

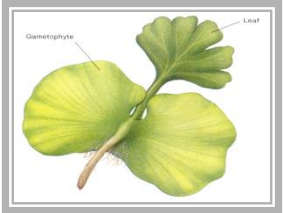
S

L.S.

GAMETOPHYTE



GAMETOPHYTE



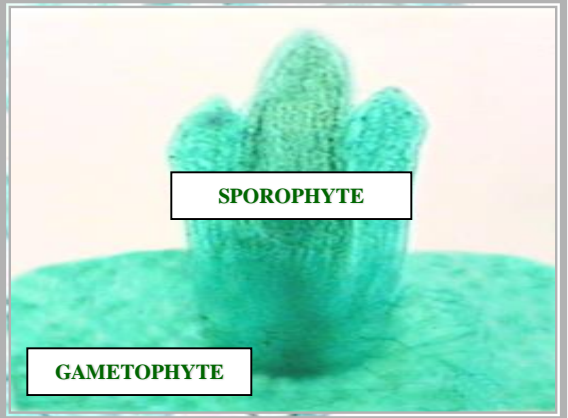
P



SPOROPHYTE

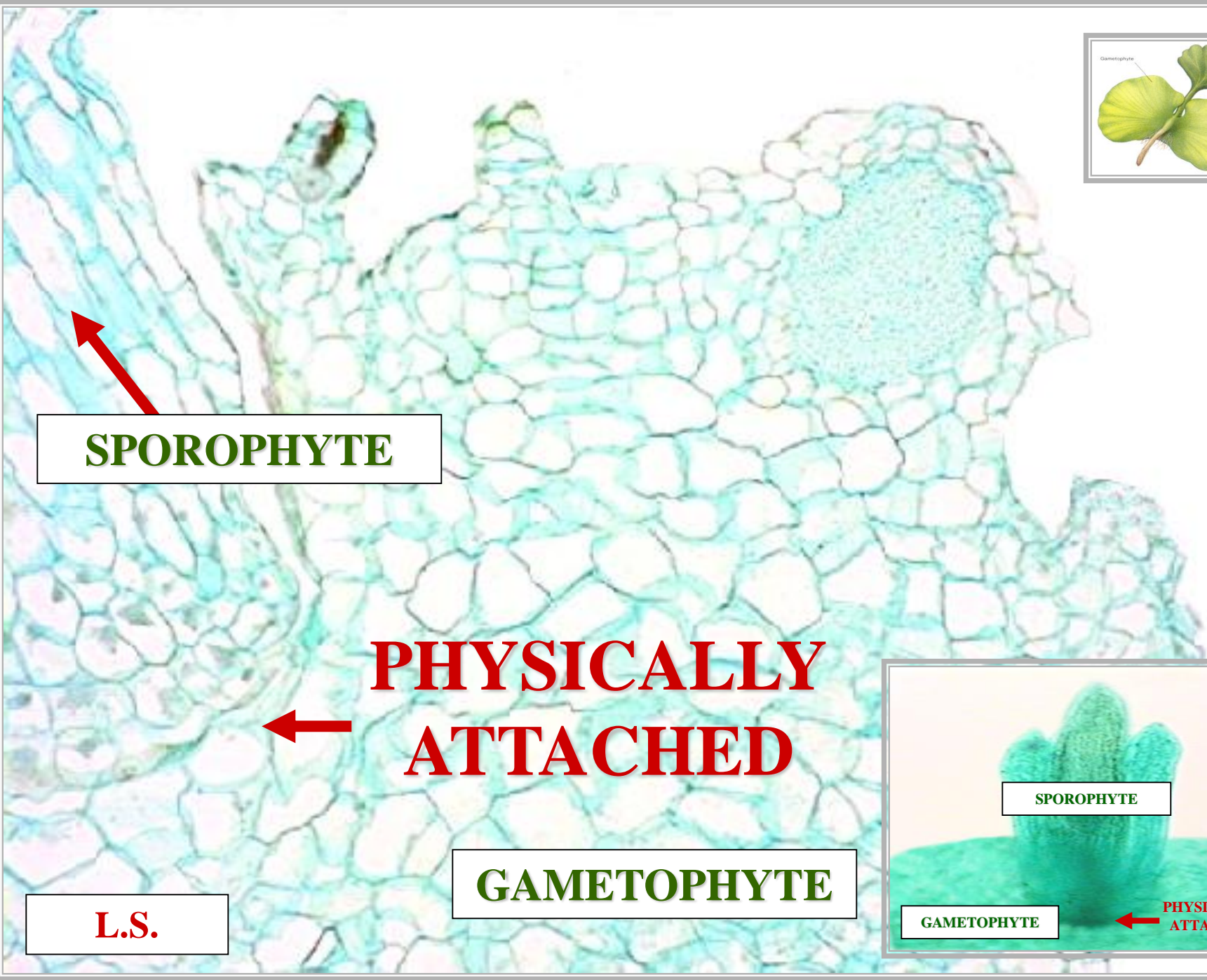
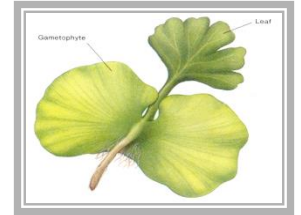
L.S.

GAMETOPHYTE



SPOROPHYTE

GAMETOPHYTE

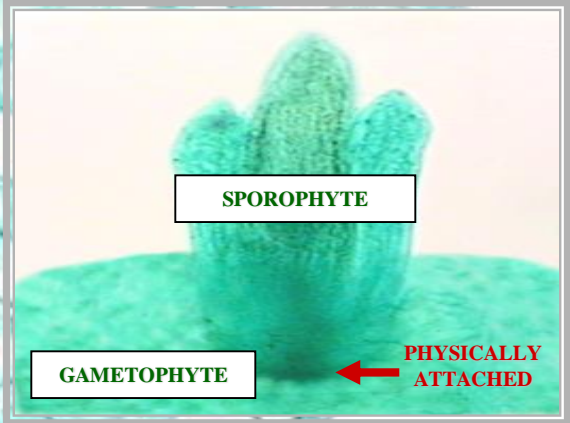


SPOROPHYTE

PHYSICALLY ATTACHED

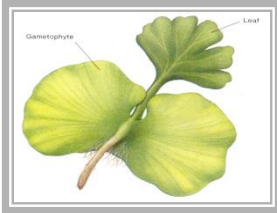
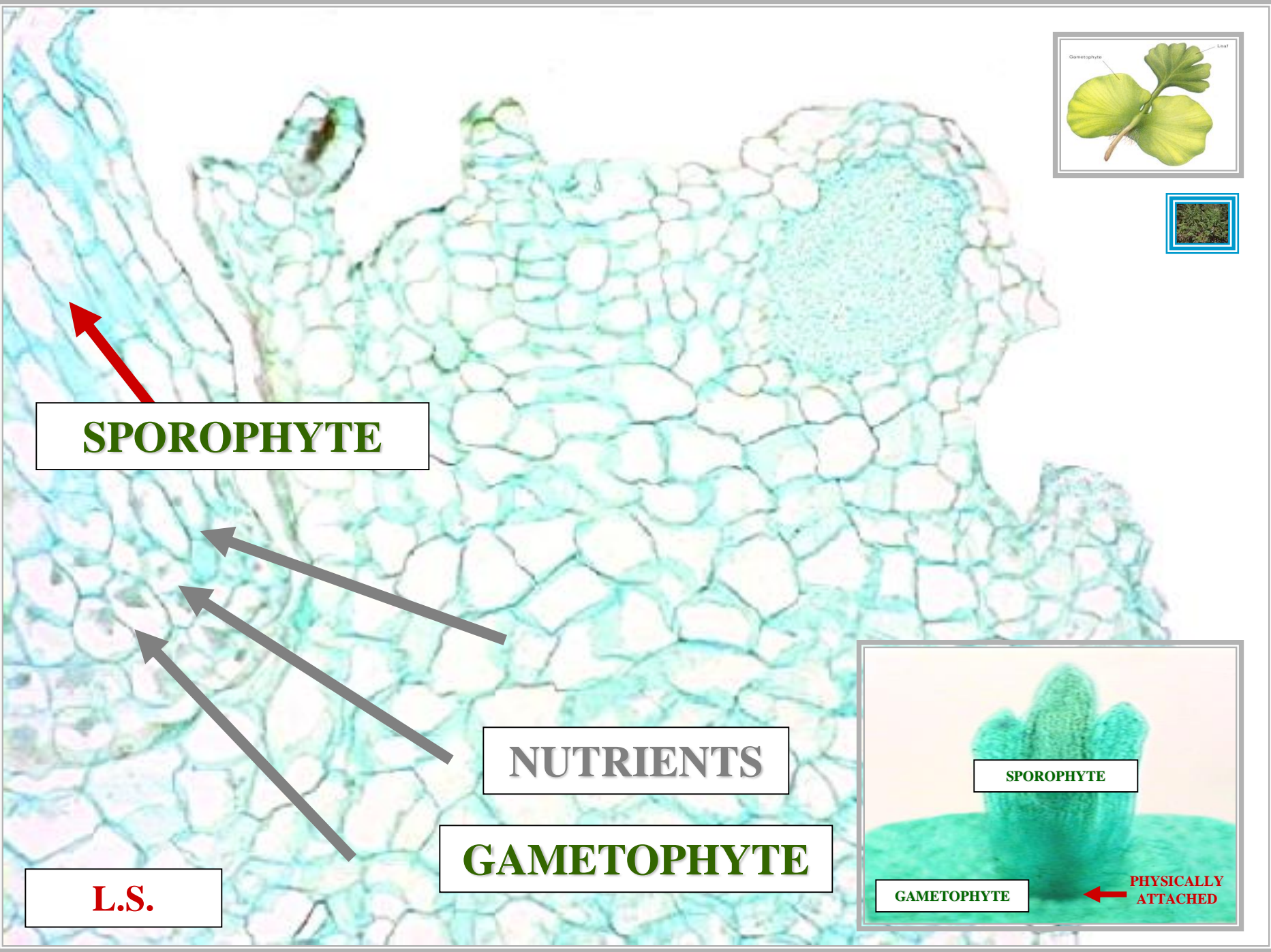
L.S.

GAMETOPHYTE



GAMETOPHYTE

PHYSICALLY ATTACHED

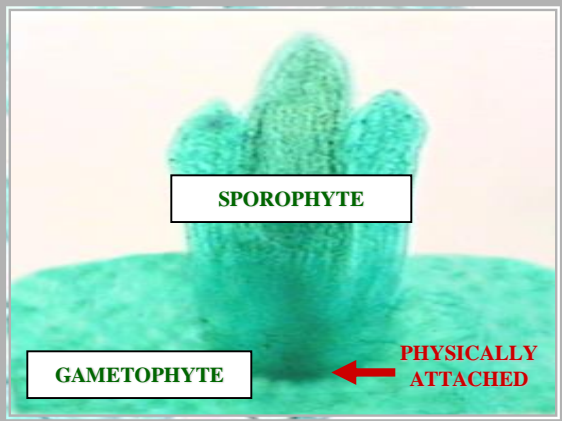


SPOROPHYTE

NUTRIENTS

GAMETOPHYTE

L.S.



