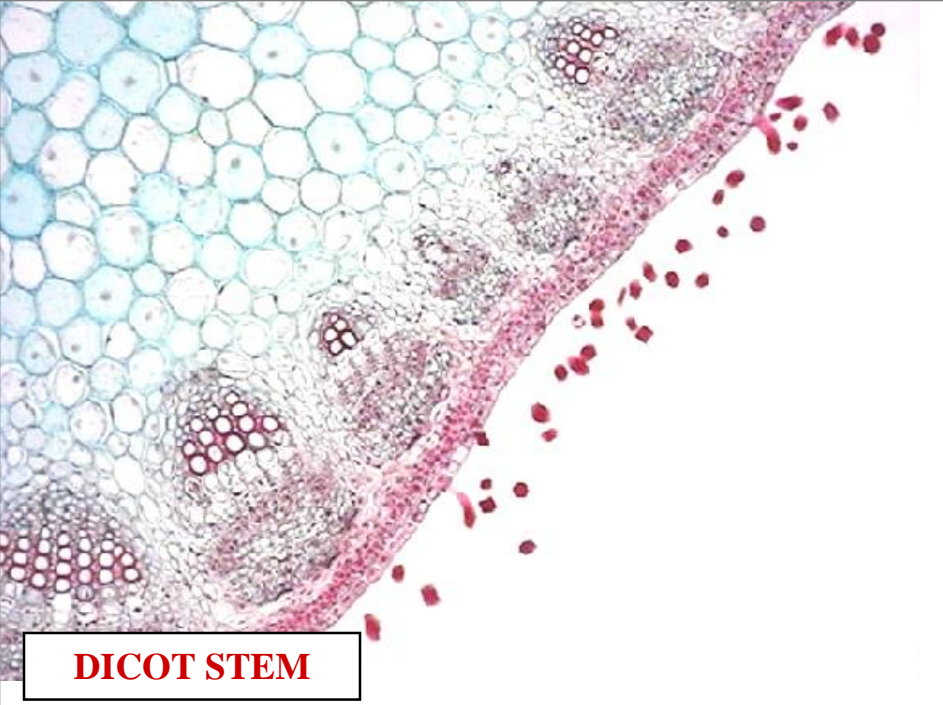
**PROTOSTELE**



**DICOT STEM**



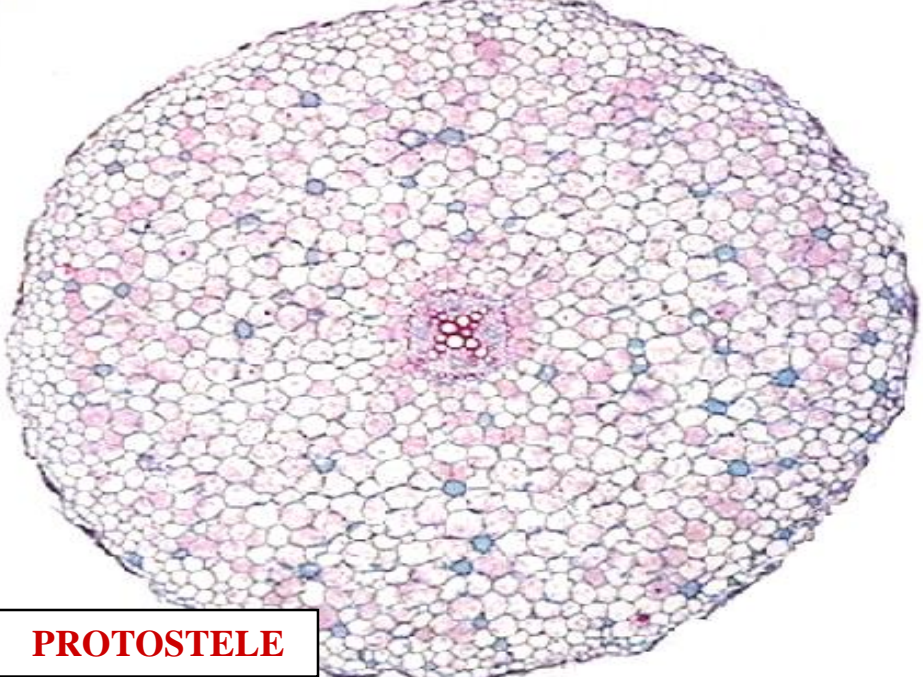
**ACTINOSTELE**



**DICOT STEM**



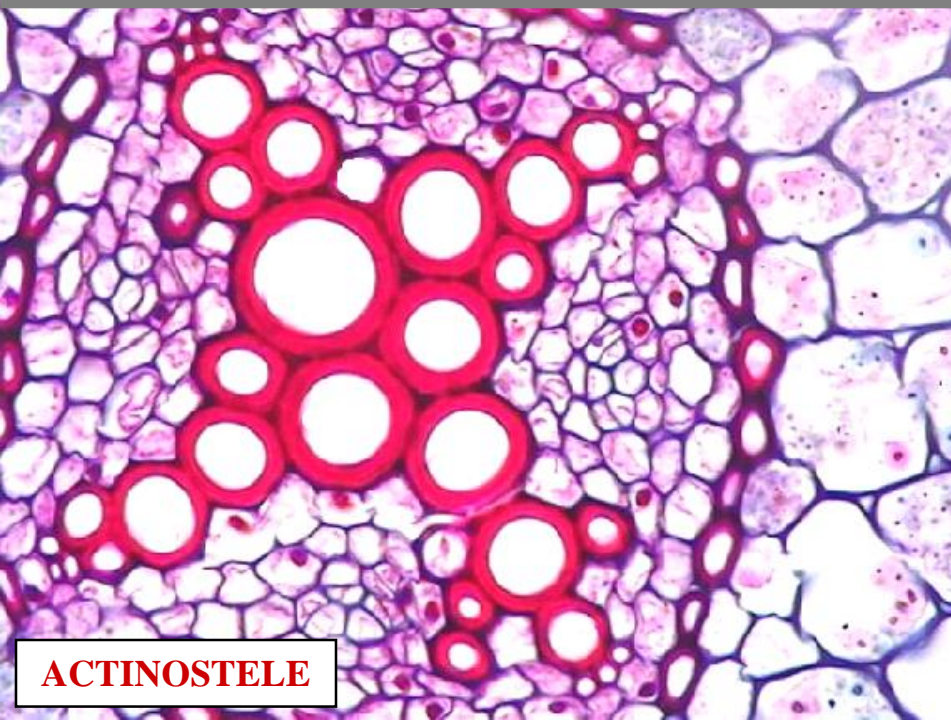
**E**



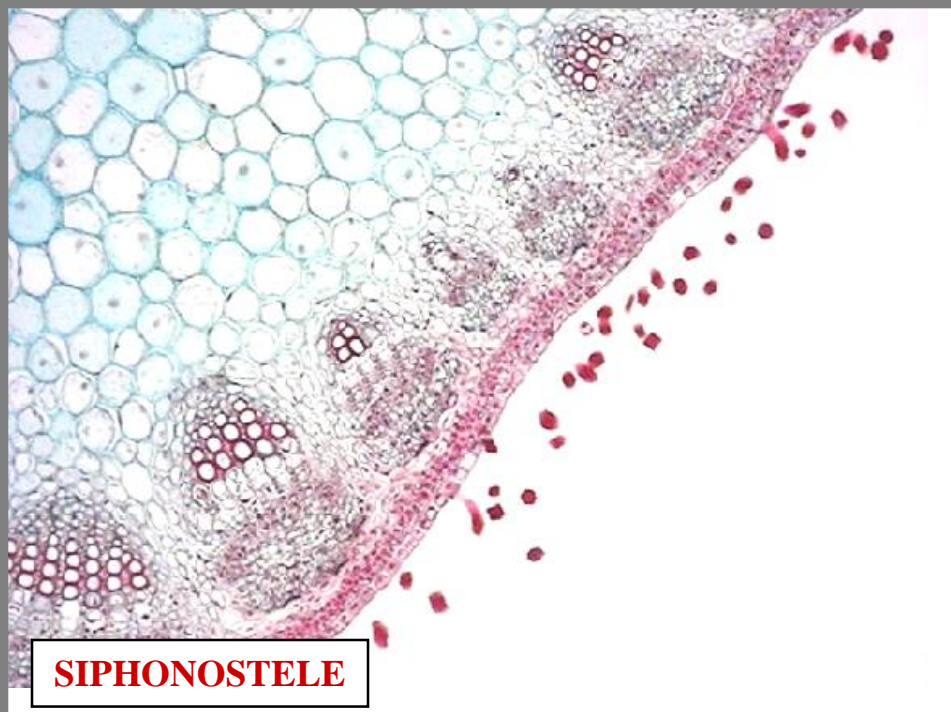
**PROTOSTELE**



**SIPHONOSTELE**

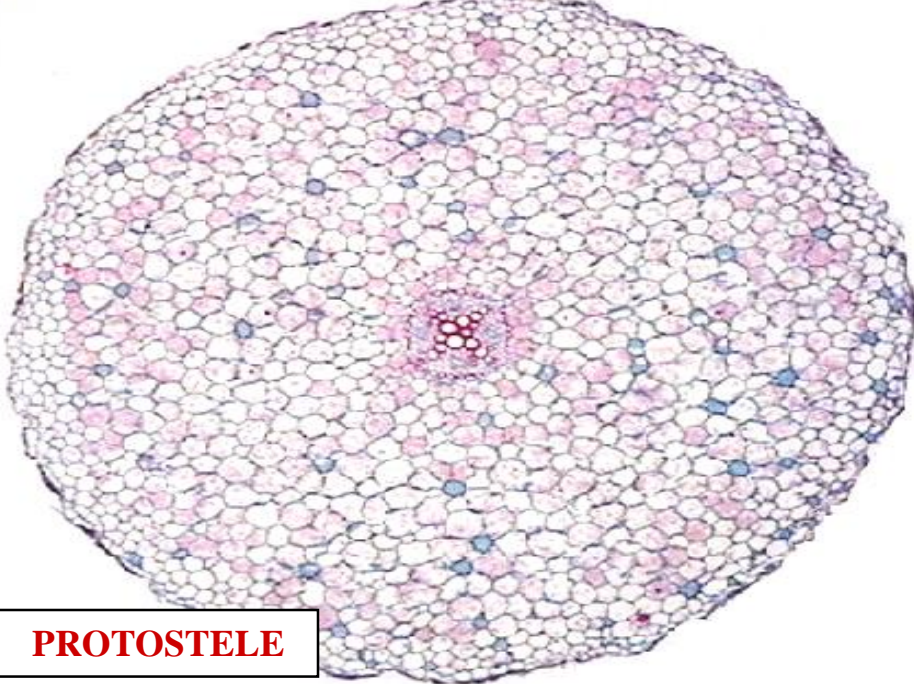


**ACTINOSTELE**



**SIPHONOSTELE**

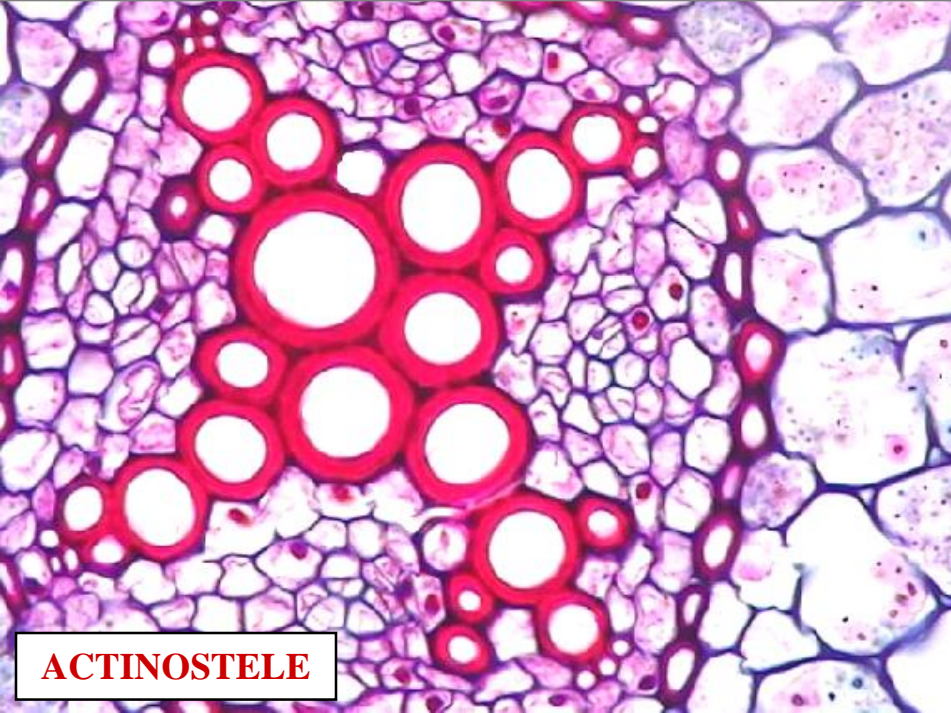




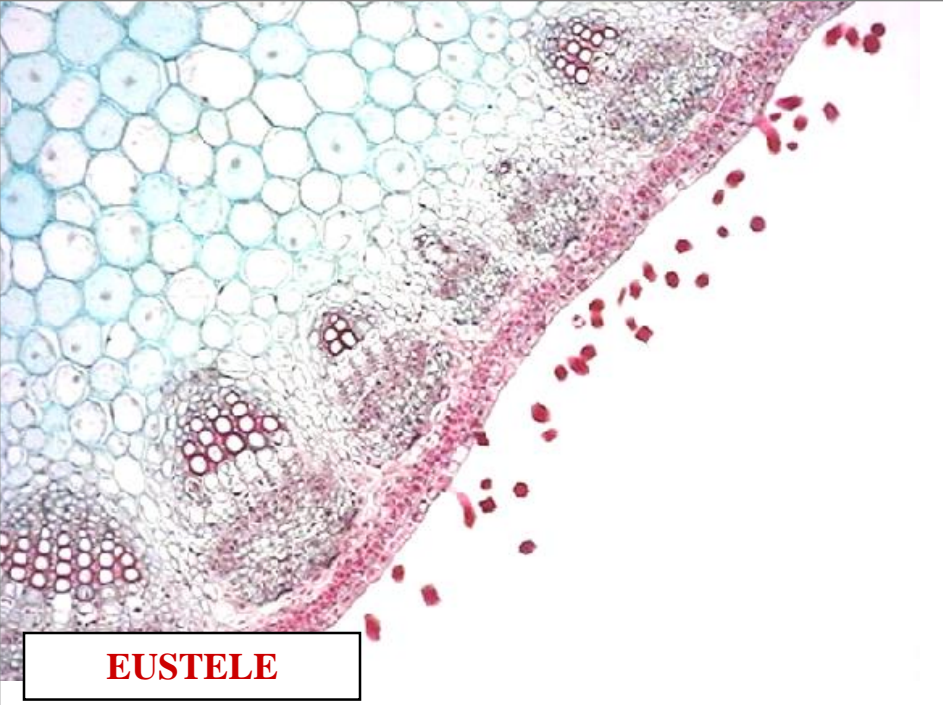
**PROTOSTELE**



**SIPHONOSTELE**



**ACTINOSTELE**



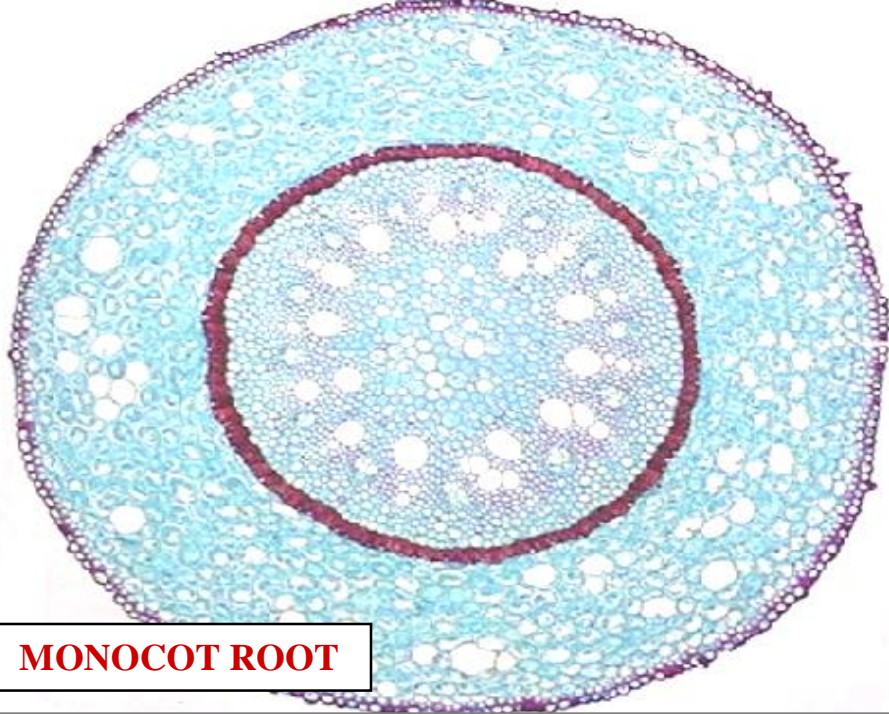
**EUSTELE**



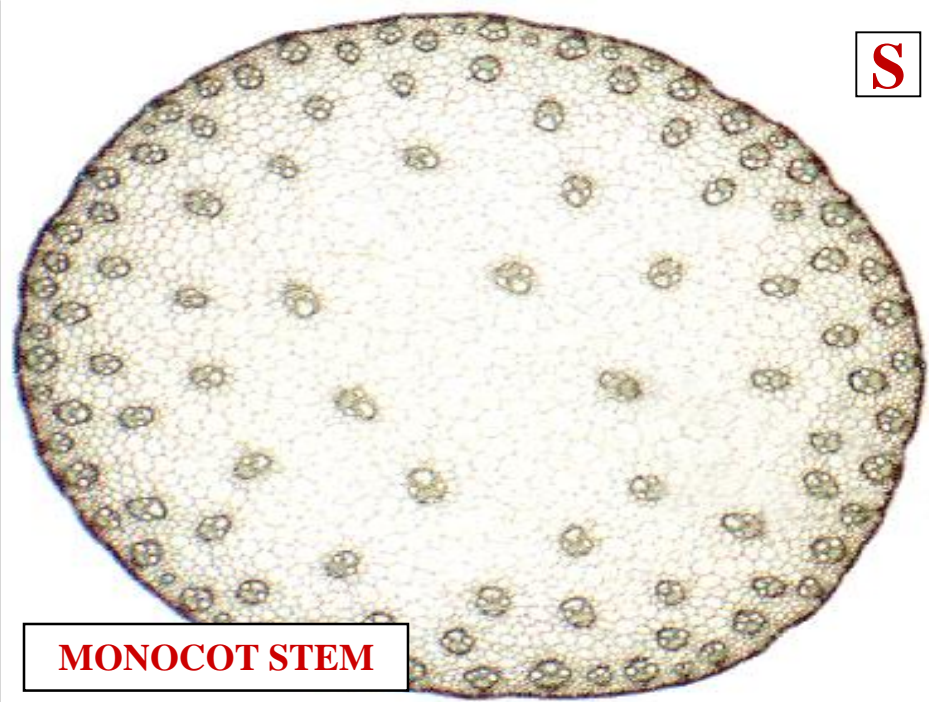


# STELE SUMMARY MONOCOTS

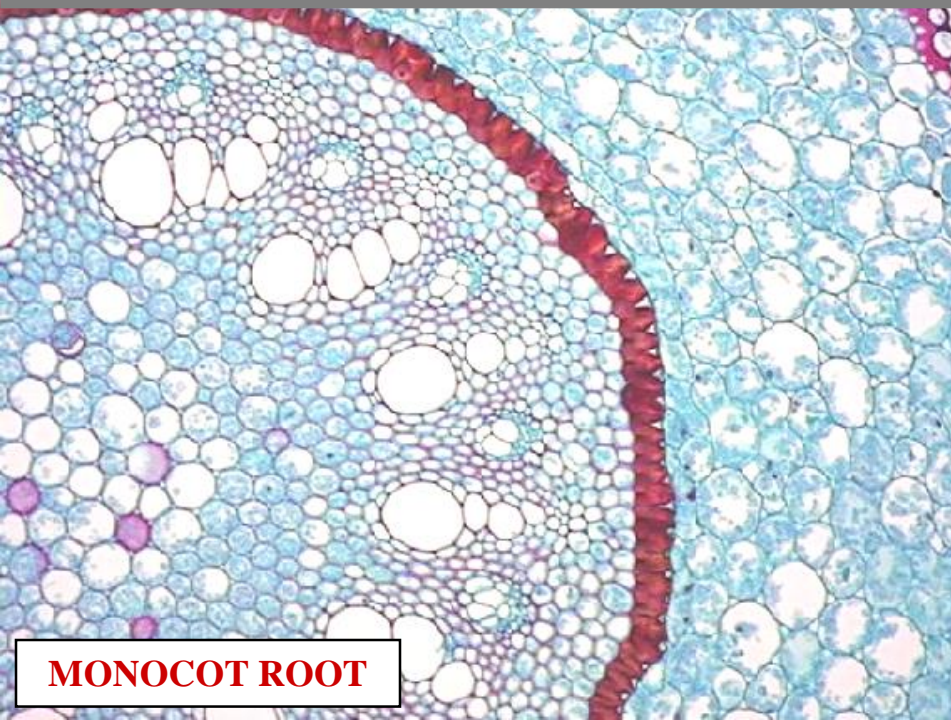




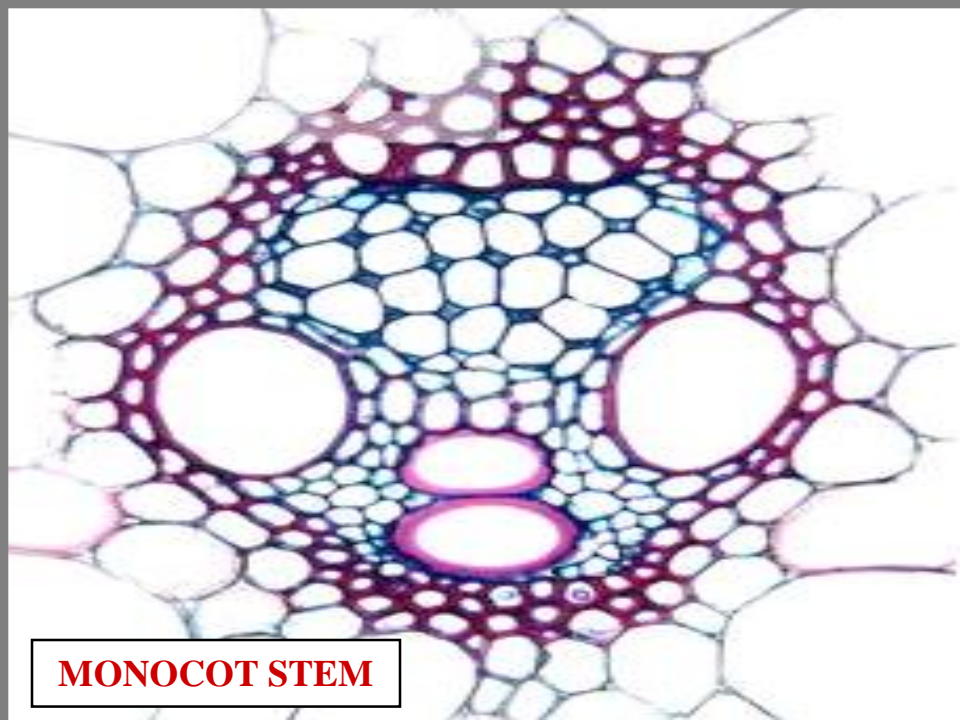
