



DICOT STEM VASCULAR TISSUE



VT

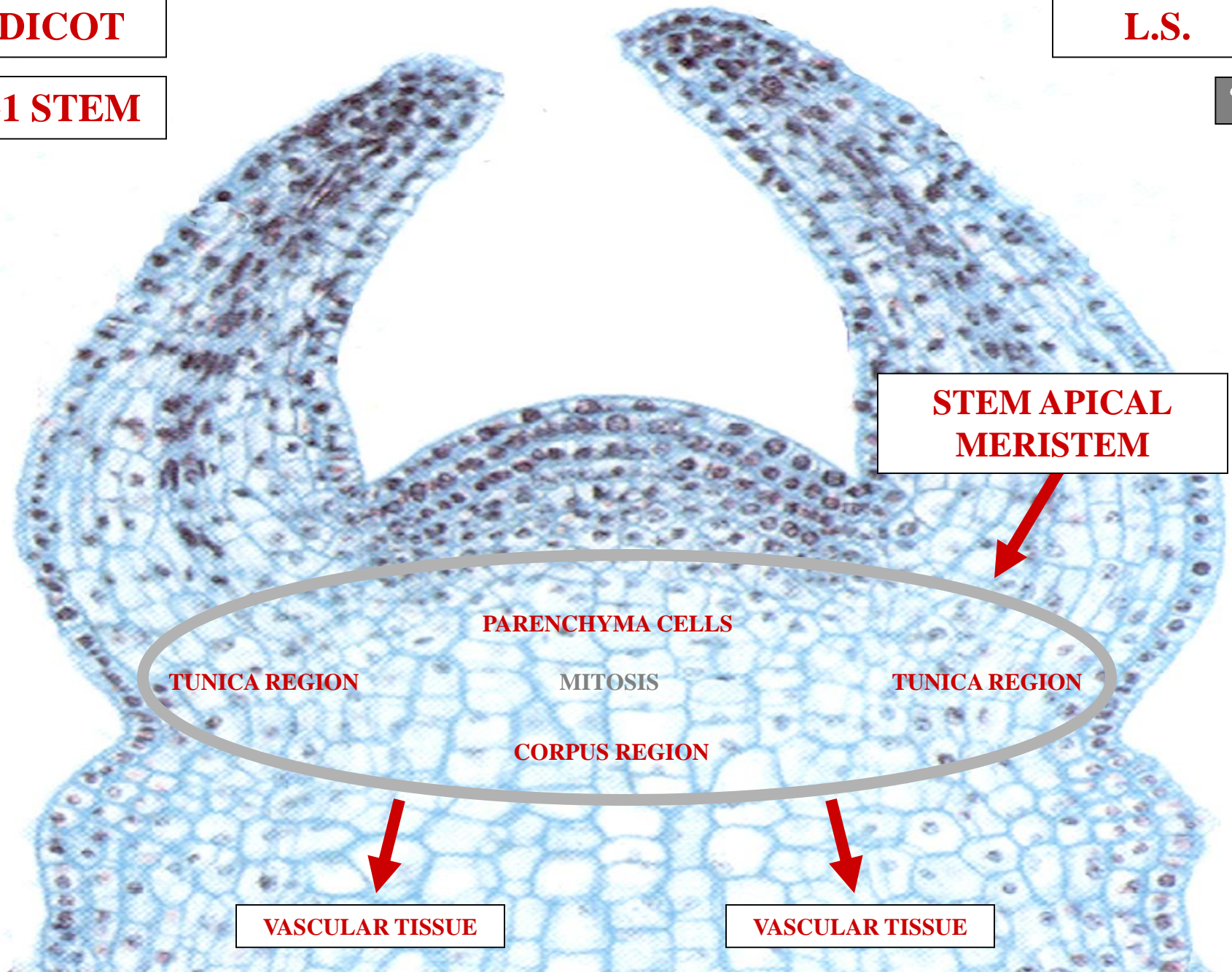
DICOT STEM
VASCULAR TISSUE
PRIMARY
MERISTEM

DICOT

~1 STEM

L.S.

?



**STEM APICAL
MERISTEM**

PARENCHYMA CELLS

MITOSIS

TUNICA REGION

TUNICA REGION

CORPUS REGION

VASCULAR TISSUE

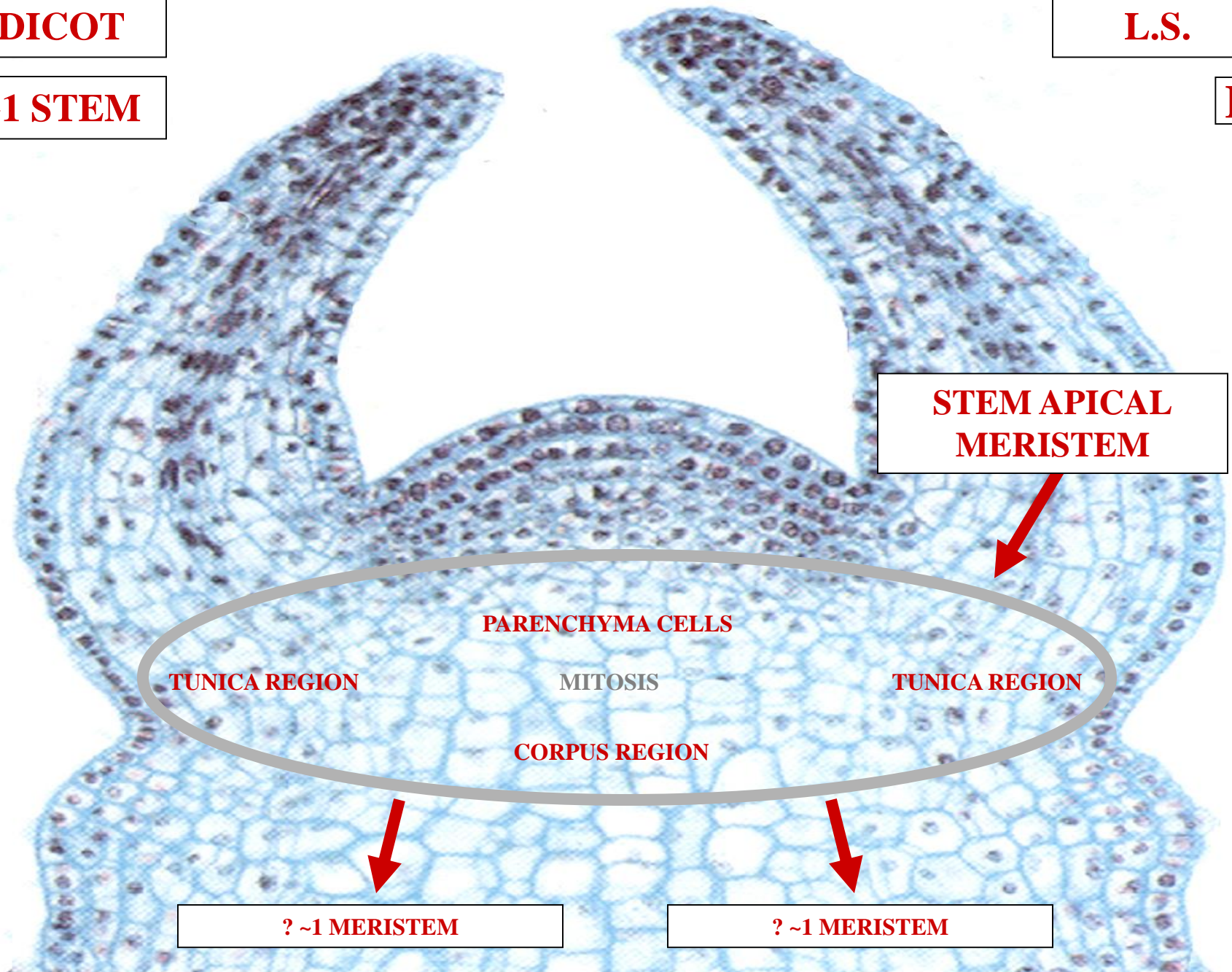
VASCULAR TISSUE

DICOT

~1 STEM

L.S.