SPOROPHYTE

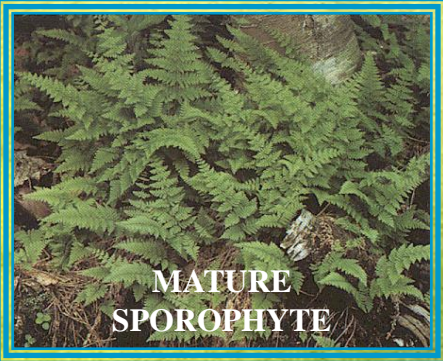
GAMETOPHYTE

PHYSICALLY ATTACHED

GAMETOPHYTE

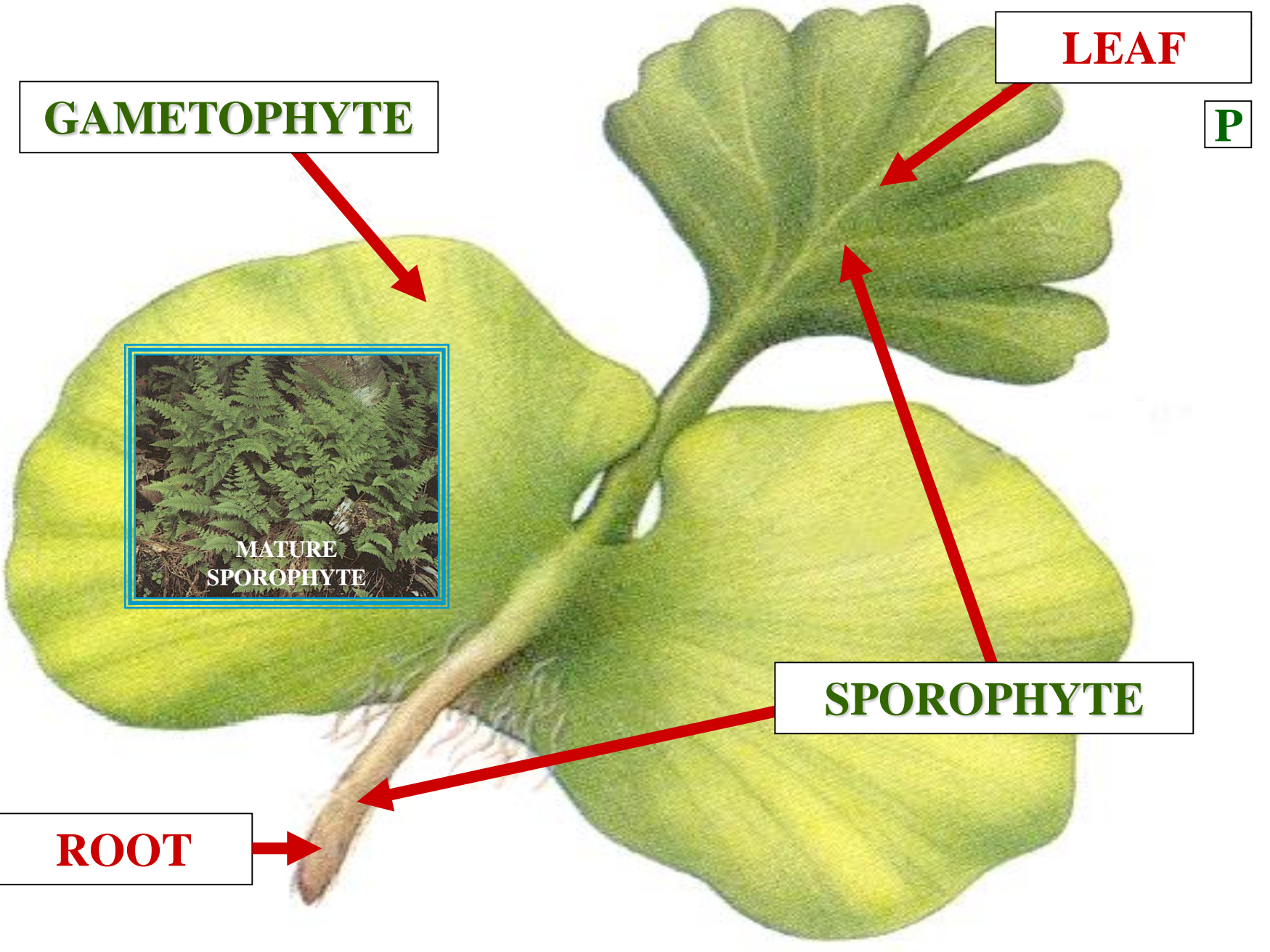
LEAF

P



SPOROPHYTE

ROOT

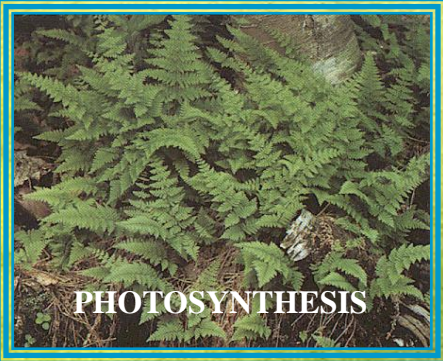


GAMETOPHYTE

LEAF

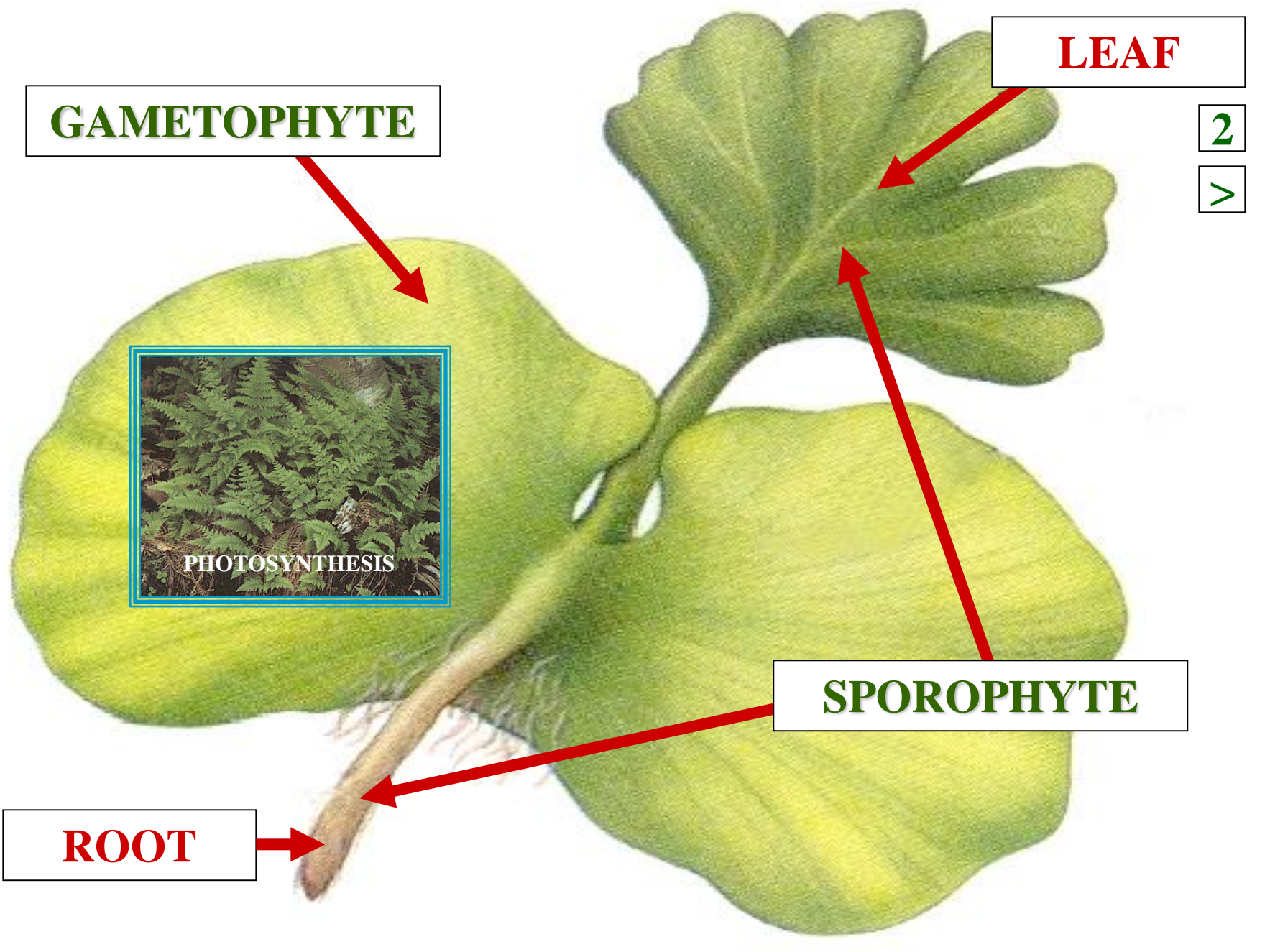
2

>



SPOROPHYTE

ROOT





EMBRYOPHYTE

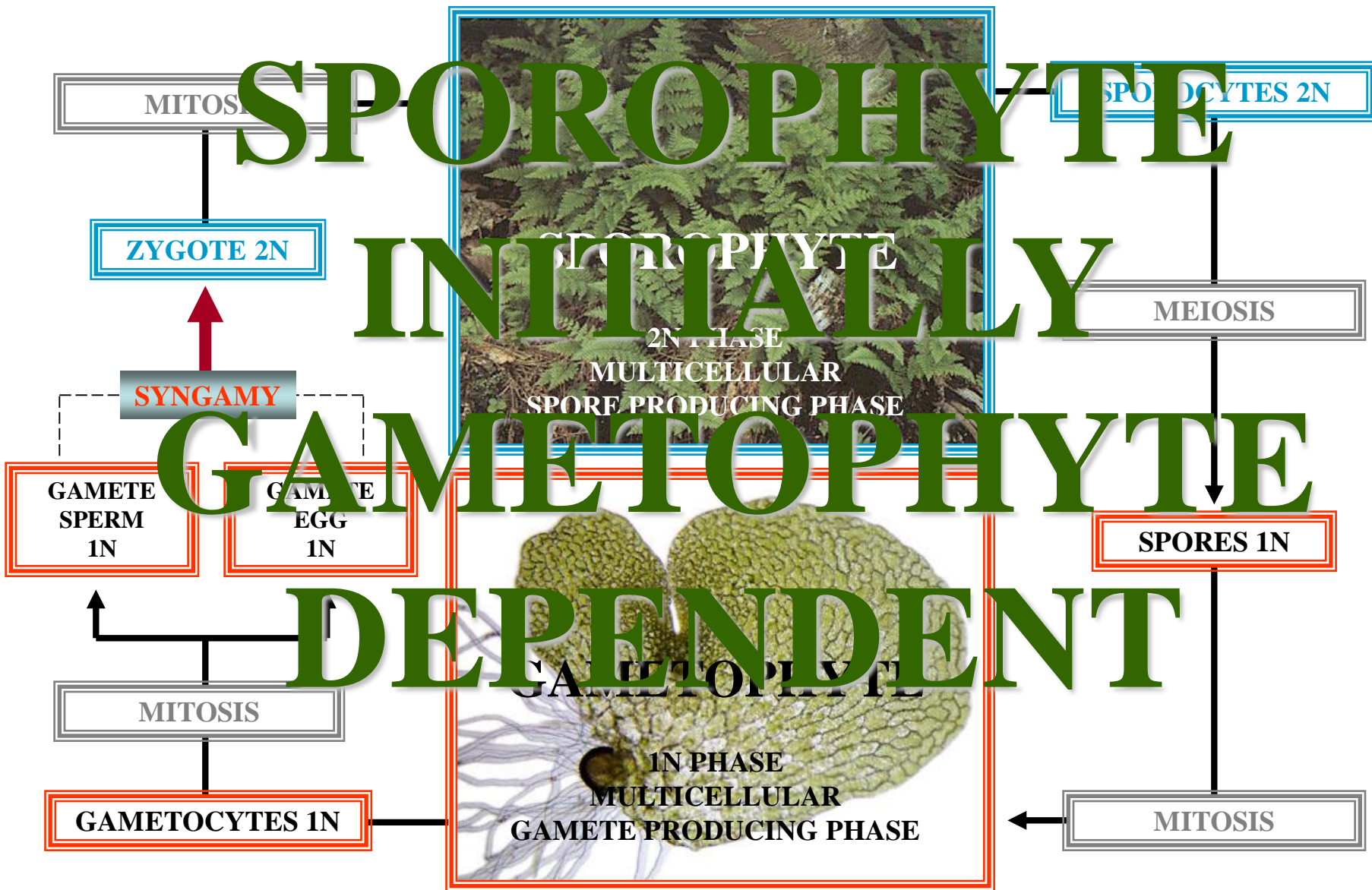
HETEROMORPHIC SPORIC LIFE CYCLE

SPOROPHYTE

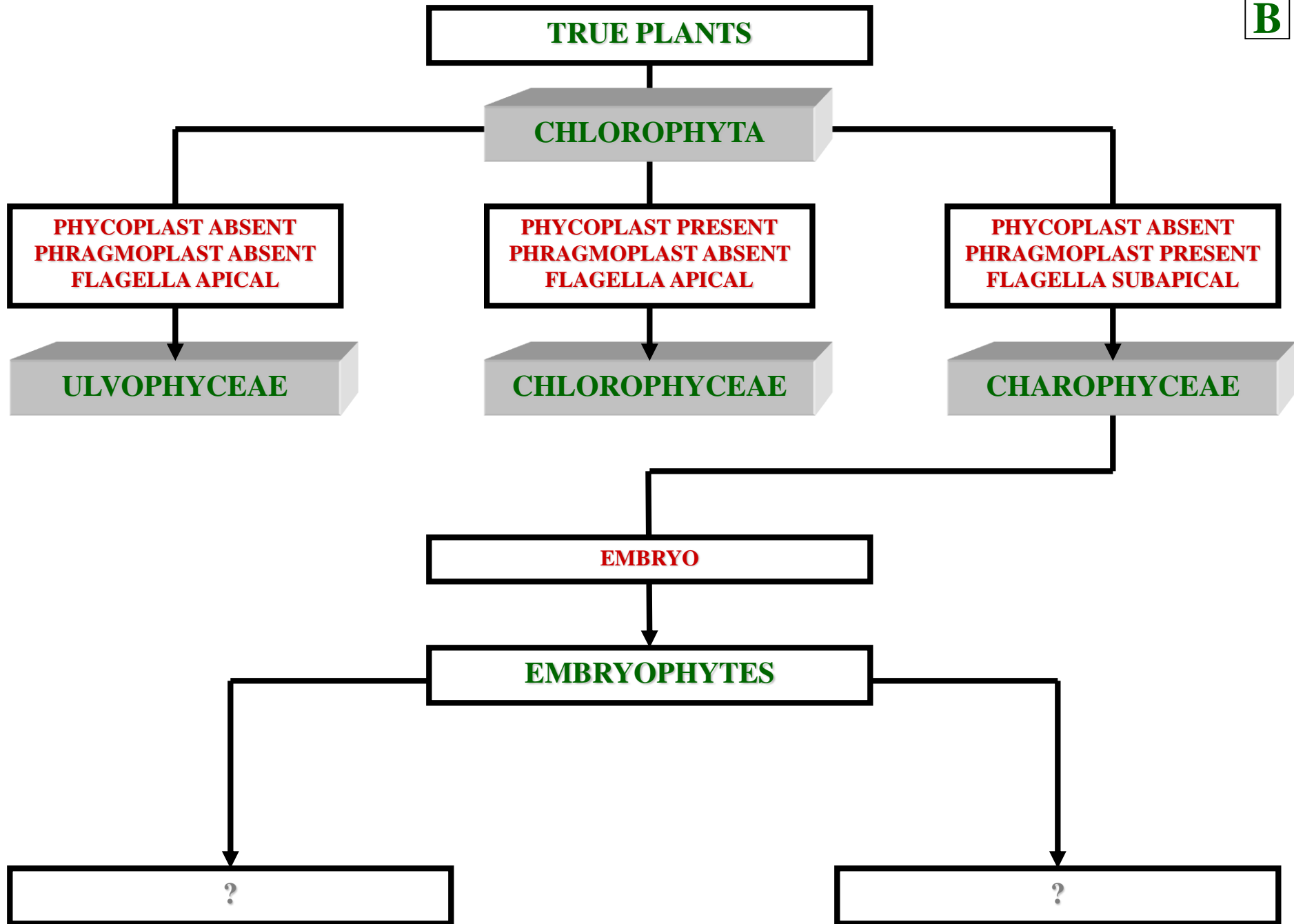
INITIALLY

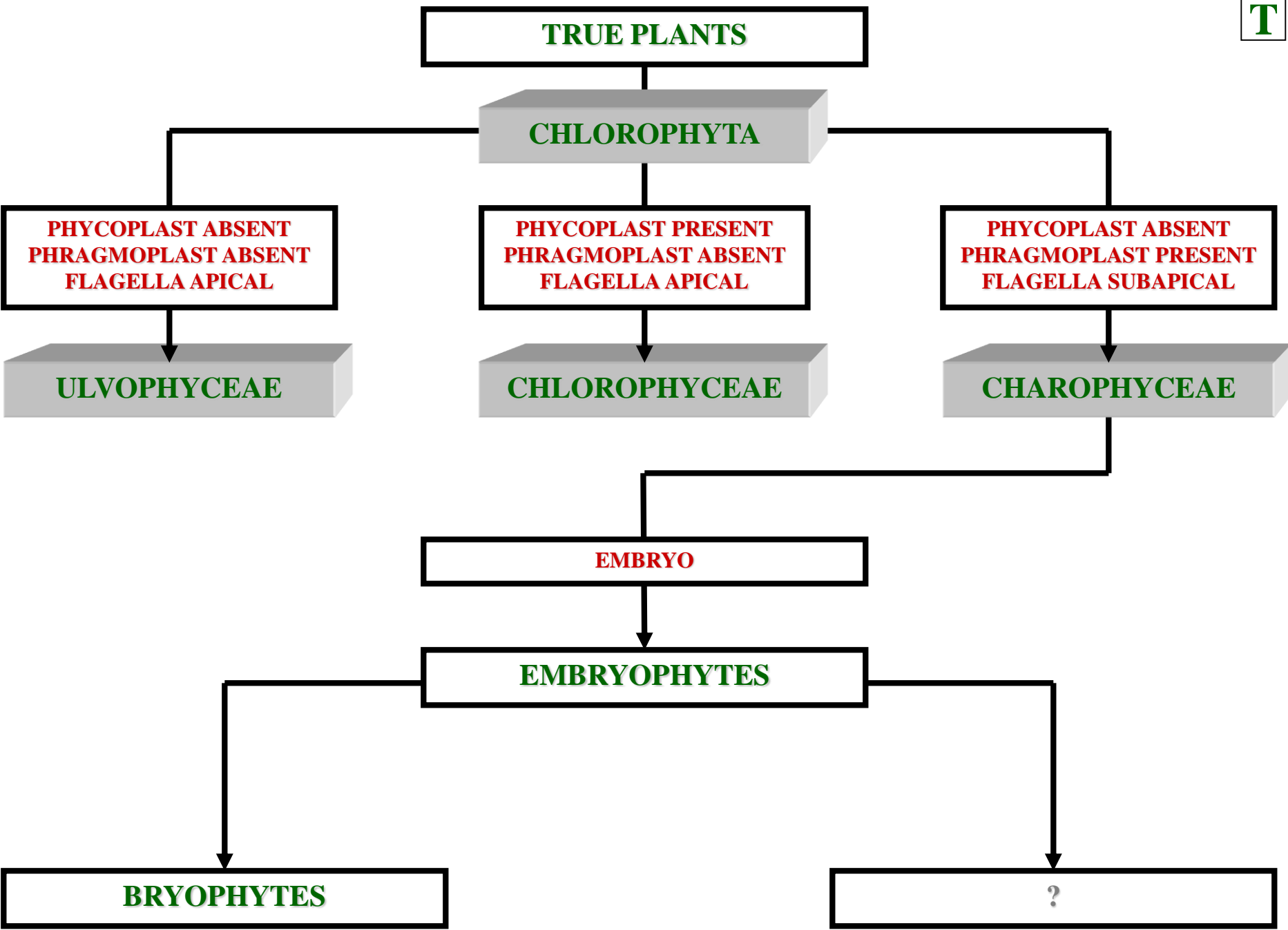
GAMETOPHYTE

DEPENDENT



EMBRYOPHYTE GRADES





TRUE PLANTS

CHLOROPHYTA

**PHYCOPLAST ABSENT
PHRAGMOPLAST ABSENT
FLAGELLA APICAL**

ULVOPHYCEAE

**PHYCOPLAST PRESENT
PHRAGMOPLAST ABSENT
FLAGELLA APICAL**

CHLOROPHYCEAE

**PHYCOPLAST ABSENT
PHRAGMOPLAST PRESENT
FLAGELLA SUBAPICAL**

CHAROPHYCEAE

EMBRYO

EMBRYOPHYTES

BRYOPHYTES

?



TRUE PLANTS

CHLOROPHYTA

**PHYCOPLAST ABSENT
PHRAGMOPLAST ABSENT
FLAGELLA APICAL**

**PHYCOPLAST PRESENT
PHRAGMOPLAST ABSENT
FLAGELLA APICAL**

**PHYCOPLAST ABSENT
PHRAGMOPLAST PRESENT
FLAGELLA SUBAPICAL**

ULVOPHYCEAE

CHLOROPHYCEAE

CHAROPHYCEAE

EMBRYO

EMBRYOPHYTES

BRYOPHYTES

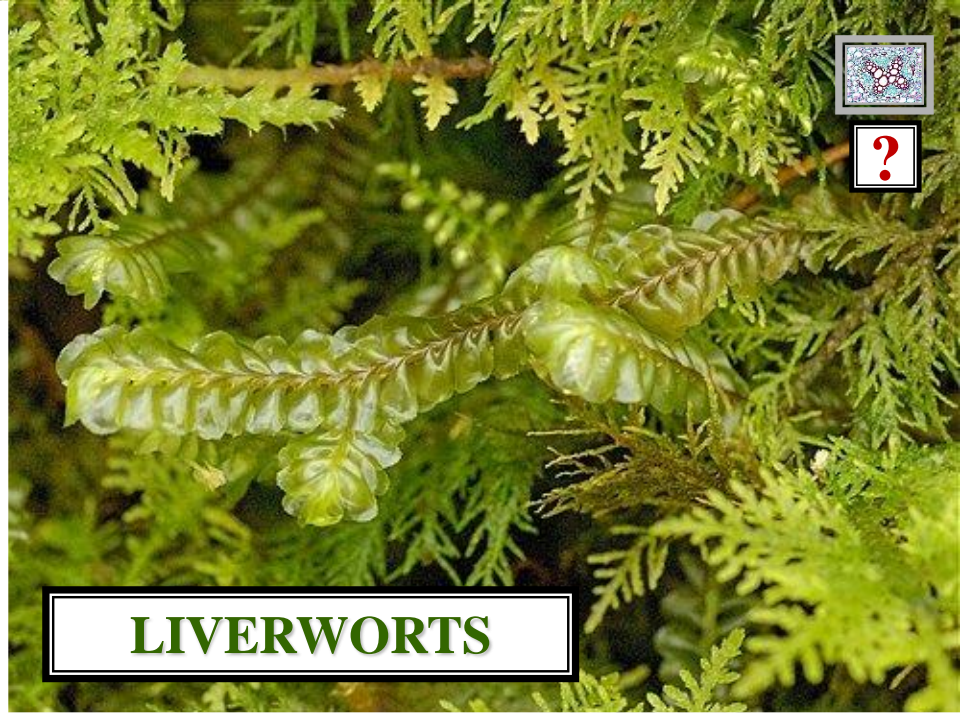
TRACHEOPHYTES



BRYOPHYTES



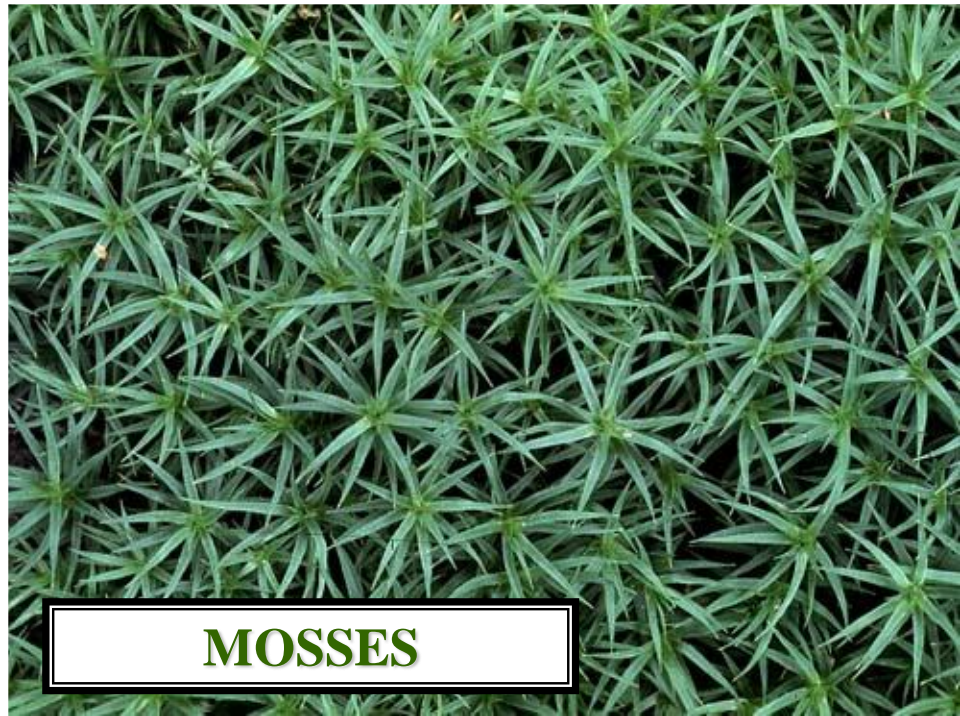
HORNWORTS



LIVERWORTS



LIVERWORTS



MOSESSES

VASCULAR TISSUE: ?

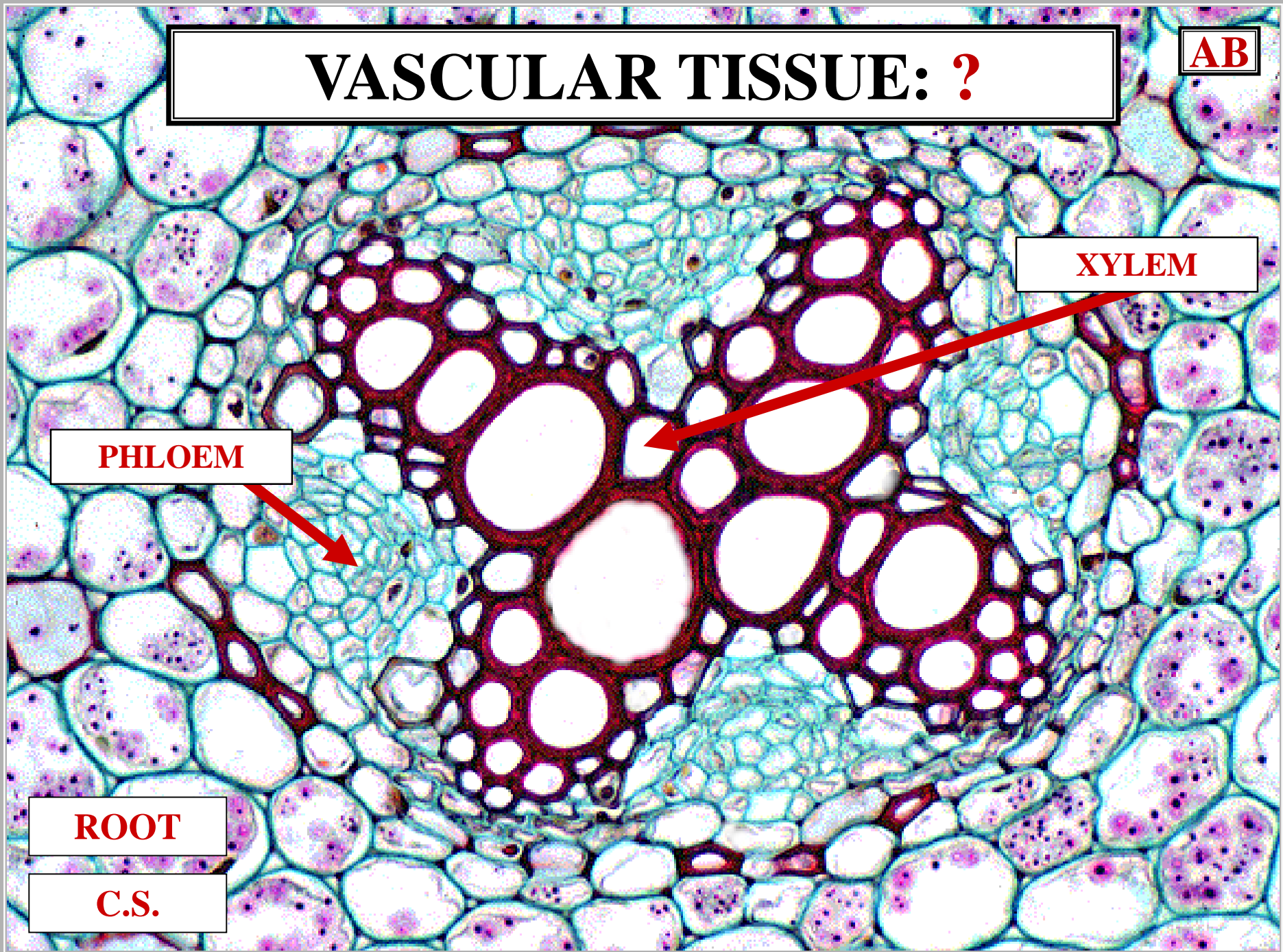
AB

XYLEM

PHLOEM

ROOT

C.S.