**MONOCOT ROOT**



**MONOCOT STEM**

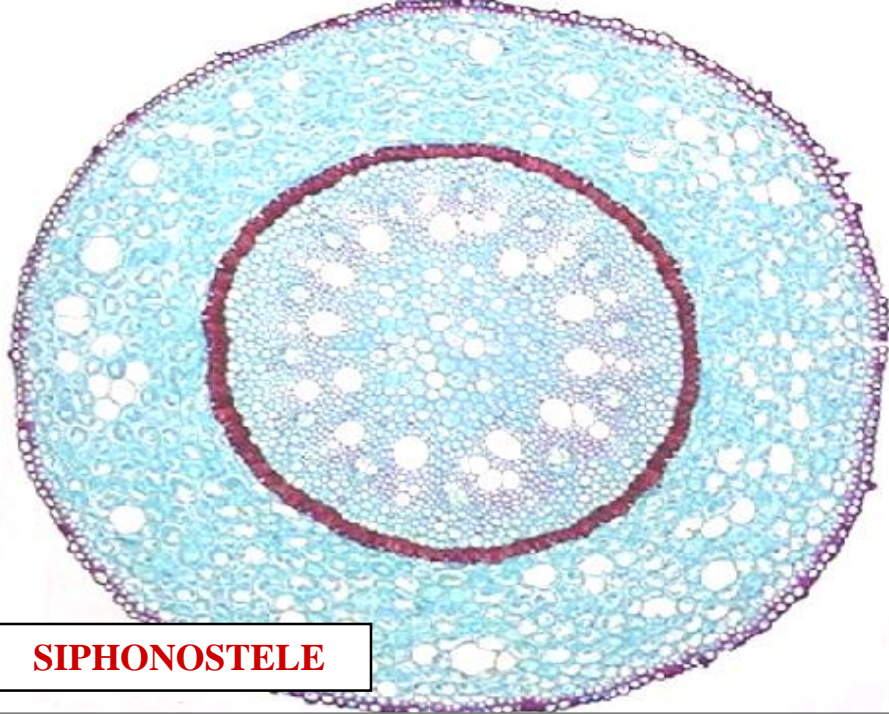


**MONOCOT ROOT**

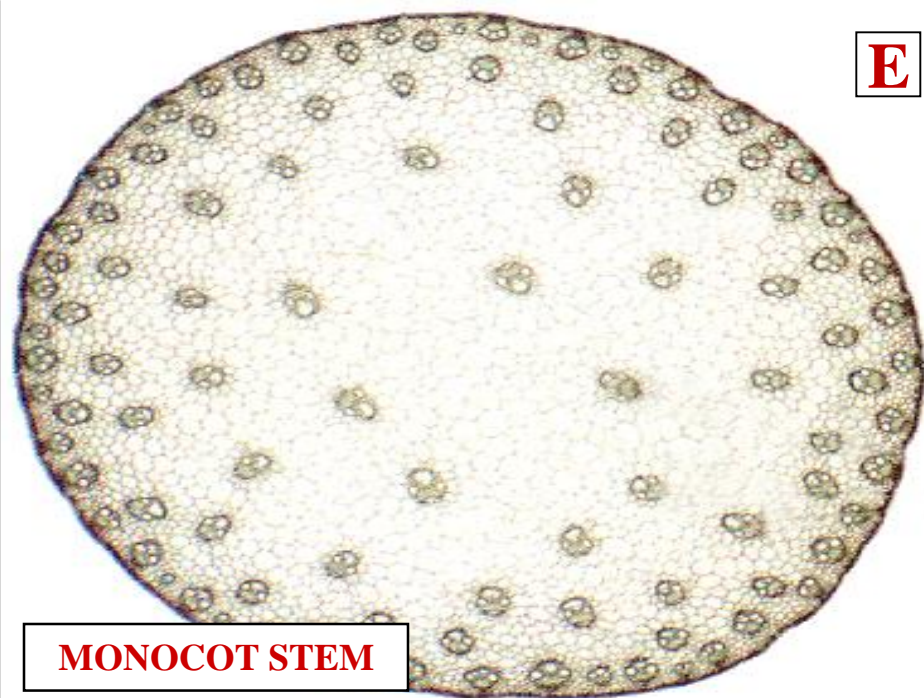


**MONOCOT STEM**



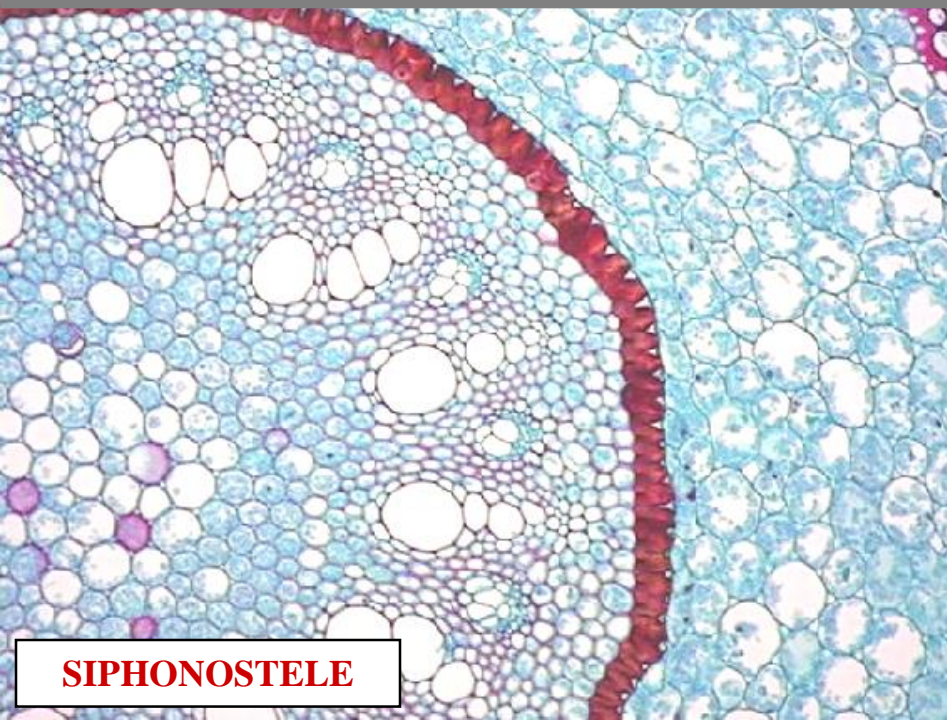


**SIPHONOSTELE**

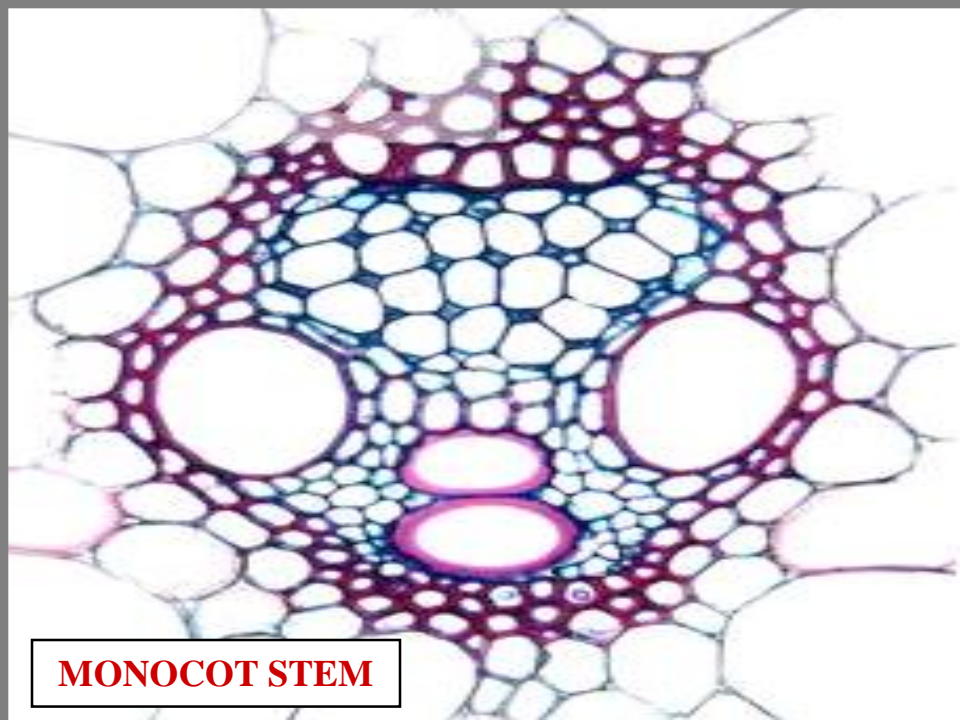


**MONOCOT STEM**

**E**

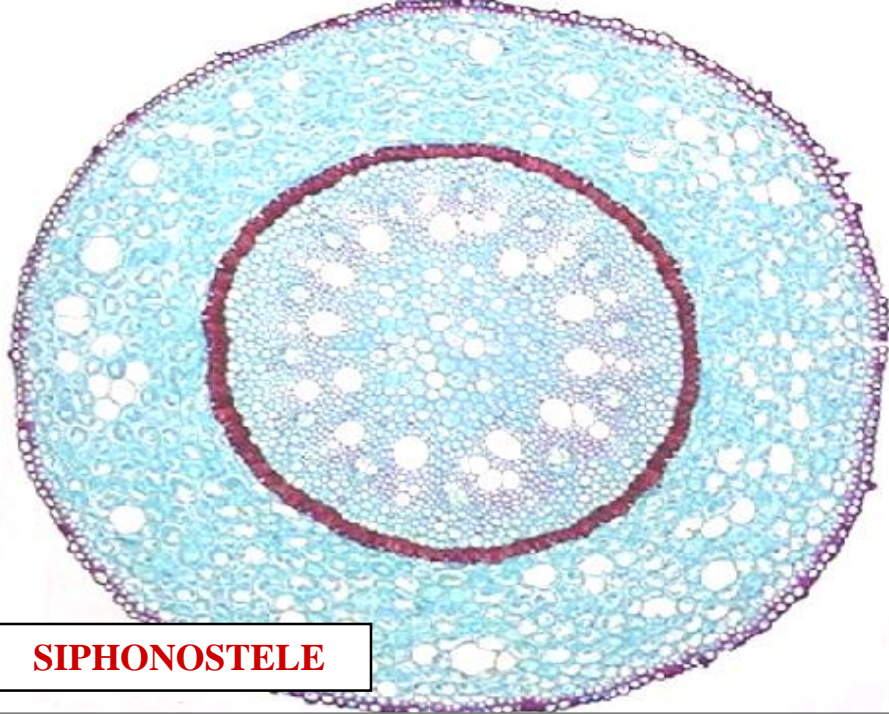


**SIPHONOSTELE**

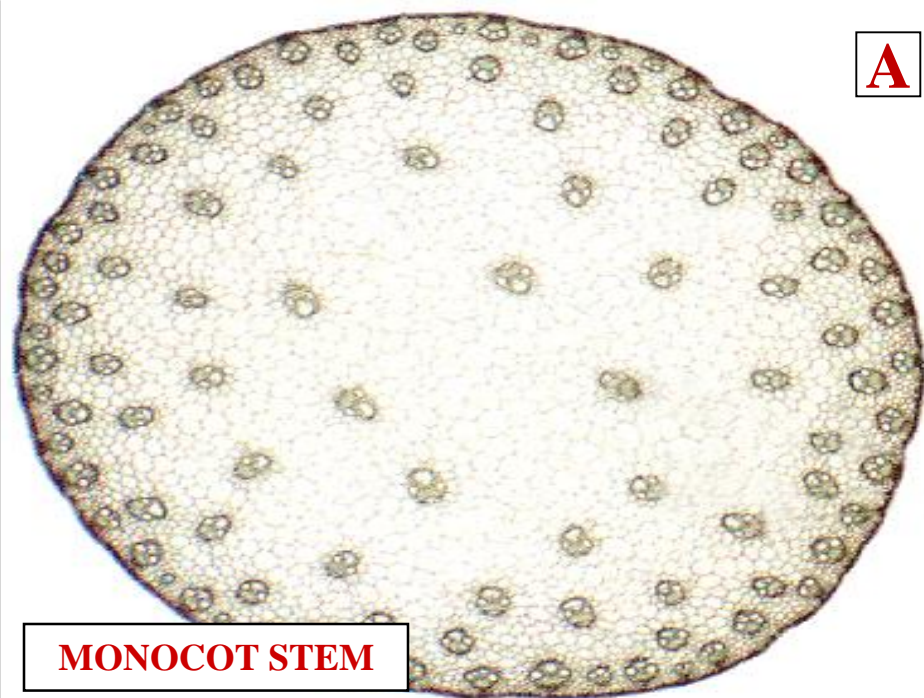


**MONOCOT STEM**



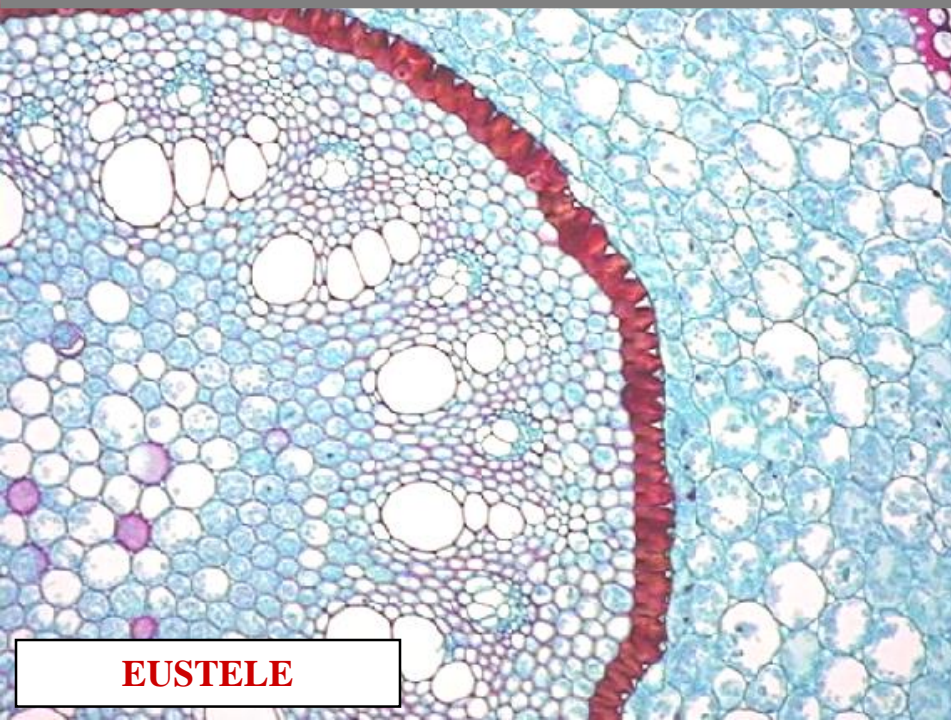


**SIPHONOSTELE**

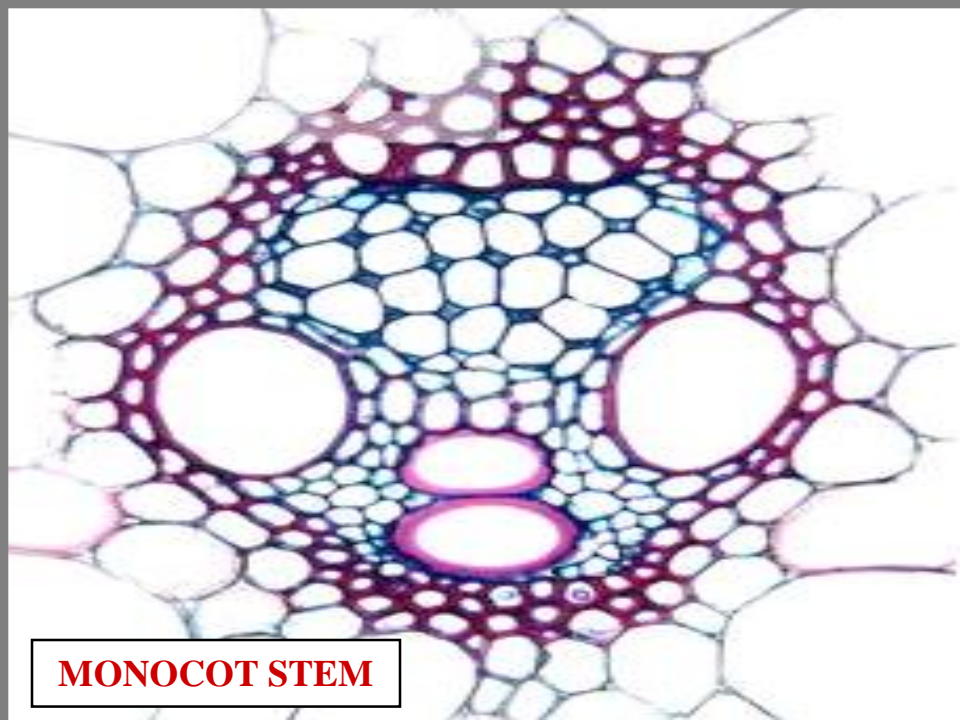


**A**

**MONOCOT STEM**

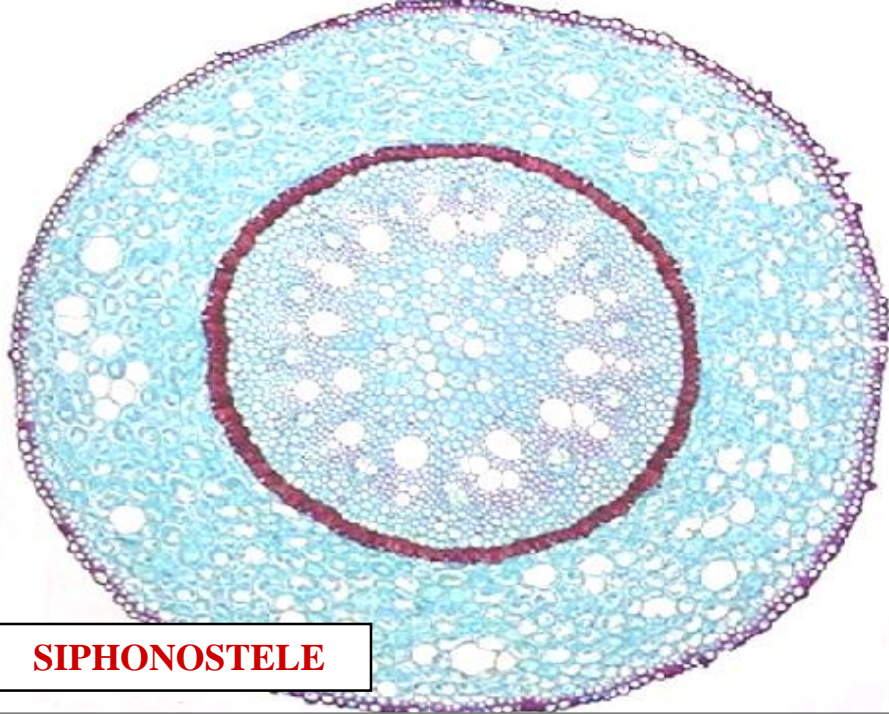


**EUSTELE**

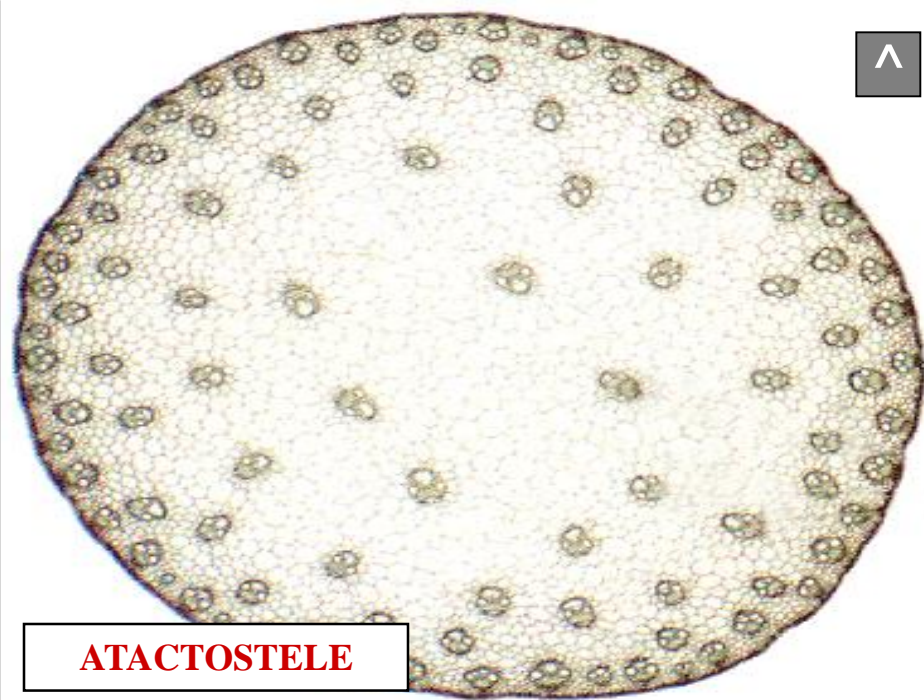


**MONOCOT STEM**

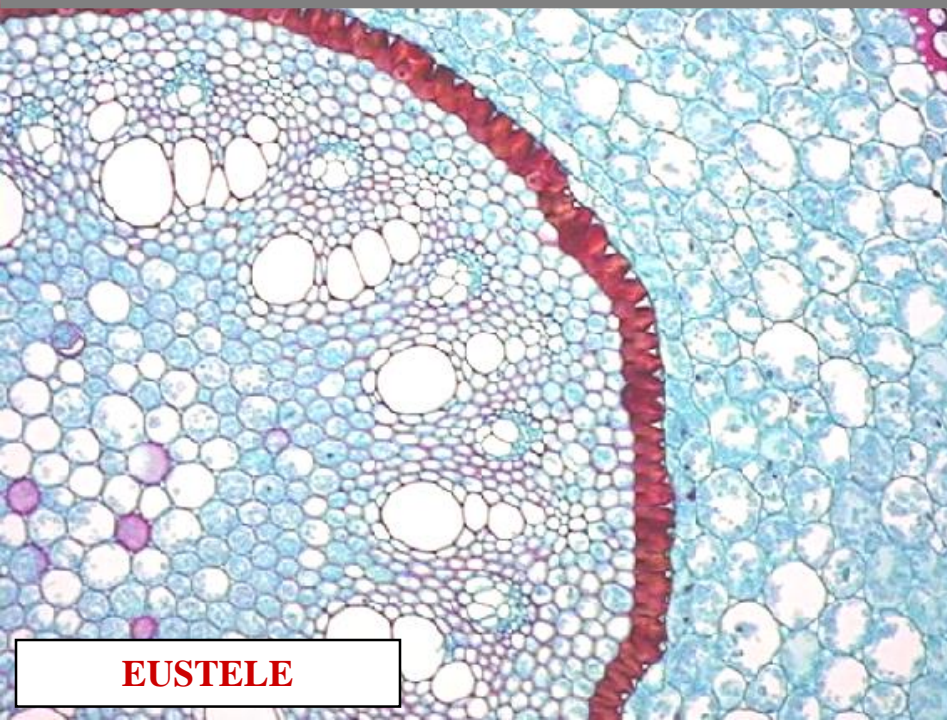