P



**STEM APICAL
MERISTEM**

PARENCHYMA CELLS

TUNICA REGION

MITOSIS

TUNICA REGION

CORPUS REGION

? ~1 MERISTEM

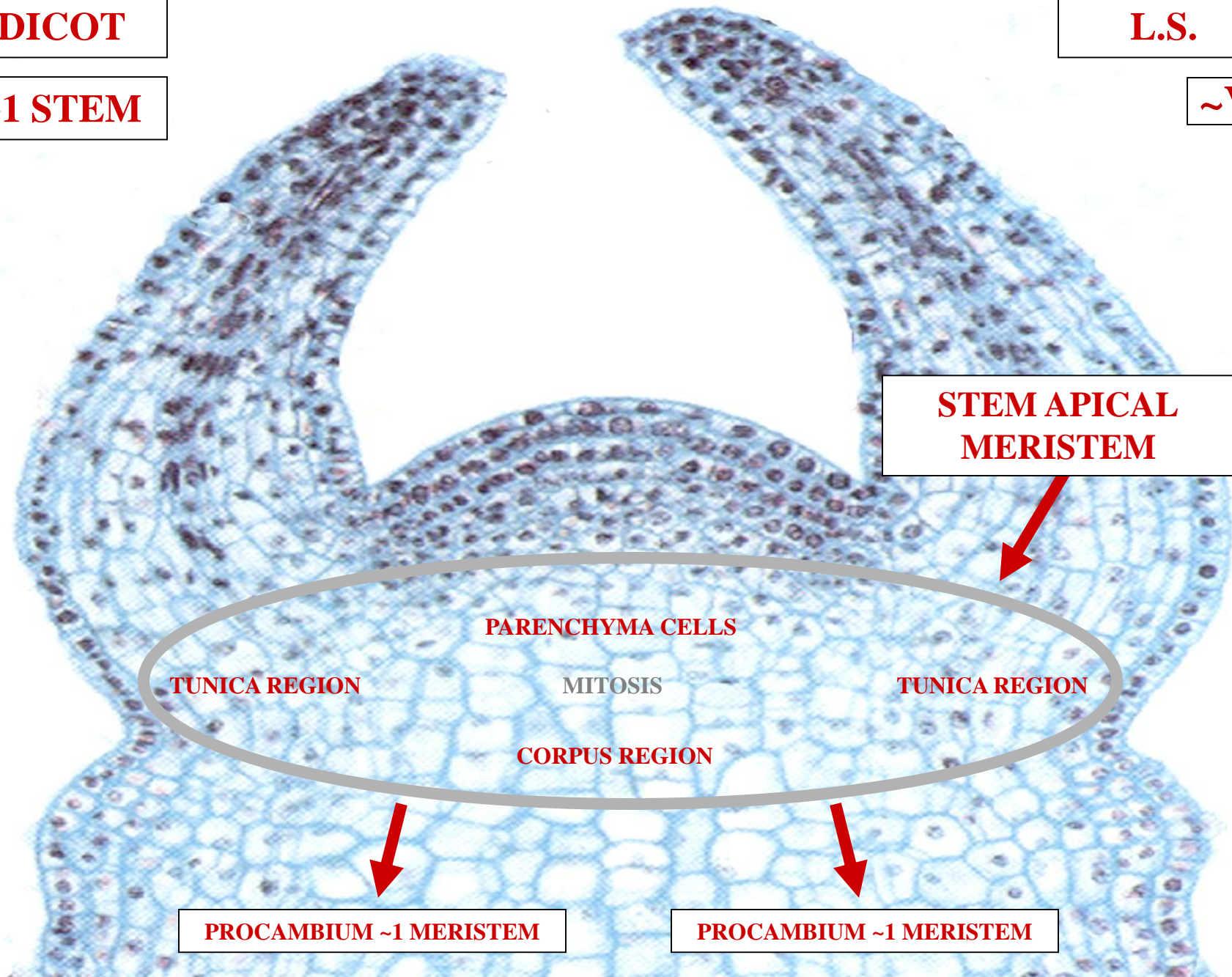
? ~1 MERISTEM

DICOT

~1 STEM

L.S.

~V



**STEM APICAL
MERISTEM**

PARENCHYMA CELLS

MITOSIS

TUNICA REGION

TUNICA REGION

CORPUS REGION

PROCAMBIUM ~1 MERISTEM

PROCAMBIUM ~1 MERISTEM

DICOT

~1 STEM

L.S.

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VB

**STEM APICAL
MERISTEM**

PARENCHYMA CELLS

MITOSIS

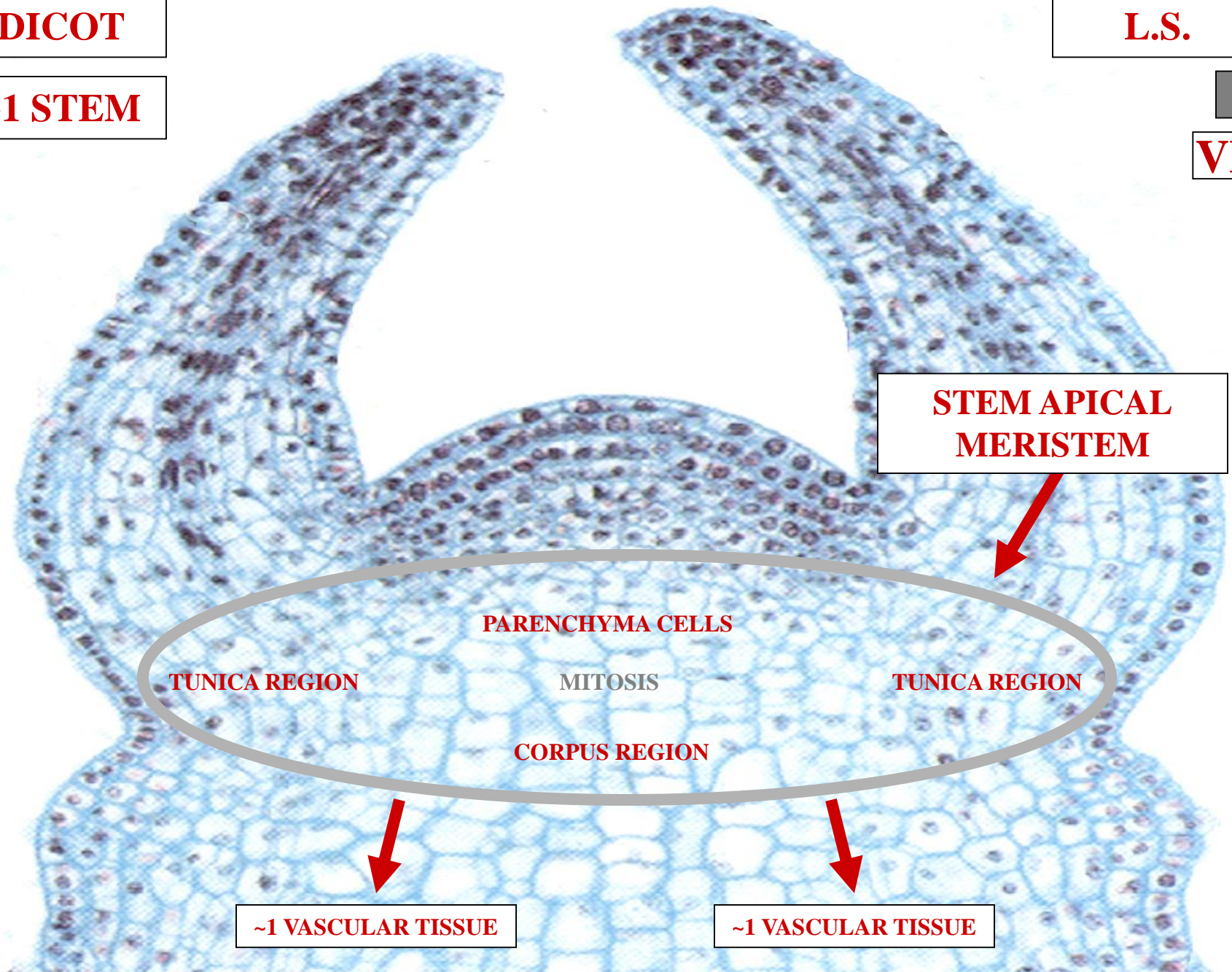
TUNICA REGION

TUNICA REGION

CORPUS REGION

~1 VASCULAR TISSUE

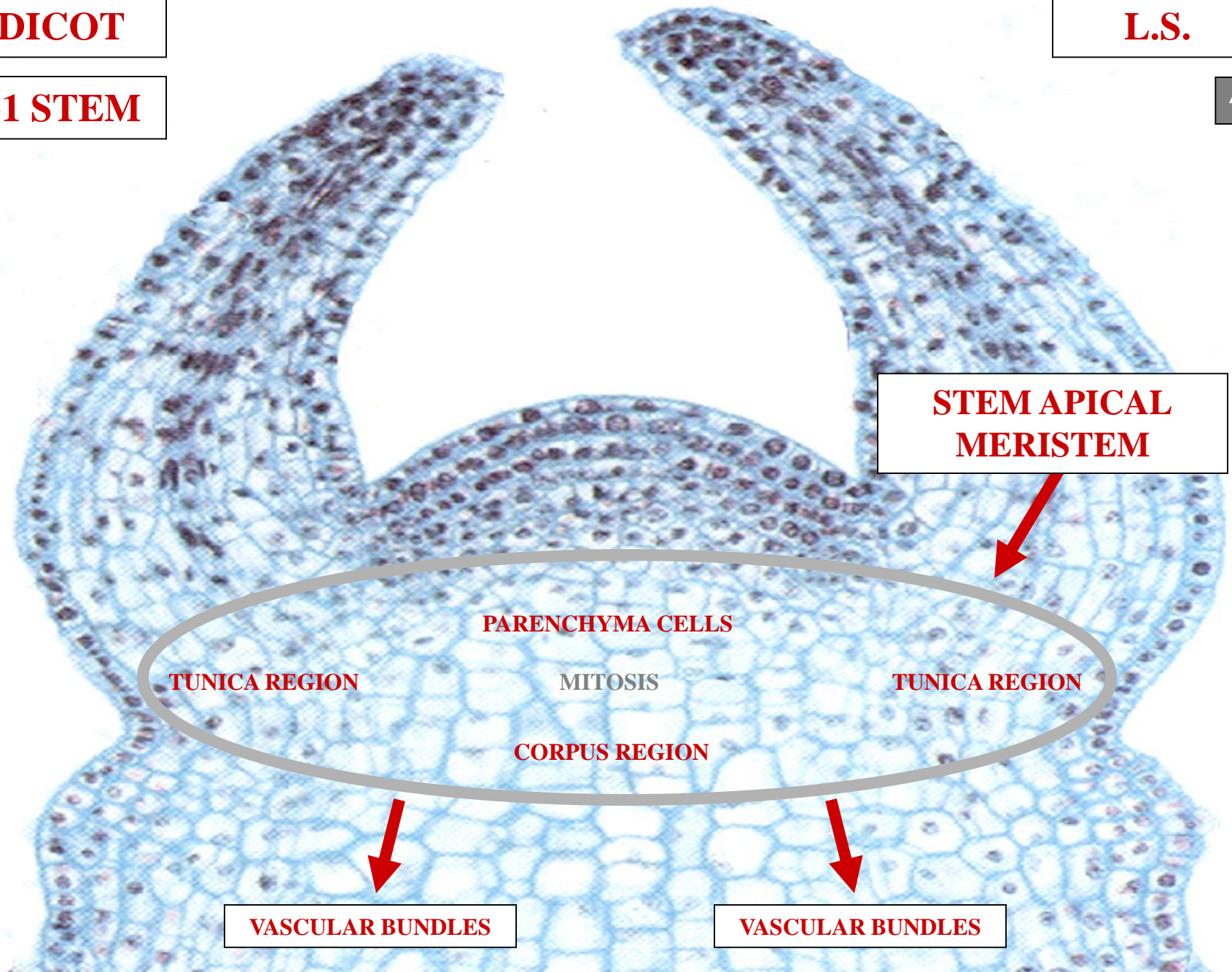
~1 VASCULAR TISSUE



DICOT

~1 STEM

L.S.