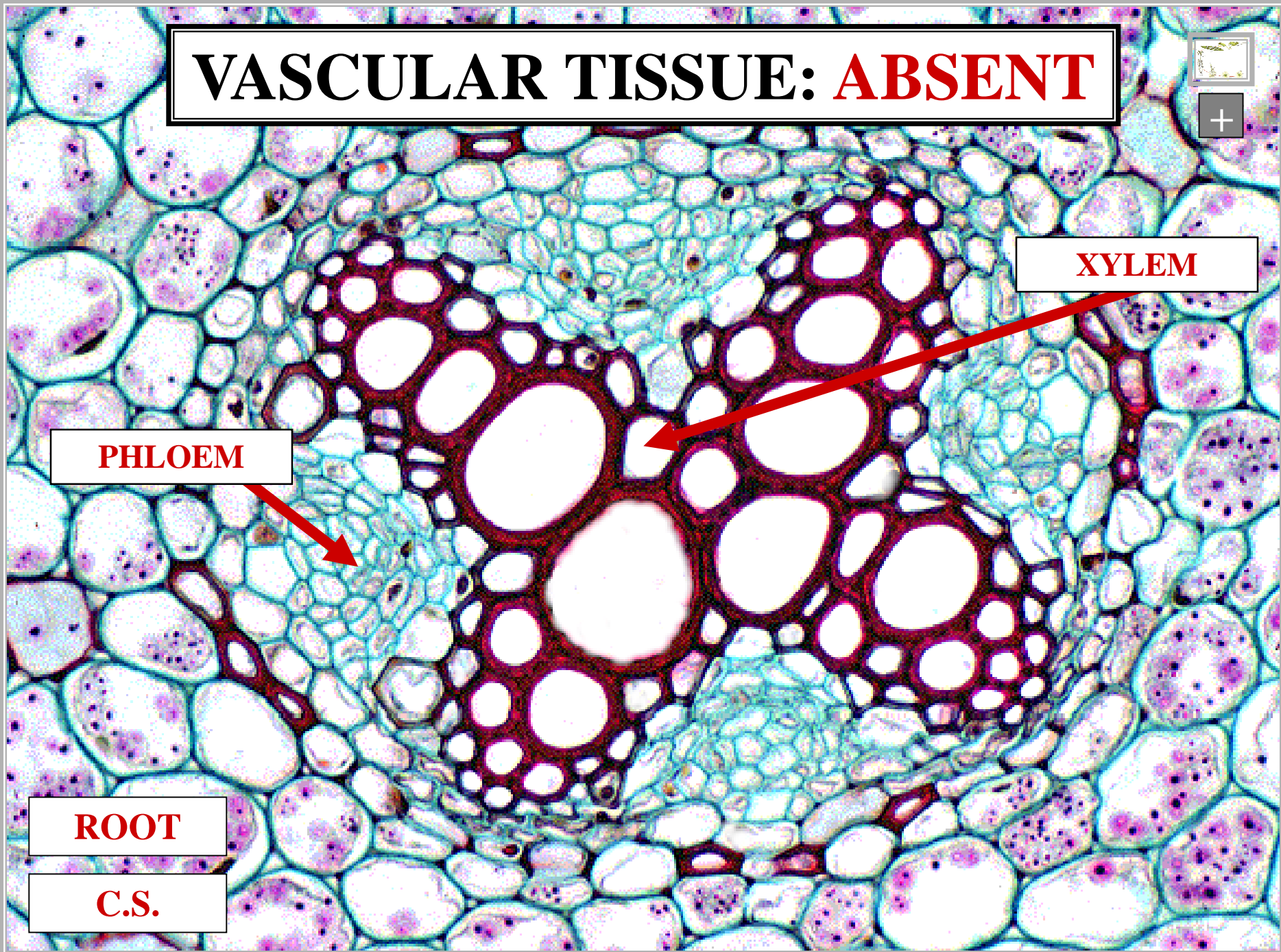
VASCULAR TISSUE: **ABSENT**

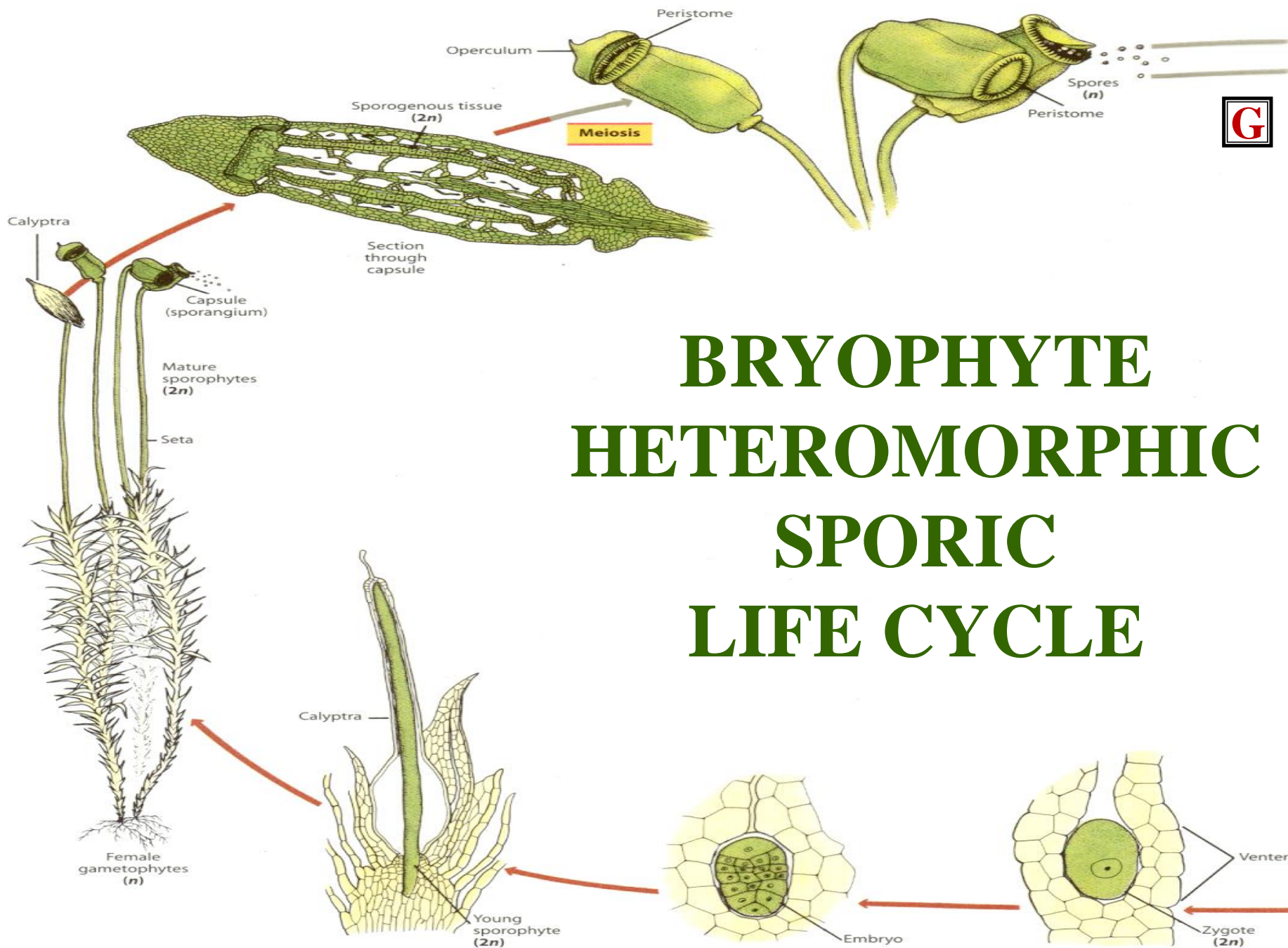
XYLEM

PHLOEM

ROOT

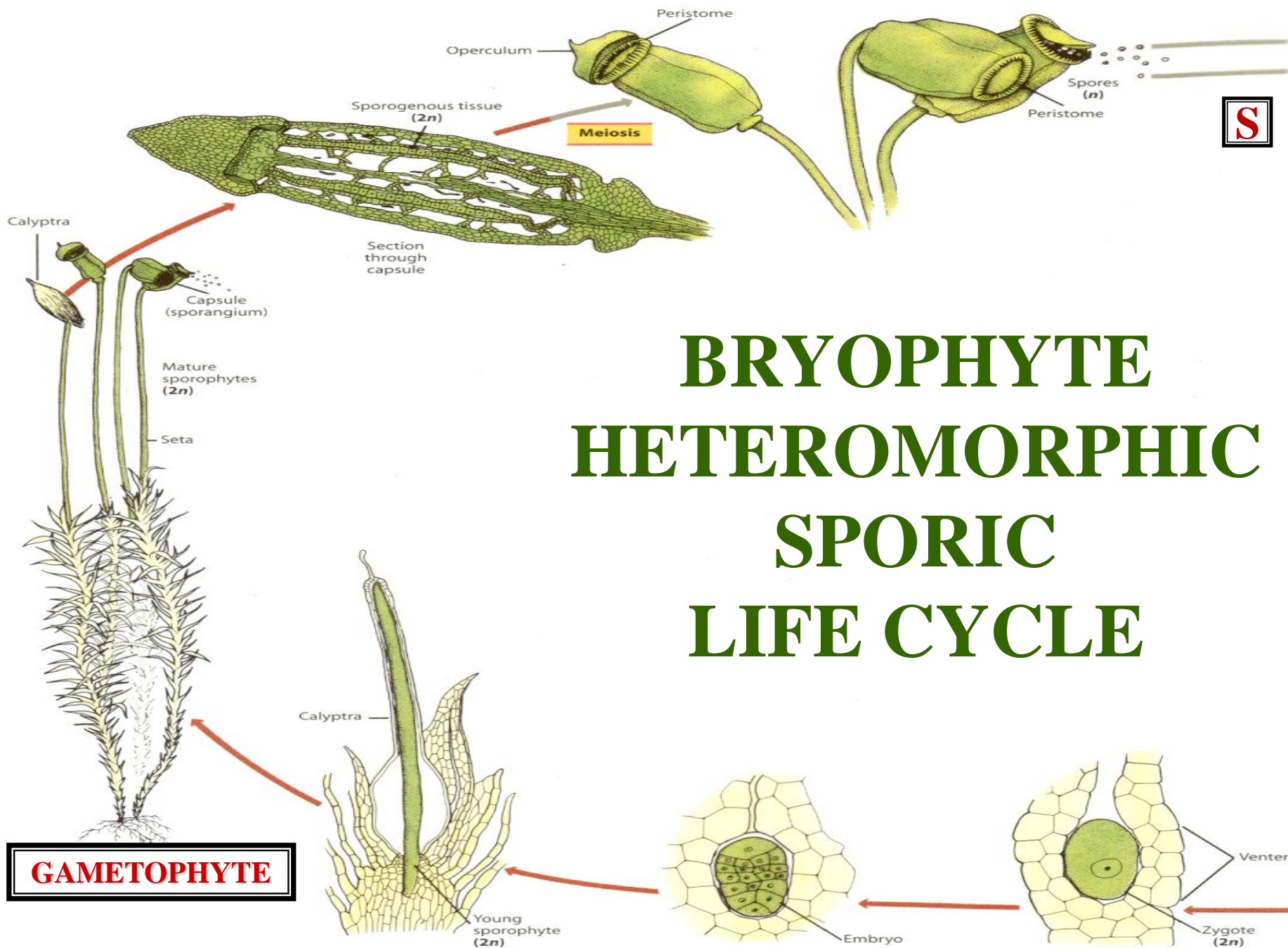
C.S.

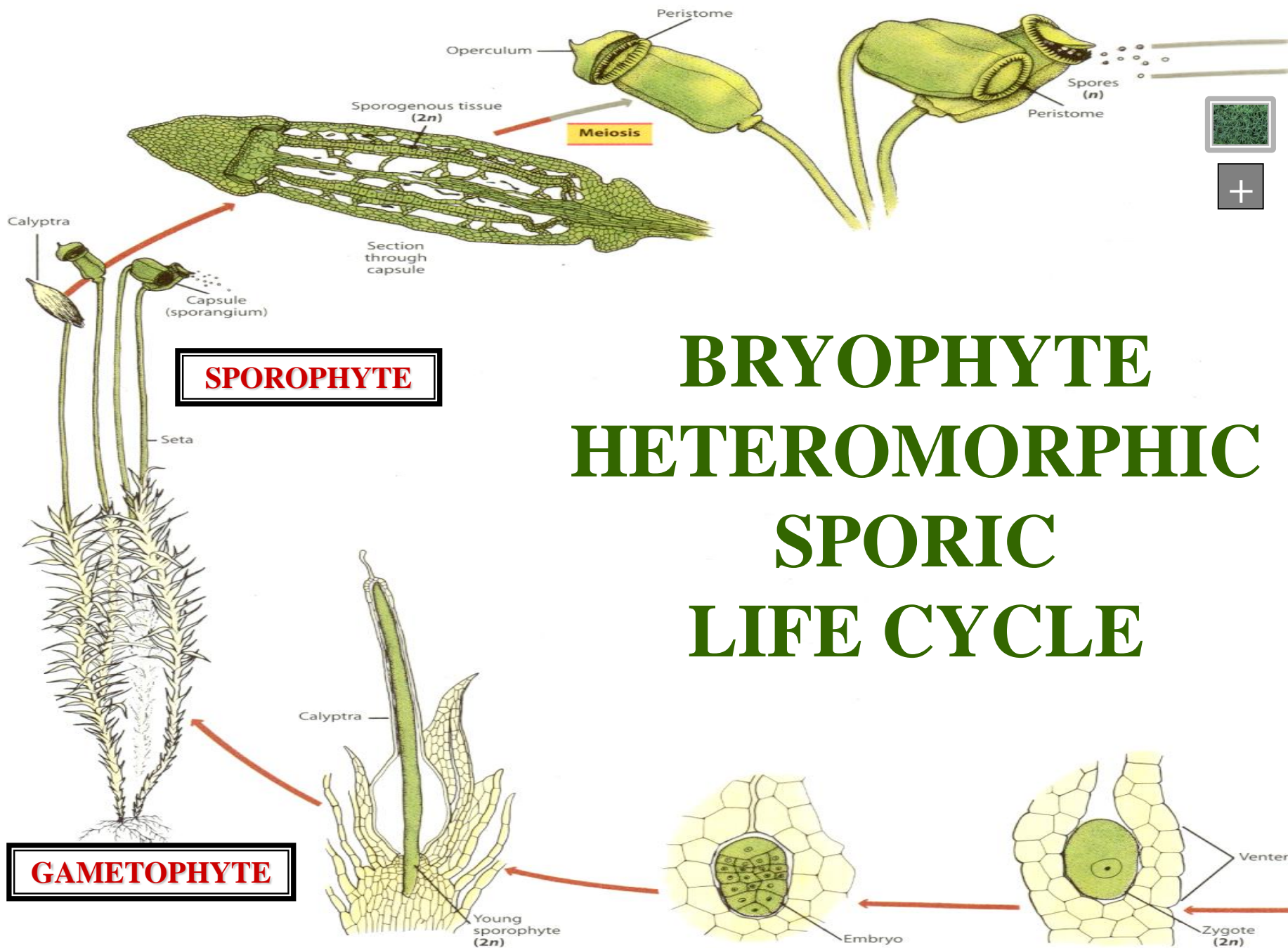




BRYOPHYTE HETEROMORPHIC SPORIC LIFE CYCLE







BRYOPHYTE HETEROMORPHIC SPORIC LIFE CYCLE

BRYOPHYTE

GAMETOPHYTE VS SPOROPHYTE



GAMETOPHYTE

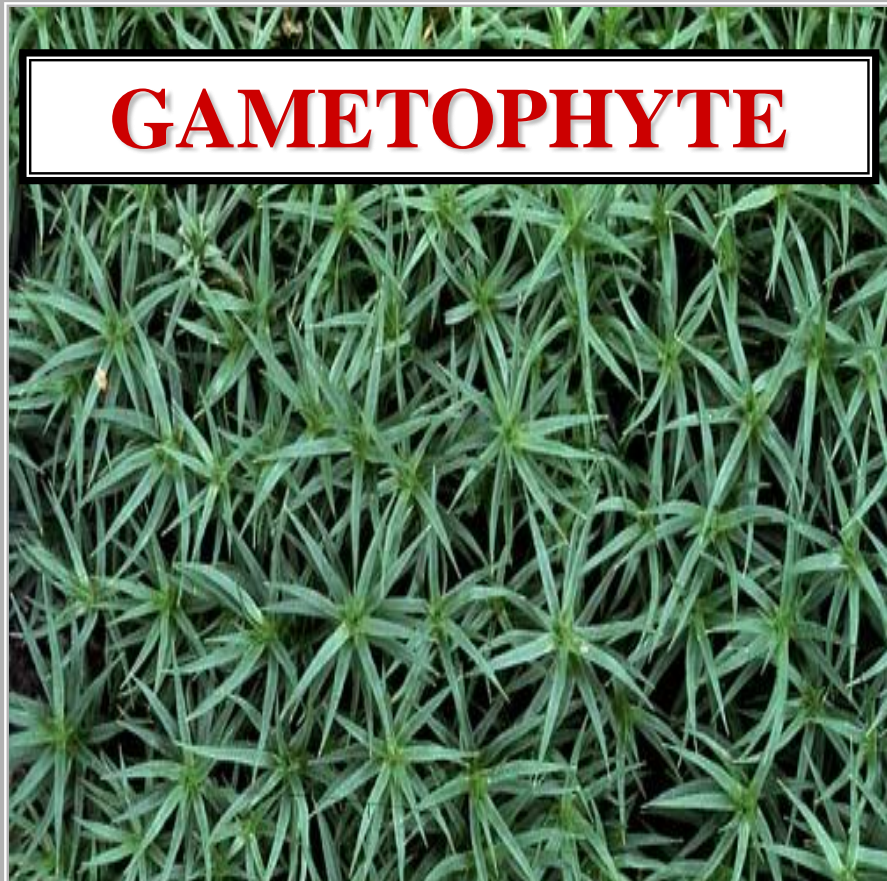


SPOROPHYTE

BRYOPHYTE

GAMETOPHYTE VS SPOROPHYTE

GAMETOPHYTE



DOMINATE



SPOROPHYTE

BRYOPHYTE

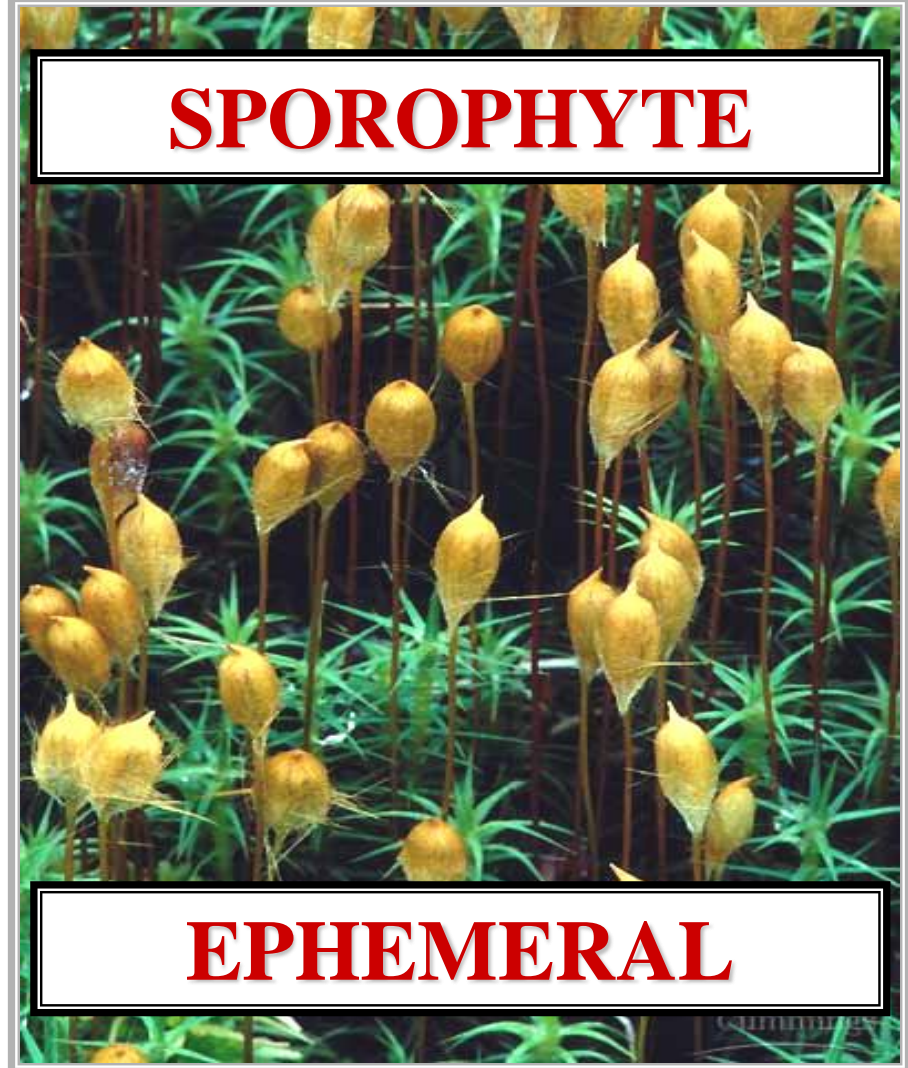
GAMETOPHYTE VS SPOROPHYTE

GAMETOPHYTE



DOMINATE

SPOROPHYTE



EPHEMERAL

BRYOPHYTE

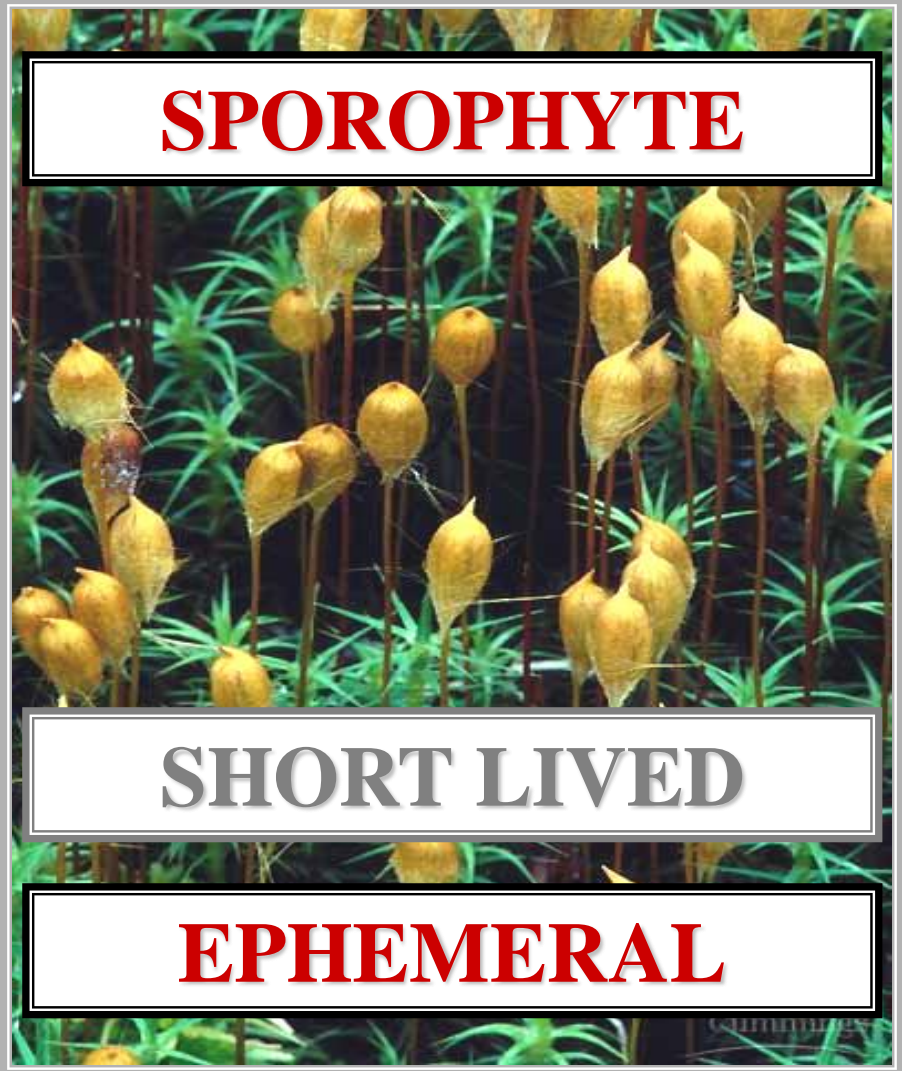
GAMETOPHYTE VS SPOROPHYTE



GAMETOPHYTE

DOMINATE

This image shows a lush, green carpet of moss gametophytes. The plants are small and densely packed, with many thin, upright stems. Each stem has several small, pointed leaves. The overall appearance is that of a thick, soft mat of vegetation.



SPOROPHYTE

SHORT LIVED

EPHEMERAL

This image shows moss sporophytes. The plants are taller and more upright than the gametophytes. They have long, thin, reddish-brown stalks that rise from the green gametophyte base. At the top of each stalk is a yellow, capsule-like structure, which is the sporophyte. The background is dark, making the yellow capsules stand out.



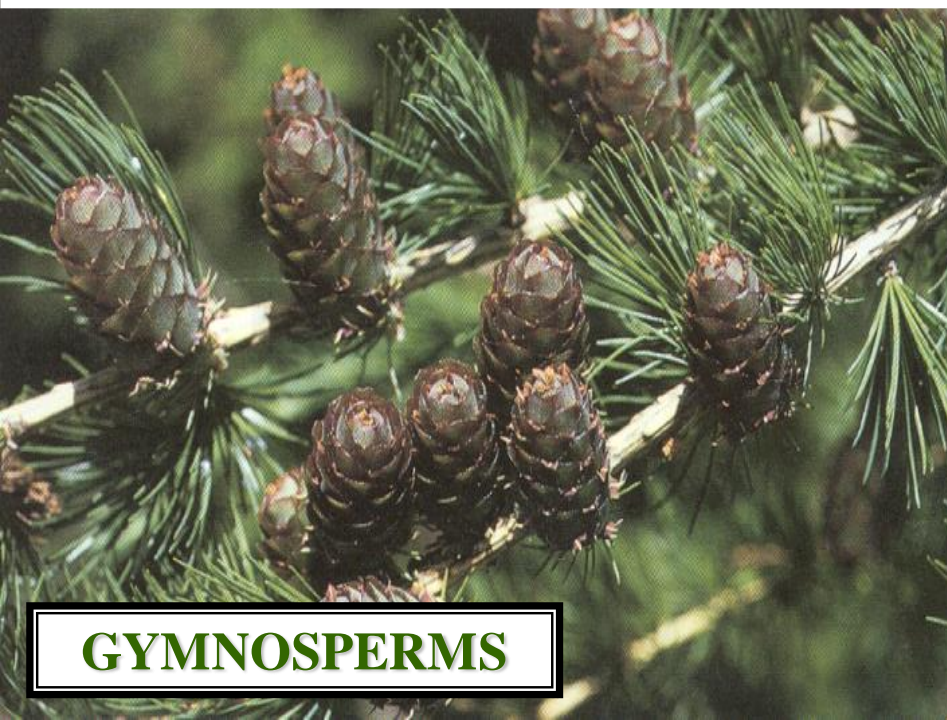
TRACHEOPHYTES



LYCOPHYTES



PTERIDOPHYTES

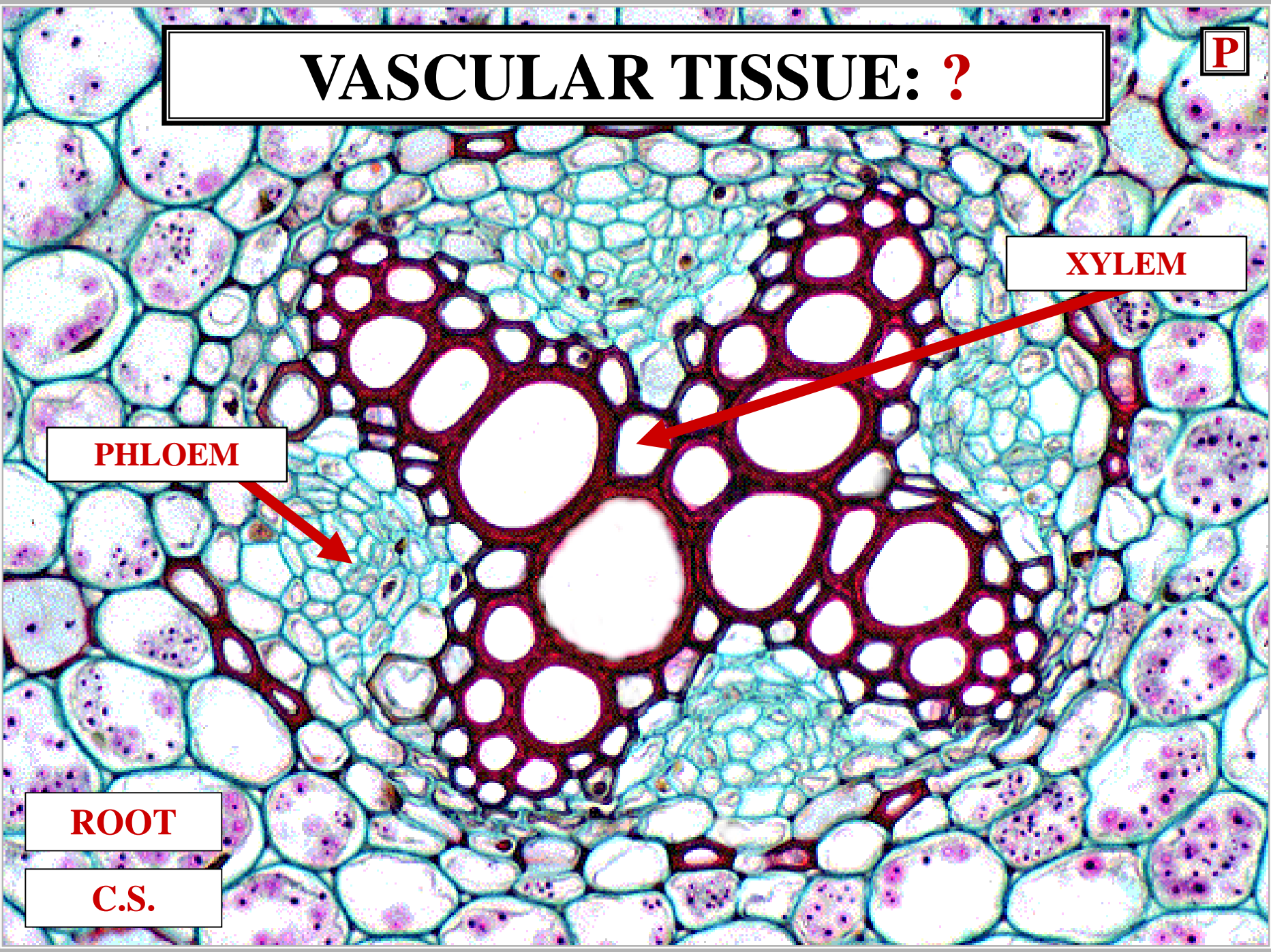


GYMNOSPERMS



ANGIOSPERMS

VASCULAR TISSUE: ?