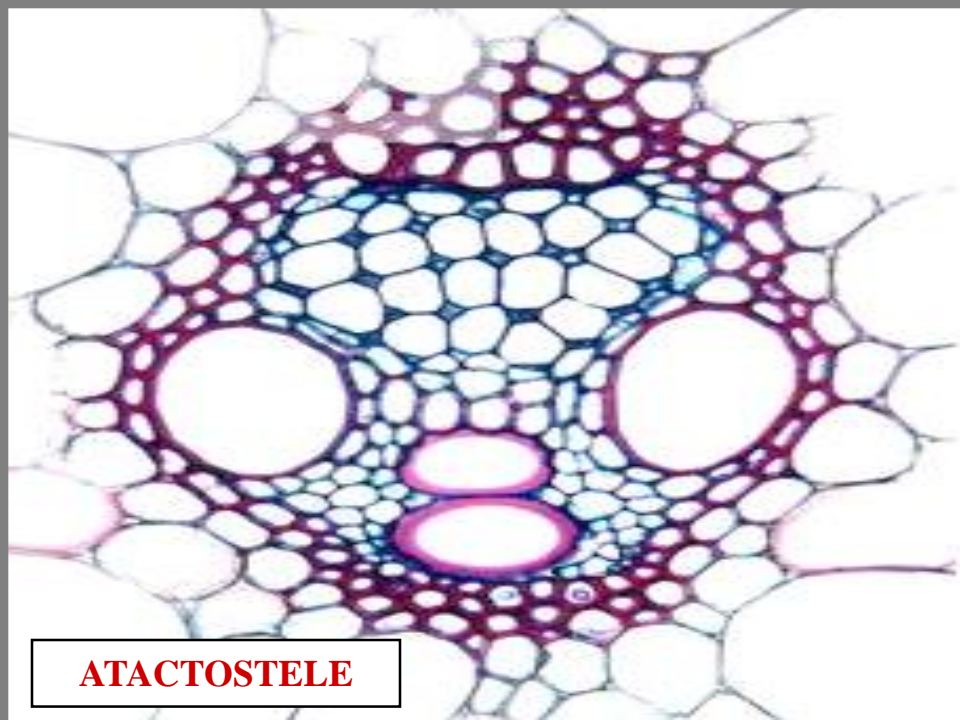
**SIPHONOSTELE**



**ATACTOSTELE**



**EUSTELE**



**ATACTOSTELE**





# STEM MORPHOLOGY

N

[Blank box]



?

[Blank box]

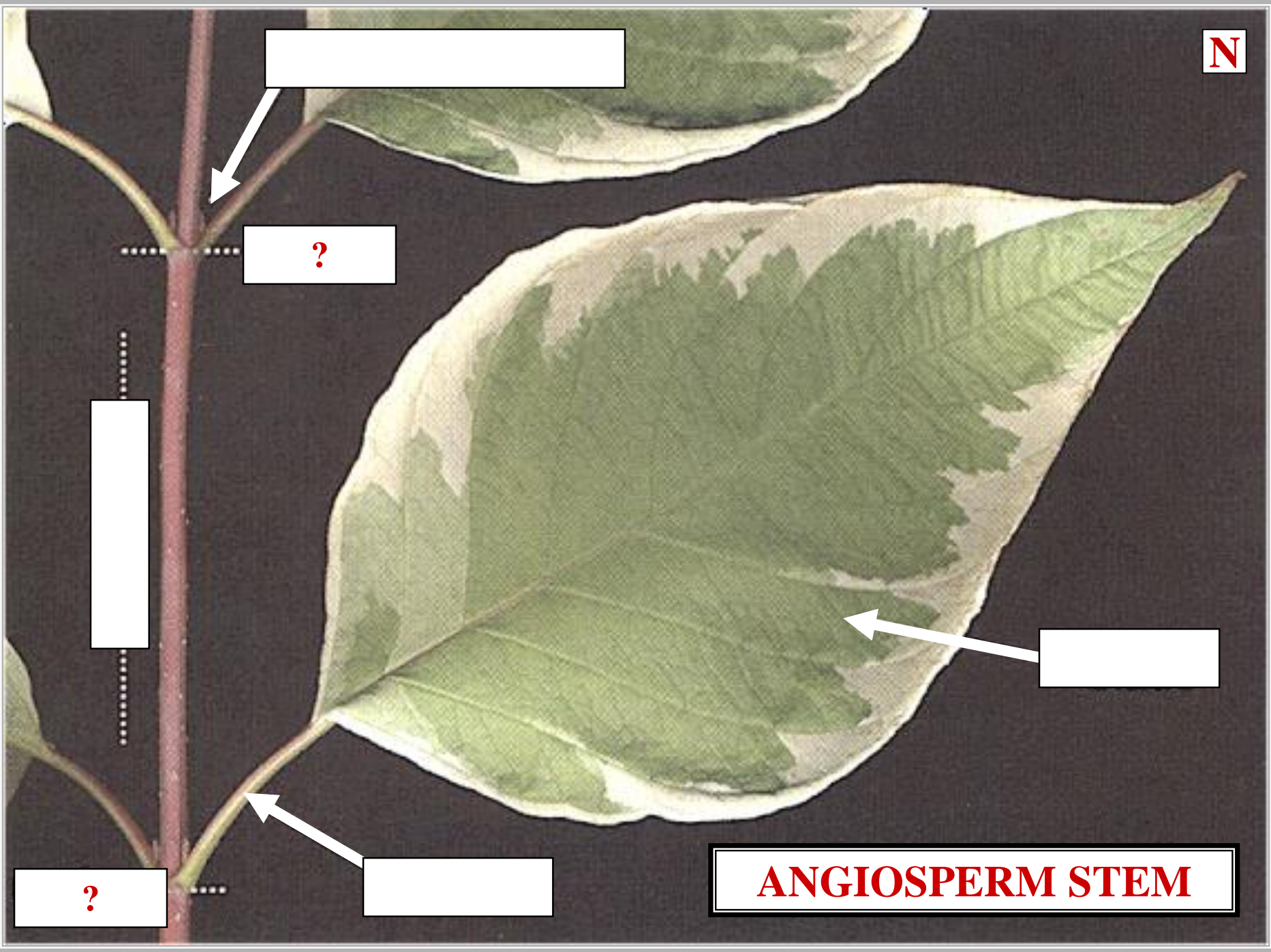
[Blank box]



[Blank box]

?

**ANGIOSPERM STEM**





?

[Blank box]



**NODE**

[Blank box]



**NODE**

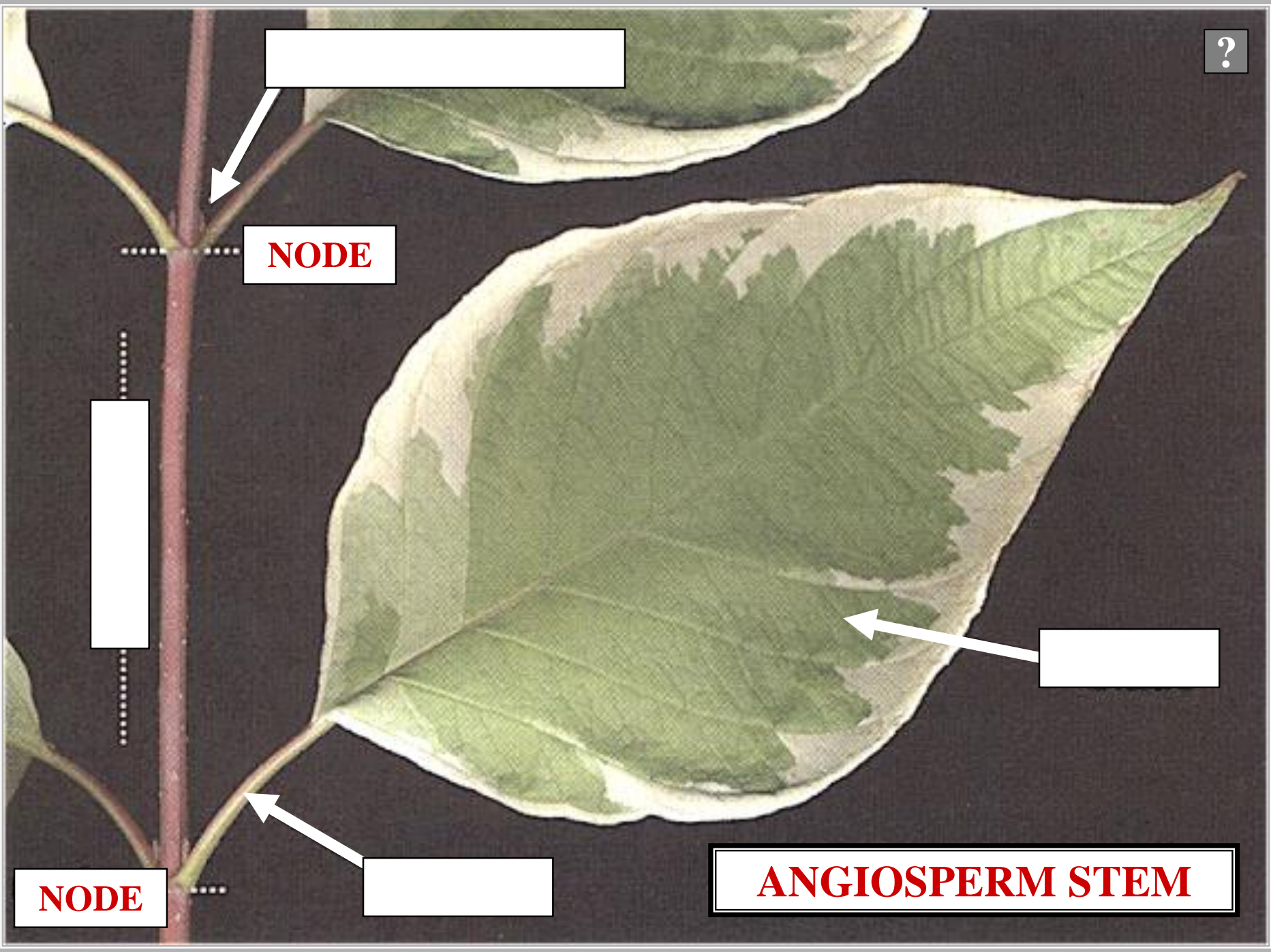
[Blank box]



[Blank box]



**ANGIOSPERM STEM**



**I**

[Blank box]



**NODE**

[Blank box]  
?  
[Blank box]



[Blank box]

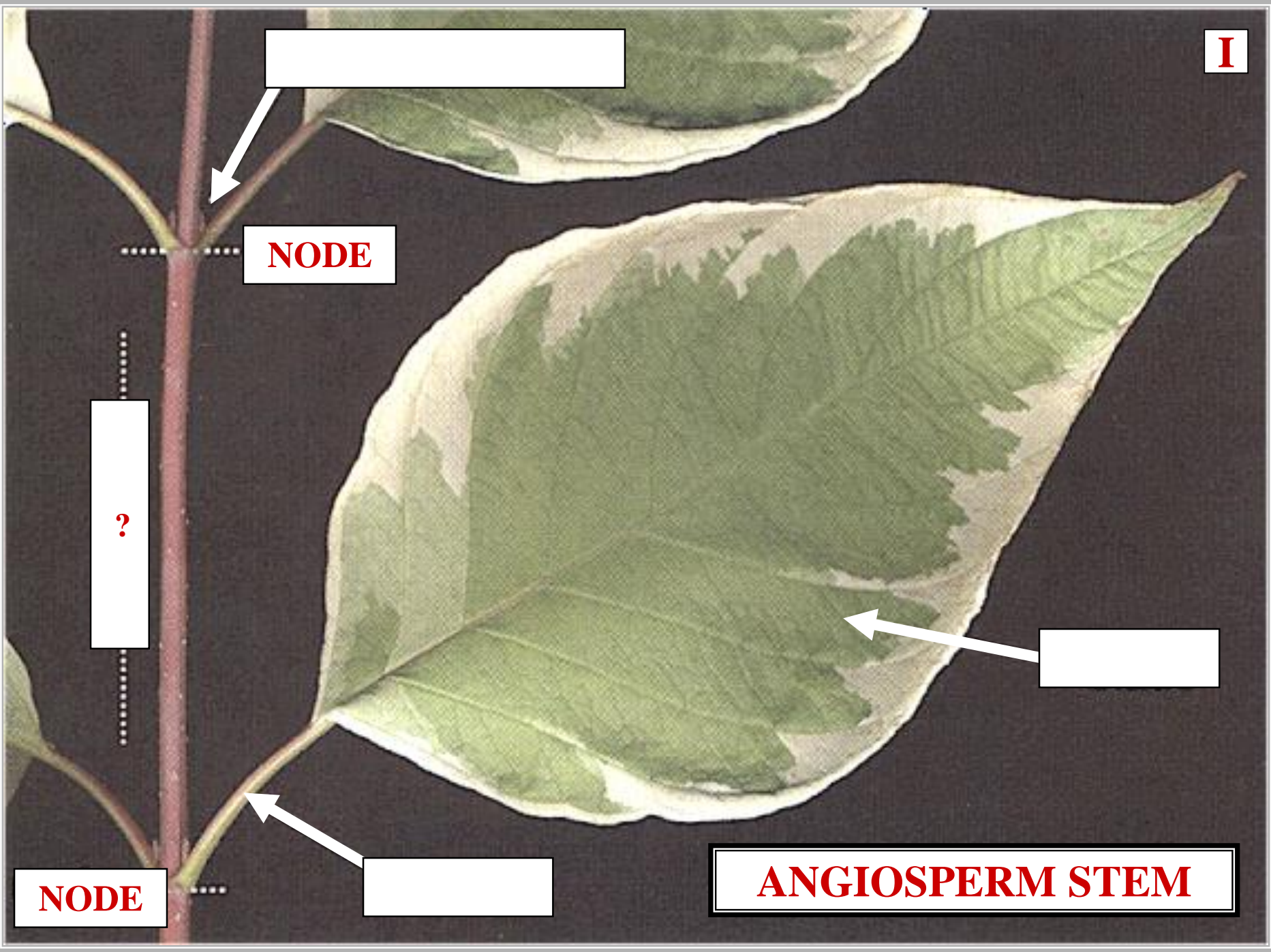


[Blank box]



**NODE**

**ANGIOSPERM STEM**







[Blank box]



**NODE**

**INTERNODE**

[Blank box]

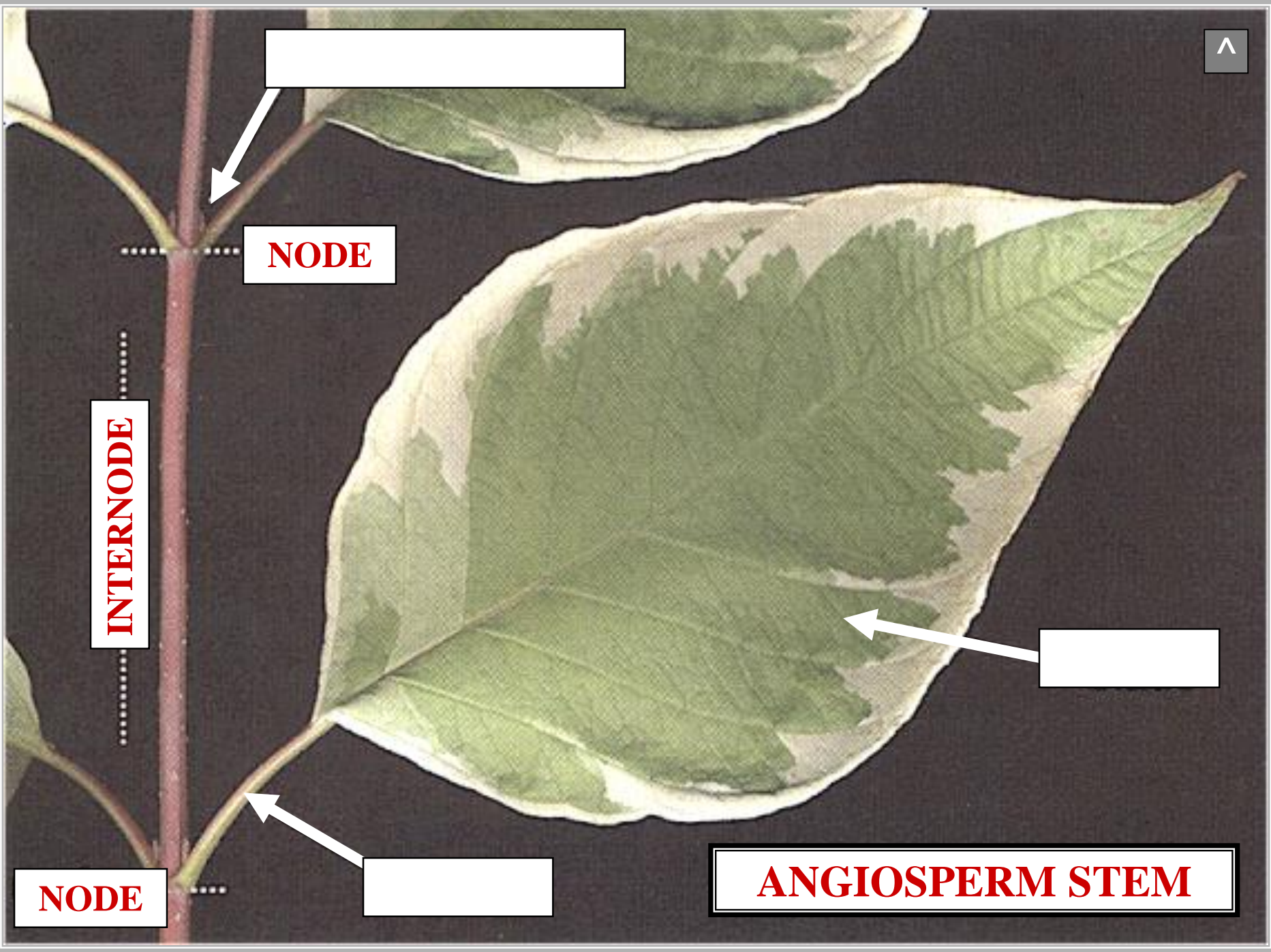


[Blank box]