**STEM APICAL
MERISTEM**

PARENCHYMA CELLS

MITOSIS

TUNICA REGION

TUNICA REGION

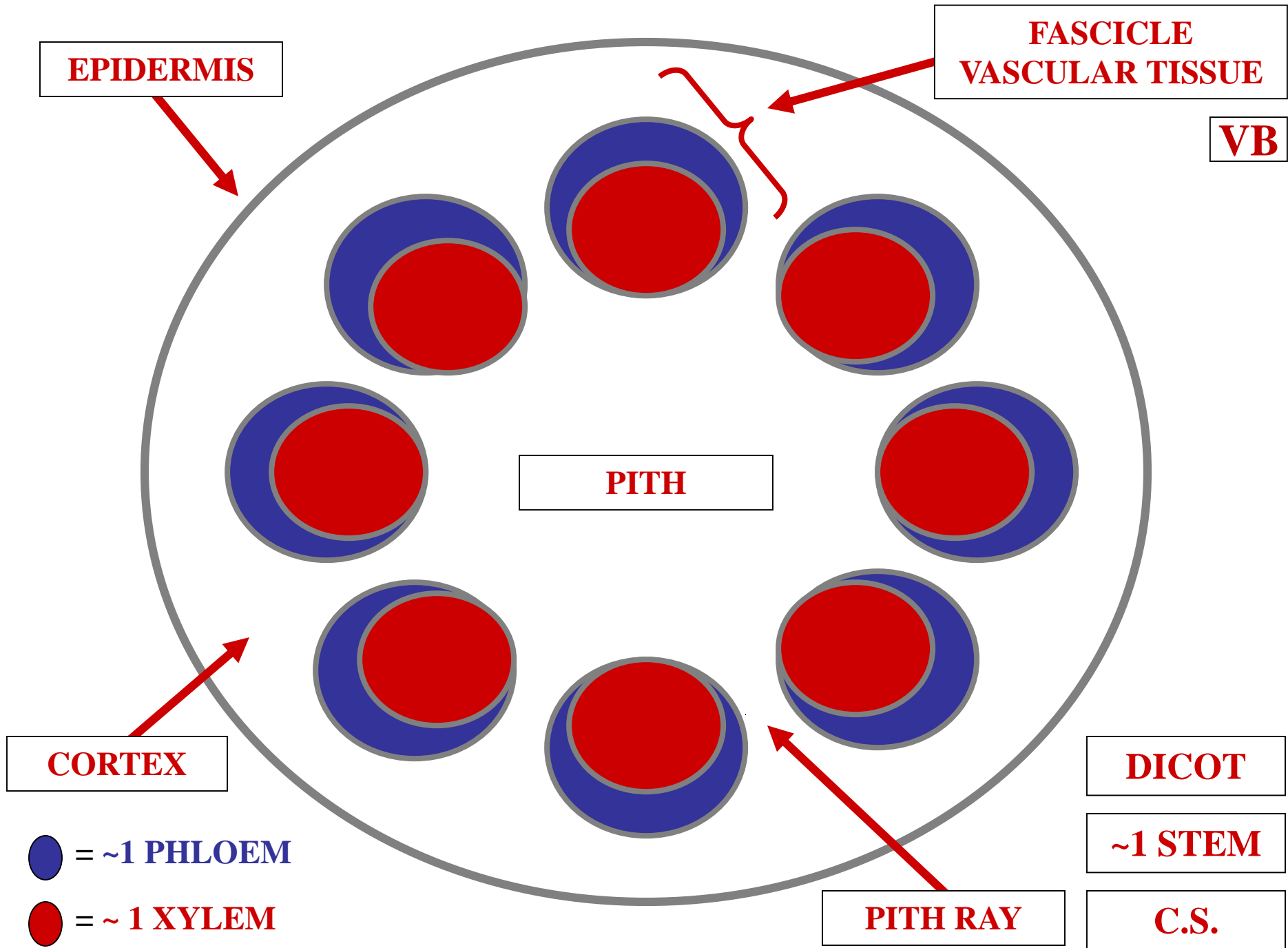
CORPUS REGION

VASCULAR BUNDLES

VASCULAR BUNDLES



TRACHEOPHYTE VASCULAR BUNDLES



EPIDERMIS

**FASCICLE
VASCULAR TISSUE**

VB

PITH

CORTEX

DICOT

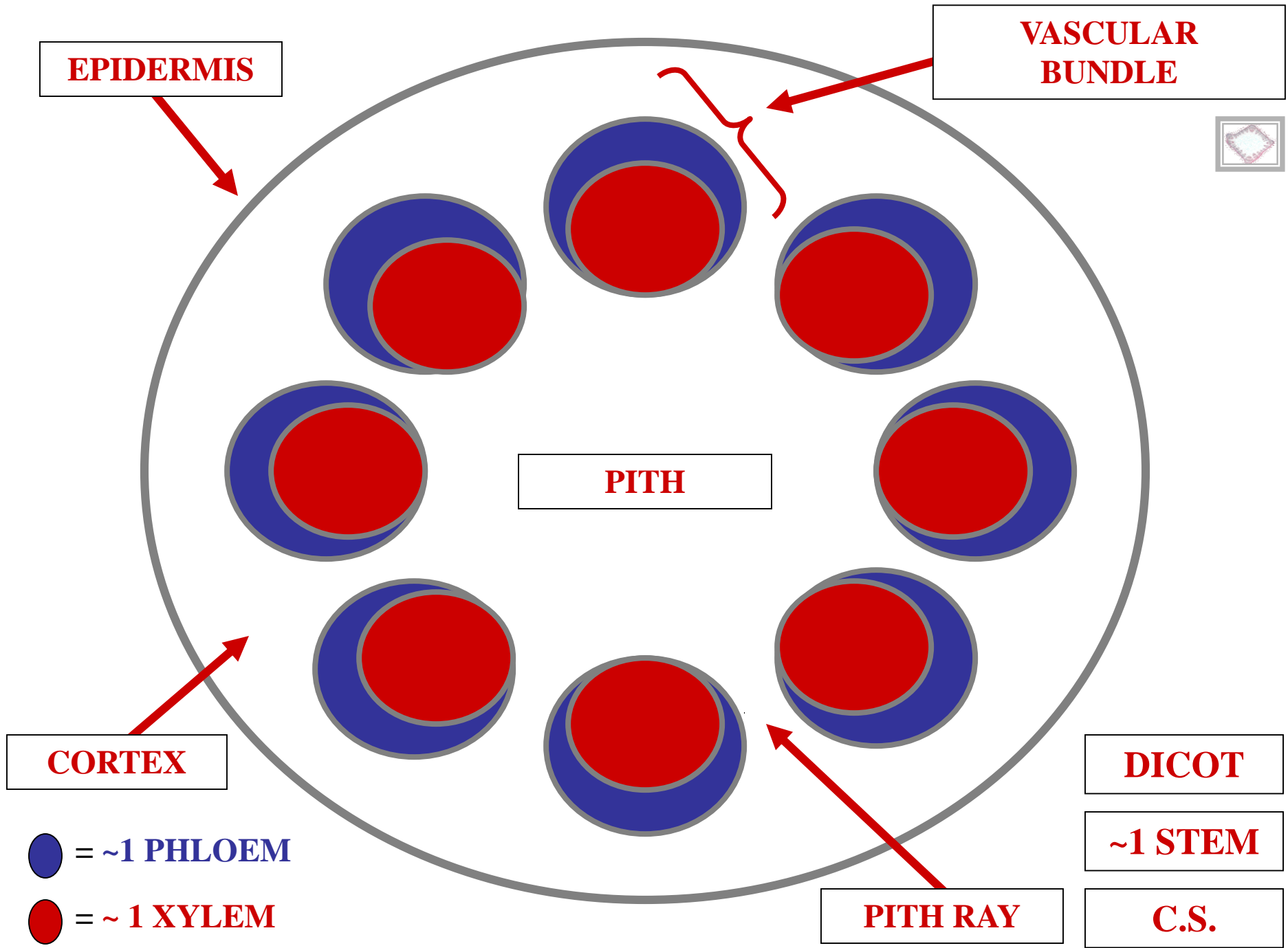
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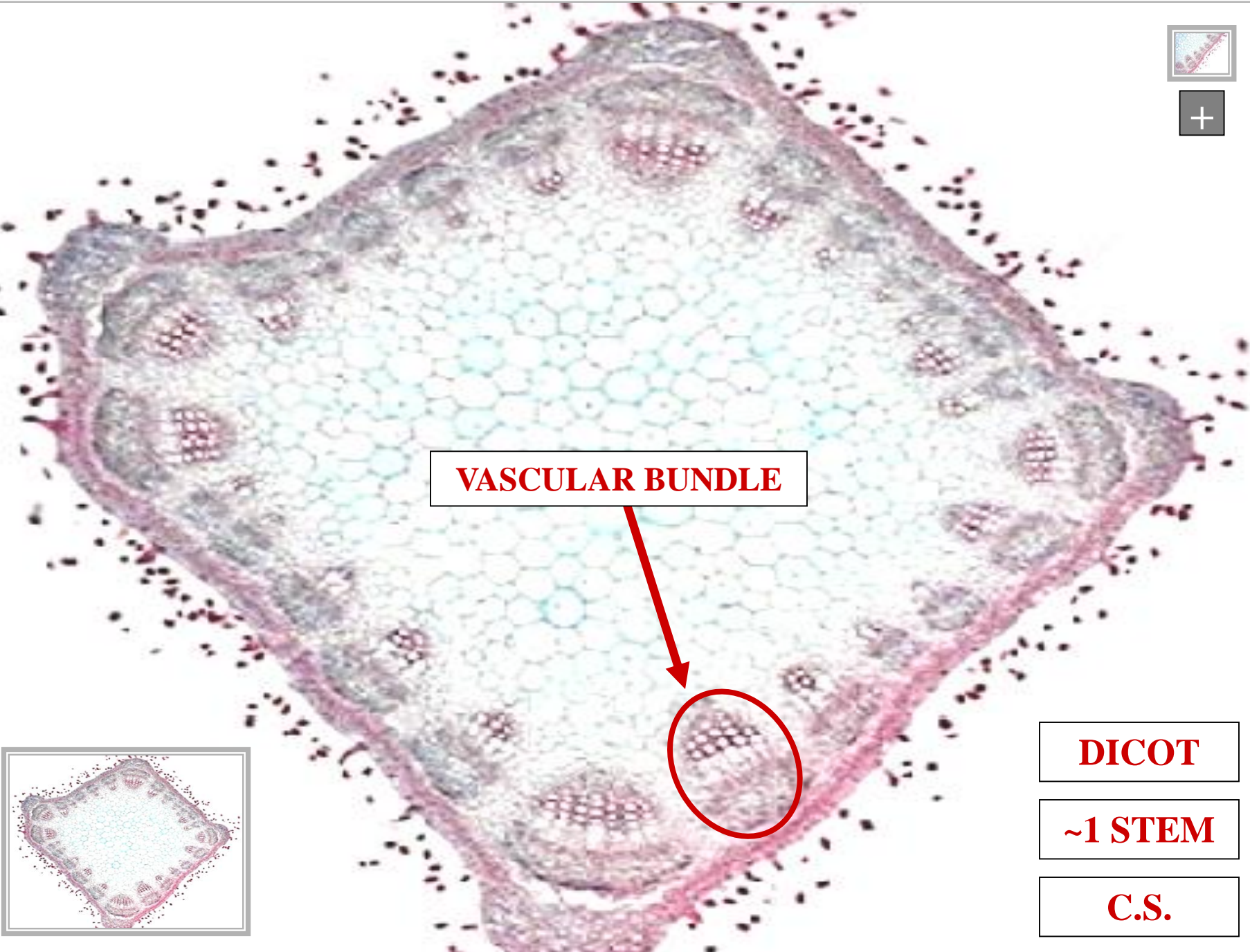
= ~1 PHLOEM