XYLEM

PHLOEM

ROOT

C.S.

VASCULAR TISSUE: **PRESENT**

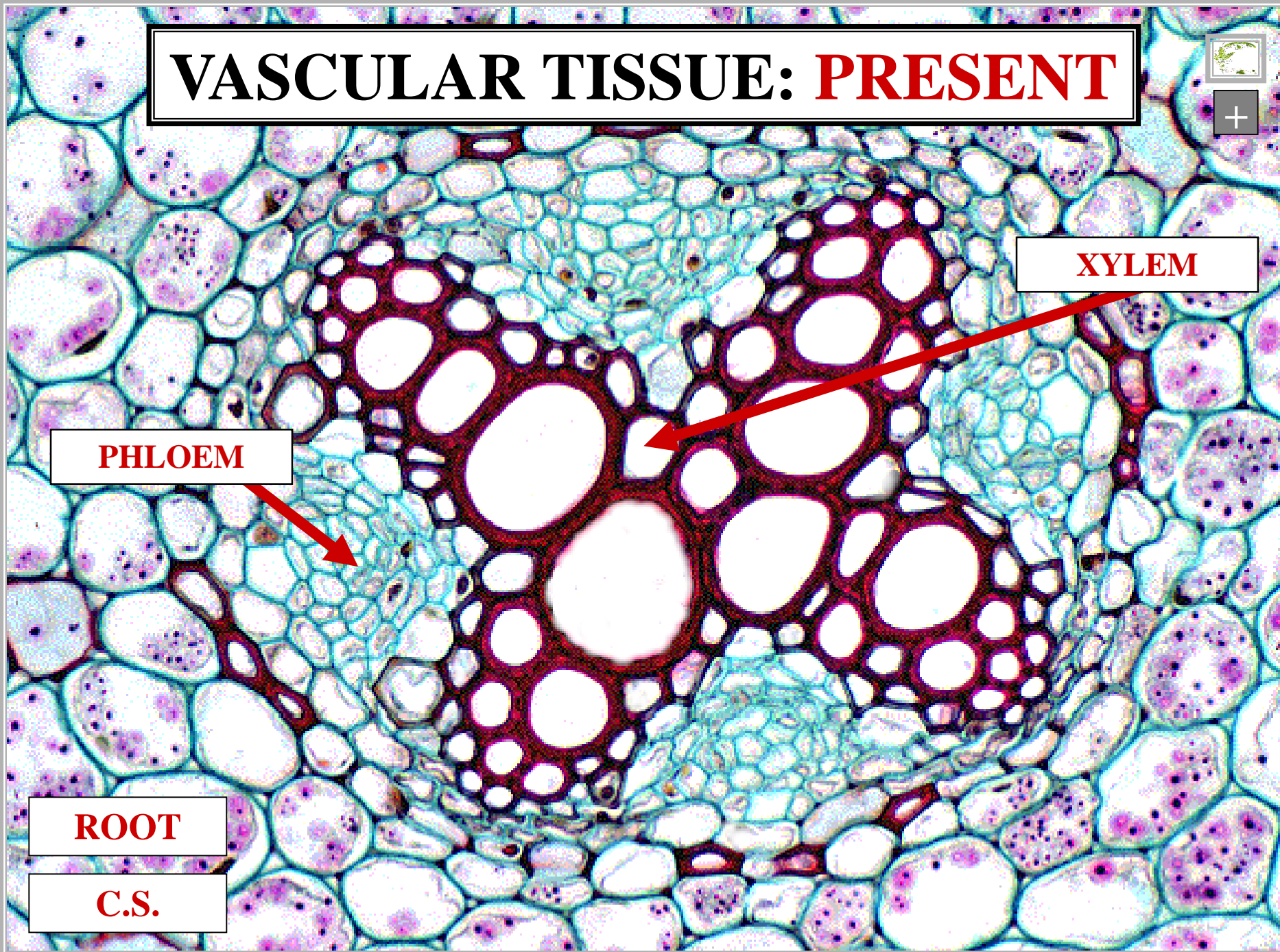


XYLEM

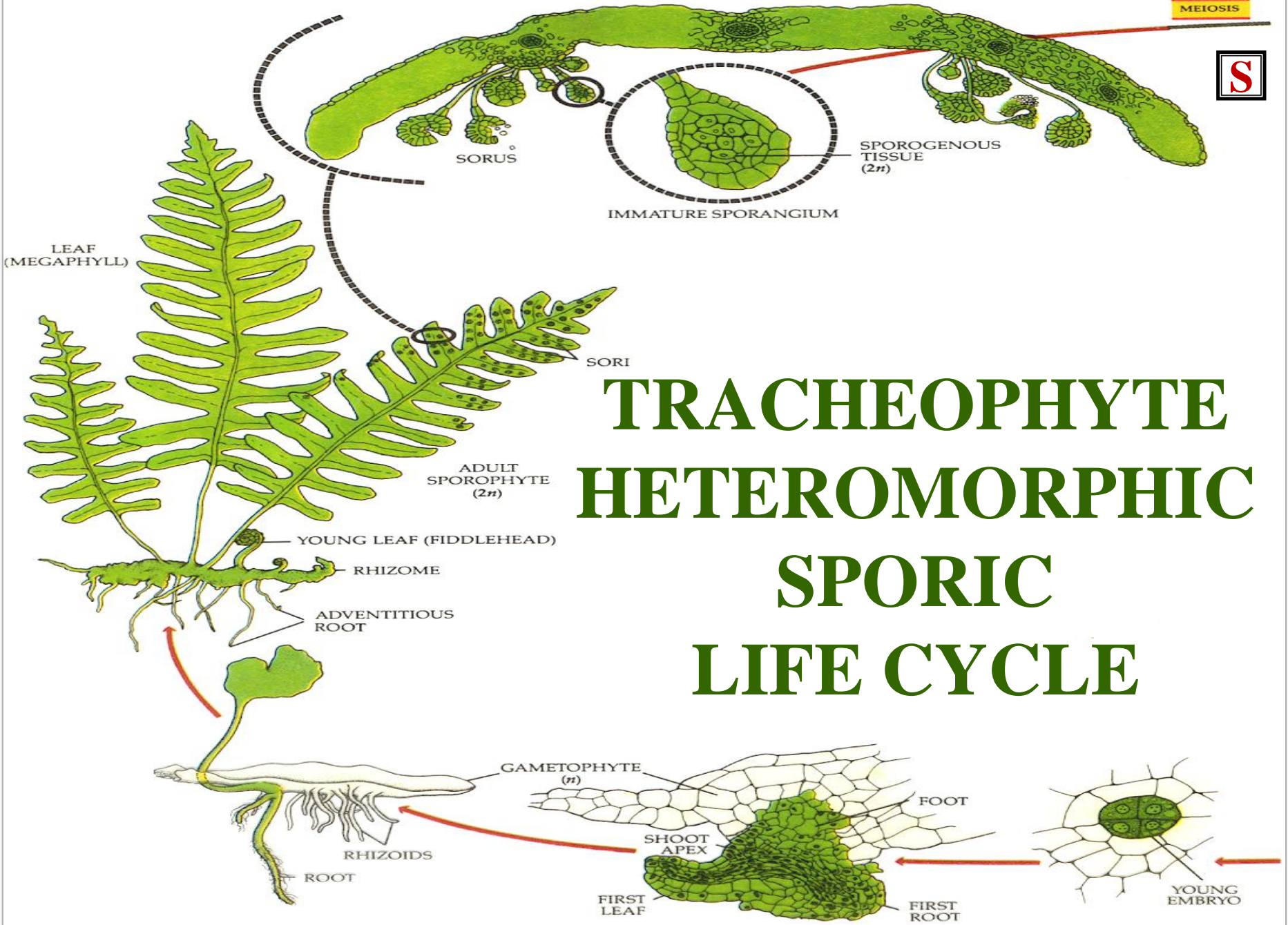
PHLOEM

ROOT

C.S.



MEIOSIS

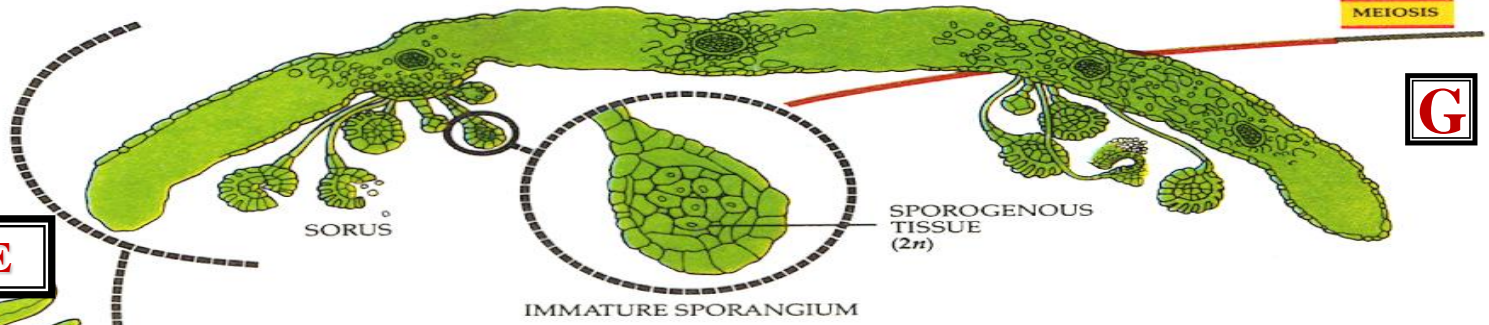


TRACHEOPHYTE HETEROMORPHIC SPORIC LIFE CYCLE

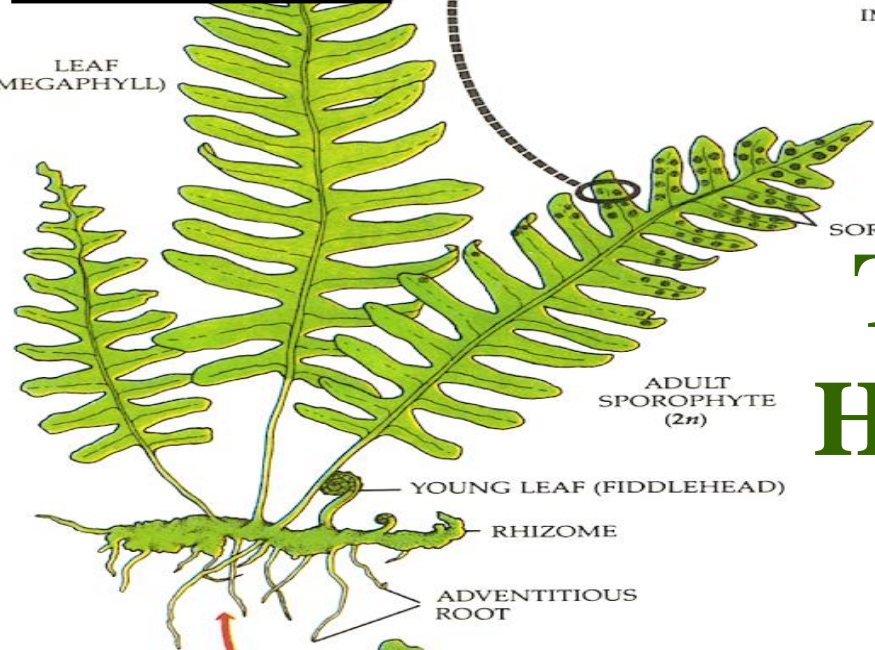
MEIOSIS



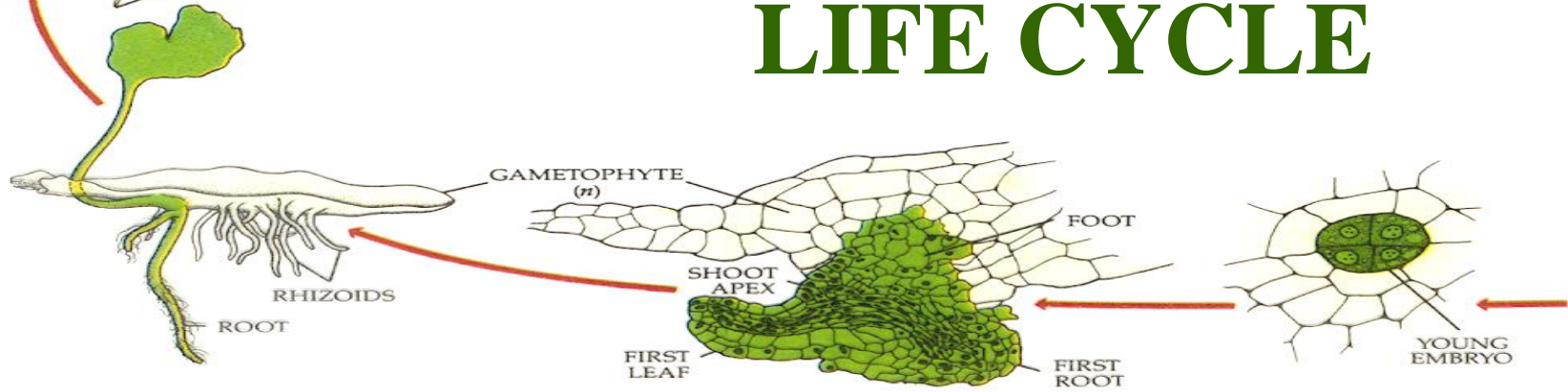
SPOROPHYTE



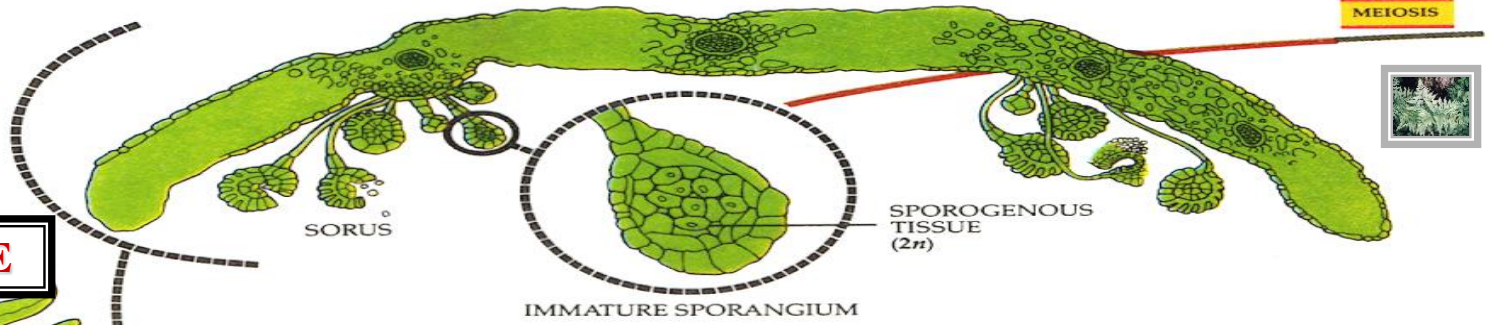
LEAF (MEGAPHYLL)



TRACHEOPHYTE HETEROMORPHIC SPORIC LIFE CYCLE

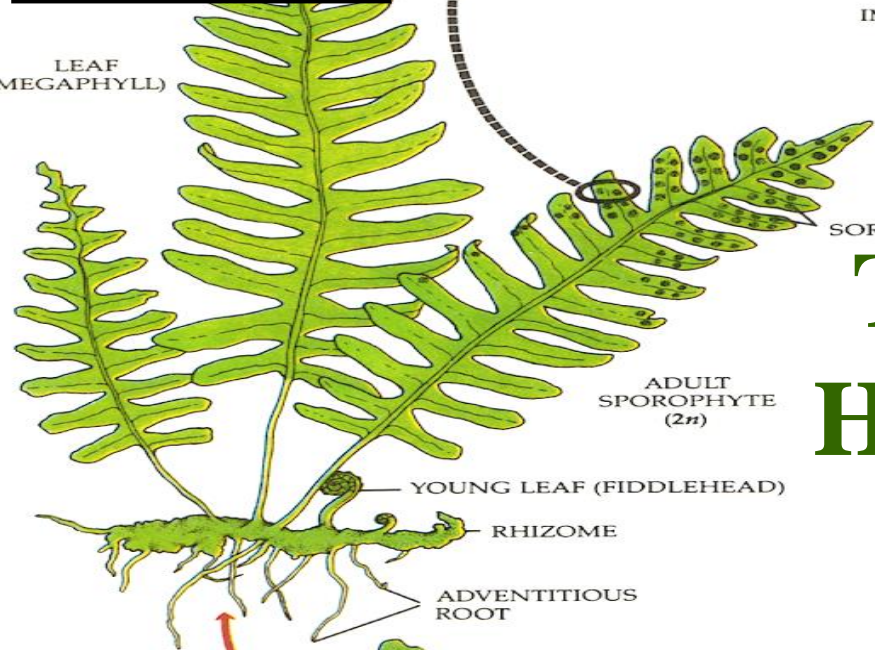


MEIOSIS



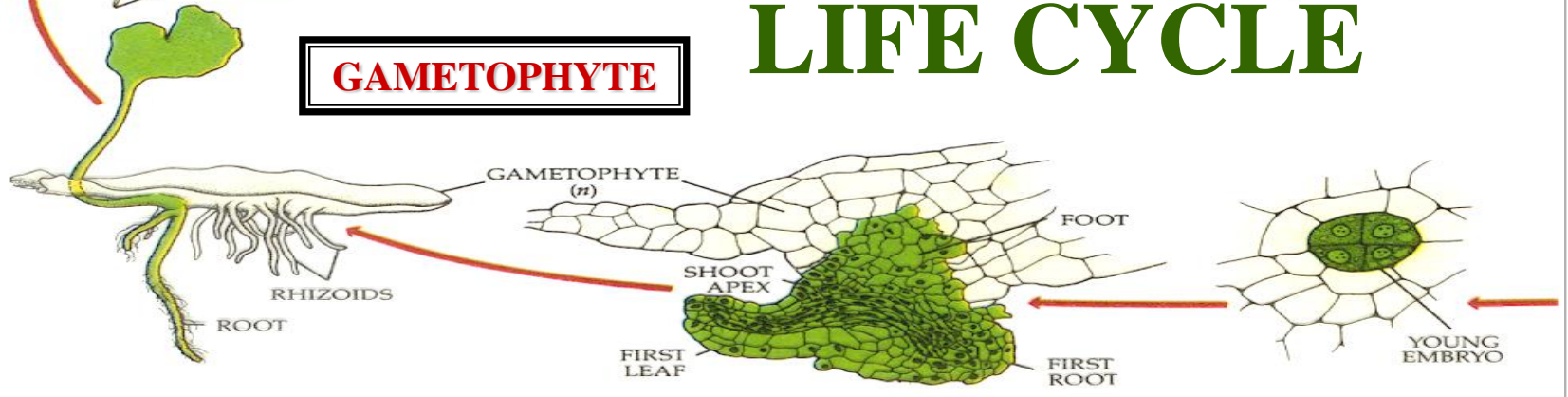
SPOROPHYTE

LEAF (MEGAPHYLL)



TRACHEOPHYTE HETEROMORPHIC SPORIC LIFE CYCLE

GAMETOPHYTE



TRACHEOPHYTE SPOROPHYTE VS GAMETOPHYTE



SPOROPHYTE



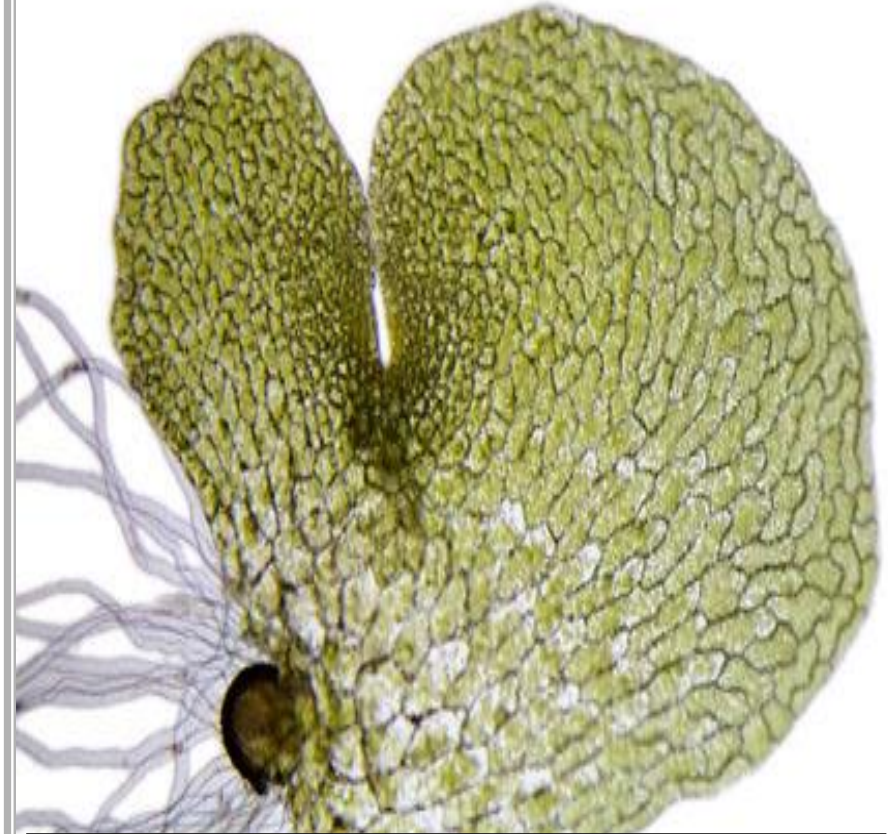
GAMETOPHYTE

TRACHEOPHYTE SPOROPHYTE VS GAMETOPHYTE

SPOROPHYTE



DOMINATE



GAMETOPHYTE



TRACHEOPHYTE SPOROPHYTE VS GAMETOPHYTE

SPOROPHYTE



DOMINATE

GAMETOPHYTE

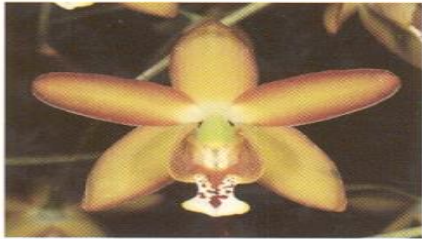


SHORT LIVED

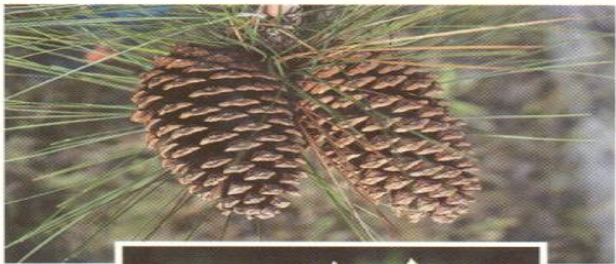
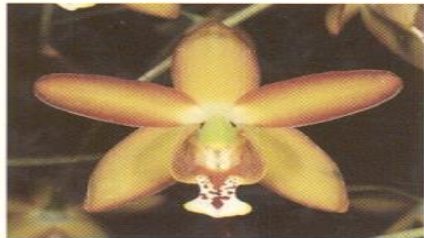
EPHEMERAL