**NODE**

**ANGIOSPERM STEM**





**LEAF**

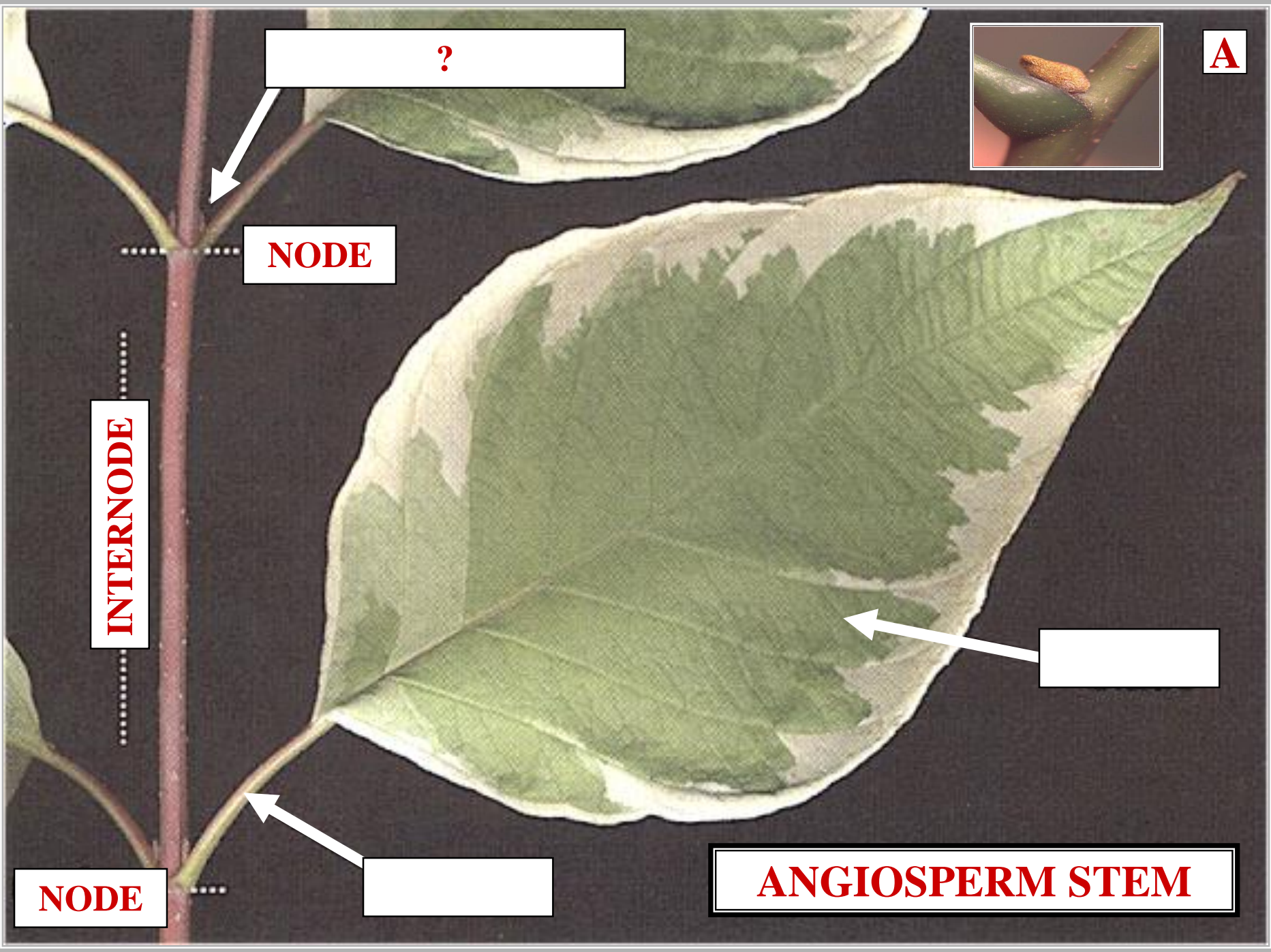




**QUESTION**

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

**QUESTION**



?



A

NODE

INTERNODE

[Empty box]

NODE

[Empty box]

ANGIOSPERM STEM



**AXILLARY BUD**

**NODE**

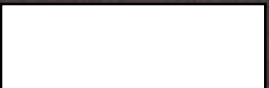
**INTERNODE**

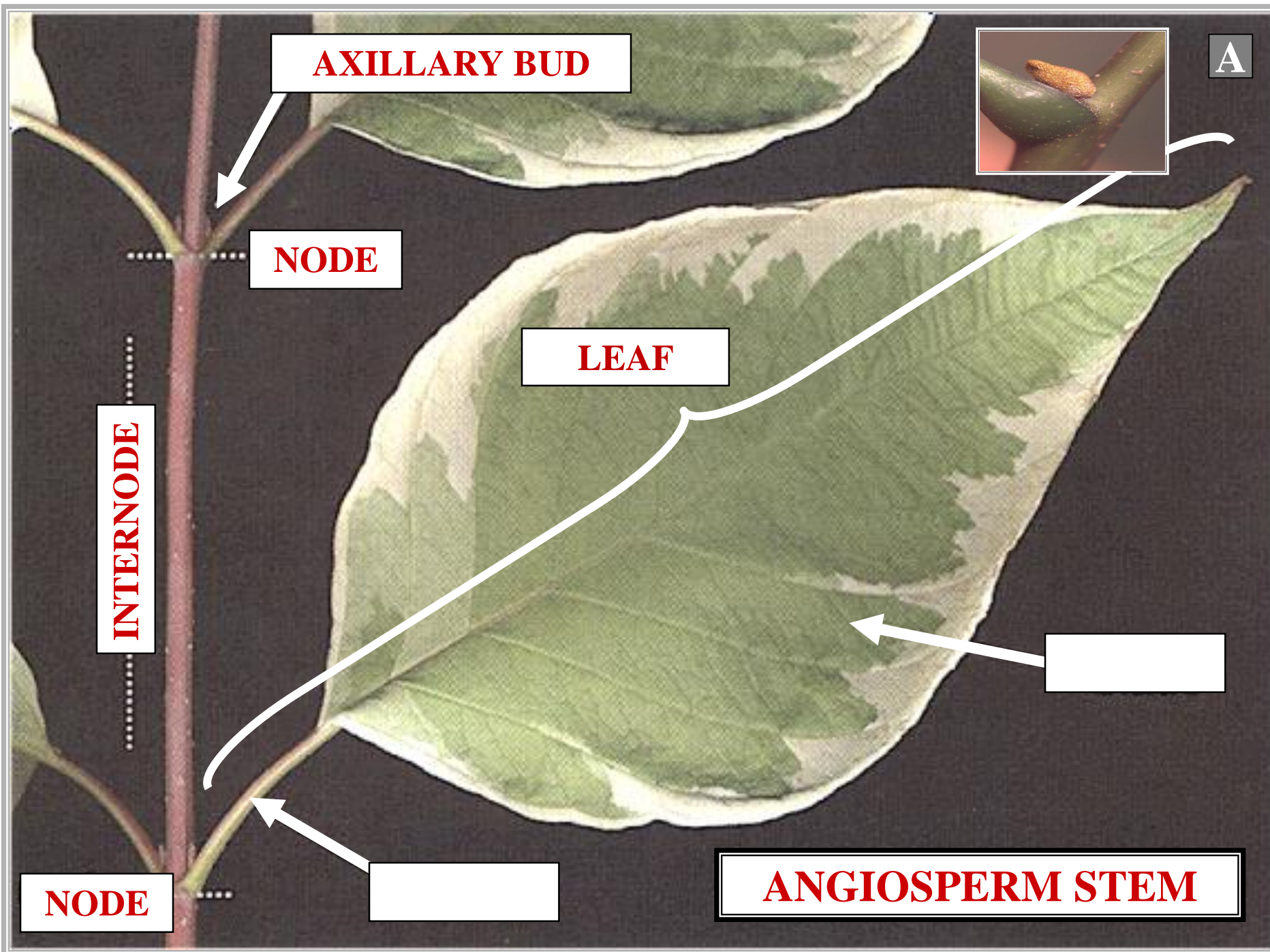
**NODE**

**ANGIOSPERM STEM**



**L**





**AXILLARY BUD**



**A**

**NODE**

**LEAF**

**INTERNODE**



**NODE**



**ANGIOSPERM STEM**





**ANSWER**

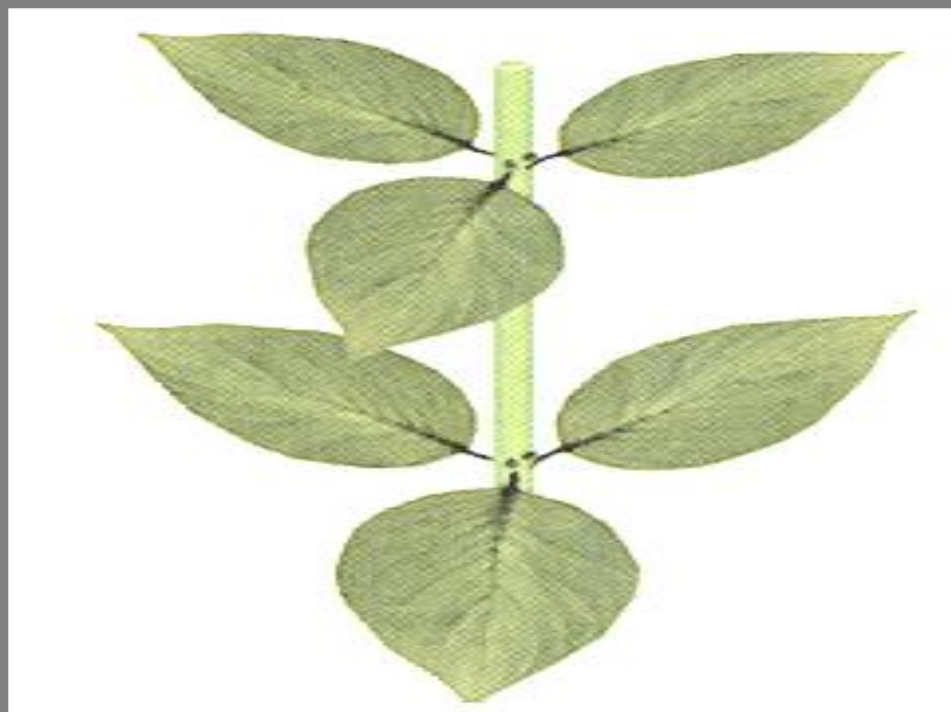
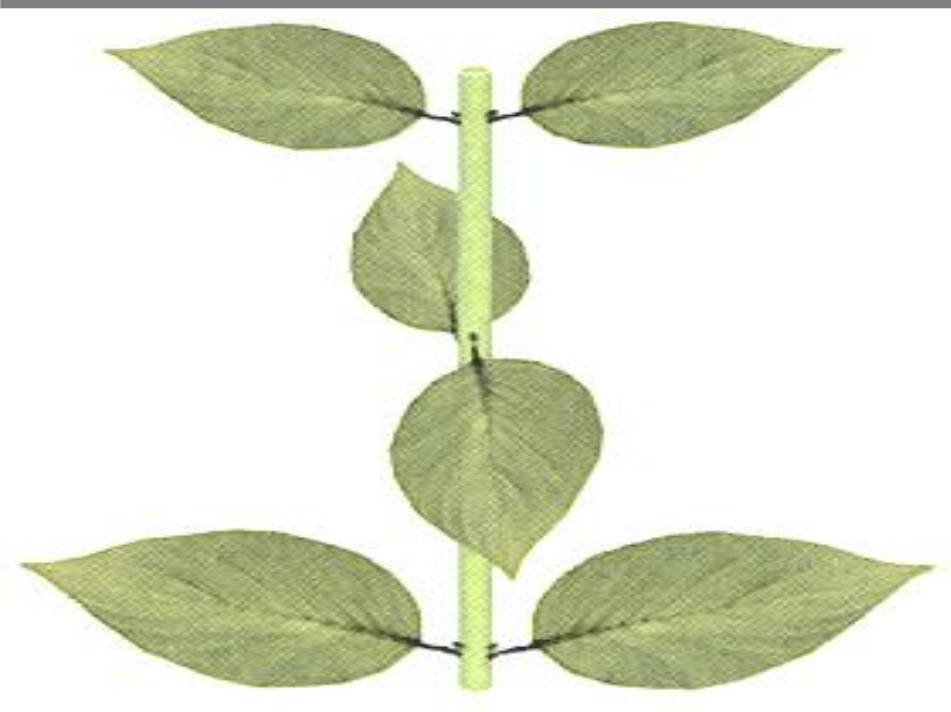
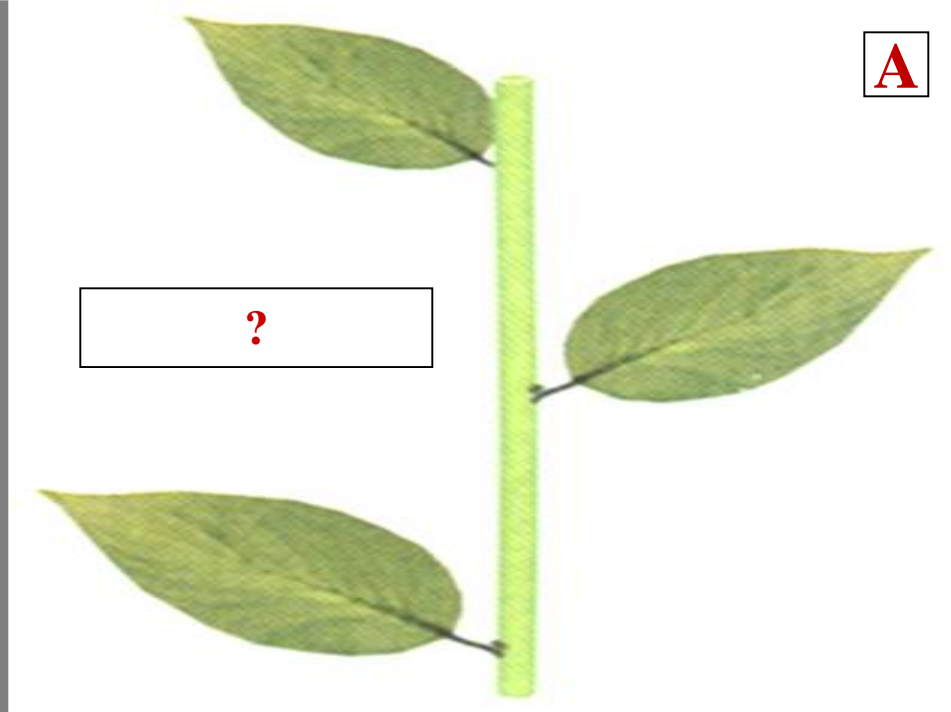
**AXILLARY BUD**

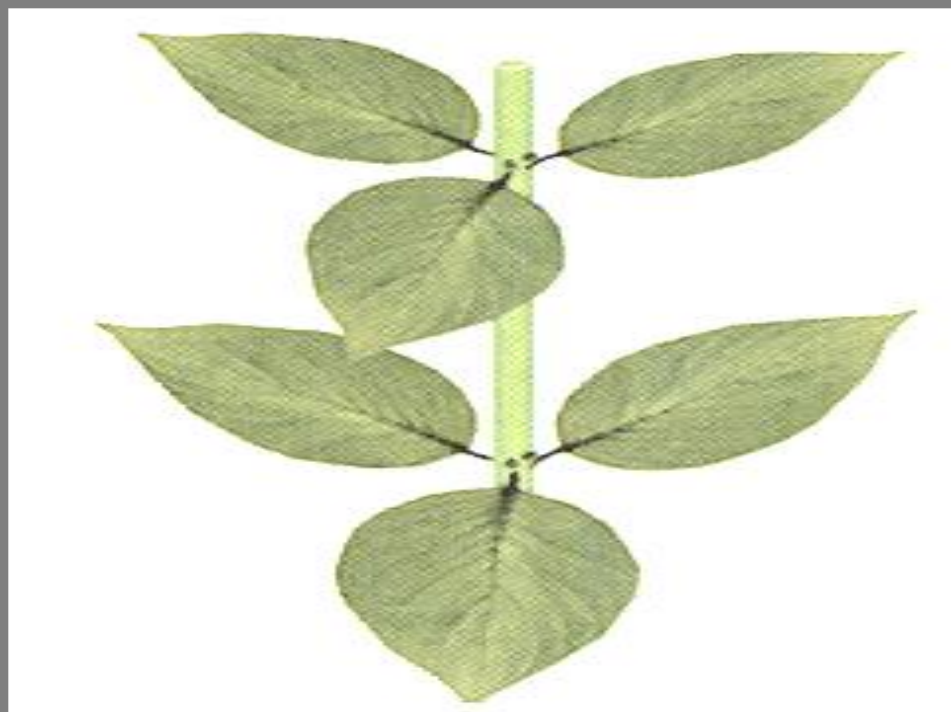
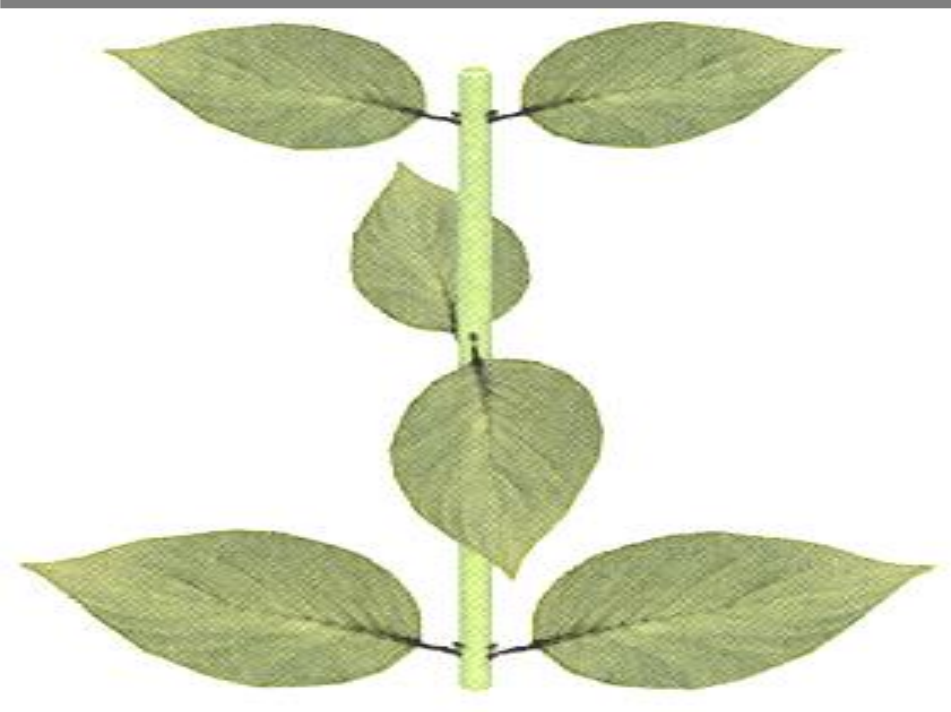
**ANSWER**