PITH RAY

C.S.

= ~ 1 XYLEM



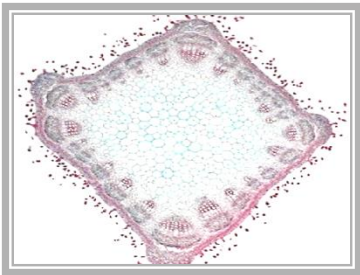


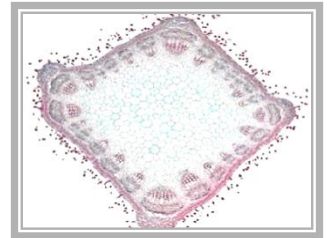
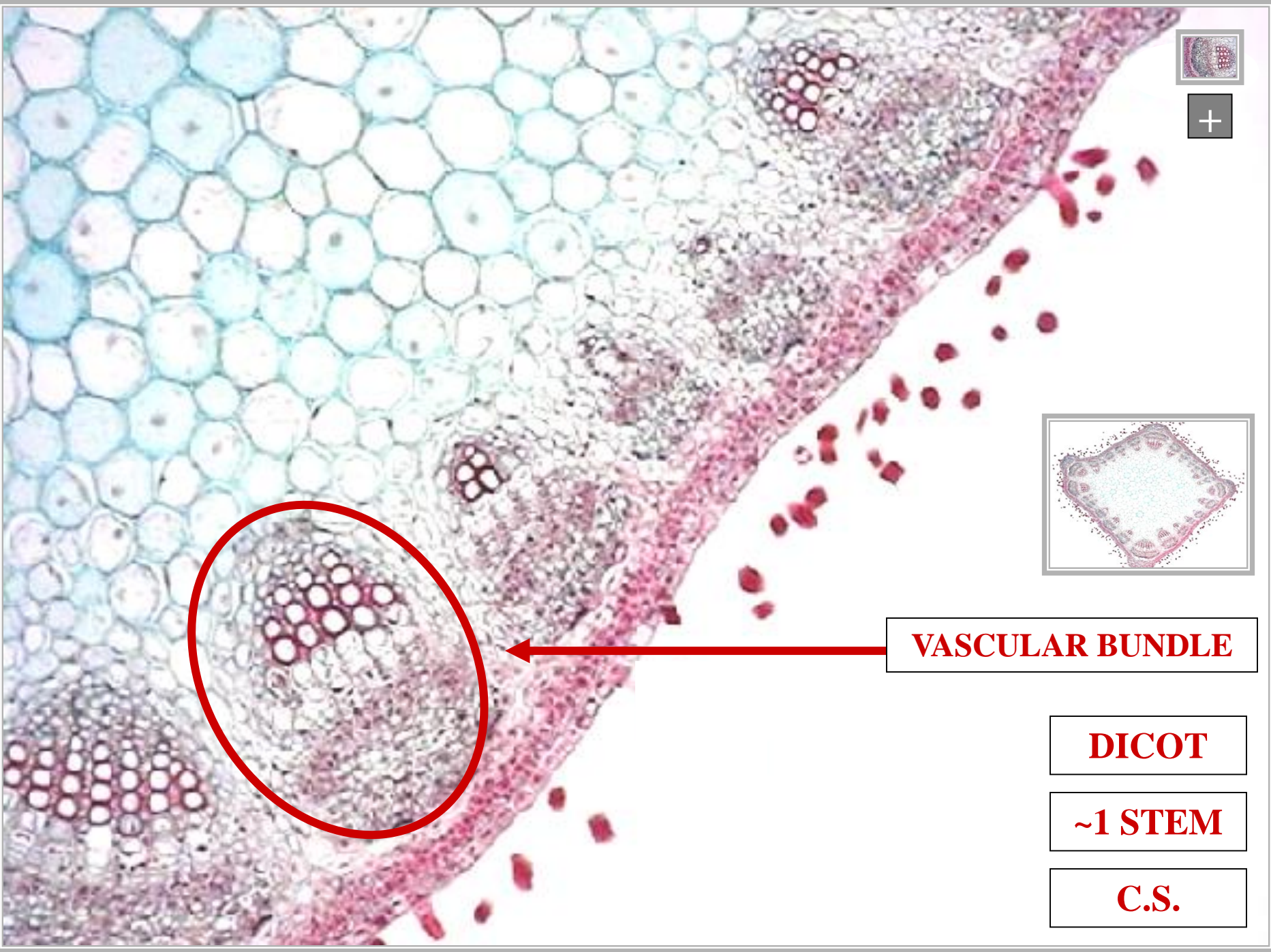
VASCULAR BUNDLE

DICOT

~1 STEM

C.S.





VASCULAR BUNDLE

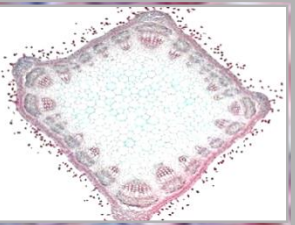
DICOT

~1 STEM

C.S.