TRACHEOPHYTE EVOLUTION

V



VASCULAR PLANT EVOLUTION



TRACHEOPHYTE EVOLUTION

SPOROPHYTE VS GAMETOPHYTE



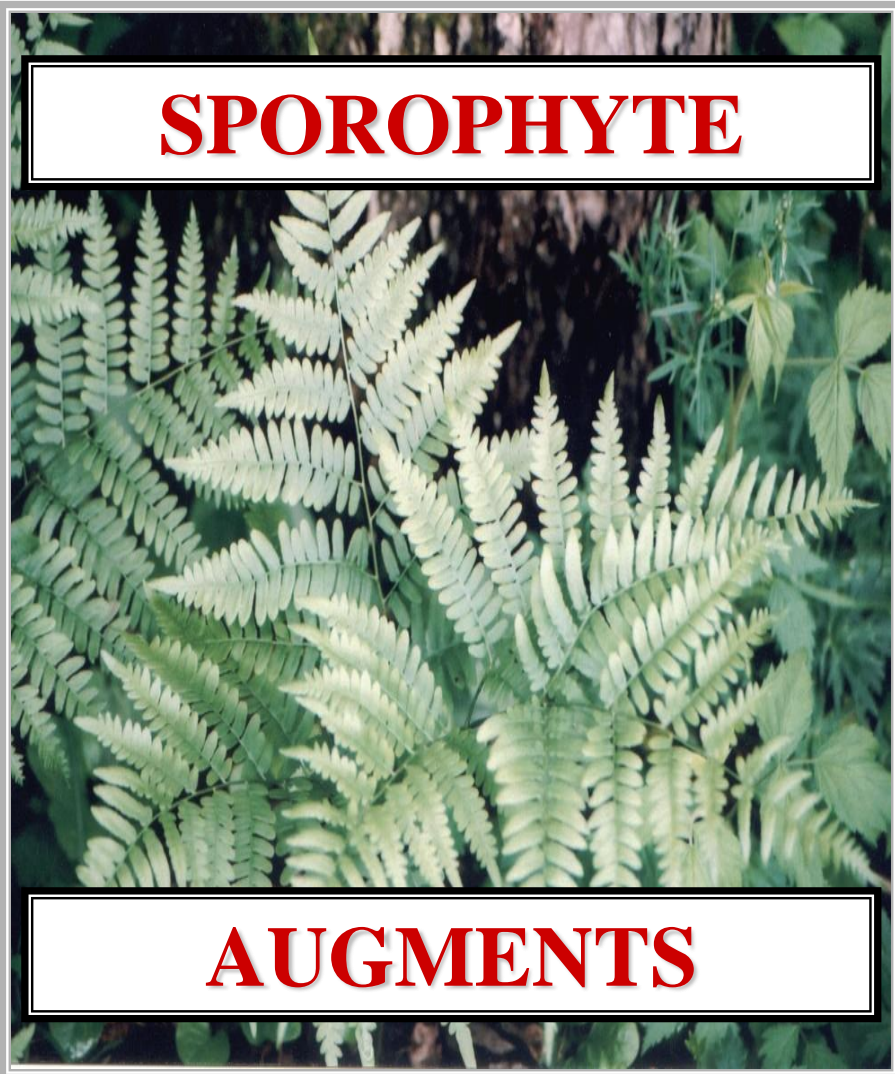
SPOROPHYTE



GAMETOPHYTE

TRACHEOPHYTE EVOLUTION

SPOROPHYTE VS GAMETOPHYTE



TRACHEOPHYTE EVOLUTION

SPOROPHYTE VS GAMETOPHYTE

SPOROPHYTE



AUGMENTS

GAMETOPHYTE



REDUCTION



VASCULAR PLANT EVOLUTION



~420

MILLION YEARS

~420 MILLION YEARS AGO



TRACHEOPHYTES EVOLVE



TRACHEOPHYTE EVOLUTION



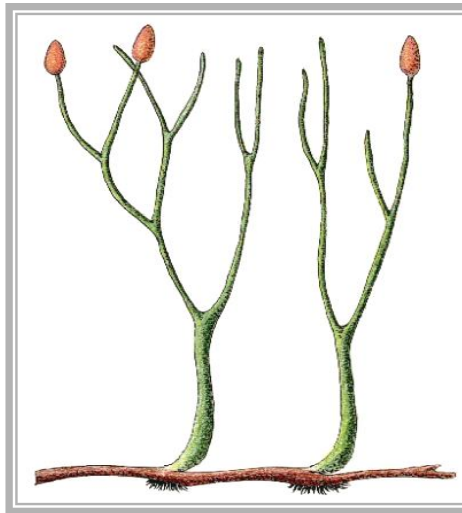
PARKA-LIKE

TRACHEOPHYTE EVOLUTION



CHAROPHYCEAE

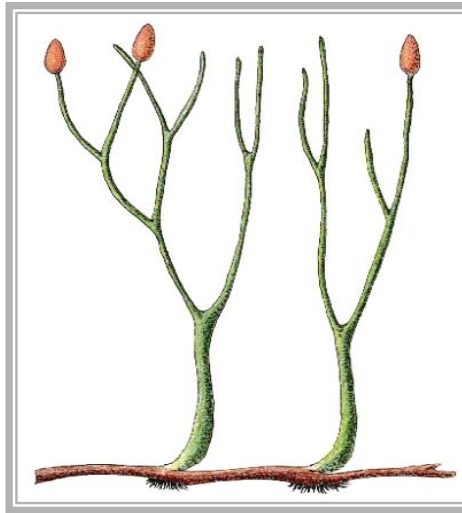
TRACHEOPHYTE EVOLUTION



CHAROPHYCEAE

AGLAOPHYTON

TRACHEOPHYTE EVOLUTION



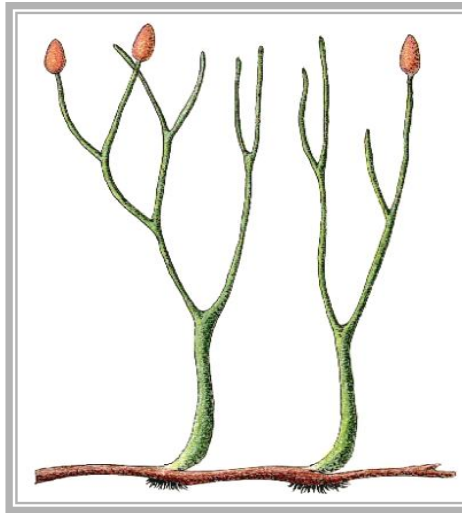
CHAROPHYCEAE

PROEMBRYOPHYTE

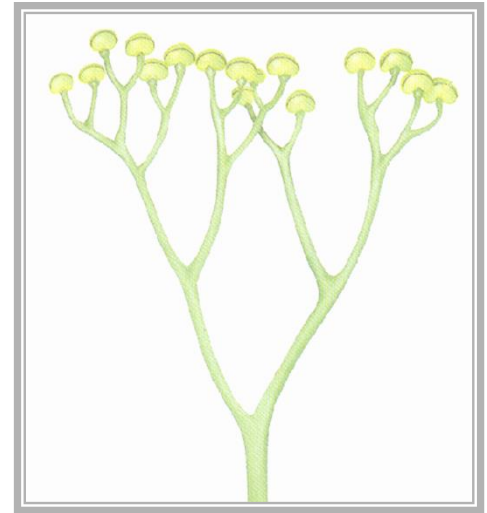
TRACHEOPHYTE EVOLUTION



CHAROPHYCEAE



PROEMBRYOPHYTE

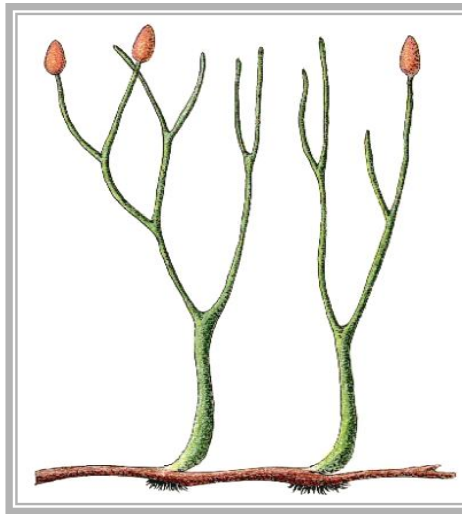


EMBRYOPHYTE

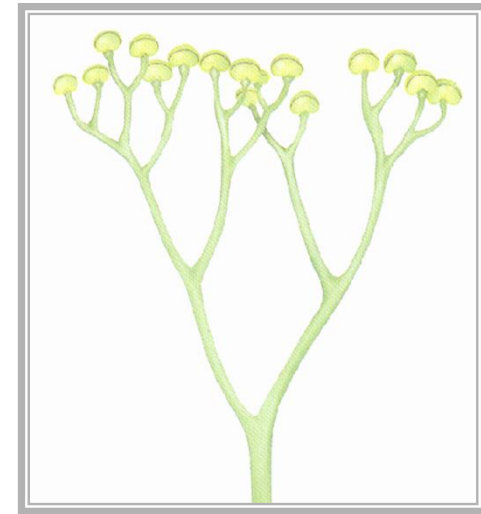
TRACHEOPHYTE EVOLUTION



CHAROPHYCEAE



PROEMBRYOPHYTE



TRACHEOPHYTE



TRACHEOPHYTES



COMMON NAME



VASCULAR PLANTS

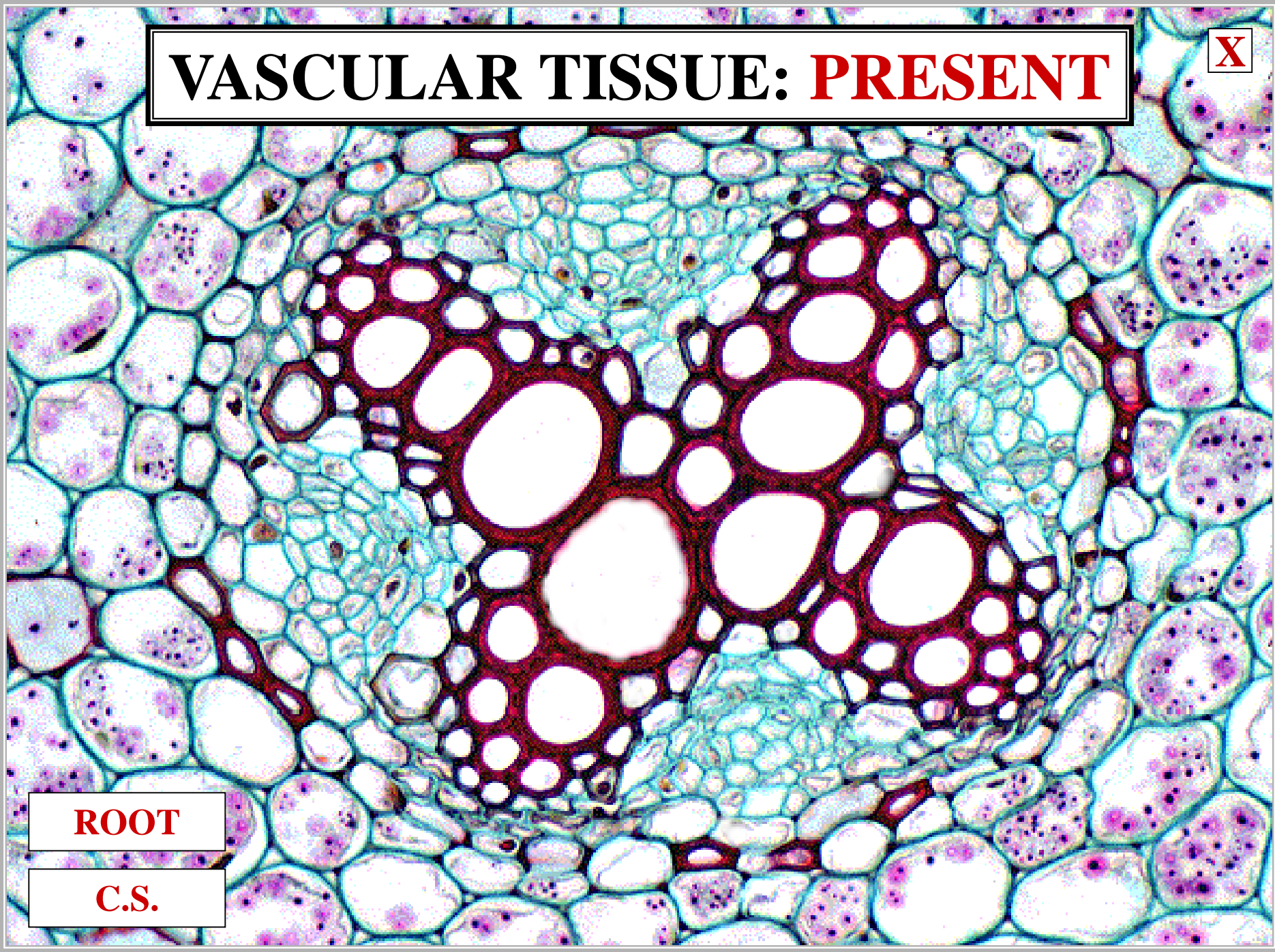


VASCULAR TISSUE: **PRESENT**

X

ROOT

C.S.



VASCULAR TISSUE: **PRESENT**

P

XYLEM

A light micrograph of a root cross-section. The central vascular cylinder is stained dark red, highlighting the xylem vessels. The surrounding cortex is stained light blue. A red arrow points from the 'XYLEM' label to the dark red vascular tissue.

ROOT

C.S.

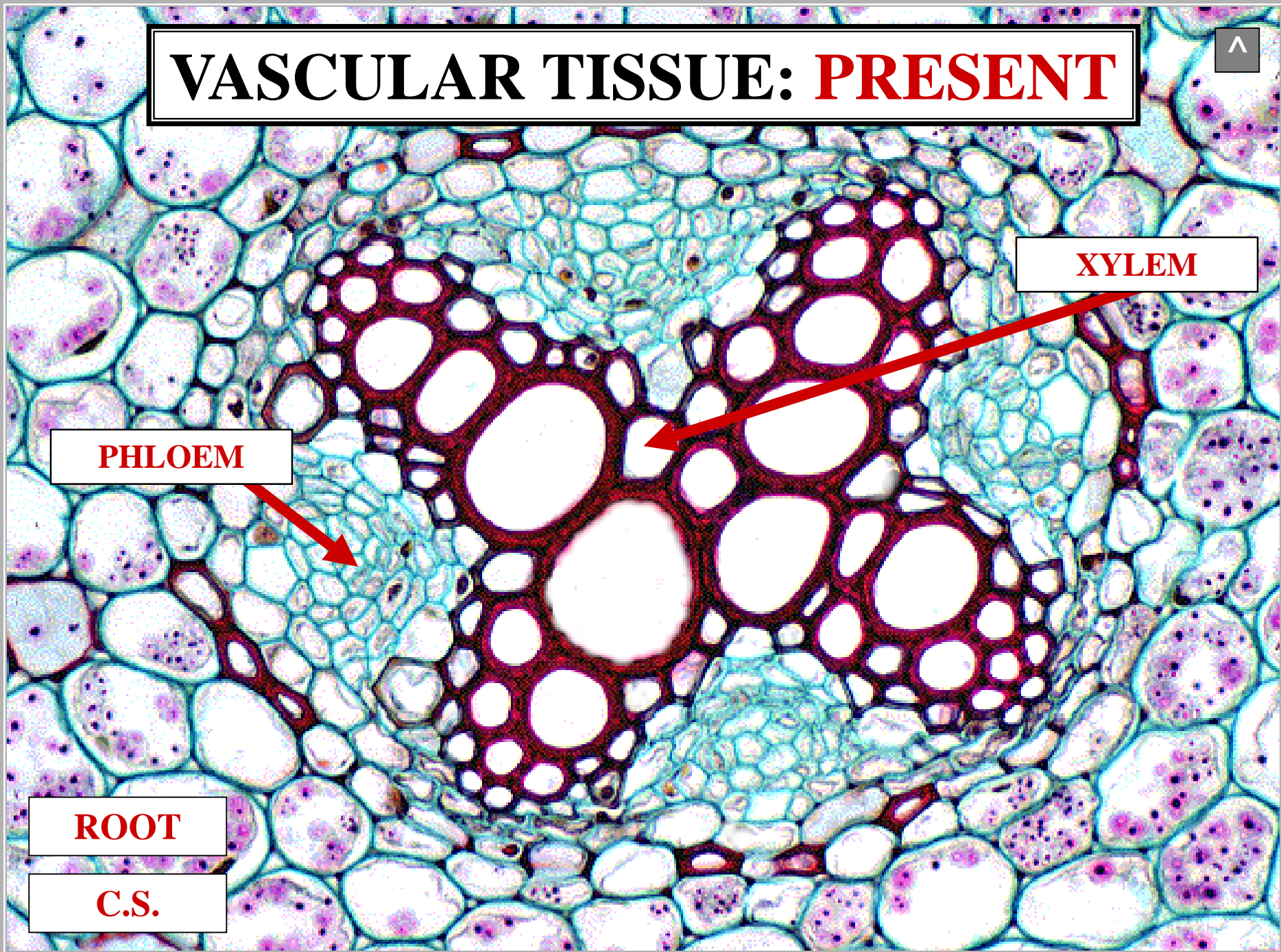
VASCULAR TISSUE: **PRESENT**

XYLEM

PHLOEM

ROOT

C.S.





DIVERSITY



~300,000 SPECIES

EARTH



DISTRIBUTION

EX

COSMOPOLITAN

EARTH

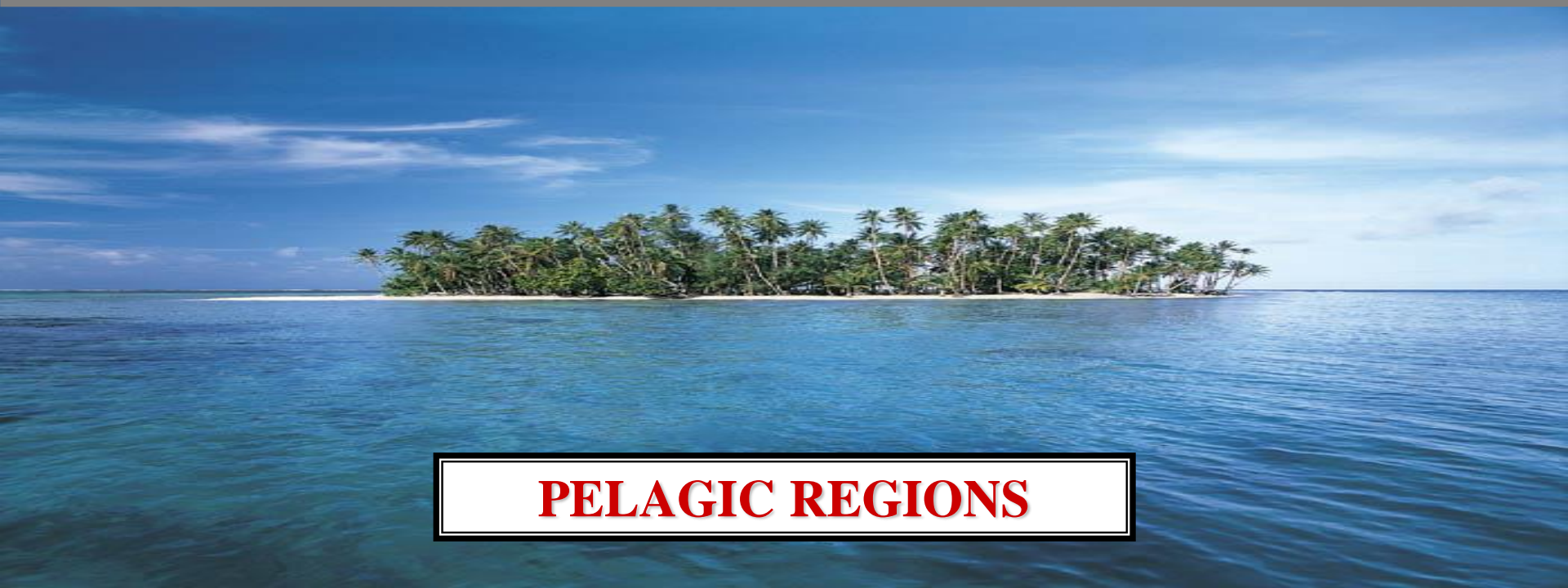


EXCEPTION

EARTH



POLAR REGIONS



PELAGIC REGIONS



GENERAL CHARACTERS

MERISTEM

MERISTEM

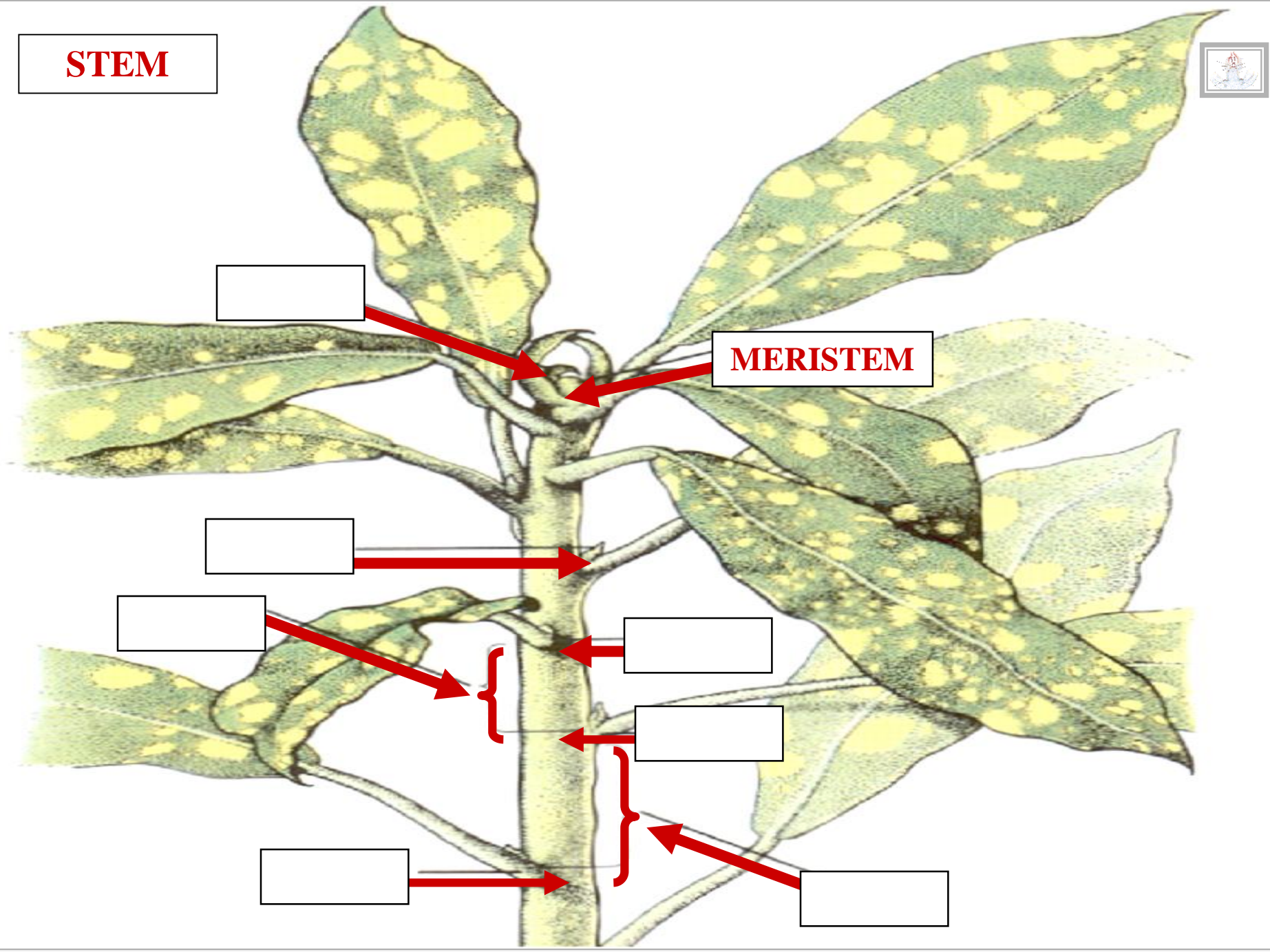


MERISTEM

GROWTH REGION

MERISTEM

STEM



MERISTEM

[]

[]

[]

[]

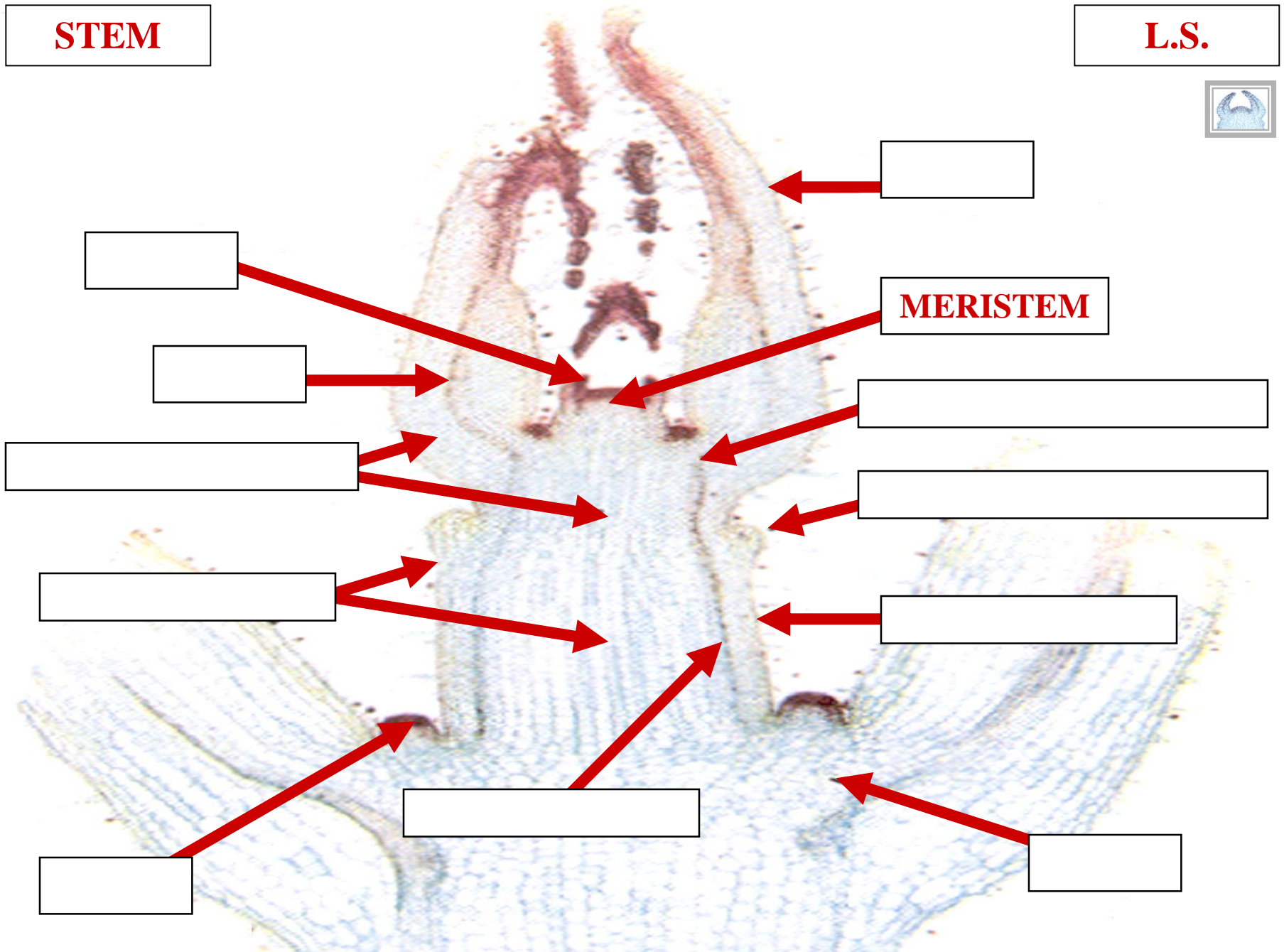
[]

[]

[]

STEM

L.S.