# LEAF PHYLLOTAXY









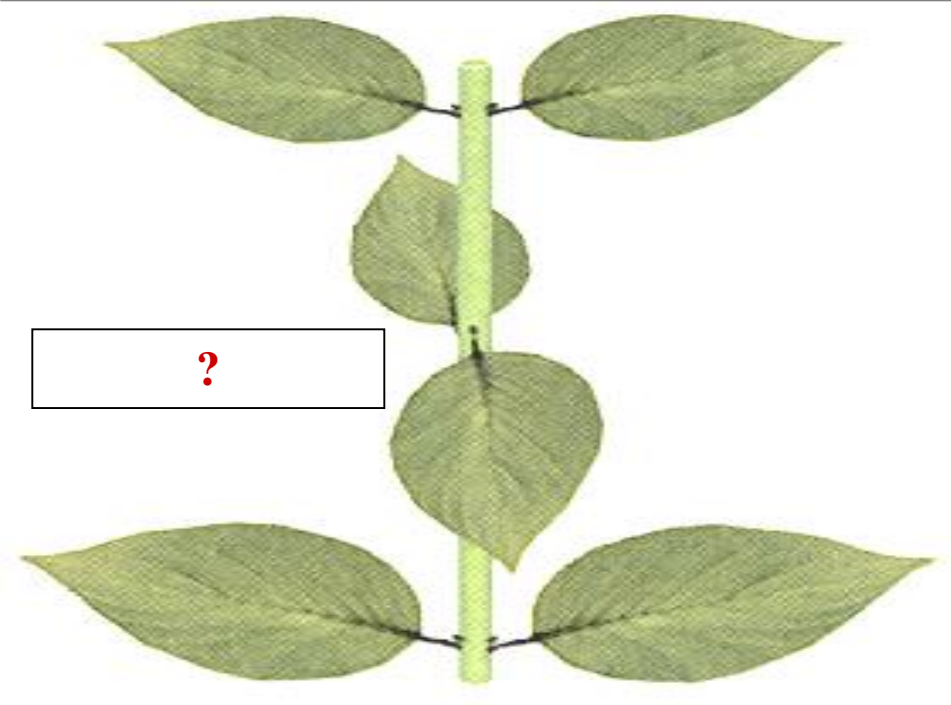


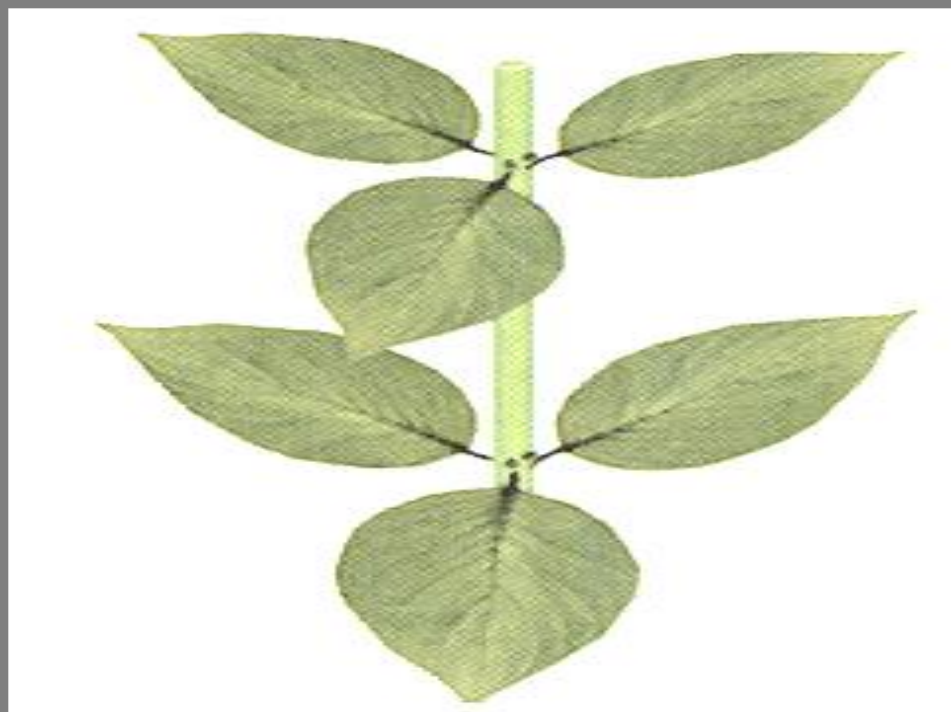
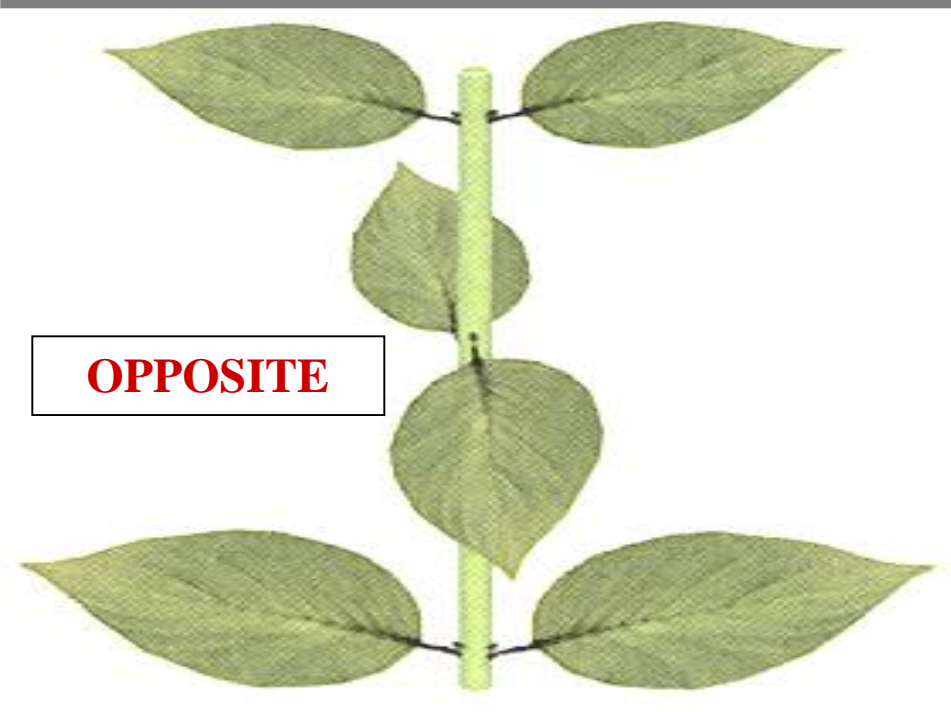
O

ALTERNATE



?





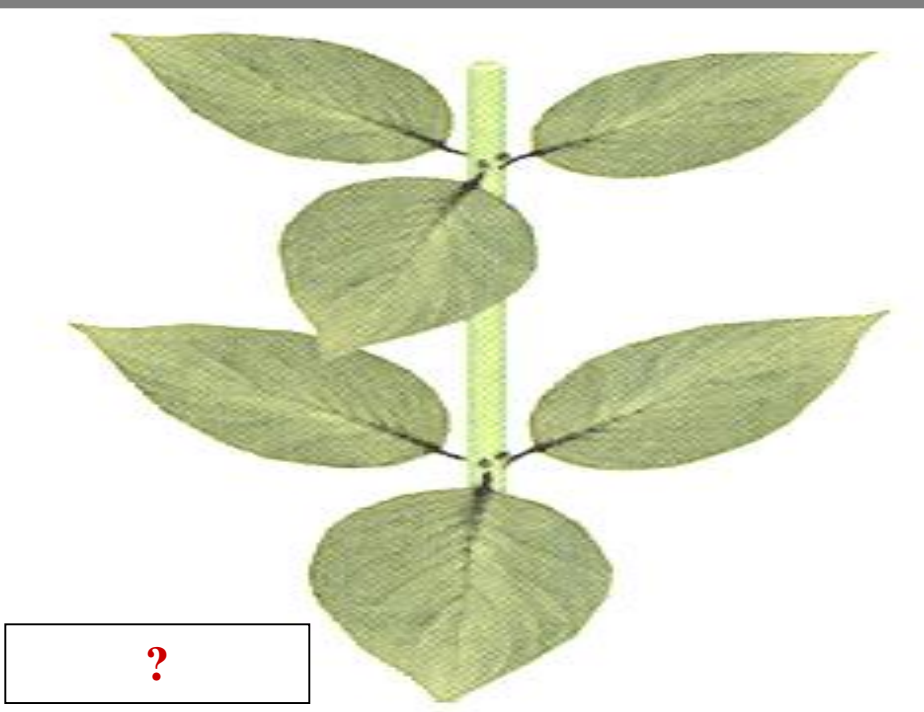
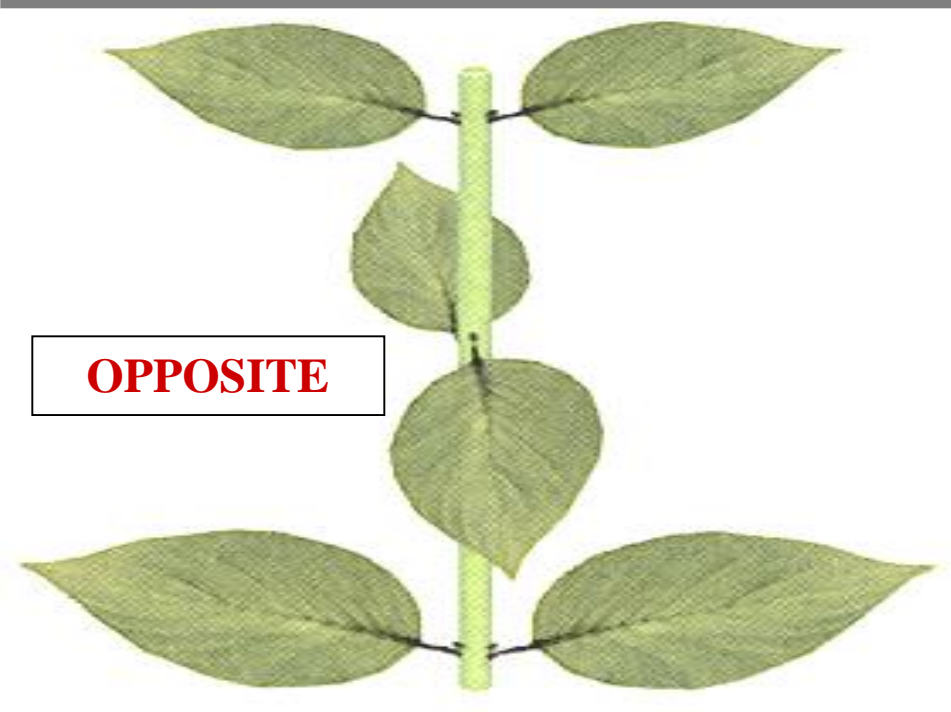




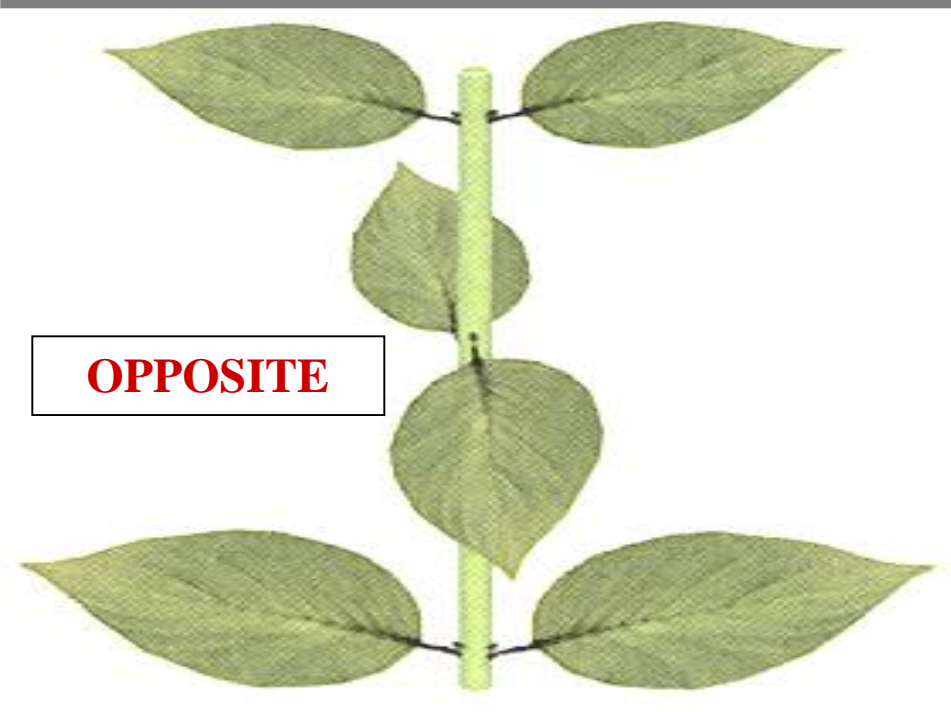
**ALTERNATE**



**OPPOSITE**



**?**







# LEAF VENATION



# DICOT LEAF VENATION



R

?



R

**RETICULATE VENATION**



# **RETICULATE VENATION**



**RETICULATE VENATION**

**MAJOR VEINS  
NETTED**

**RETICULATE VENATION**



**RETICULATE VENATION**

**DICOT LEAF VENATION**



# MONOCOT LEAF VENATION



?



**PARALLEL VENATION**



# **PARALLEL VENATION**

# PARALLEL VENATION



MAJOR VEINS  
EQUAL DISTANT

PARALLEL VENATION





**PARALLEL VENATION**

**MONOCOT LEAF VENATION**



# DICOT LEAF





# DICOT LEAF MORPHOLOGY

# **SIMPLE DICOT LEAF**



**SIMPLE  
DICOT LEAF**

**DICOT LEAF**  
**SIMPLE LEAF**



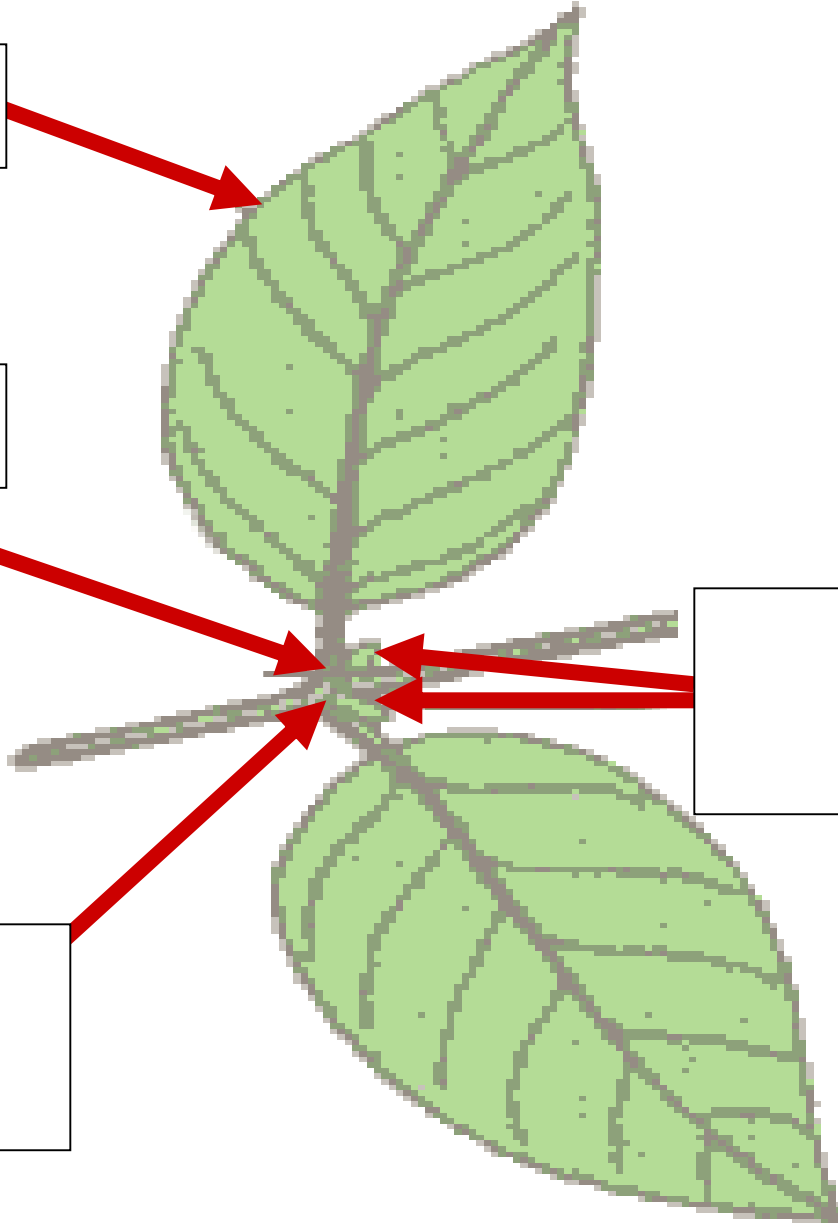
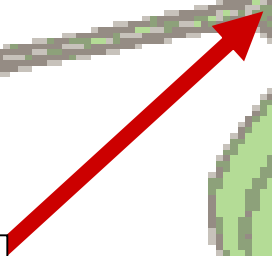
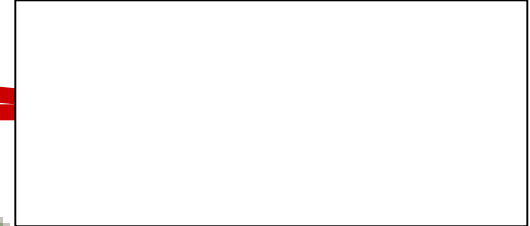
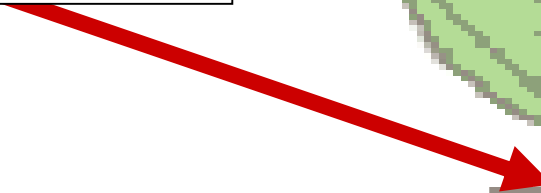
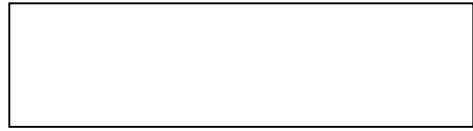
**LEAFLETS ABSENT**

**DICOT LEAF**  
**SIMPLE LEAF**



# **SIMPLE LEAF**

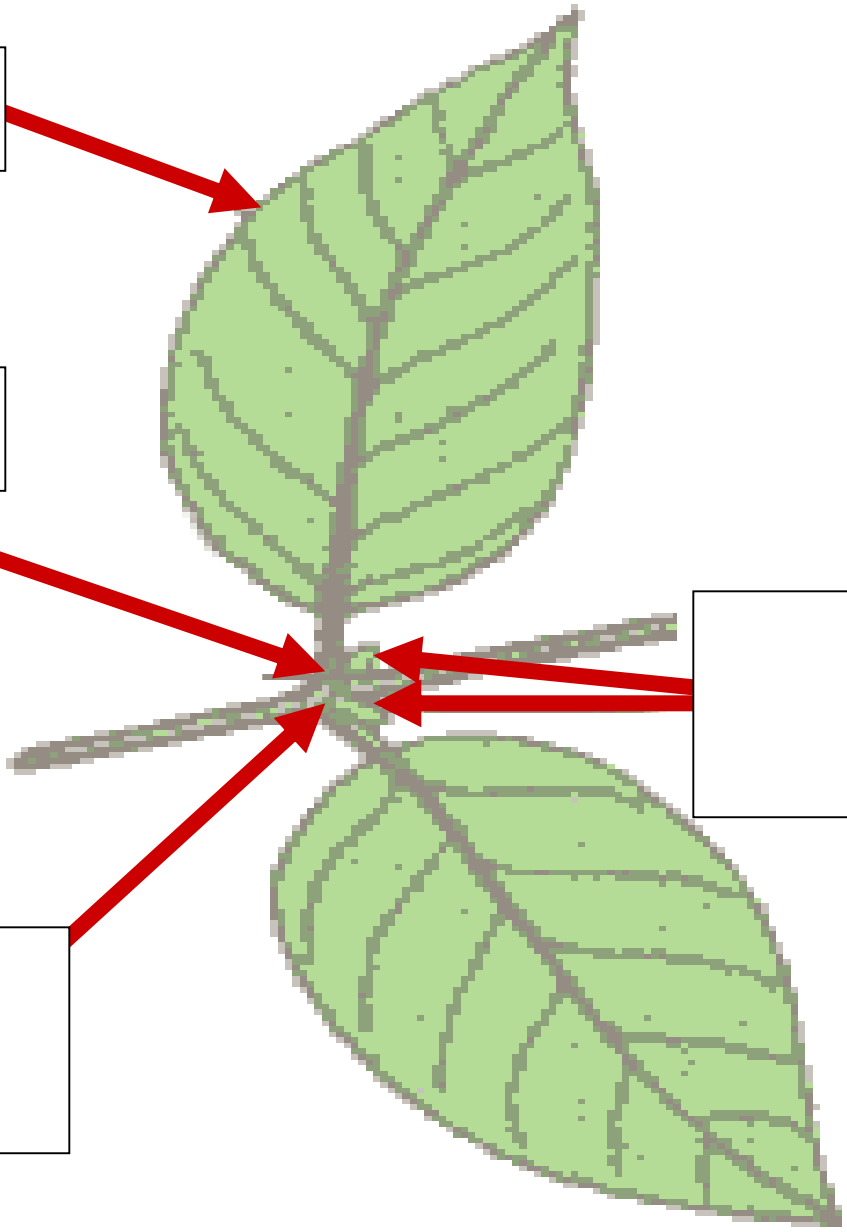
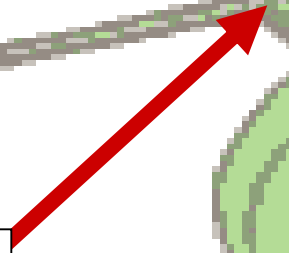
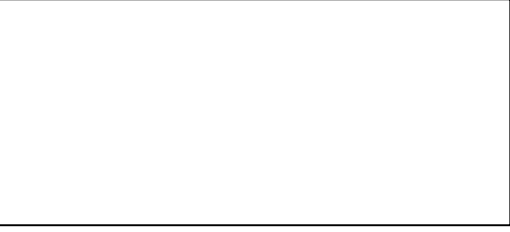
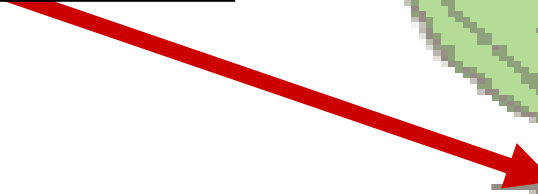
**LL**