CORTEX

PITH

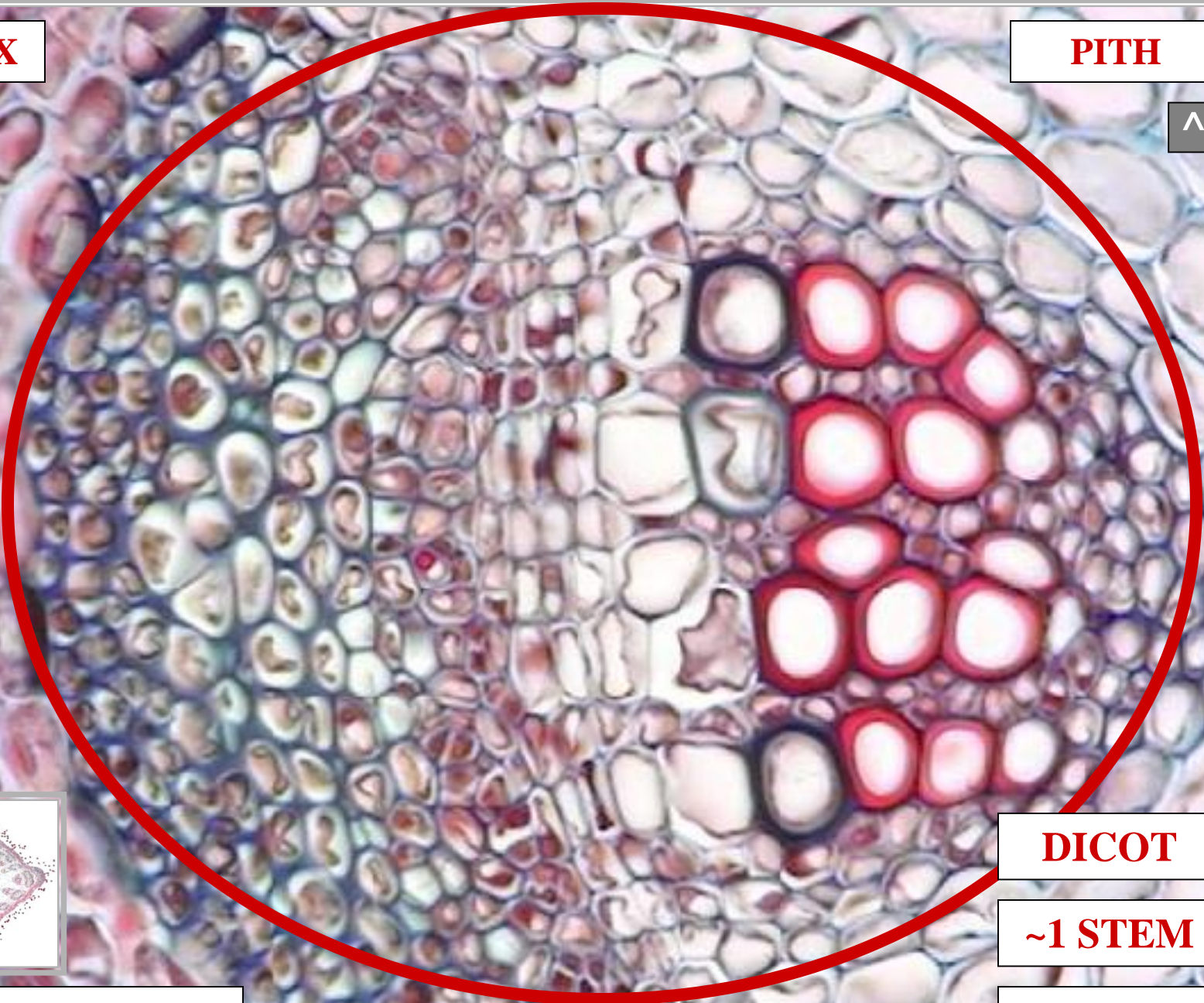


VASCULAR BUNDLE

DICOT

~1 STEM

C.S.



TRACHEOPHYTE VASCULAR BUNDLE TYPES

**TRACHEOPHYTE
VASCULAR BUNDLE
TYPES**

COLLATERAL VASCULAR BUNDLE

**TRACHEOPHYTE
VASCULAR BUNDLE
TYPES**

**TRACHEOPHYTE
VASCULAR BUNDLE
TYPES**

**COLLATERAL VASCULAR BUNDLE
BICOLLATERAL VASCULAR BUNDLE**

**TRACHEOPHYTE
VASCULAR BUNDLE
TYPES**

**TRACHEOPHYTE
VASCULAR BUNDLE
TYPES**

**COLLATERAL VASCULAR BUNDLE
BICOLLATERAL VASCULAR BUNDLE
CONCENTRIC VASCULAR BUNDLE**

**TRACHEOPHYTE
VASCULAR BUNDLE
TYPES**

**COLLATERAL
VASCULAR
BUNDLE**

**VASCULAR BUNDLE
COLLATERAL BUNDLE**



**PHLOEM OUTSIDE
XYLEM INSIDE**

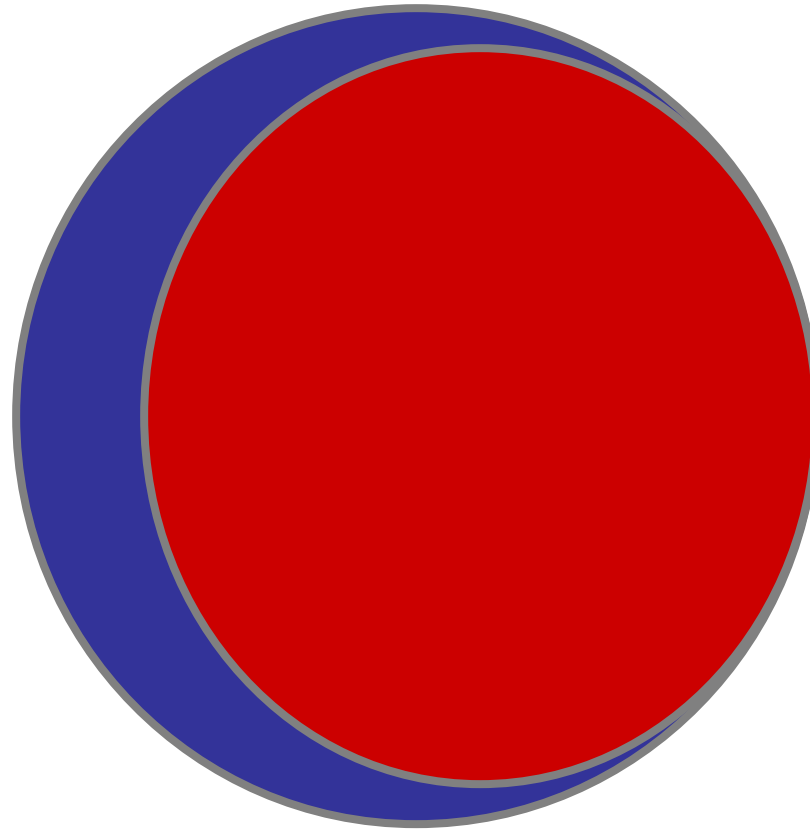
**VASCULAR BUNDLE
COLLATERAL BUNDLE**



VASCULAR BUNDLE

CORTEX

OUTSIDE



PITH

INSIDE

● = ~1 PHLOEM

● = ~ 1 XYLEM

COLLATERAL

STEM

C.S.

CORTEX

OUTSIDE

PITH

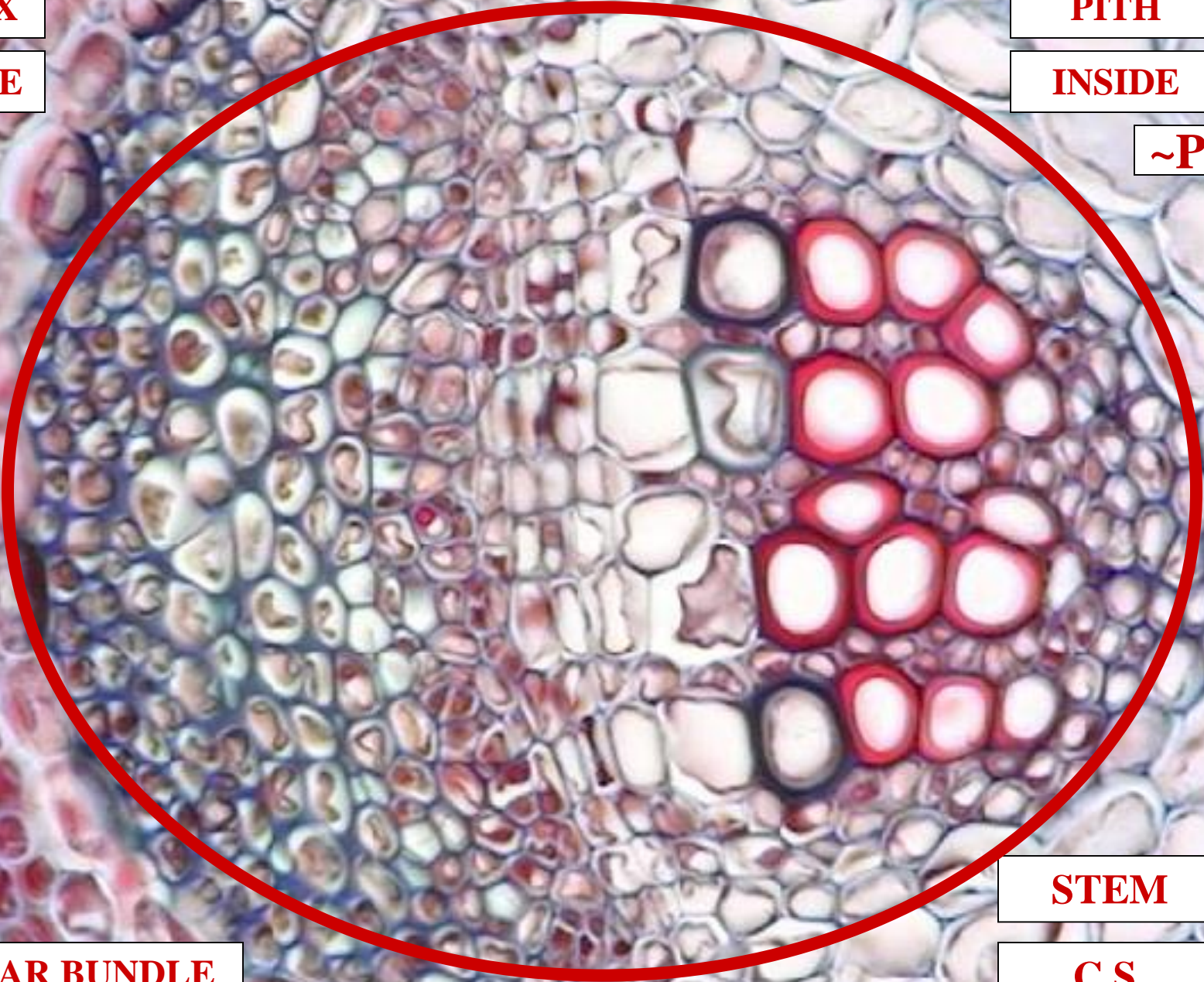
INSIDE

~P

VASCULAR BUNDLE

STEM

C.S.