MERISTEM

[Empty box]

[Empty box]

[Empty box]

[Empty box]

[Empty box]

[Empty box]

[Empty box]

[Empty box]

[Empty box]

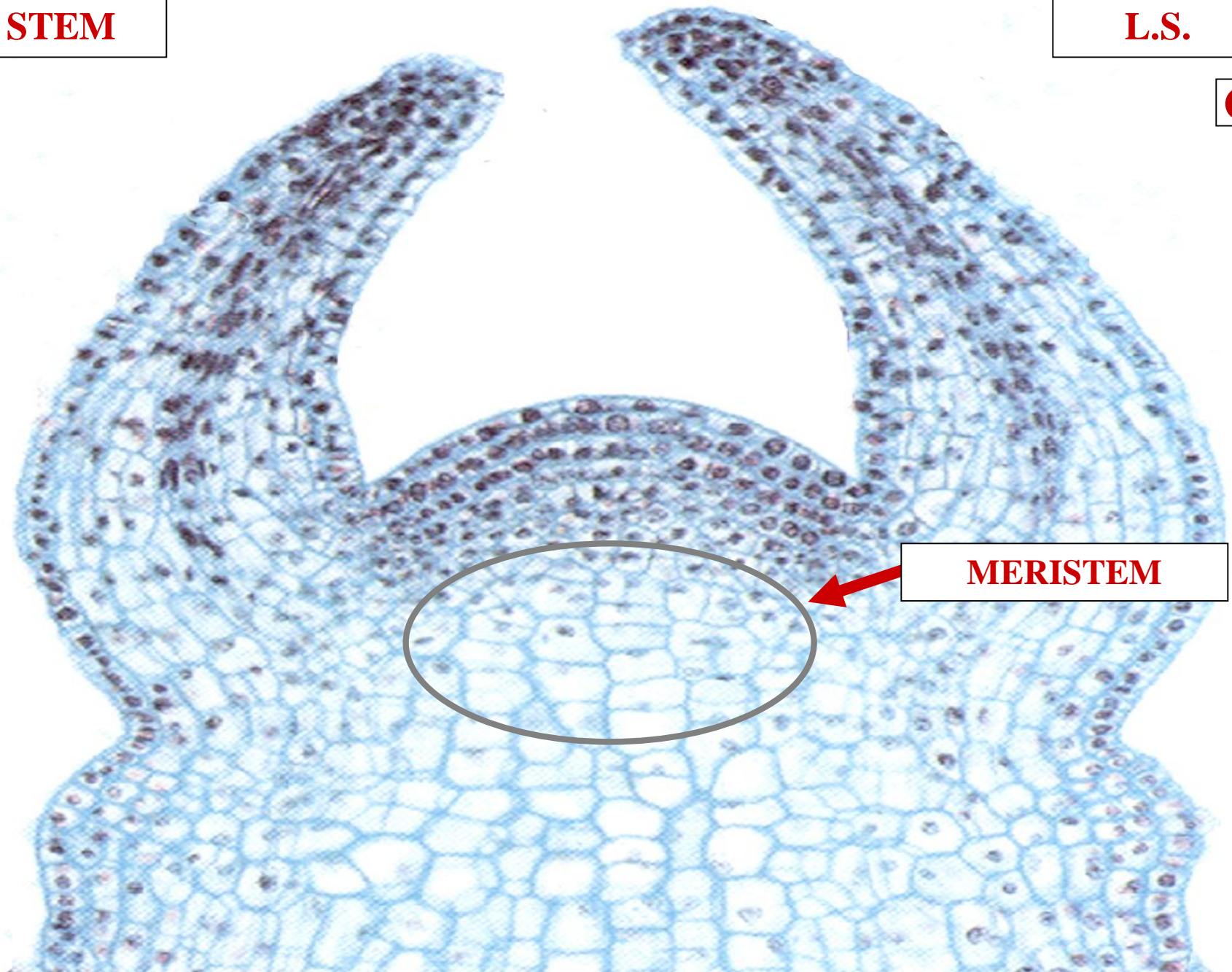
[Empty box]

[Empty box]

STEM

L.S.

C

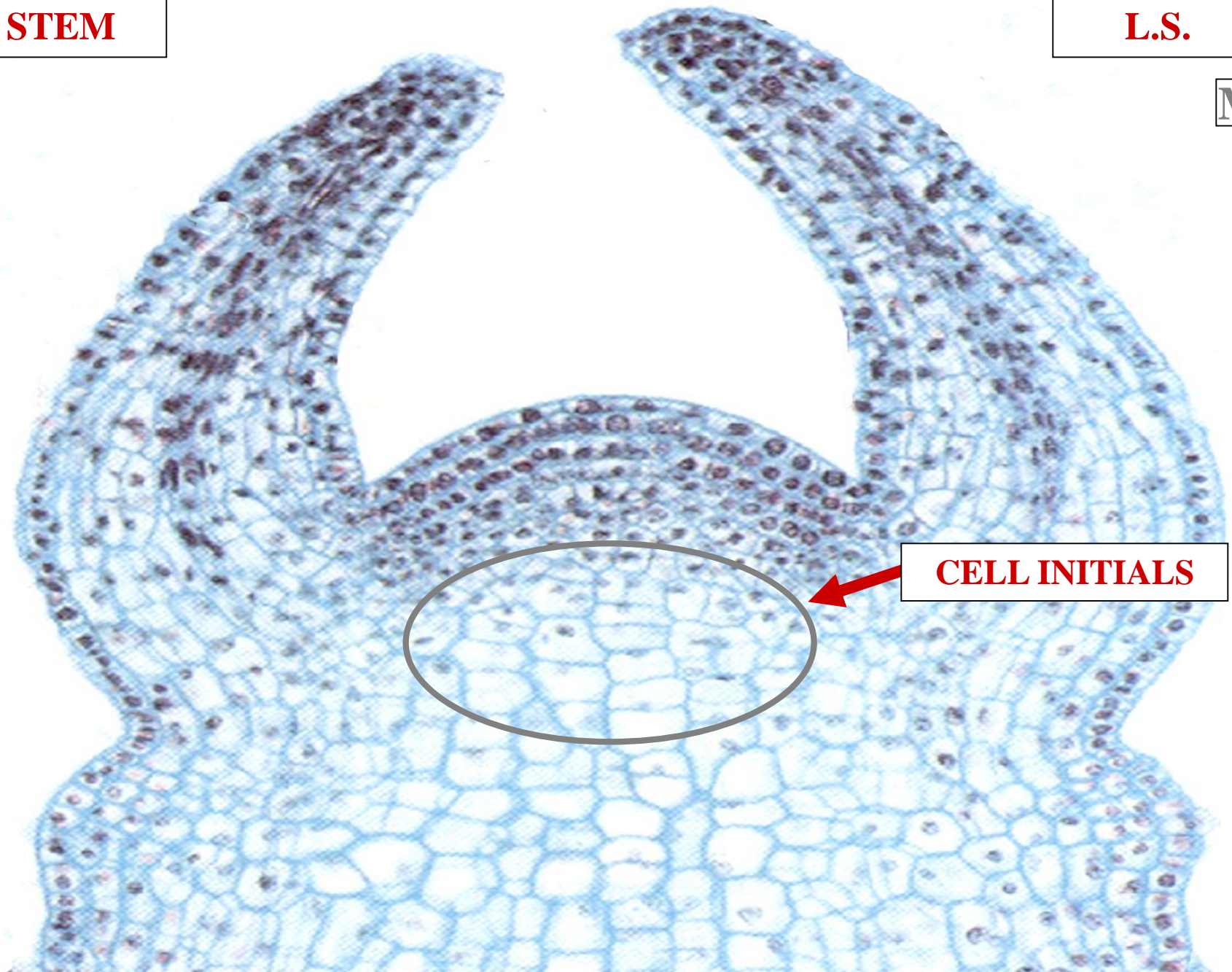


MERISTEM

STEM

L.S.

M

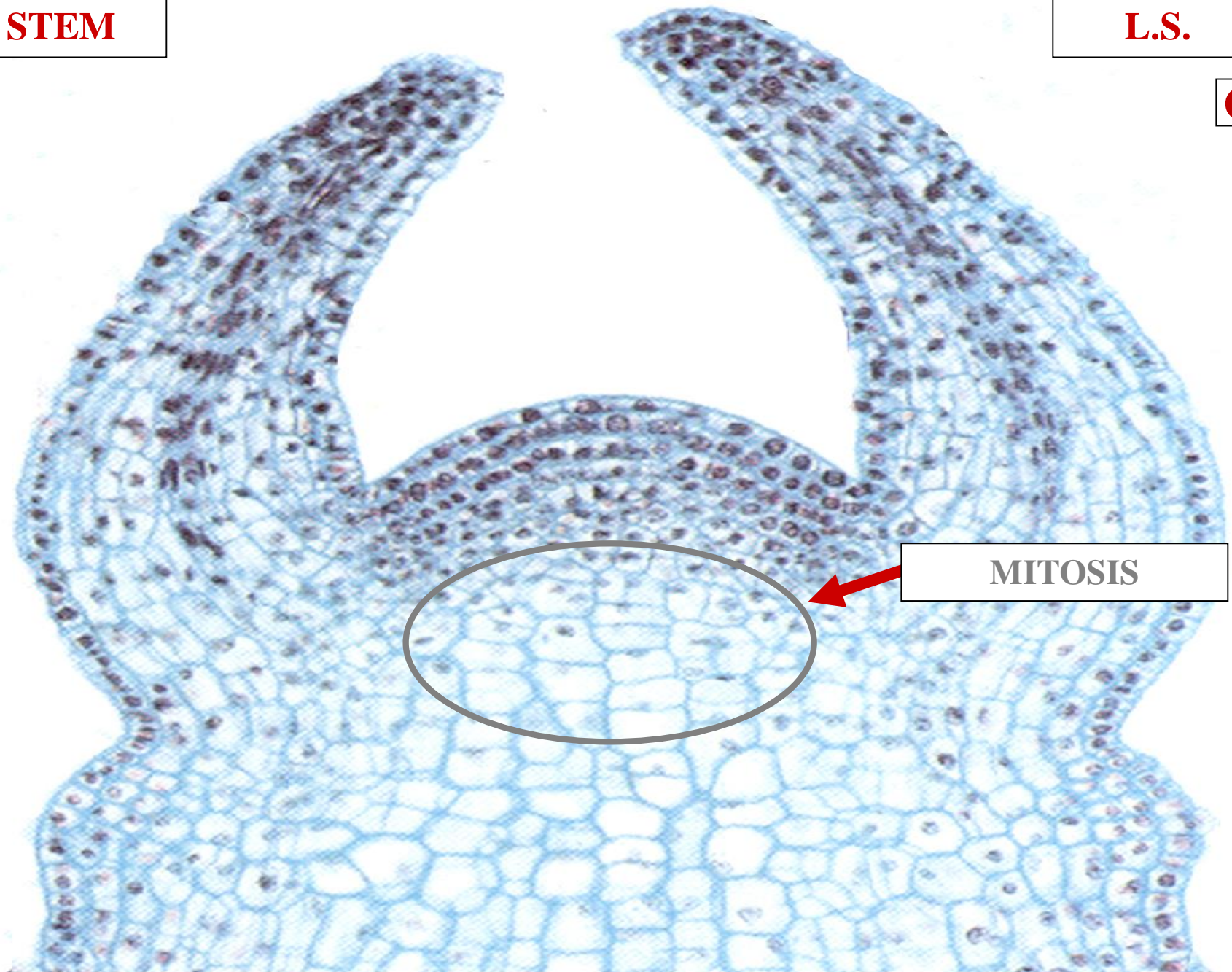


CELL INITIALS

STEM

L.S.

C

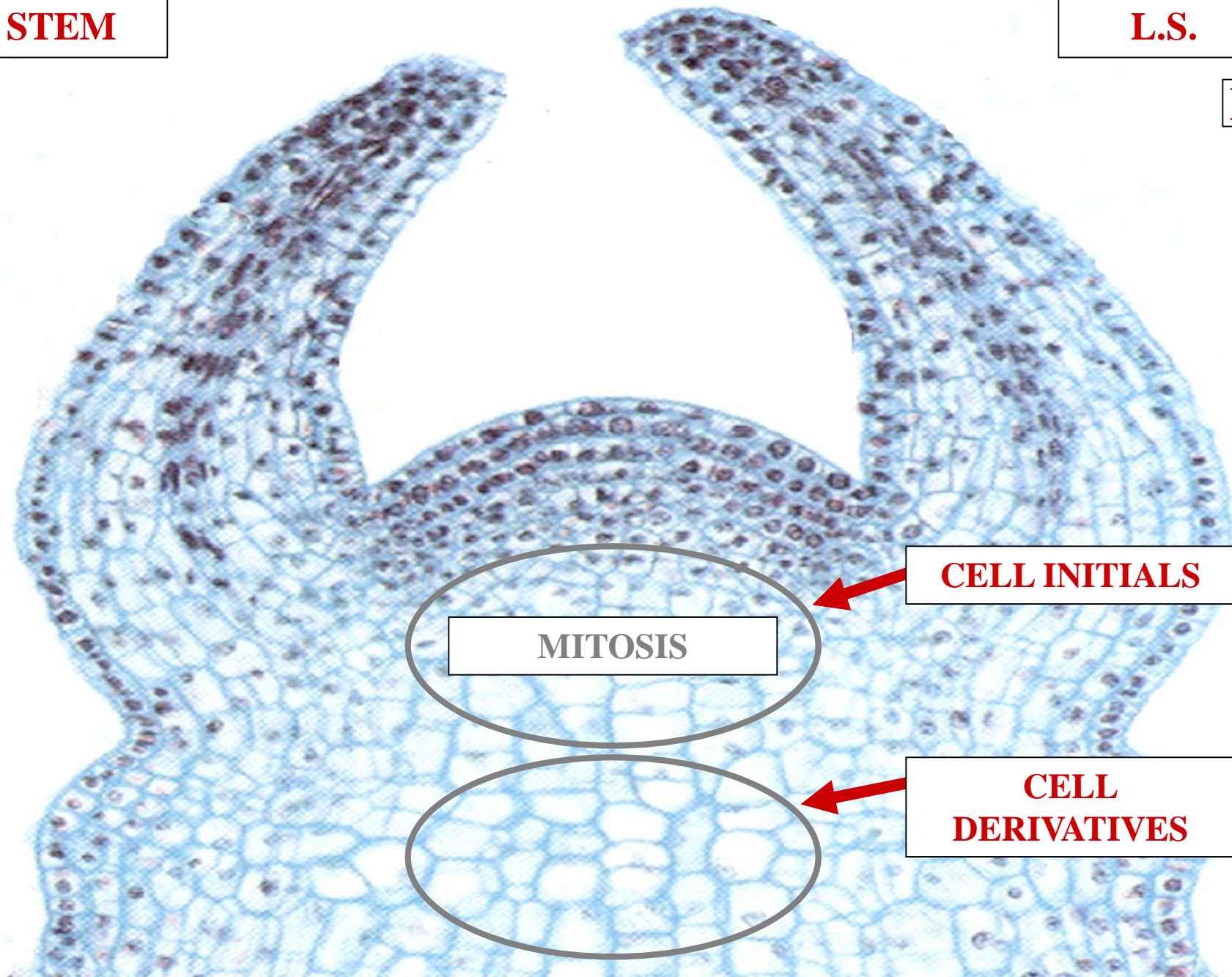


MITOSIS

STEM

L.S.

D



CELL INITIALS

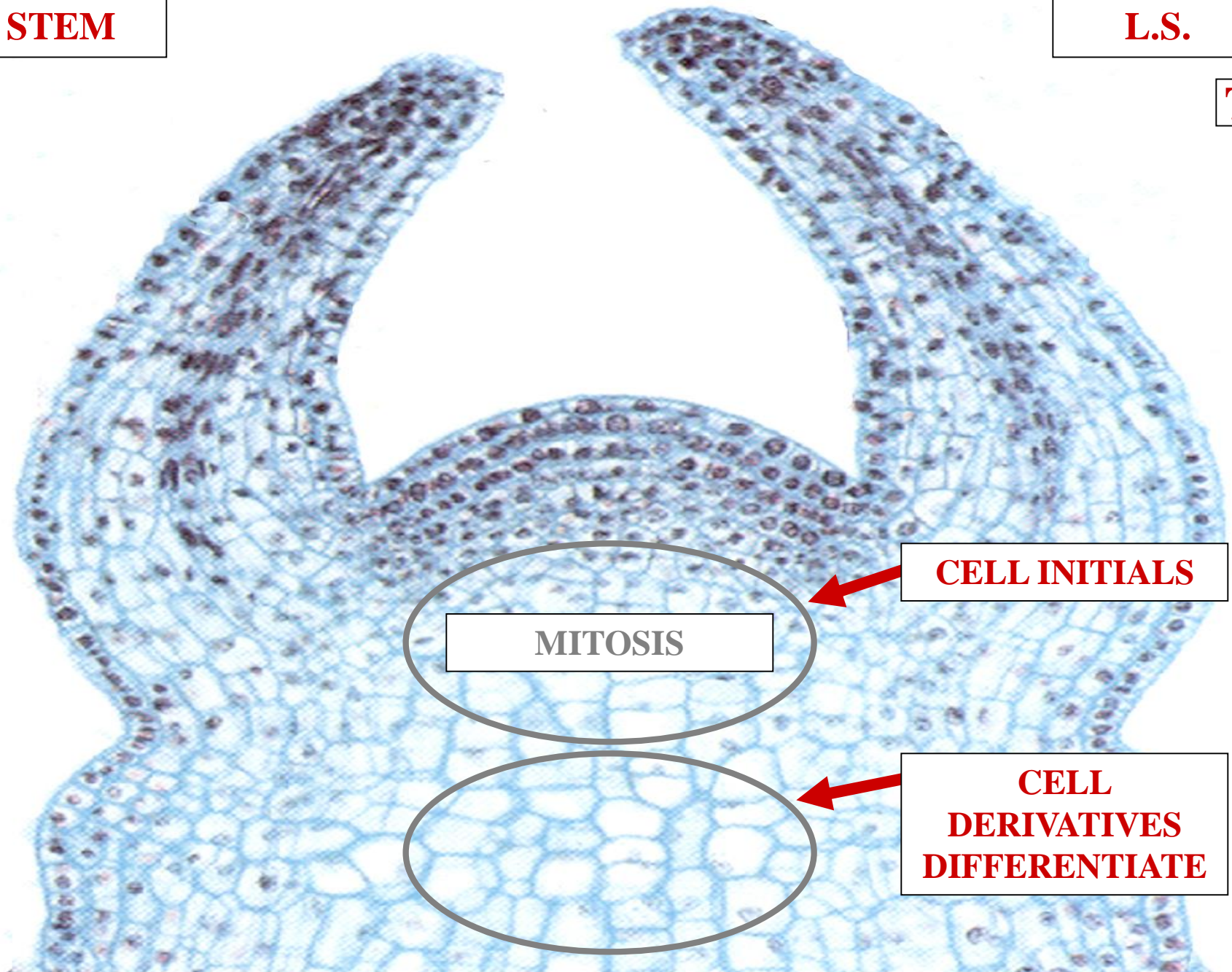
MITOSIS

**CELL
DERIVATIVES**

STEM

L.S.