**SIMPLE  
LEAF**

**LEAFLETS  
ABSENT**

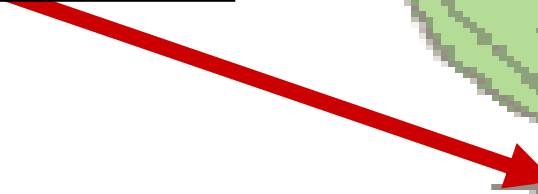
**AB**



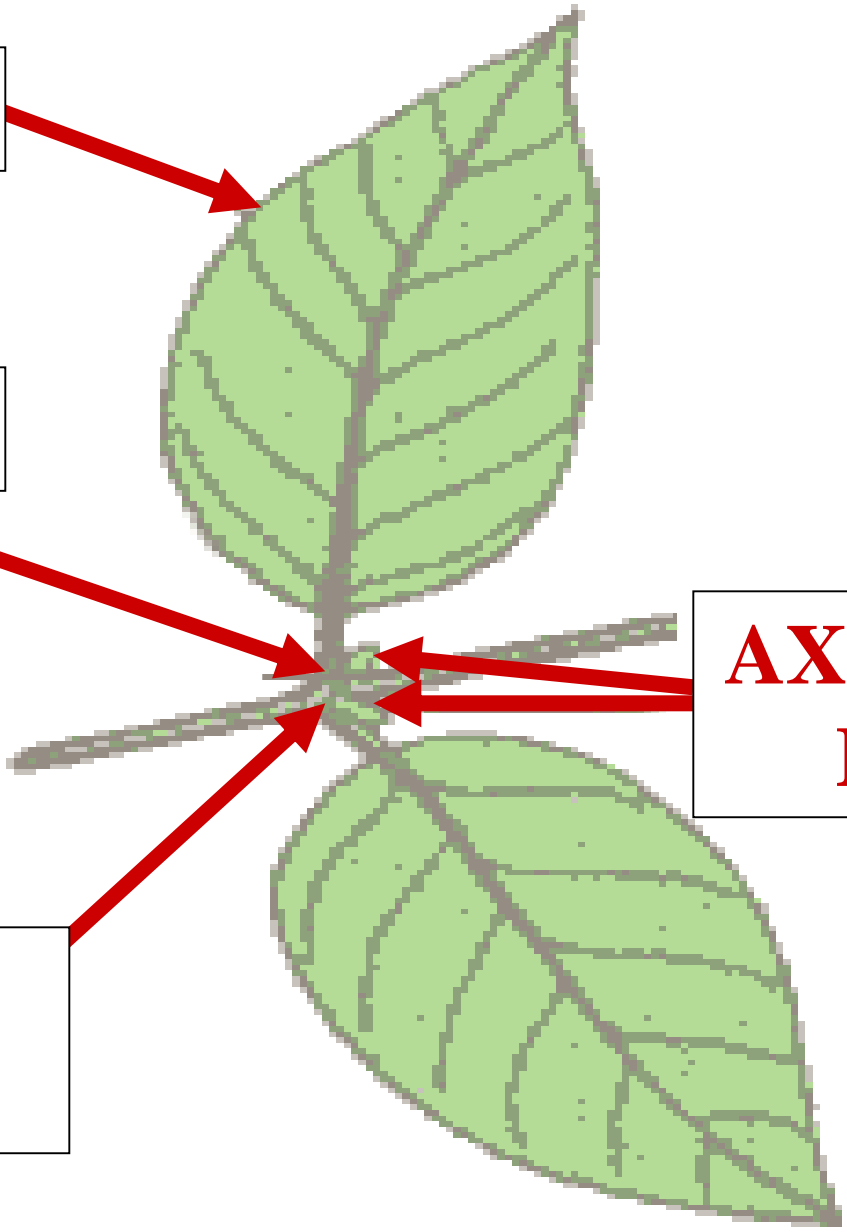
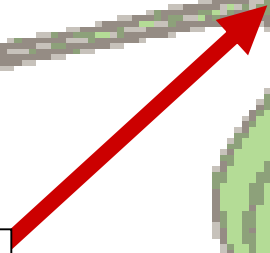


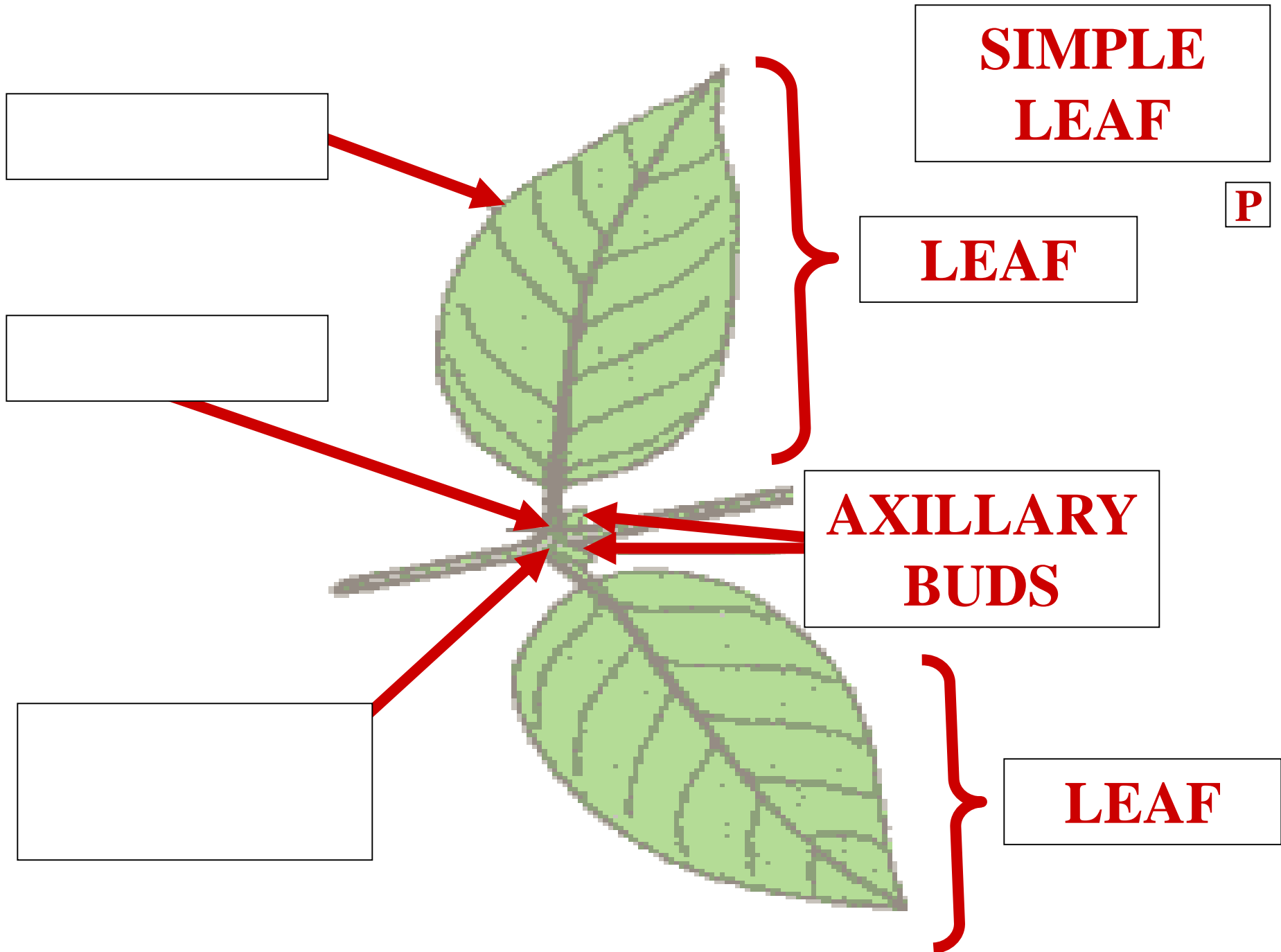
**SIMPLE  
LEAF**

**LF**

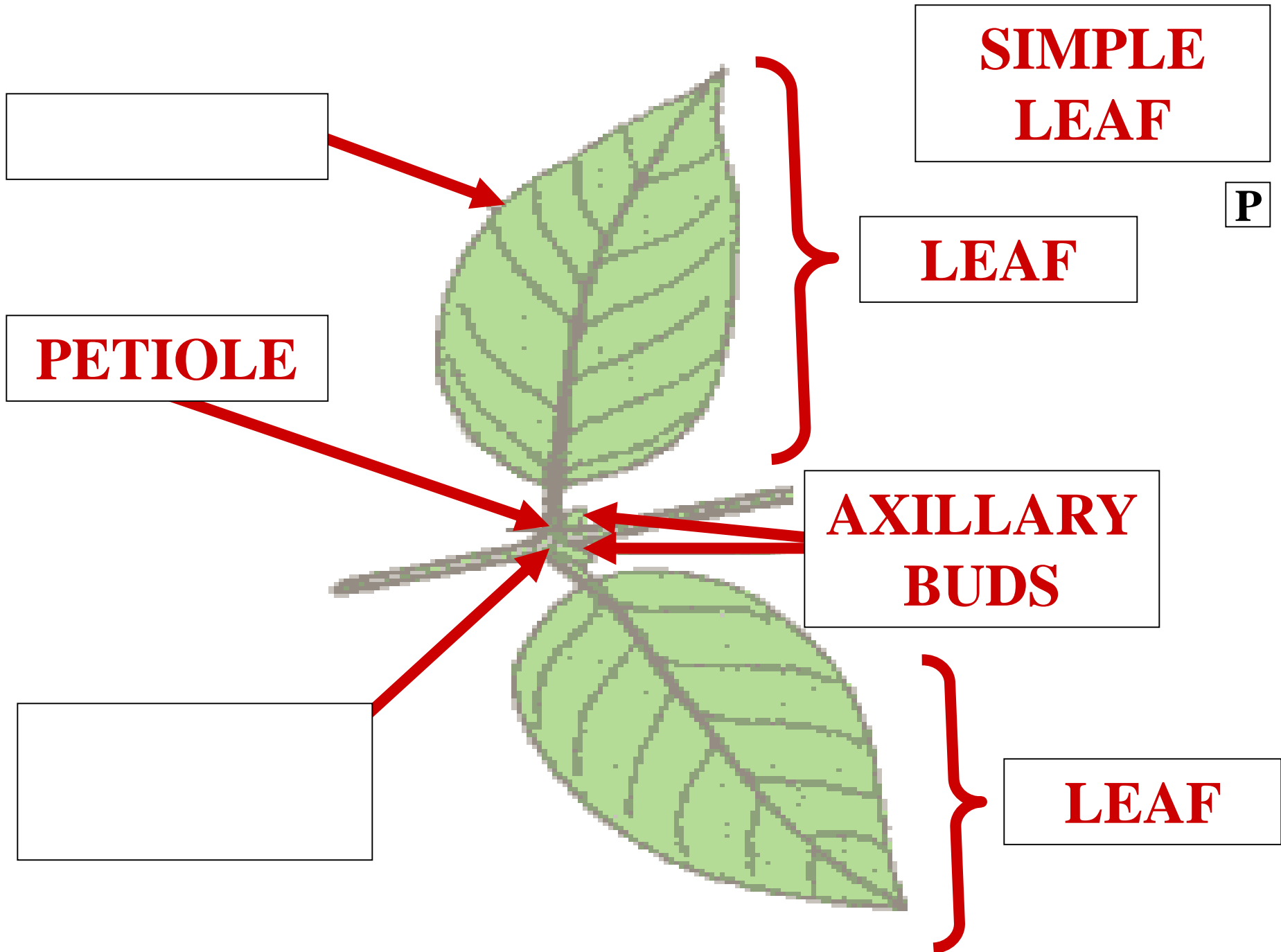


**AXILLARY  
BUDS**









**PETIOLE**



# **DICOT LEAF PETIOLE**



**LEAF STALK**

# **DICOT LEAF PETIOLE**

**SIMPLE  
LEAF**

**S**

**LEAF**

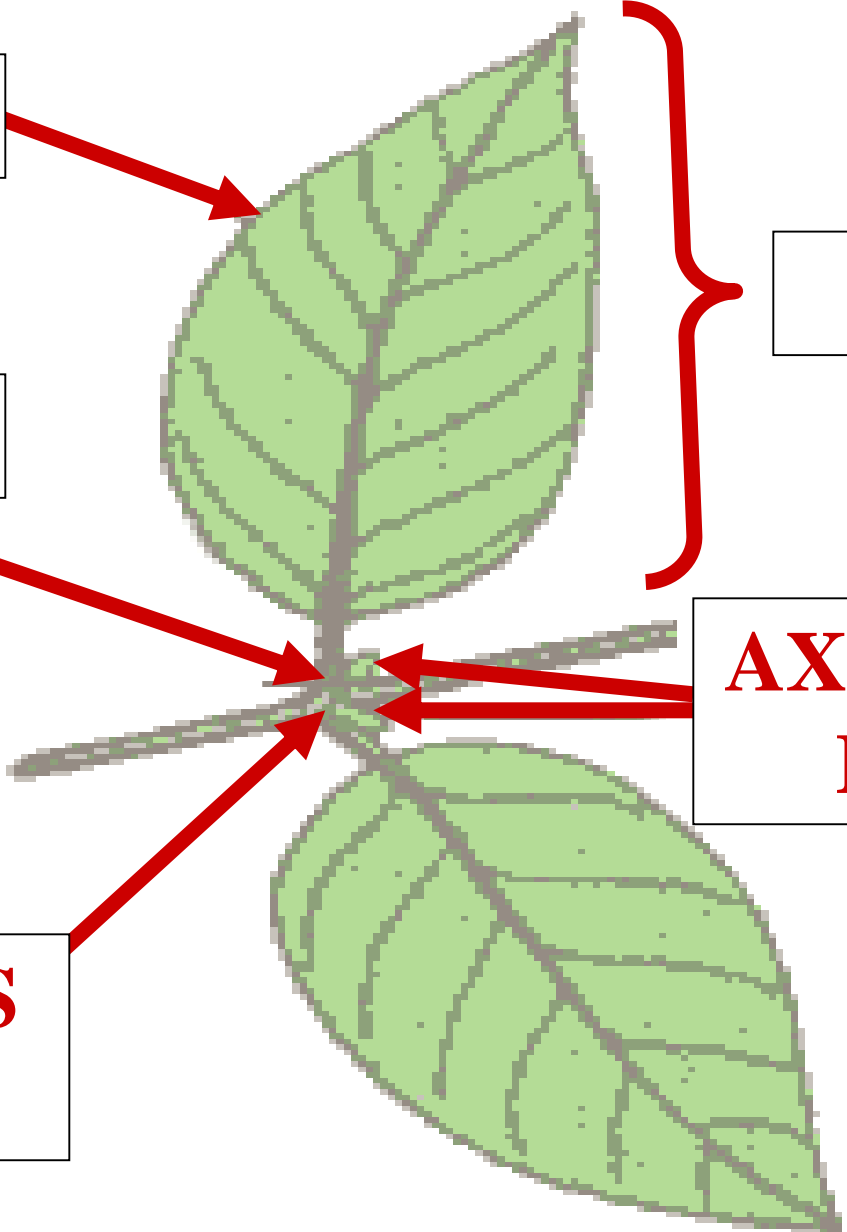
**AXILLARY  
BUDS**

**LEAF**

**PETIOLE**



**STIPULES  
ABSENT**





**STIPULE**

**DICOT LEAF  
STIPULE**



**LEAF-LIKE APPENDAGE  
AT PETIOLE BASE**

**DICOT LEAF  
STIPULE**



**DICOT LEAF  
STIPULE**



**LEAF-LIKE APPENDAGE  
AT PETIOLE BASE**

---

**PRESENT OR ABSENT**

**DICOT LEAF  
STIPULE**

**SIMPLE  
LEAF**

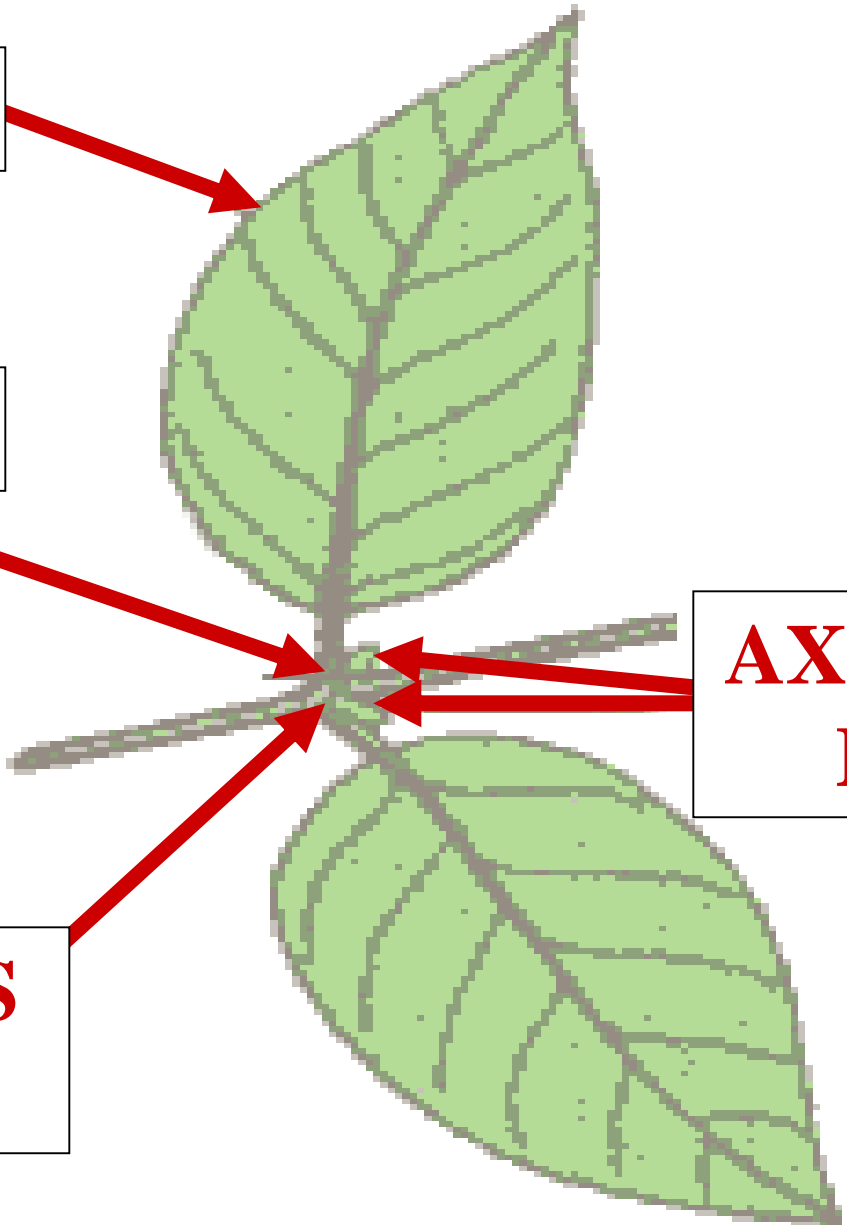
**L**

[Empty box]