CORTEX

OUTSIDE

PITH

INSIDE

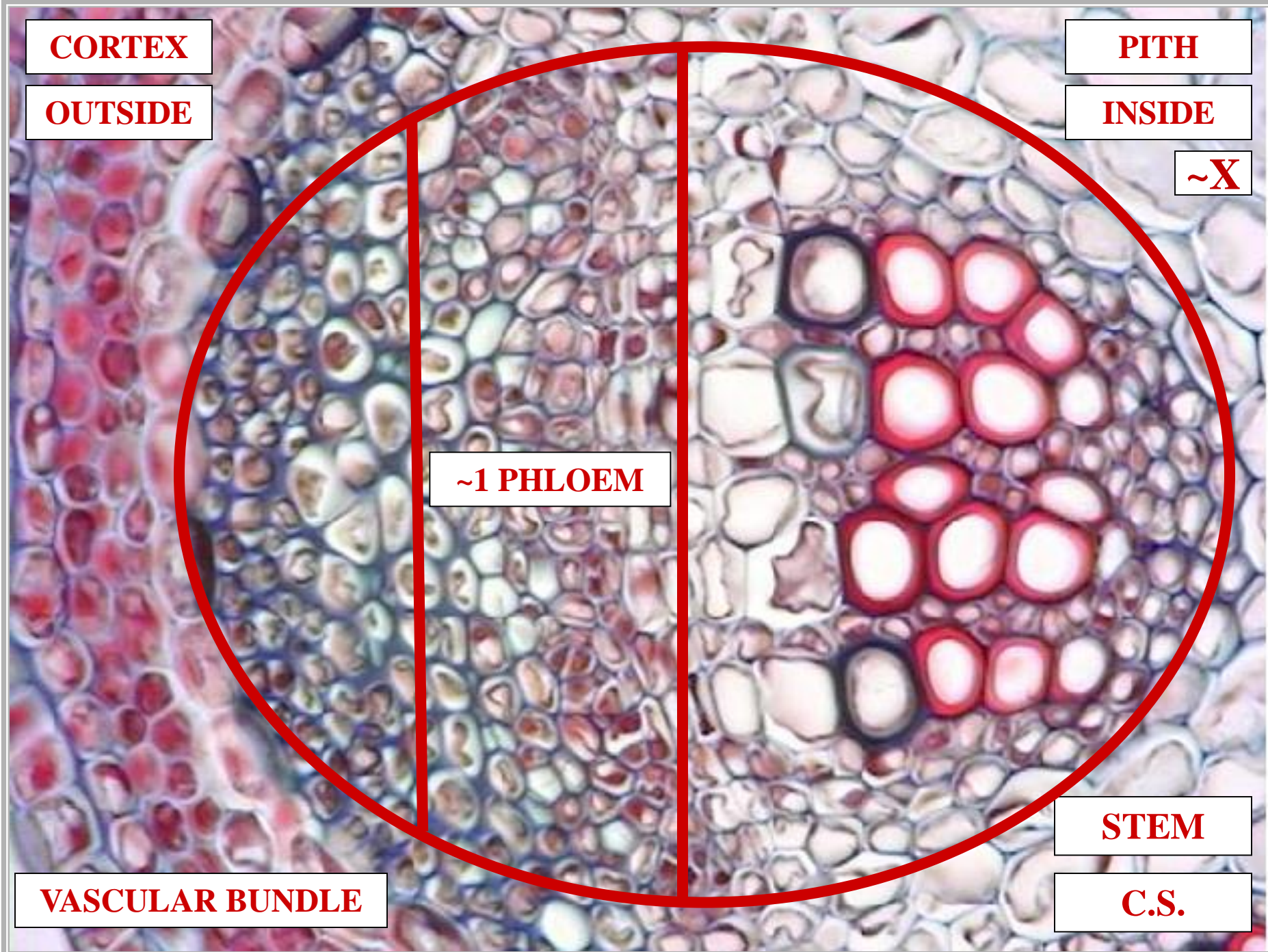
~X

~1 PHLOEM

VASCULAR BUNDLE

STEM

C.S.



CORTEX

OUTSIDE

PITH

INSIDE

^

BC

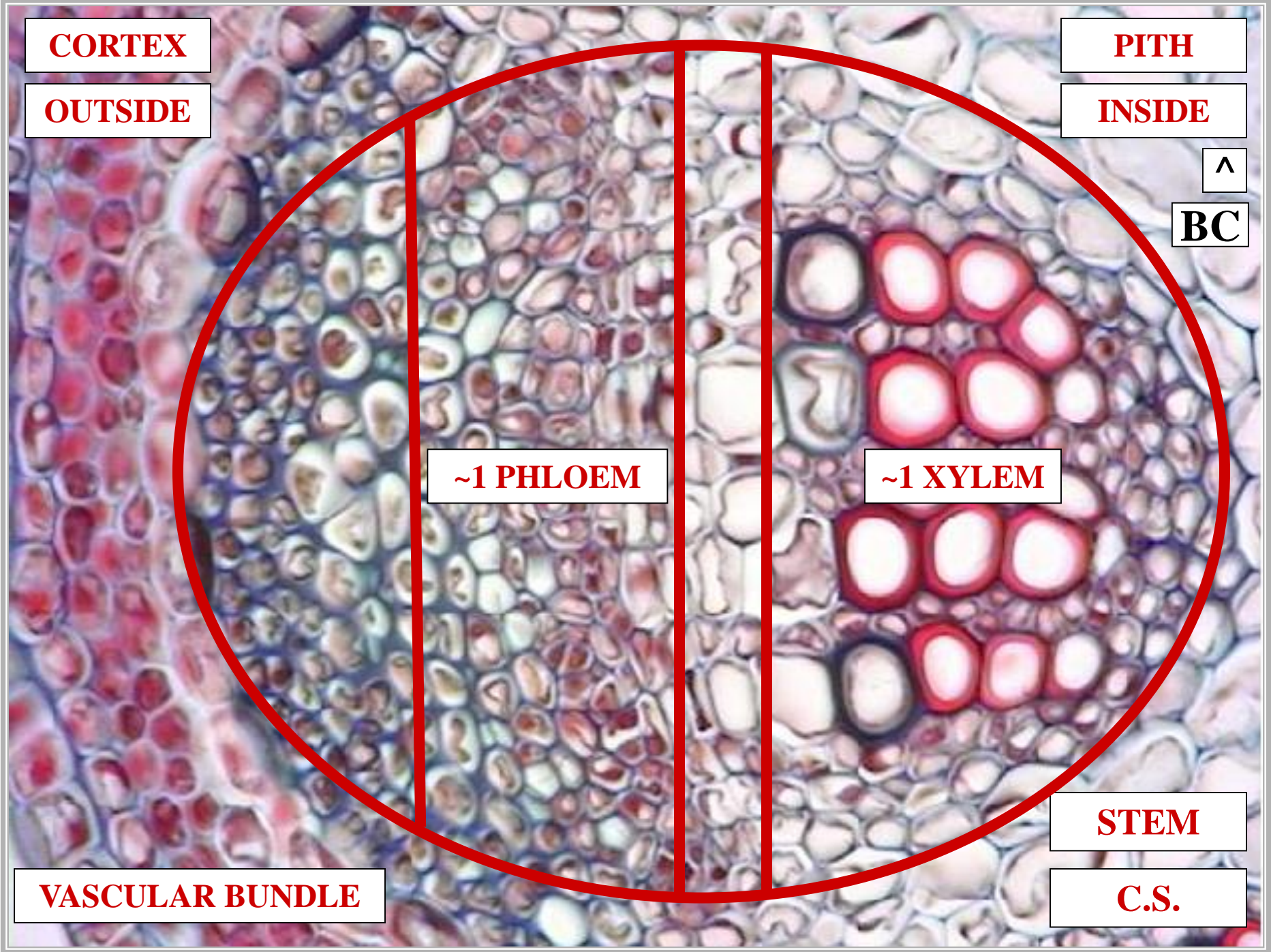
~1 PHLOEM

~1 XYLEM

VASCULAR BUNDLE

STEM

C.S.