T



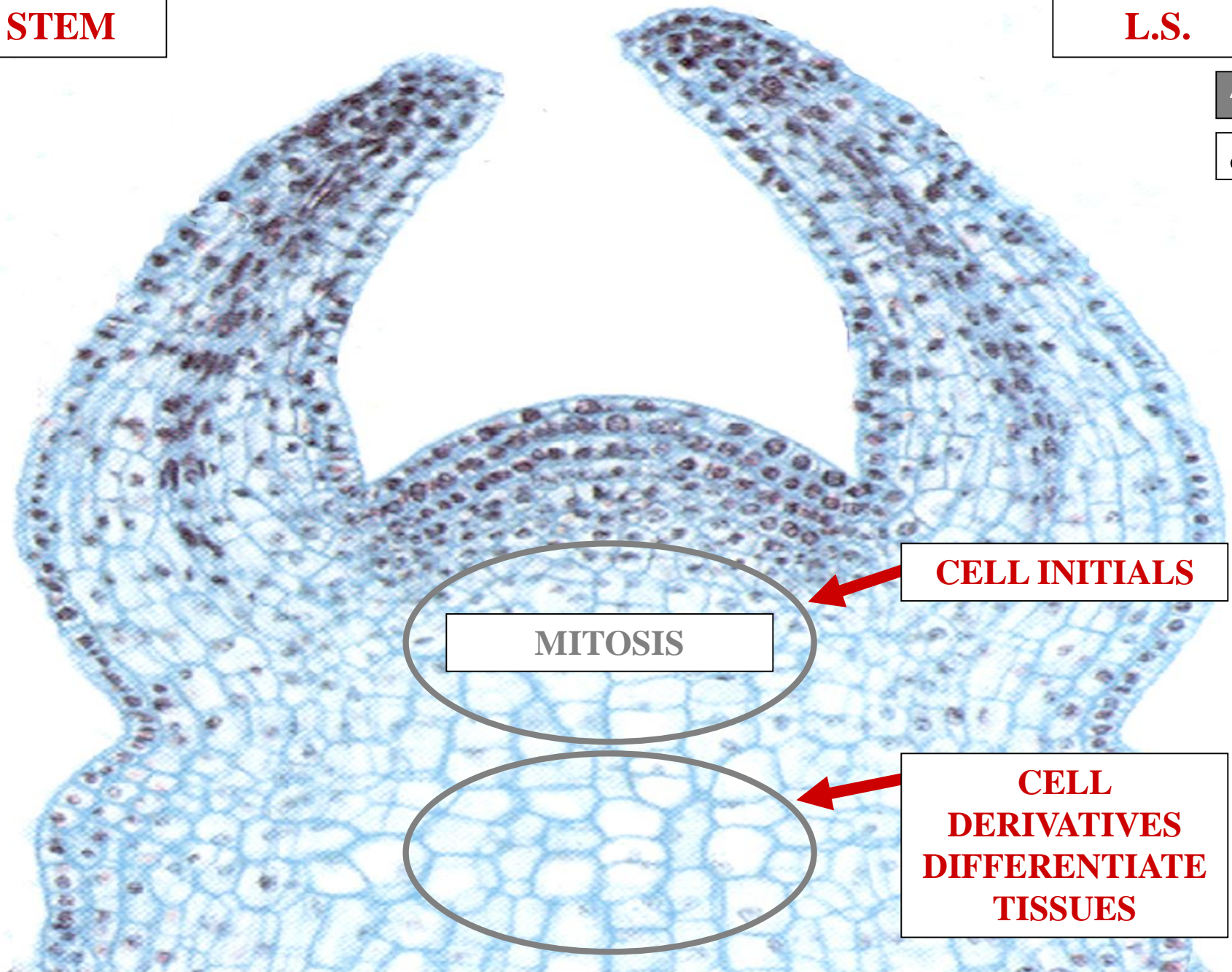
MITOSIS

CELL INITIALS

CELL DERIVATIVES DIFFERENTIATE

STEM

L.S.



MITOSIS

CELL INITIALS

**CELL
DERIVATIVES
DIFFERENTIATE
TISSUES**



TRACHEOPHYTE HISTOLOGY

TYPICAL TRACHEOPHYTE

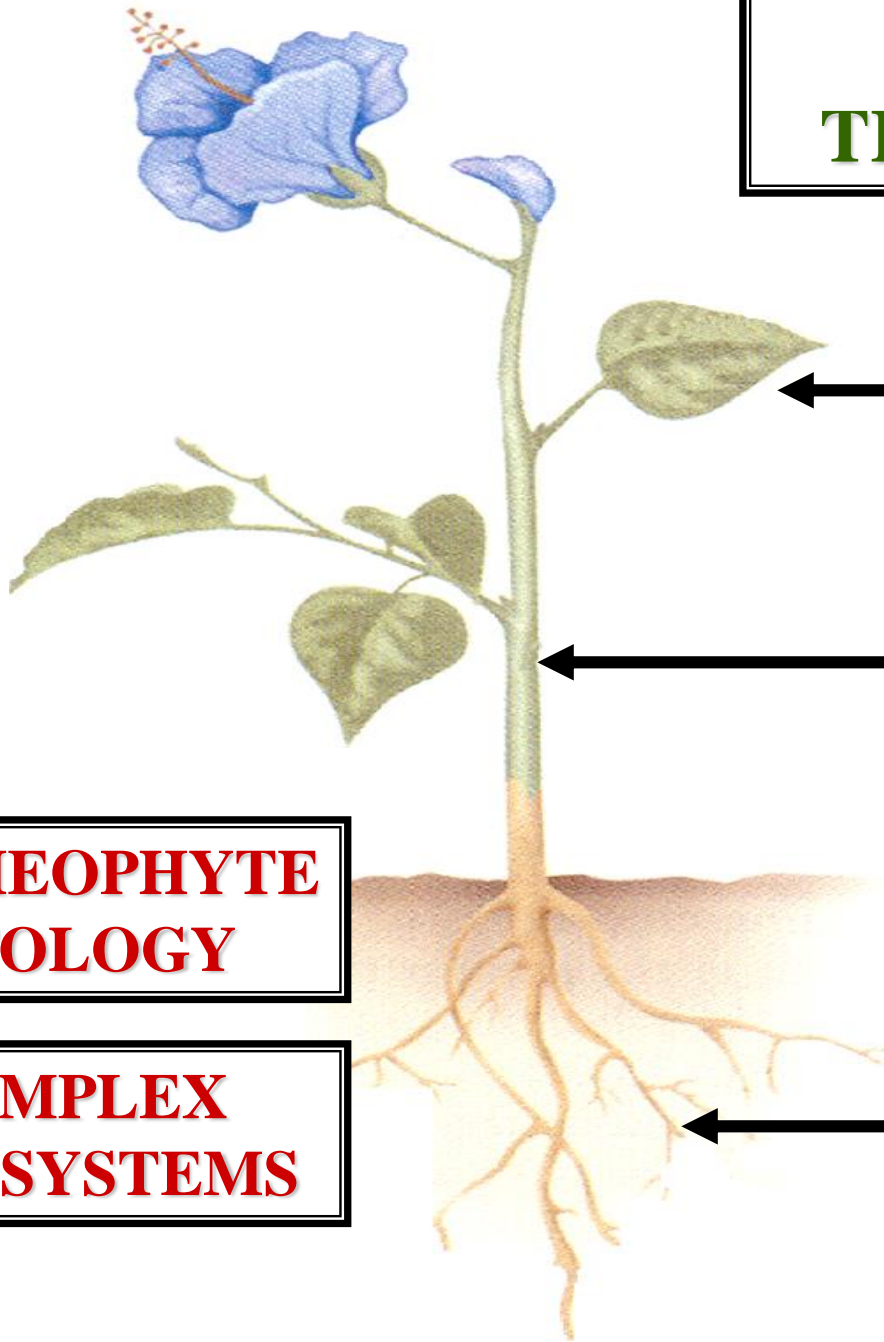
LEAF

STEM

ROOT

**TRACHEOPHYTE
HISTOLOGY**

**3 COMPLEX
TISSUE SYSTEMS**



TRACHEOPHYTE COMPLEX TISSUES

**TRACHEOPHYTE
COMPLEX TISSUES**

GROUND TISSUE

**TRACHEOPHYTE
COMPLEX TISSUES**

**TRACHEOPHYTE
COMPLEX TISSUES**

GROUND TISSUE

VASCULAR TISSUE

**TRACHEOPHYTE
COMPLEX TISSUES**

TRACHEOPHYTE COMPLEX TISSUES



GROUND TISSUE

VASCULAR TISSUE

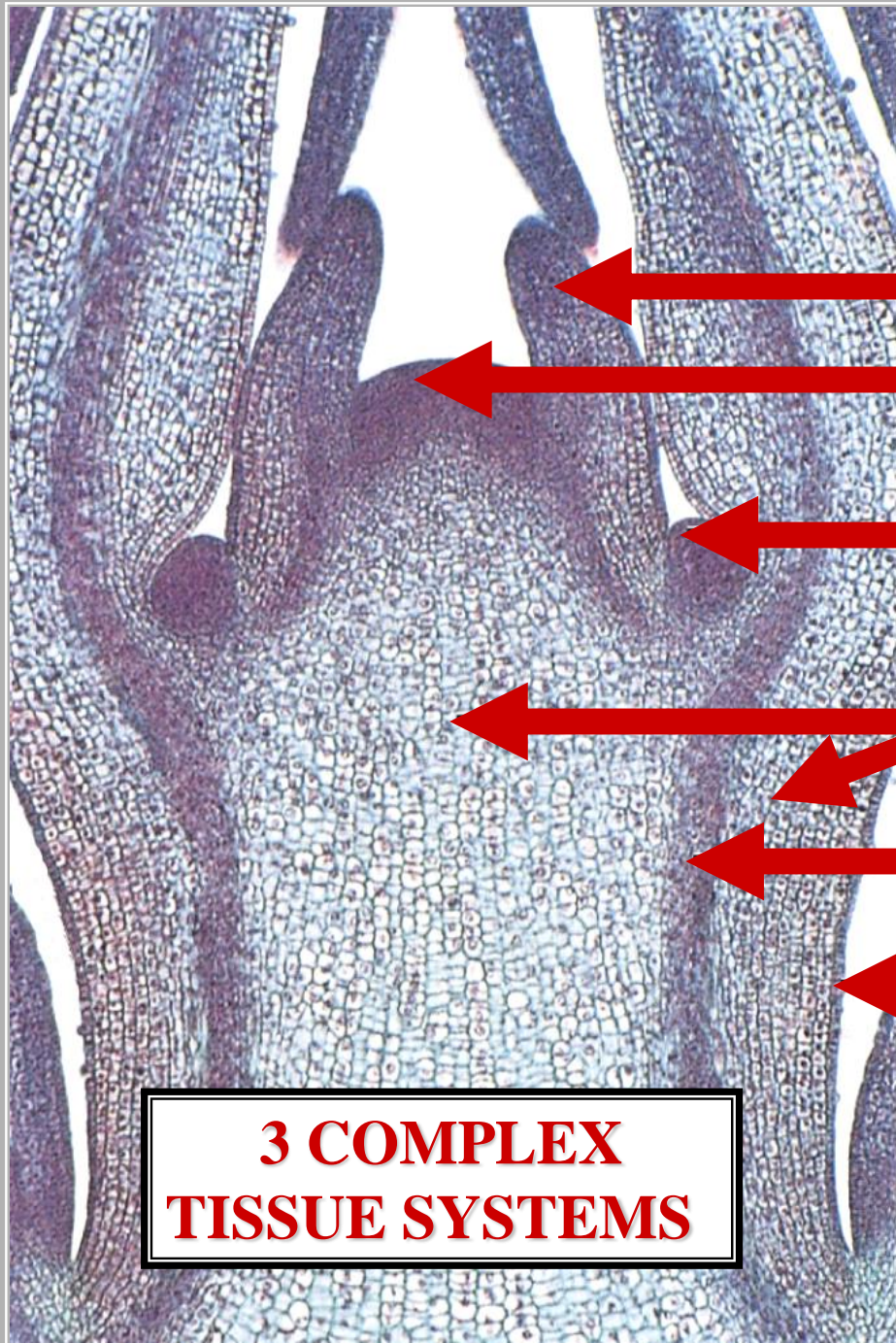
DERMAL TISSUE

TRACHEOPHYTE COMPLEX TISSUES

TRACHEOPHYTE COMPLEX TISSUES

+

G



[]

**APICAL
MERISTEM**

[]

[]

[]

[]

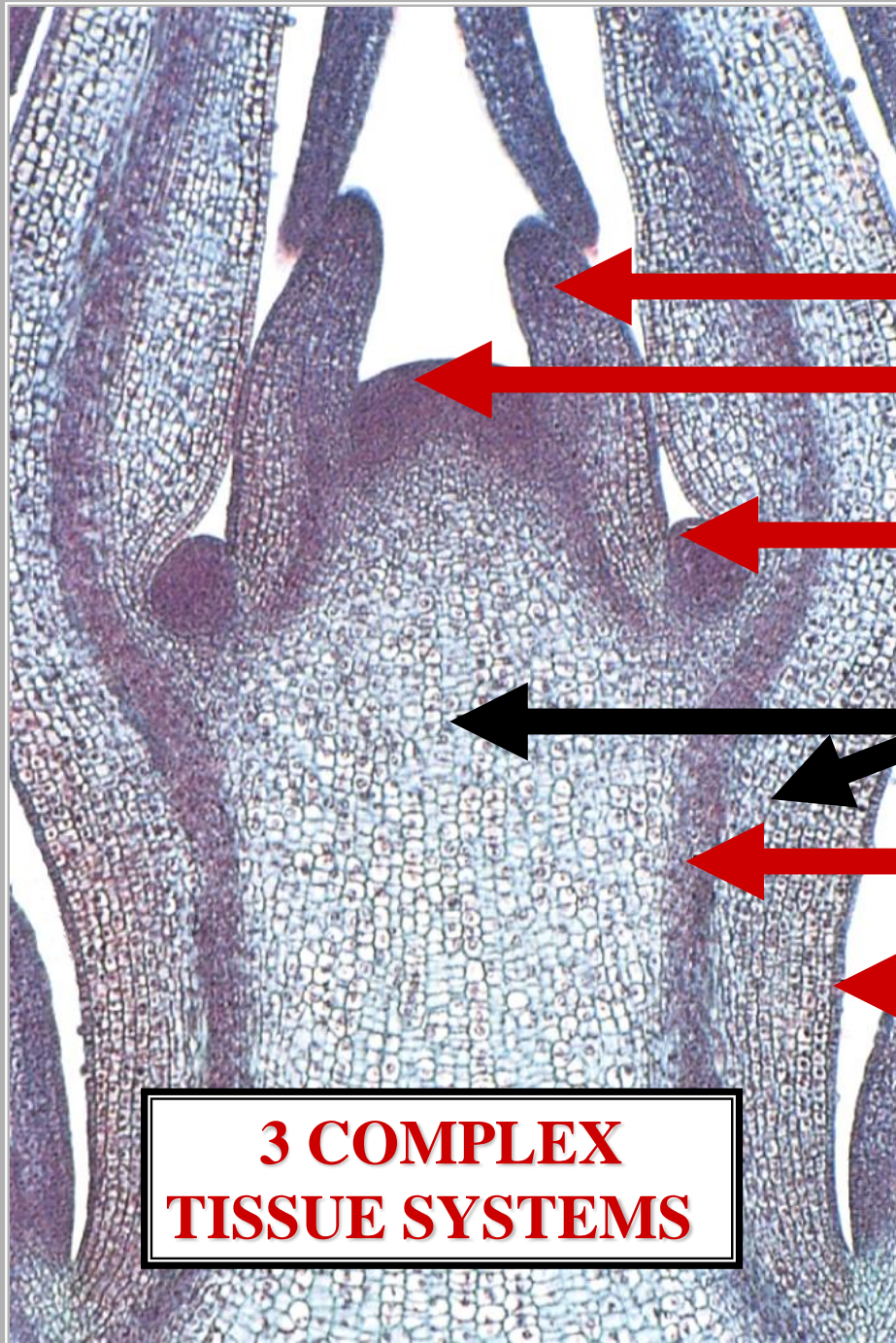
**3 COMPLEX
TISSUE SYSTEMS**

STEM

L.S.

TRACHEOPHYTE COMPLEX TISSUES

V



[]

**APICAL
MERISTEM**

[]

GROUND TISSUE

[]

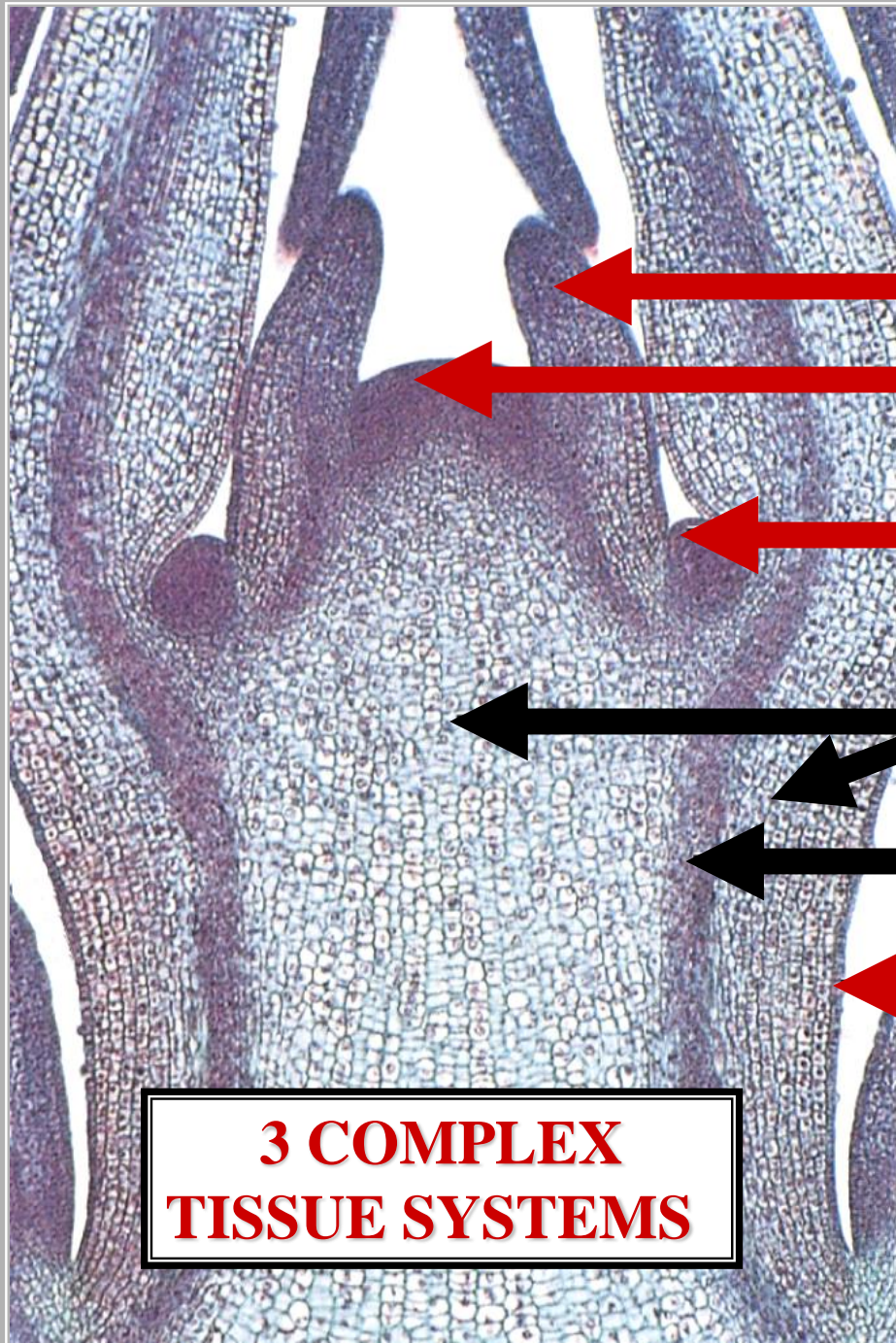
[]

**3 COMPLEX
TISSUE SYSTEMS**

STEM

L.S.

TRACHEOPHYTE D COMPLEX TISSUES



[Empty box]

**APICAL
MERISTEM**

[Empty box]

GROUND TISSUE

VASCULAR TISSUE

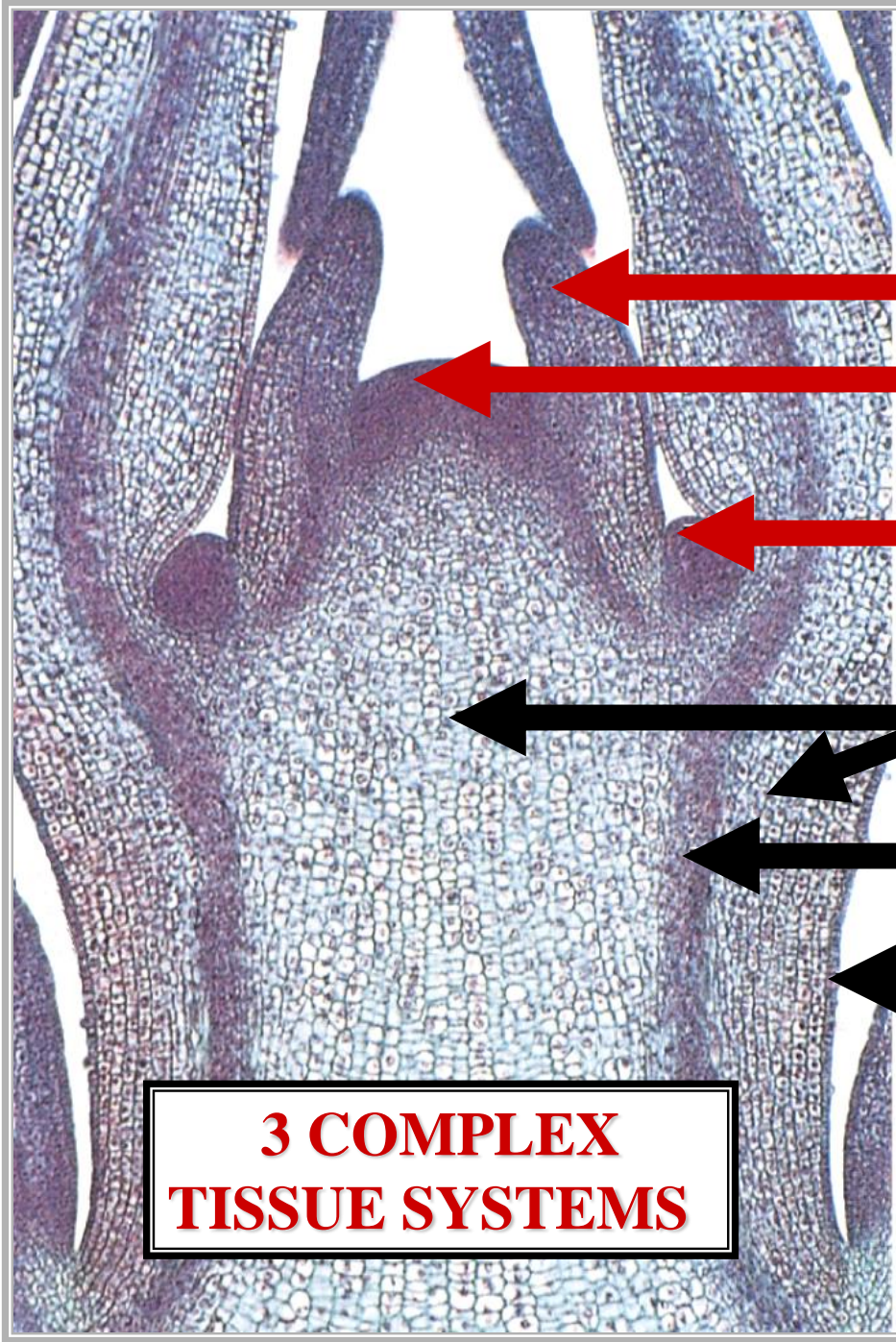
[Empty box]

STEM

L.S.