**PETIOLE**



**STIPULES  
ABSENT**



**AXILLARY  
BUDS**



**LEAF**



**SIMPLE  
LEAF**

**LAMINA**

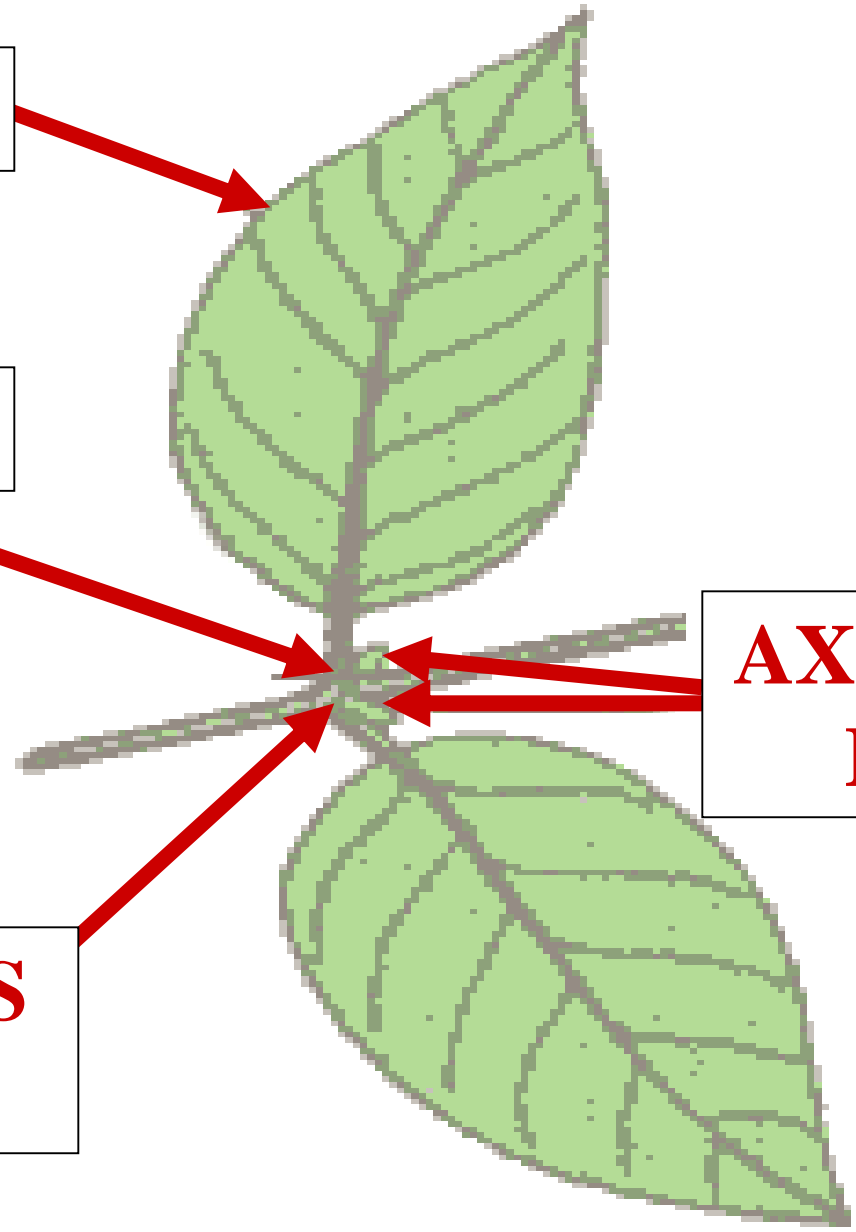
**PETIOLE**



**STIPULES  
ABSENT**

**AXILLARY  
BUDS**

**LEAF**



# COMPOUND DICOT LEAF



# **COMPOUND DICOT LEAF**

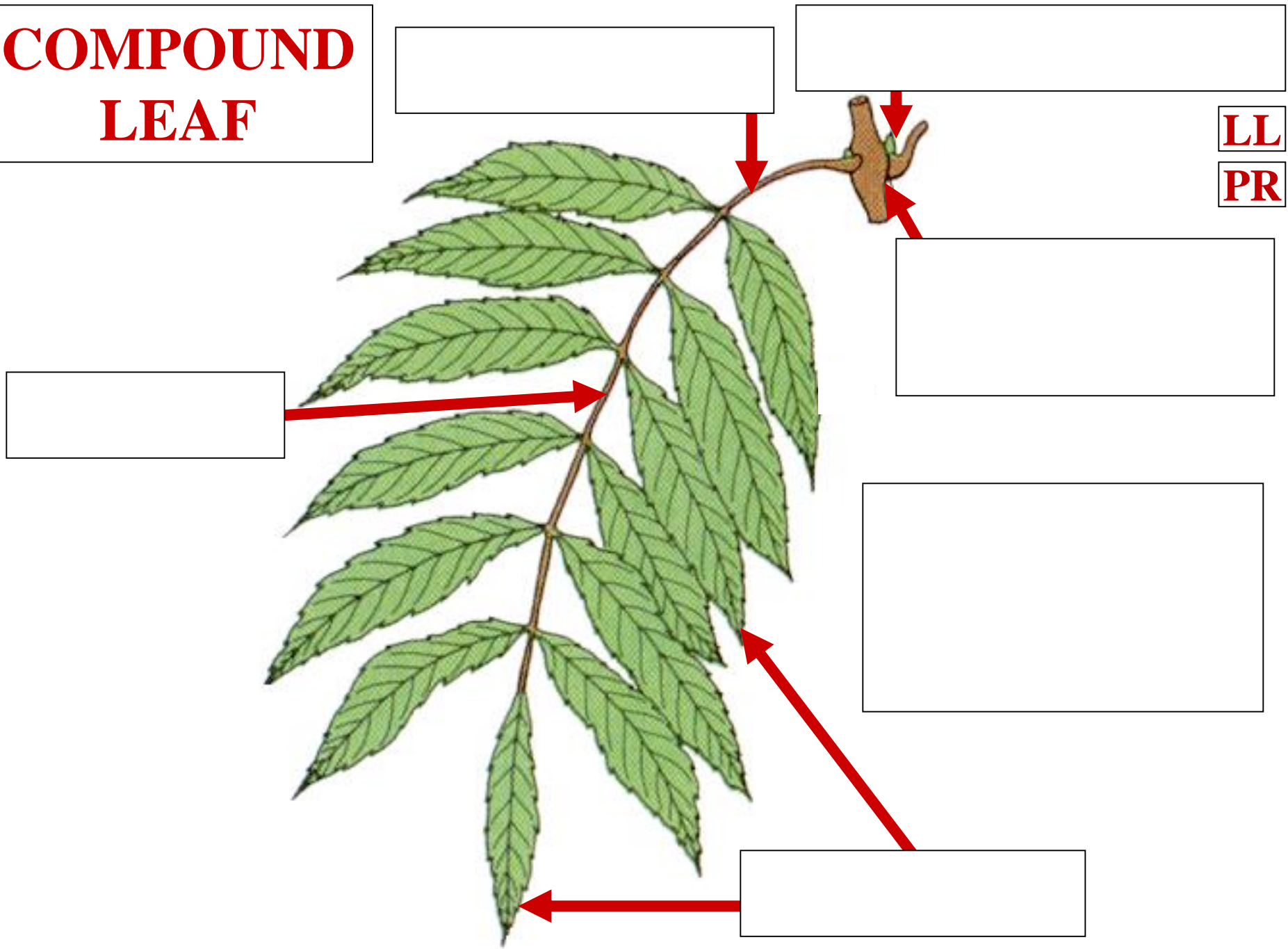
**DICOT LEAF**  
**COMPOUND LEAF**



**LEAFLETS PRESENT**

**DICOT LEAF**  
**COMPOUND LEAF**

# COMPOUND LEAF



[Empty box for label]

[Empty box for label]

LL

PR

[Empty box for label]

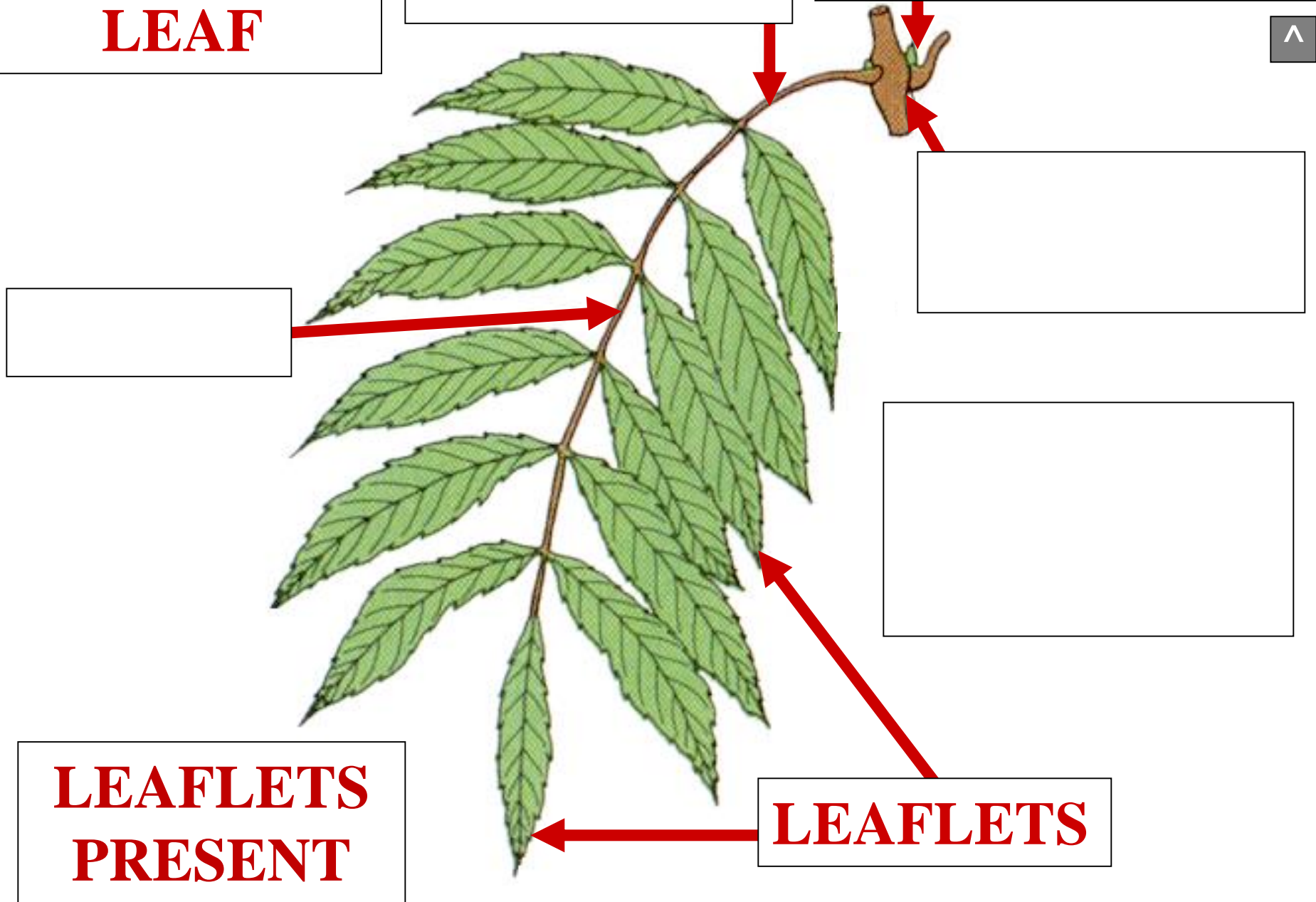
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[Empty box for label]

[Empty box for label]



# COMPOUND LEAF





**PINNATELY  
COMPOUND  
DICOT LEAF  
VS  
PALMATELY  
COMPOUND  
DICOT LEAF**

**PINNATELY  
COMPOUND  
DICOT LEAF**



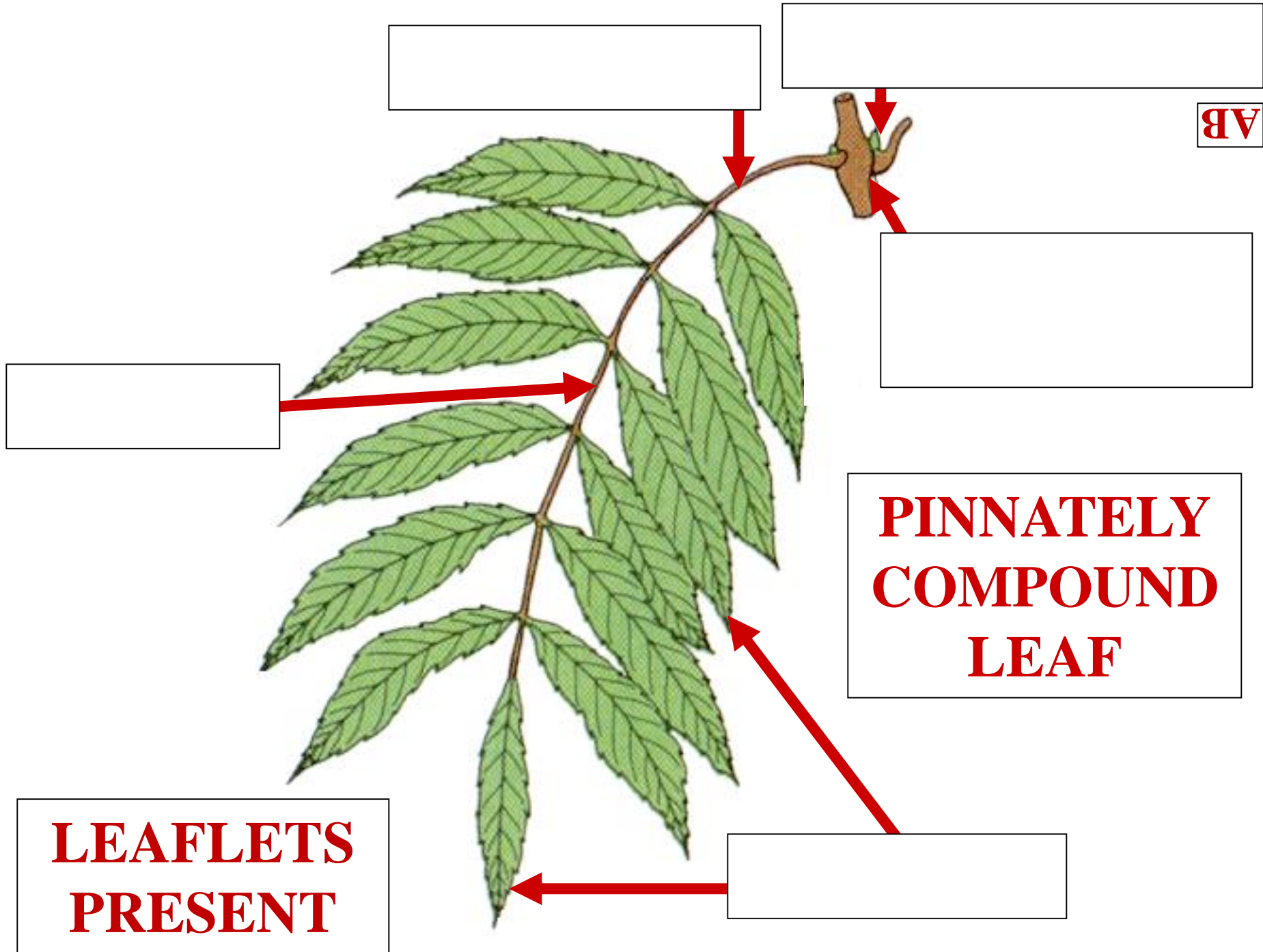
**PINNATELY  
COMPOUND  
DICOT LEAF**



**DICOT LEAF**  
**PINNATELY COMPOUND**

**RACHIS PRESENT**

**DICOT LEAF**  
**PINNATELY COMPOUND**



[Empty box]

[Empty box]

AB

[Empty box]

[Empty box]

**PINNATELY  
COMPOUND  
LEAF**

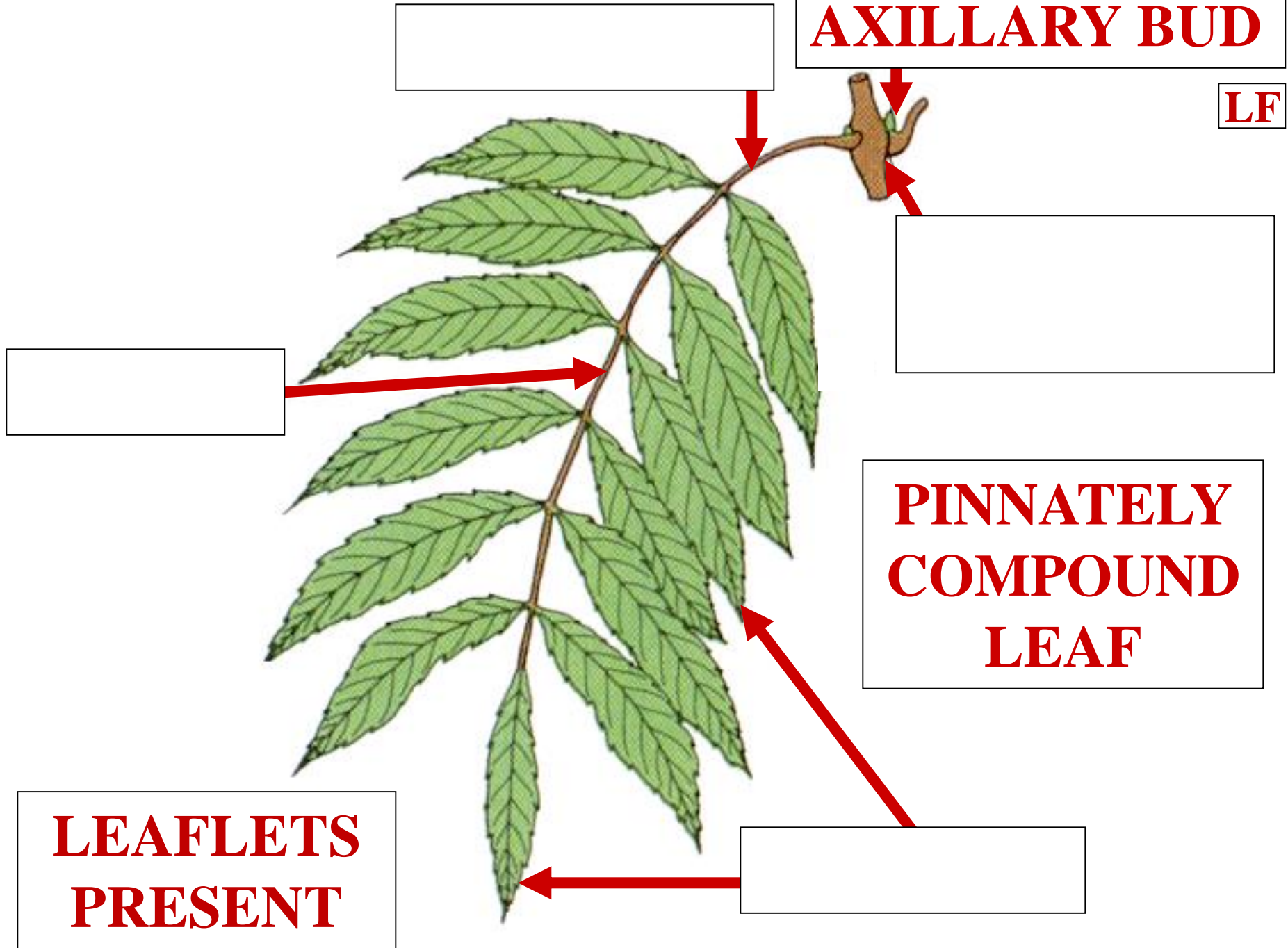
**LEAFLETS  
PRESENT**

[Empty box]



**AXILLARY BUD**

**LF**



**PINNATELY  
COMPOUND  
LEAF**

**LEAFLETS  
PRESENT**

**AXILLARY BUD**

**P**

[Empty box]

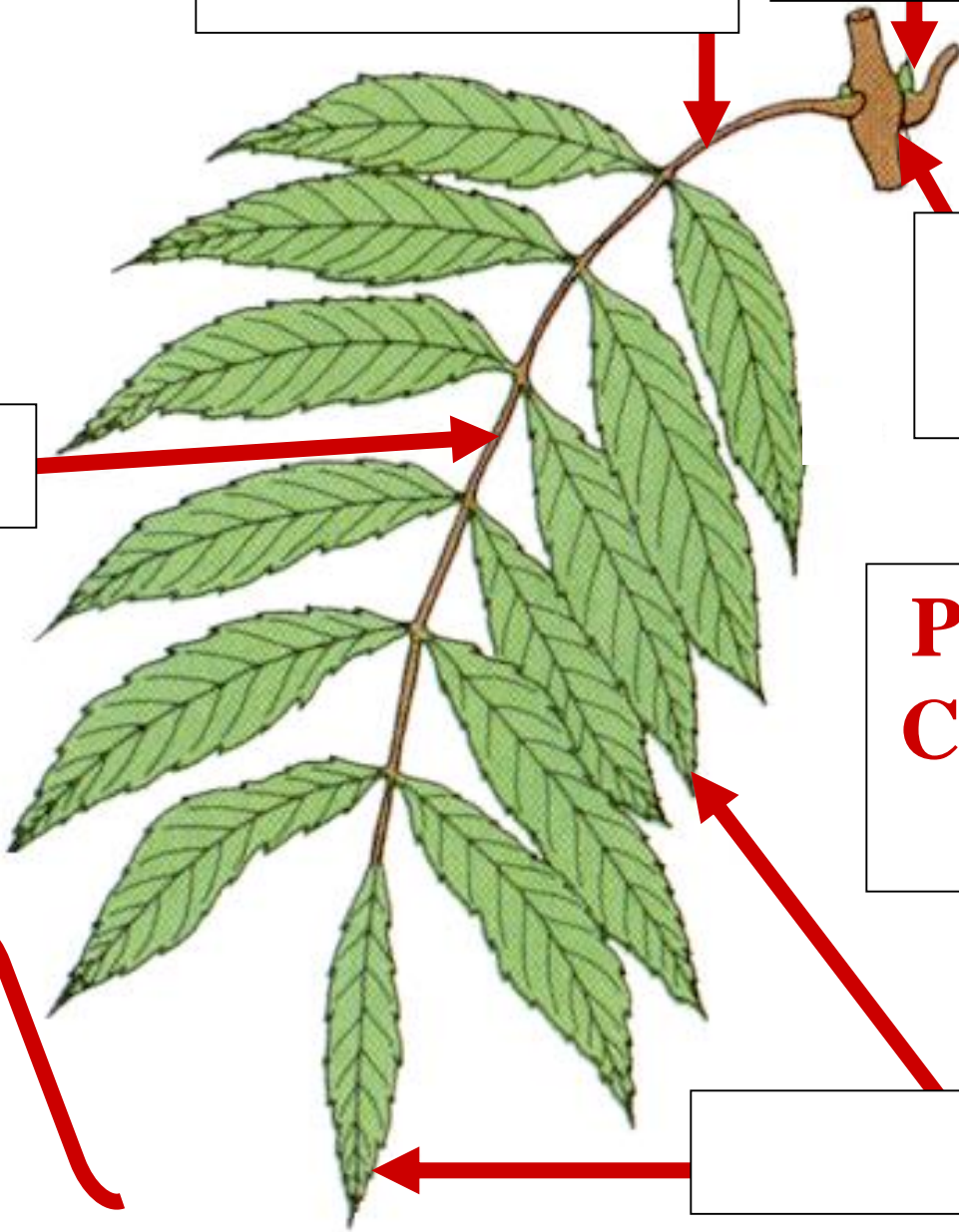
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**PINNATELY  
COMPOUND  
LEAF**

[Empty box]

[Empty box]

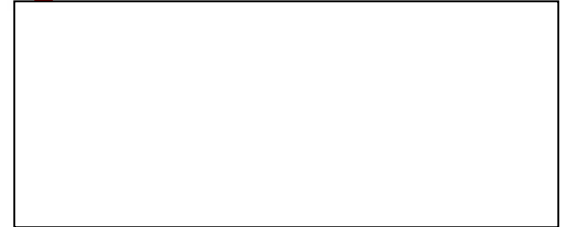
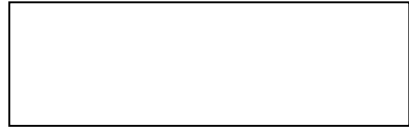
**LEAF**