**BICOLLATERAL
VASCULAR
BUNDLE**

VASCULAR BUNDLE
BICOLLATERAL BUNDLE



PHLOEM
OUTSIDE & INSIDE
XYLEM

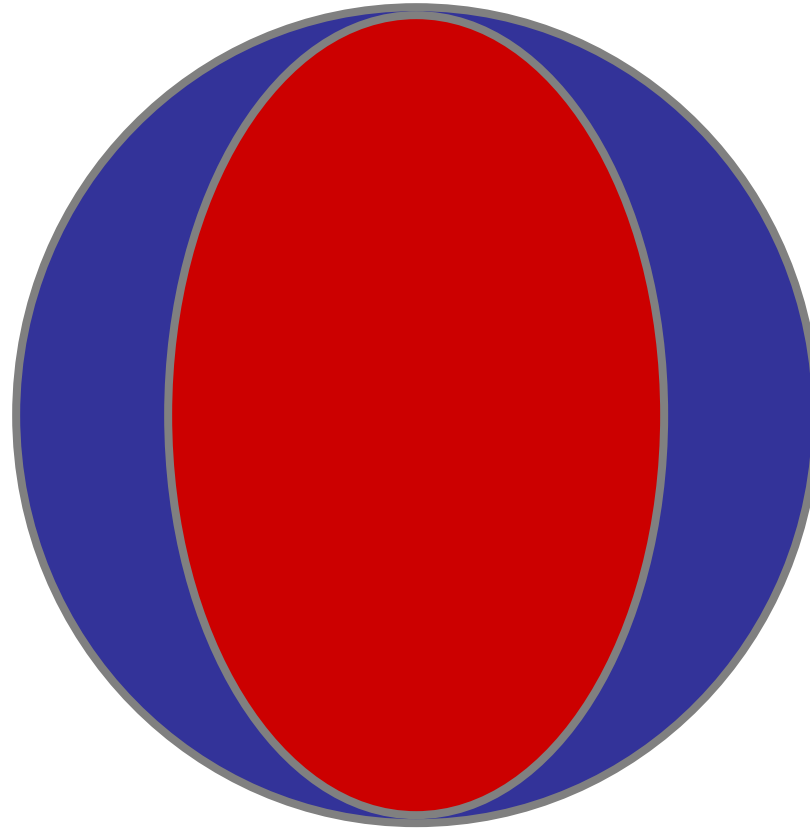
VASCULAR BUNDLE
BICOLLATERAL BUNDLE



VASCULAR BUNDLE

CORTEX

OUTSIDE



PITH

INSIDE

● = ~1 PHLOEM

● = ~ 1 XYLEM

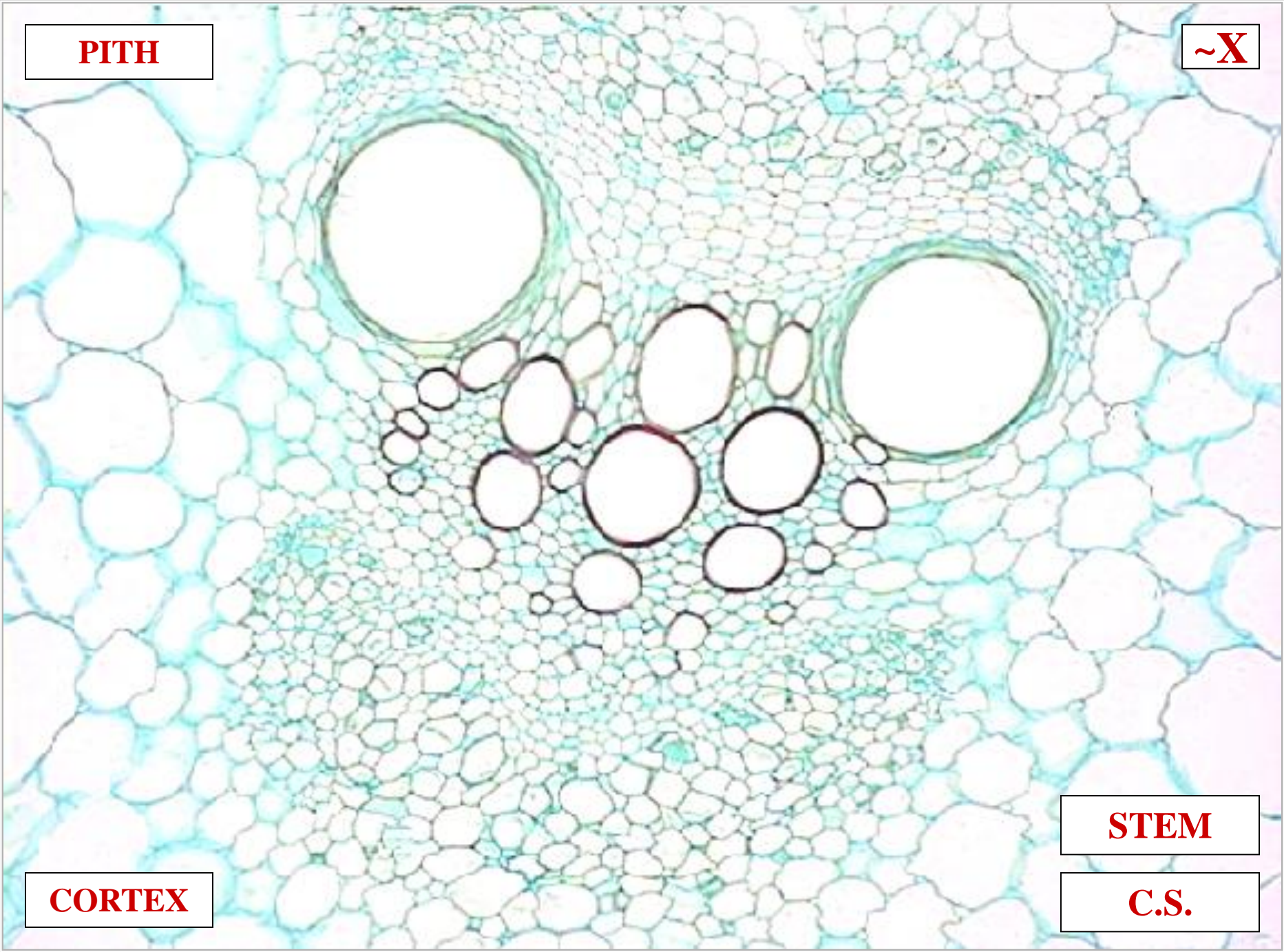
BICOLLATERAL

STEM

C.S.

PITH

~X



CORTEX

STEM

C.S.

PITH

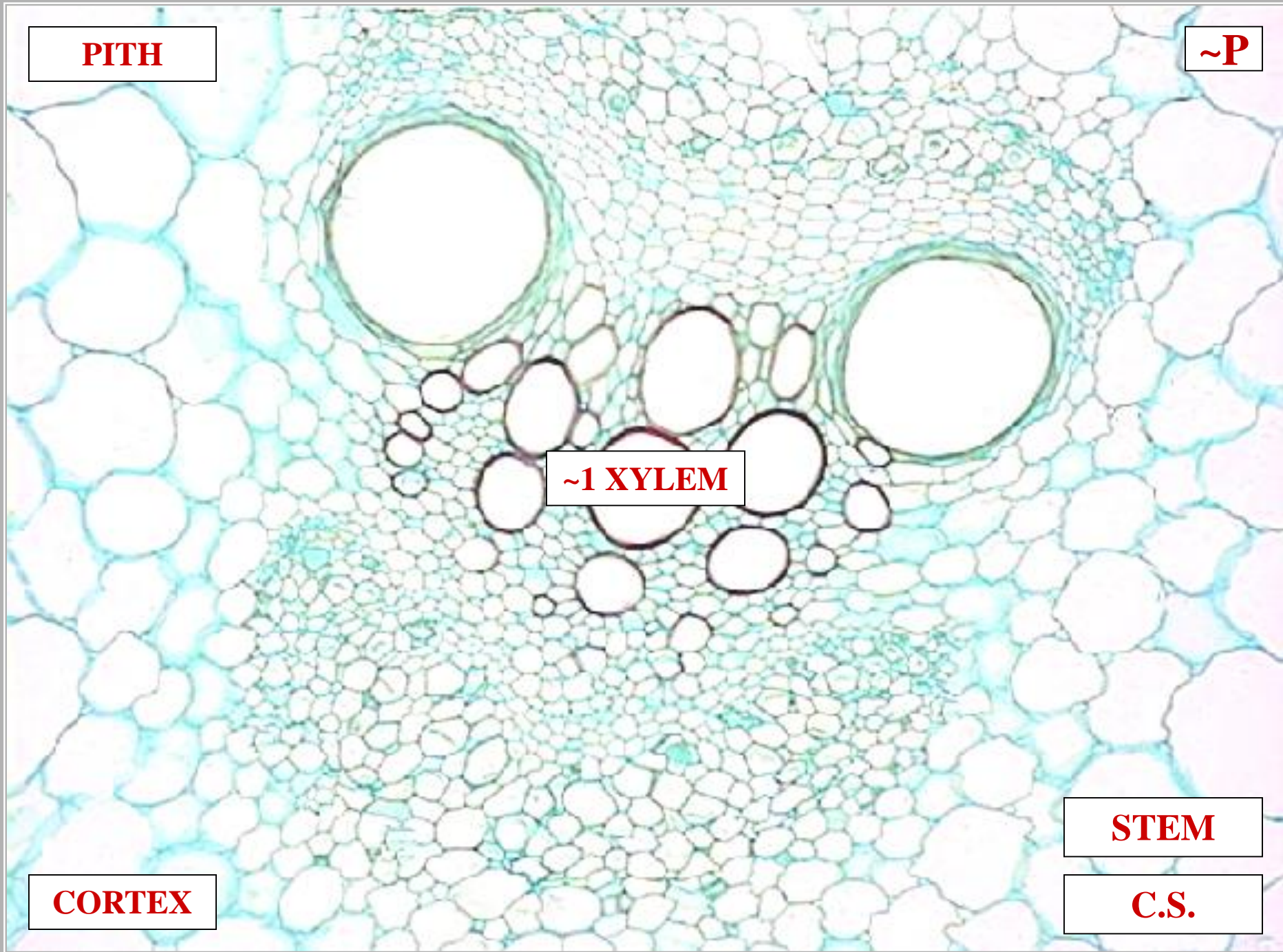
~P

~1 XYLEM

CORTEX

STEM

C.S.