**3 COMPLEX
TISSUE SYSTEMS**

TRACHEOPHYTE COMPLEX TISSUES



[Empty box]

**APICAL
MERISTEM**

[Empty box]

GROUND TISSUE

VASCULAR TISSUE

DERMAL TISSUE

**3 COMPLEX
TISSUE SYSTEMS**

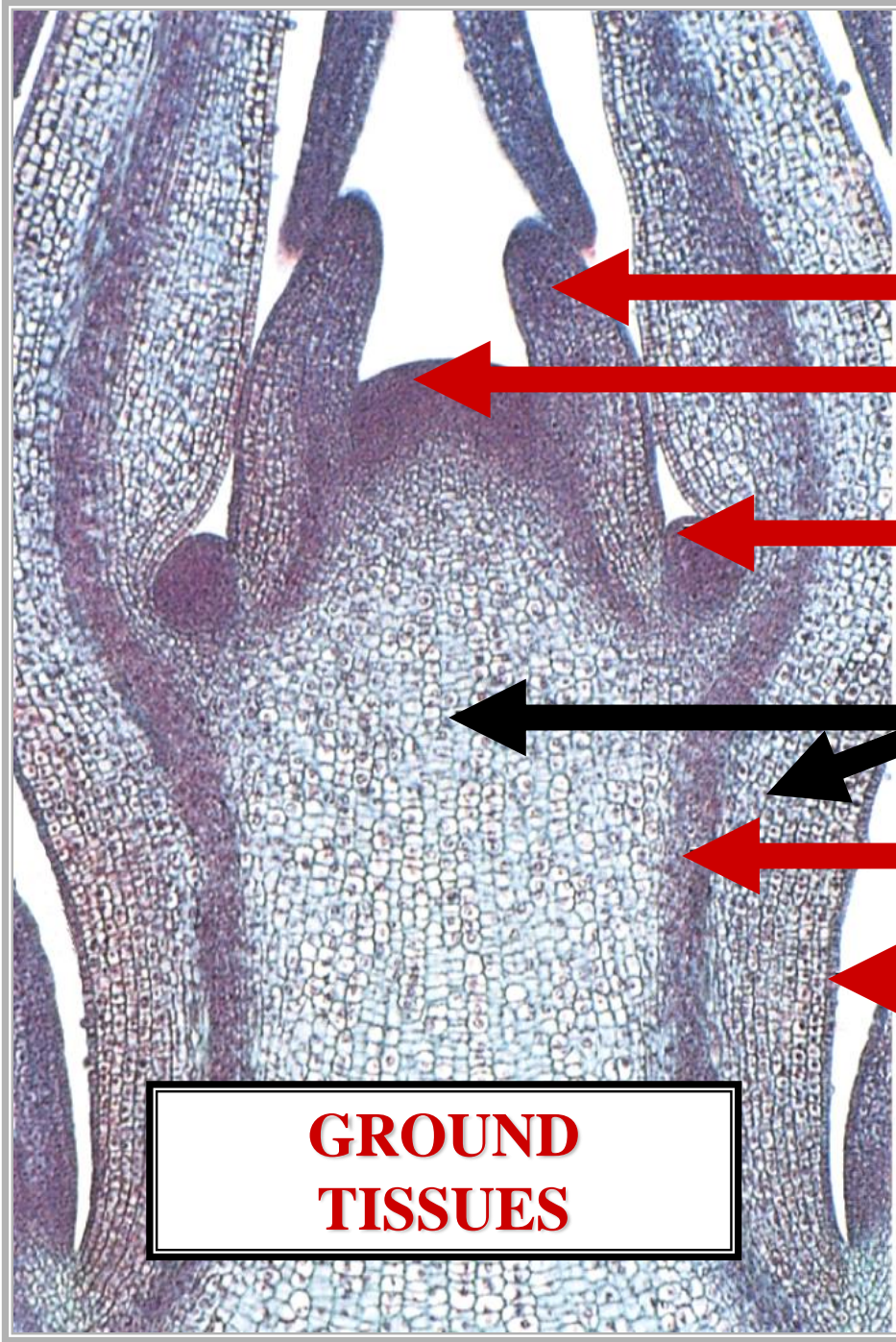
STEM

L.S.



GROUND TISSUE

TRACHEOPHYTE COMPLEX TISSUES



[Empty box]

**APICAL
MERISTEM**

[Empty box]

GROUND TISSUE

[Empty box]

[Empty box]

**GROUND
TISSUES**

STEM

L.S.

GROUND TISSUE TYPES

GROUND TISSUE TYPES

PARENCHYMA TISSUE

GROUND TISSUE TYPES

GROUND TISSUE TYPES

PARENCHYMA TISSUE

COLLENCHYMA TISSUE

GROUND TISSUE TYPES

GROUND TISSUE TYPES



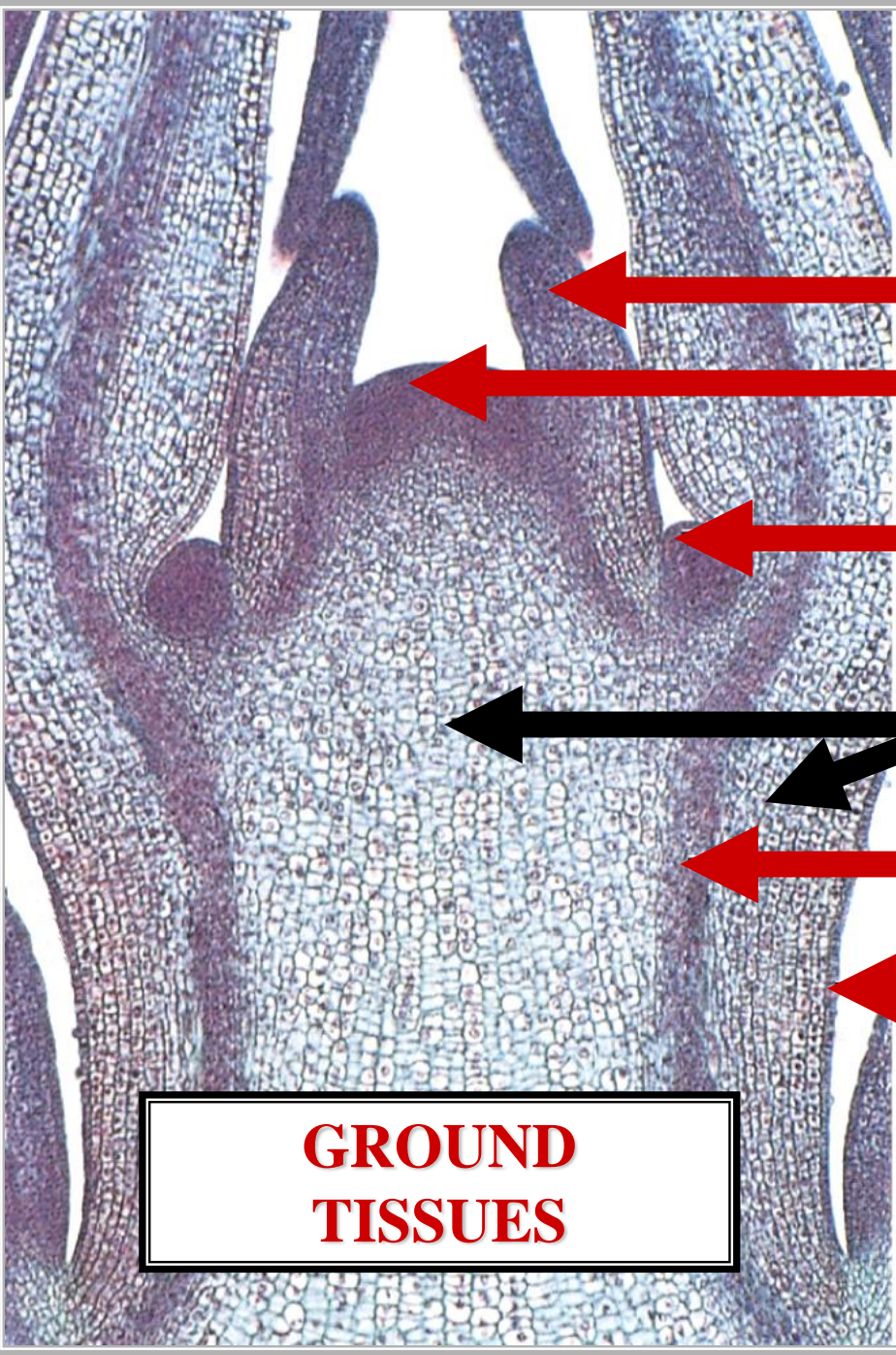
PARENCHYMA TISSUE
COLLENCHYMA TISSUE
SCLERENCHYMA TISSUE

GROUND TISSUE TYPES

TRACHEOPHYTE GROUND TISSUES

T

P



[]

**APICAL
MERISTEM**

[]

GROUND TISSUE

[]

[]

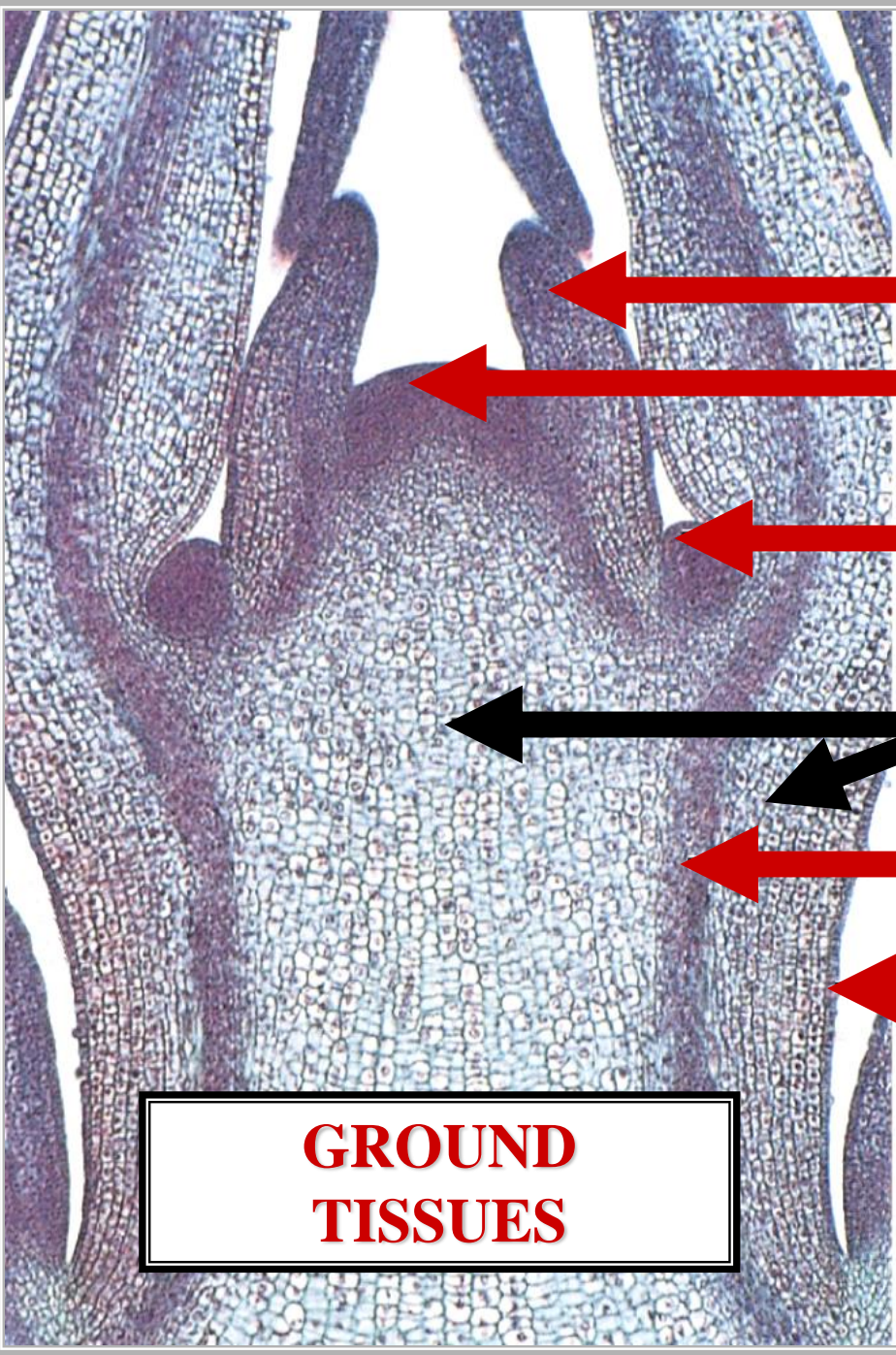
**GROUND
TISSUES**

STEM

L.S.

TRACHEOPHYTE GROUND TISSUES

C



[]

**APICAL
MERISTEM**

[]

PARENCHYMA TISSUE

[]

[]

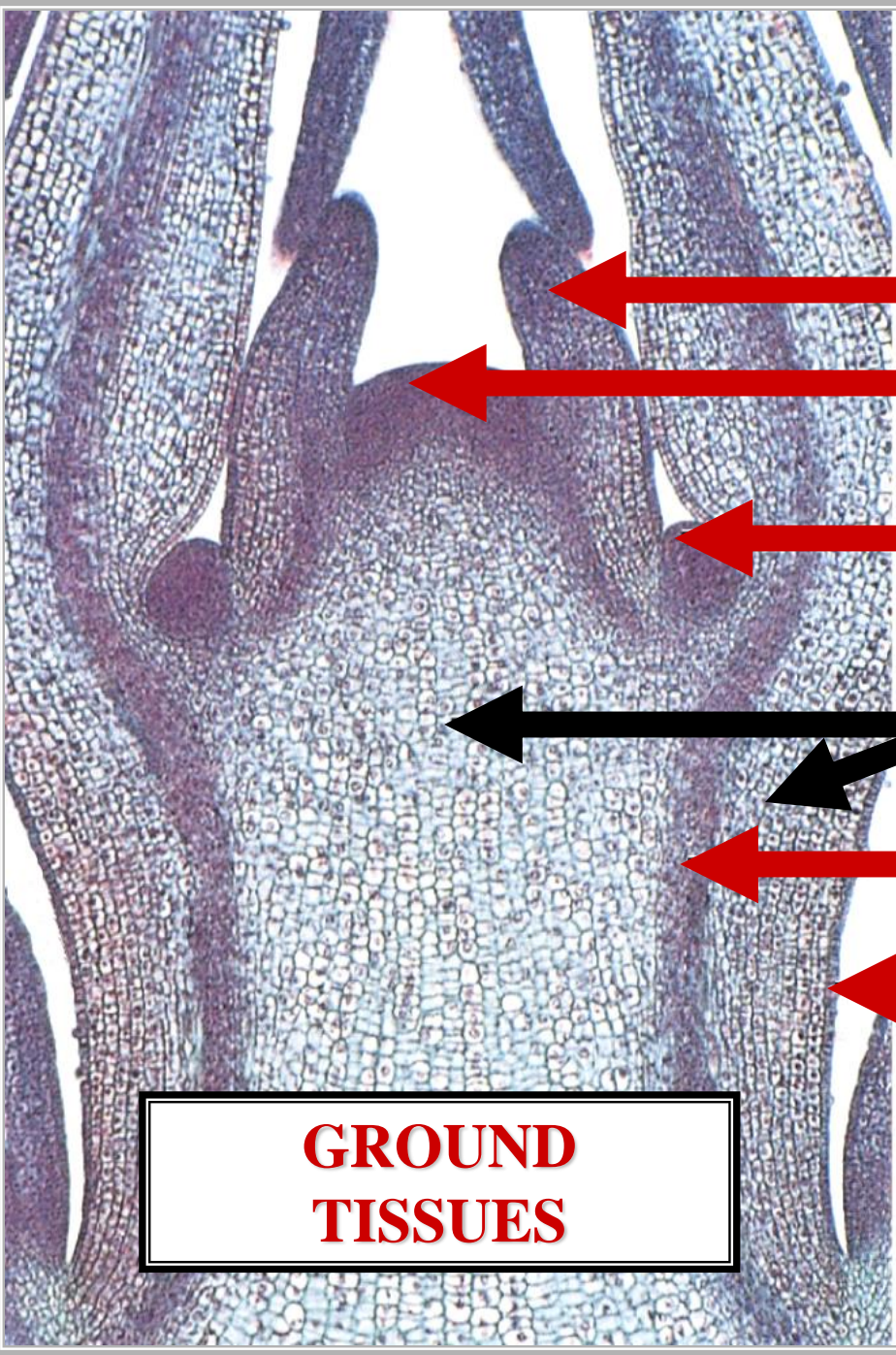
**GROUND
TISSUES**

STEM

L.S.

TRACHEOPHYTE GROUND TISSUES

S



[]

**APICAL
MERISTEM**

[]

COLLENCHYMA TISSUE

[]

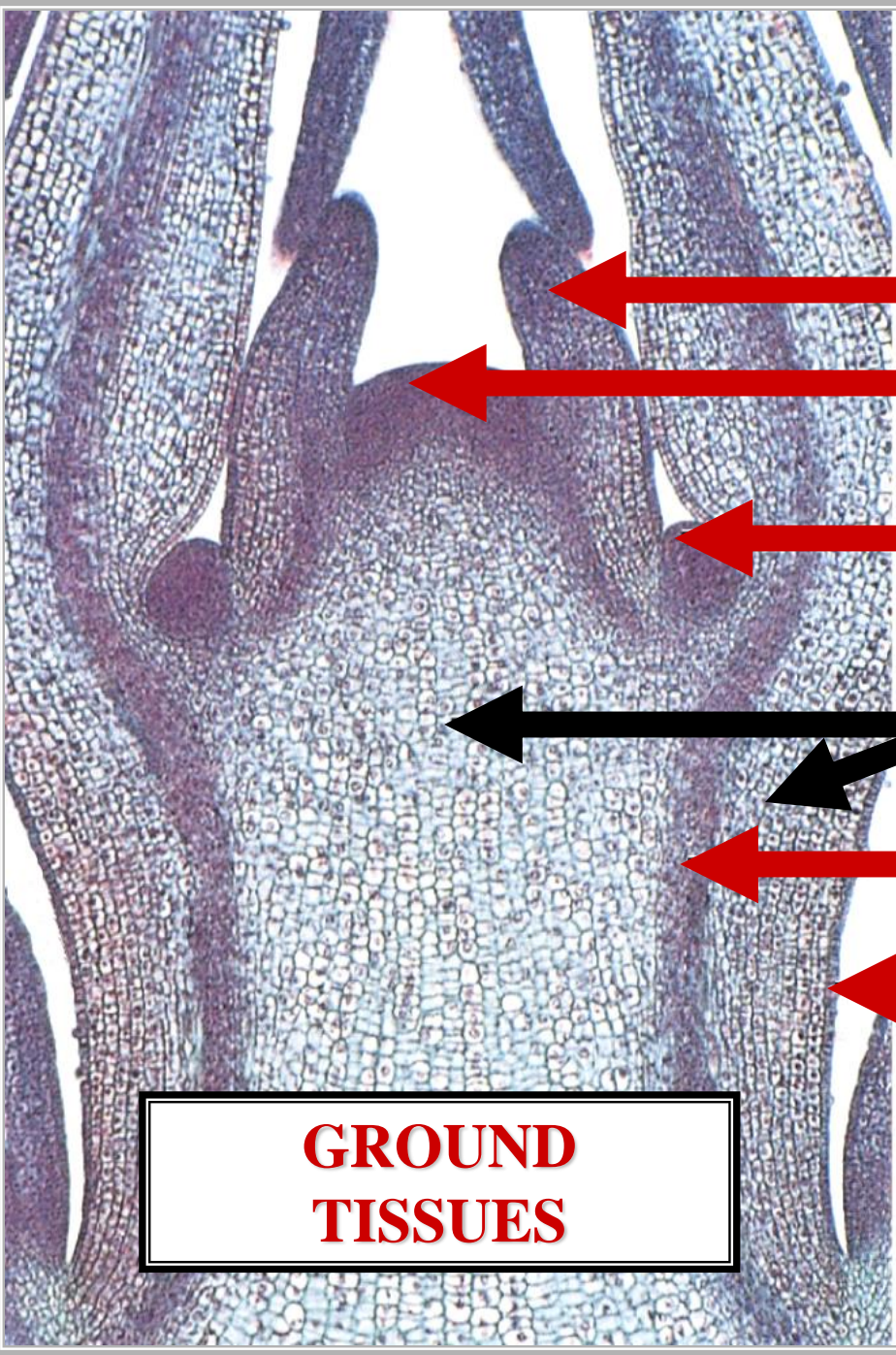
[]

**GROUND
TISSUES**

STEM

L.S.

TRACHEOPHYTE GROUND TISSUES



[Empty box]

**APICAL
MERISTEM**

[Empty box]

SCLERENCHYMA TISSUE

[Empty box]

[Empty box]

**GROUND
TISSUES**

STEM

L.S.



PARENCHYMA TISSUE

PARENCHYMA CELLS

PARENCHYMA CELL

PARENCHYMA CELL



BASIC PLANT CELL

**PARENCHYMA
CELL**

PARENCHYMA CELL

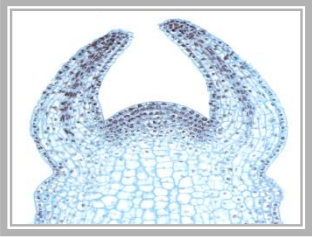


BASIC PLANT CELL

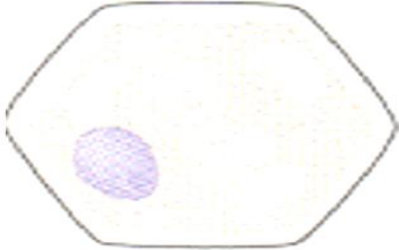
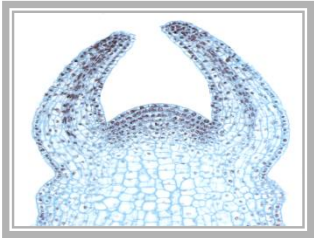
**ALL PLANT CELLS INITIALLY
PARENCHYMA CELLS**

PARENCHYMA CELL

STEM MERISTEM



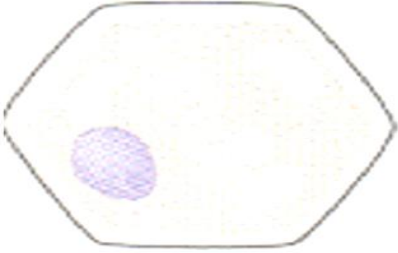
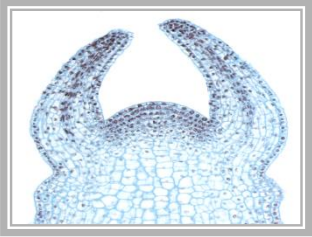
**STEM
MERISTEM**



CELL INITIAL

**PARENCHYMA
BASIC
PLANT CELL**

**STEM
MERISTEM**

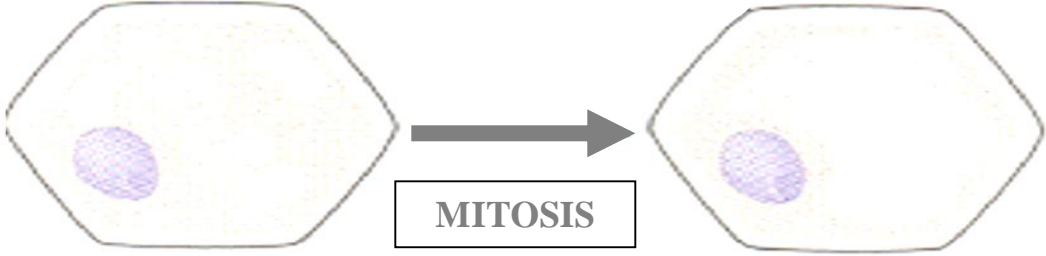
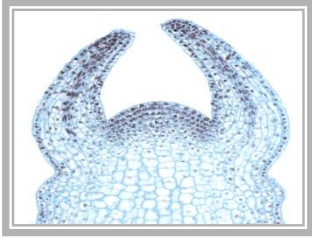


CELL INITIAL

PARENCHYMA CELL

**PARENCHYMA
BASIC
PLANT CELL**

**STEM
MERISTEM**



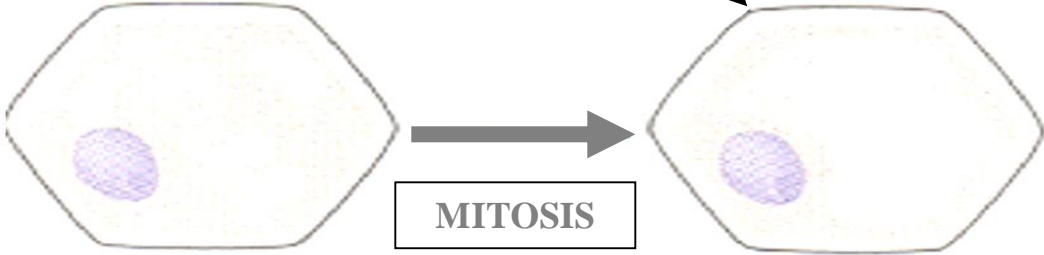
CELL INITIAL

PARENCHYMA CELL

**PARENCHYMA
BASIC
PLANT CELL**

**STEM
MERISTEM**

DERIVATIVE CELL



CELL INITIAL

PARENCHYMA CELL

**PARENCHYMA
BASIC
PLANT CELL**