**PETIOLE**

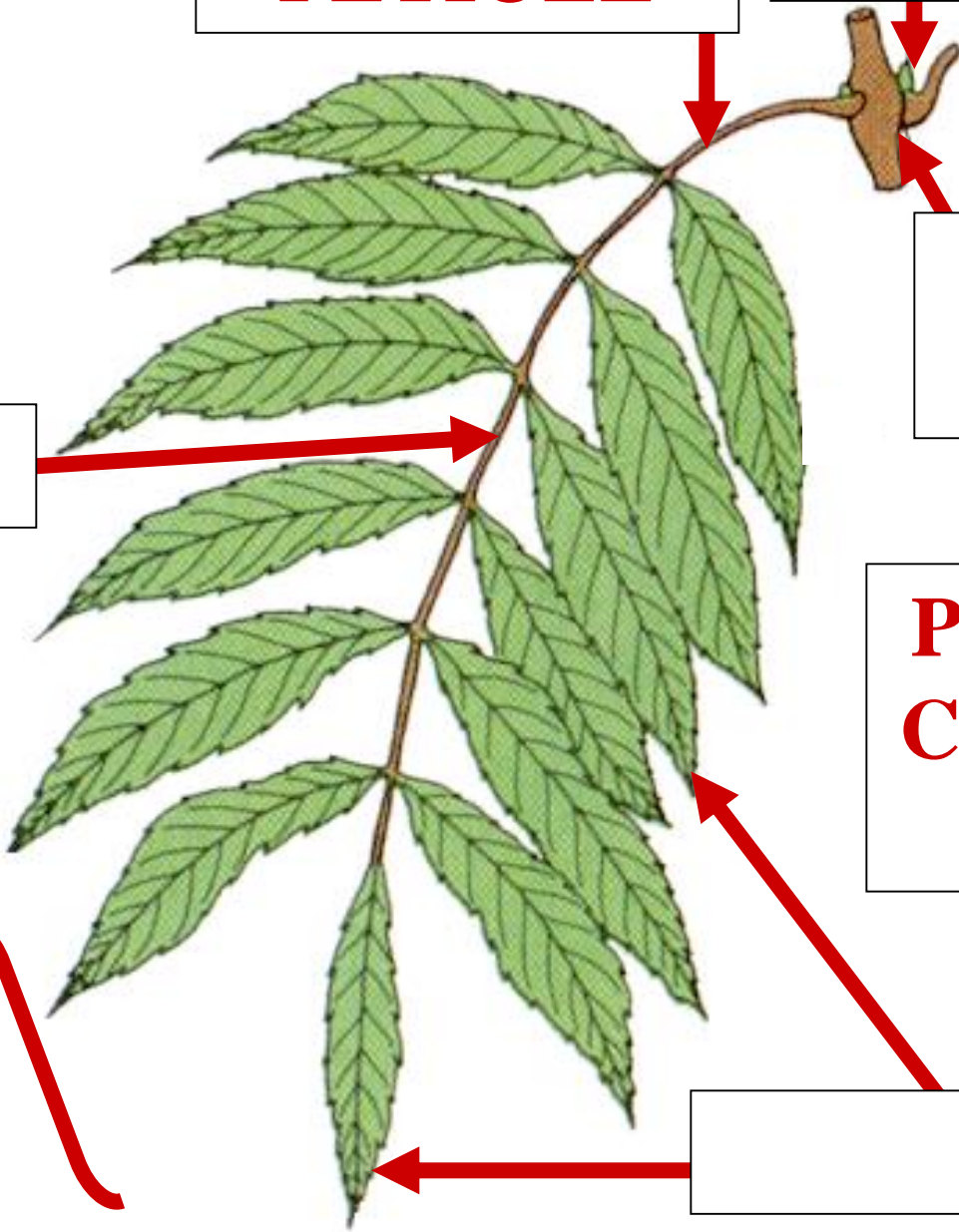
**AXILLARY BUD**

**S**



**PINNATELY  
COMPOUND  
LEAF**

**LEAF**







**PETIOLE**

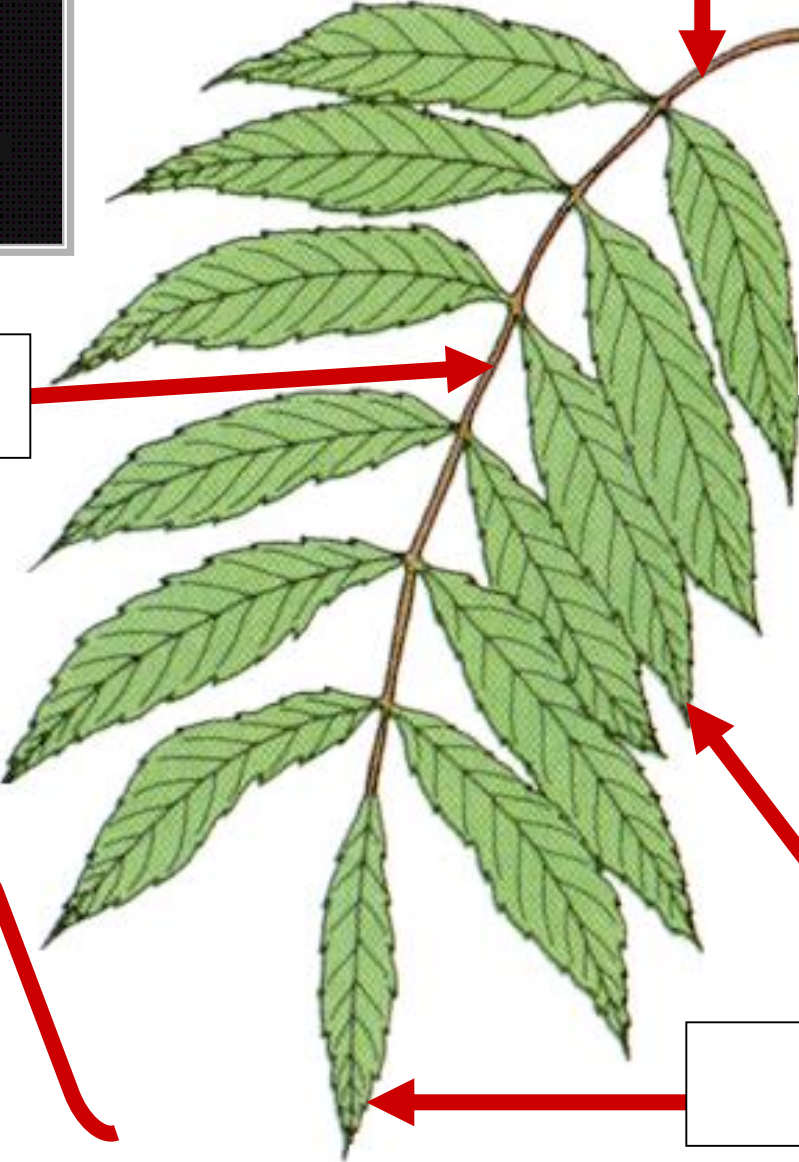
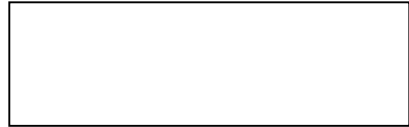
**AXILLARY BUD**

**R**

**STIPULES  
ABSENT**

**PINNATELY  
COMPOUND  
LEAF**

**LEAF**





**PETIOLE**

**AXILLARY BUD**

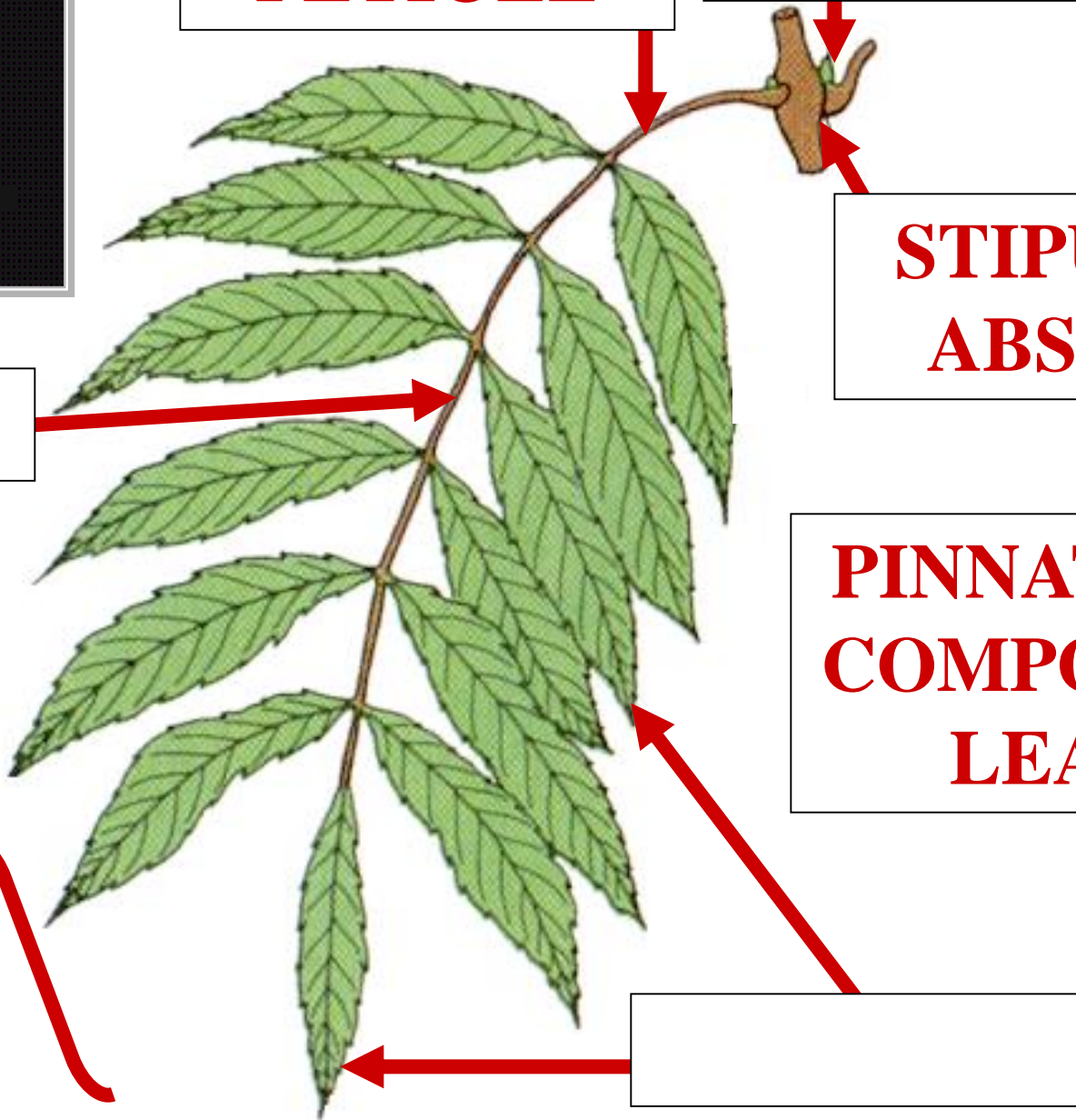
**L**

**STIPULES  
ABSENT**

**RACHIS**

**PINNATELY  
COMPOUND  
LEAF**

**LEAF**





**PETIOLE**

**AXILLARY BUD**

**LL**

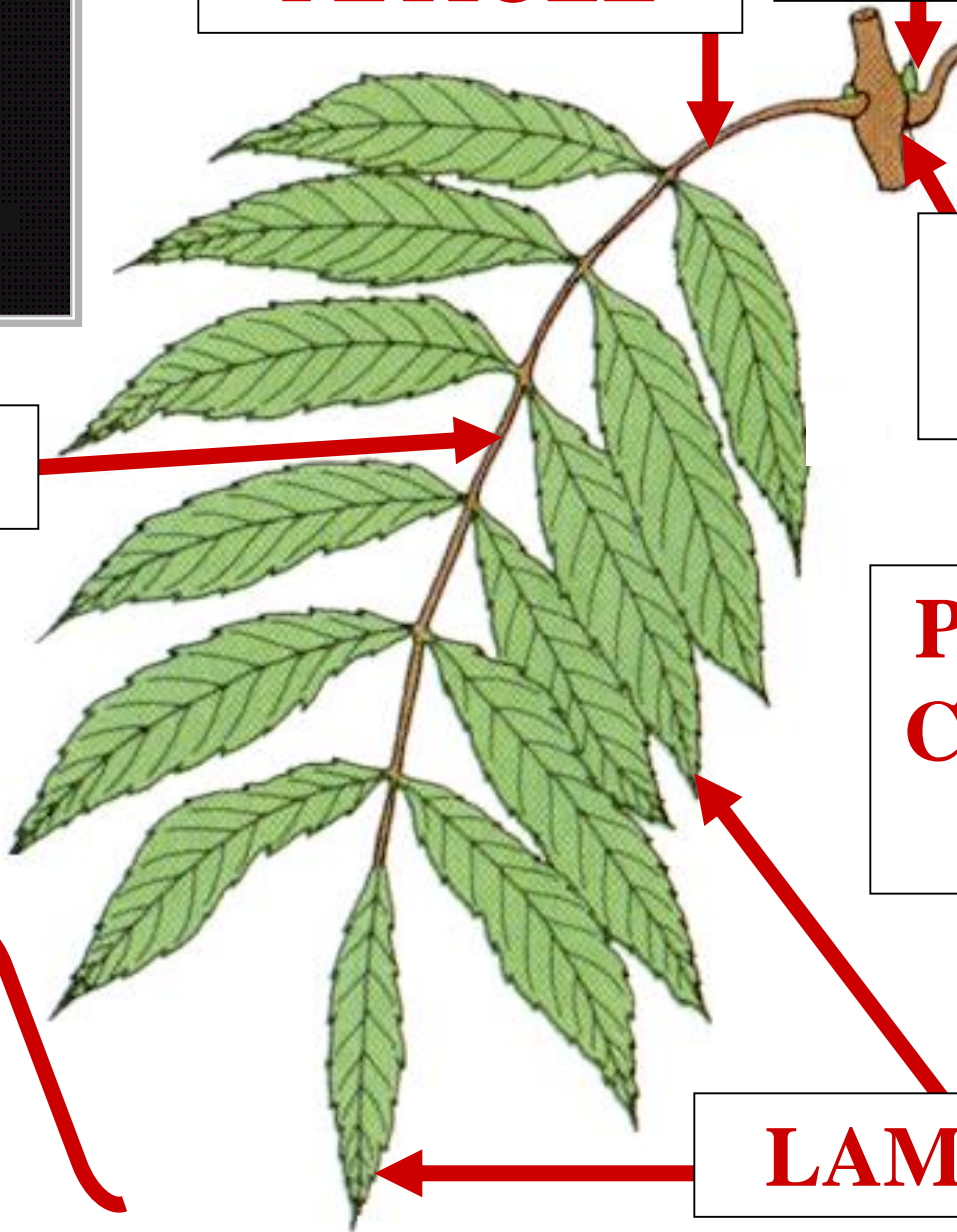
**STIPULES  
ABSENT**

**RACHIS**

**PINNATELY  
COMPOUND  
LEAF**

**LEAF**

**LAMINA**







**PETIOLE**

**AXILLARY BUD**



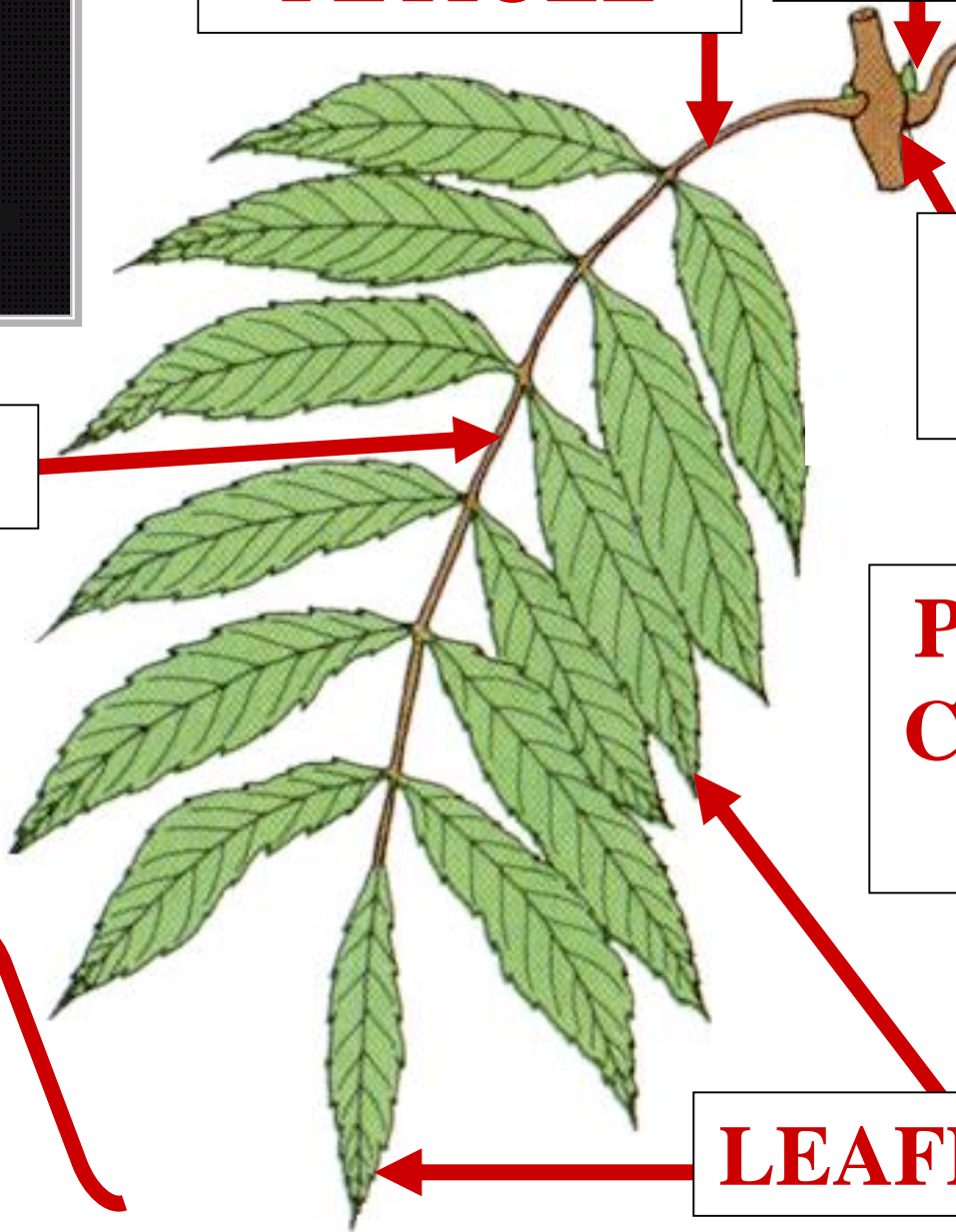
**STIPULES  
ABSENT**

**RACHIS**

**PINNATELY  
COMPOUND  
LEAF**

**LEAF**

**LEAFLETS**



**PALMATELY  
COMPOUND  
DICOT LEAF**

**PALMATELY  
COMPOUND  
DICOT LEAF**





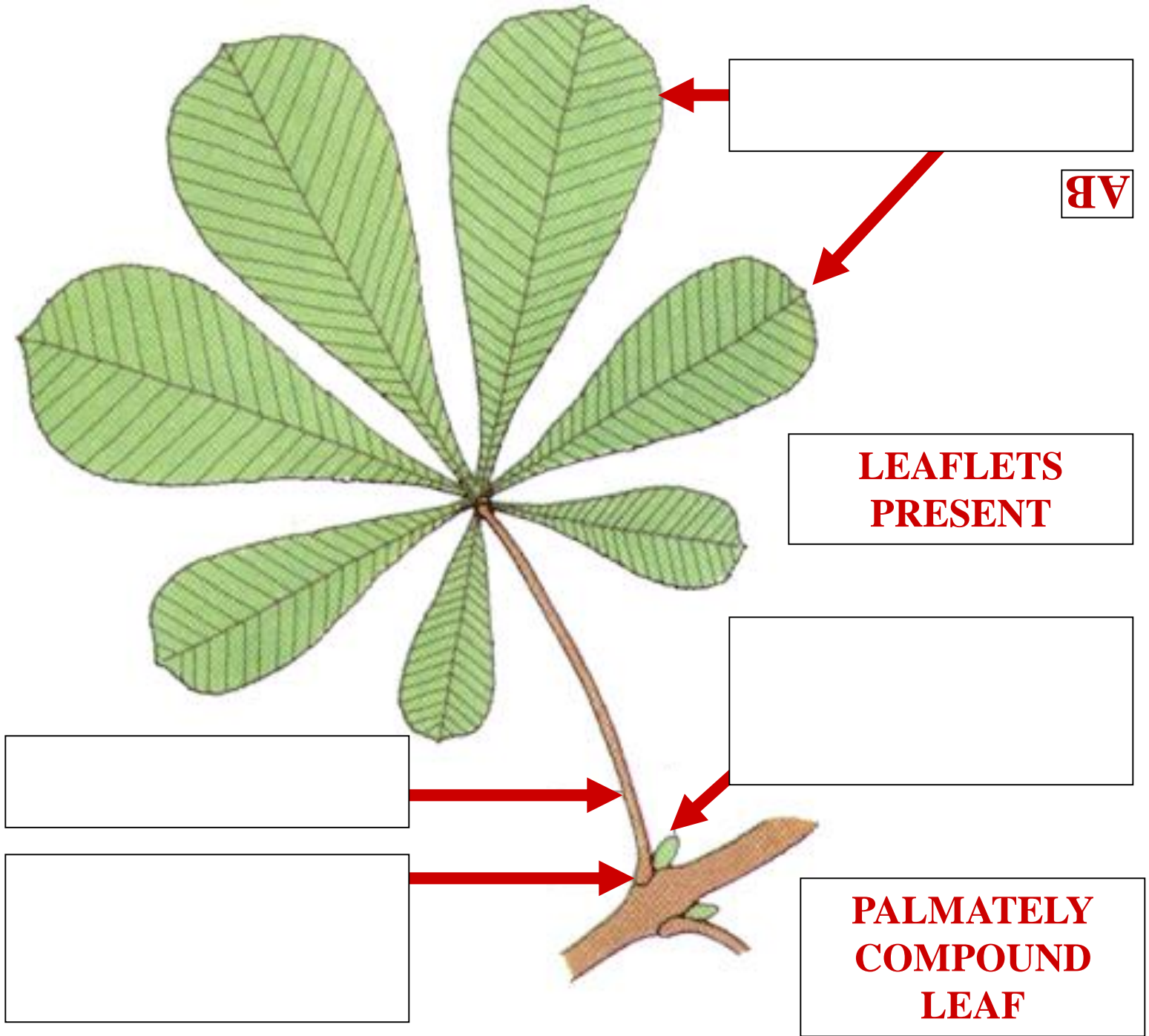
**DICOT LEAF**

**PALMATELY COMPOUND**

**RACHIS ABSENT**

**DICOT LEAF**

**PALMATELY COMPOUND**



AB

**LEAFLETS  
PRESENT**

**PALMATELY  
COMPOUND  
LEAF**