PITH

~P

~1 XYLEM

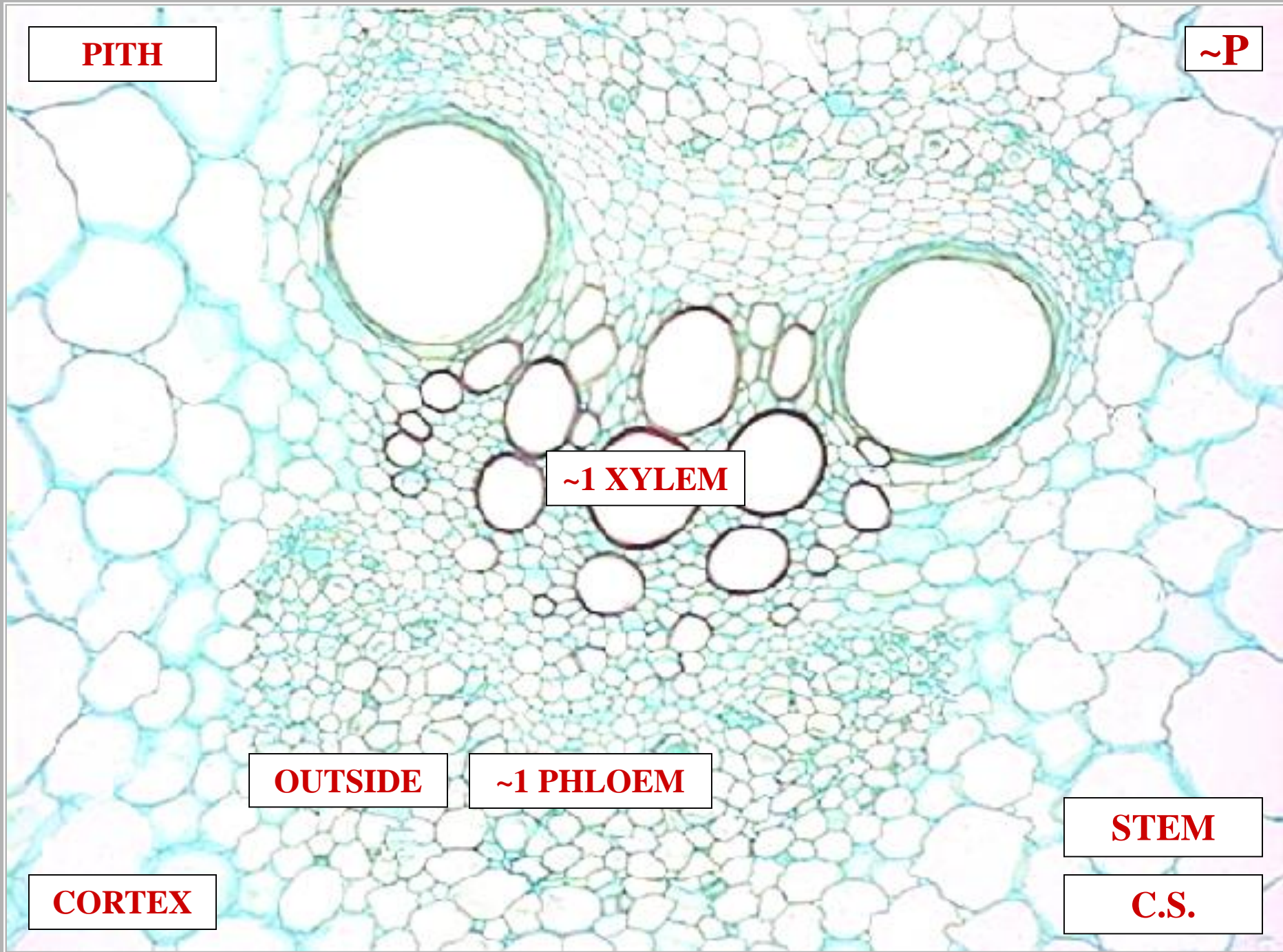
OUTSIDE

~1 PHLOEM

STEM

CORTEX

C.S.



PITH

^

CN

~1 PHLOEM

INSIDE

~1 XYLEM

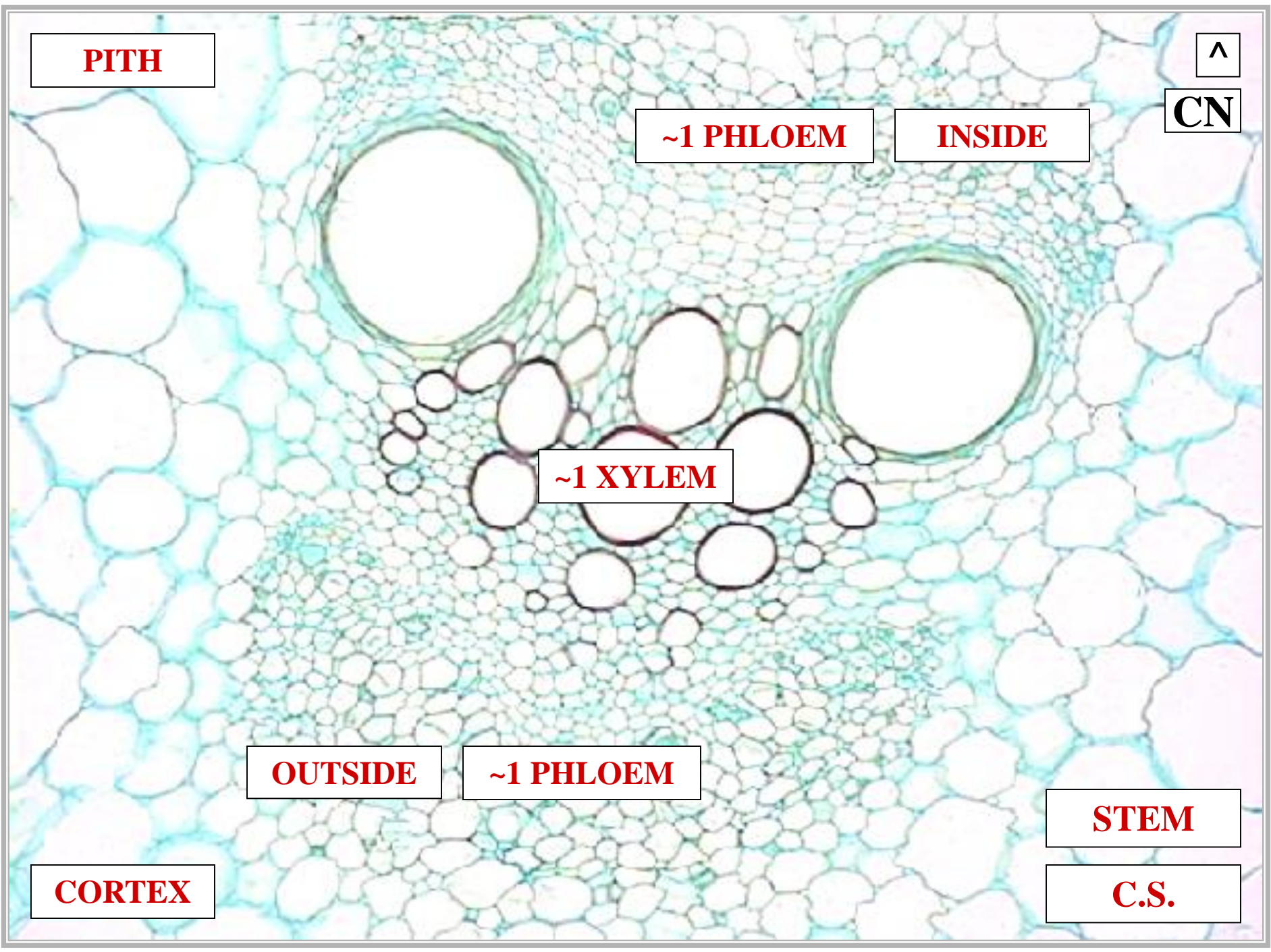
OUTSIDE

~1 PHLOEM

STEM

CORTEX

C.S.



**CONCENTRIC
VASCULAR
BUNDLE**

VASCULAR BUNDLE
CONCENTRIC BUNDLE

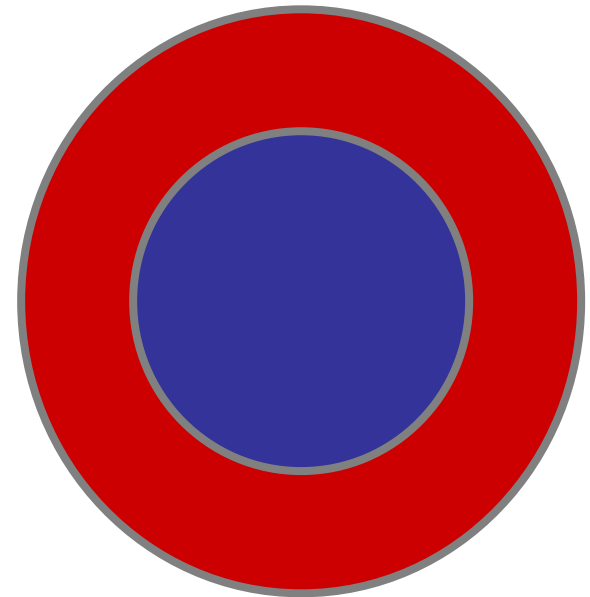
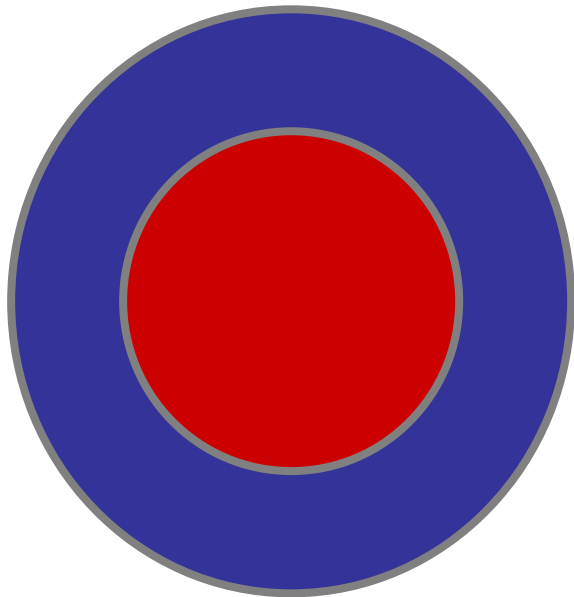


PHLOEM AND XYLEM
SPHERICAL

VASCULAR BUNDLE
CONCENTRIC BUNDLE



VASCULAR BUNDLES



 = ~1 PHLOEM

 = ~1 XYLEM

CONCENTRIC

STEM

C.S.

CONCENTRIC VASCULAR BUNDLE TYPES

**CONCENTRIC
VASCULAR BUNDLE
TYPES**

AMPHICRIBRAL CONCENTRIC V.B.

**CONCENTRIC
VASCULAR BUNDLE
TYPES**

**CONCENTRIC
VASCULAR BUNDLE
TYPES**

**AMPHICRIBRAL CONCENTRIC V.B.
AMPHIVASAL CONCENTRIC V.B.**

**CONCENTRIC
VASCULAR BUNDLE
TYPES**

**AMPHICRIBRAL
CONCENTRIC
VASCULAR
BUNDLE**

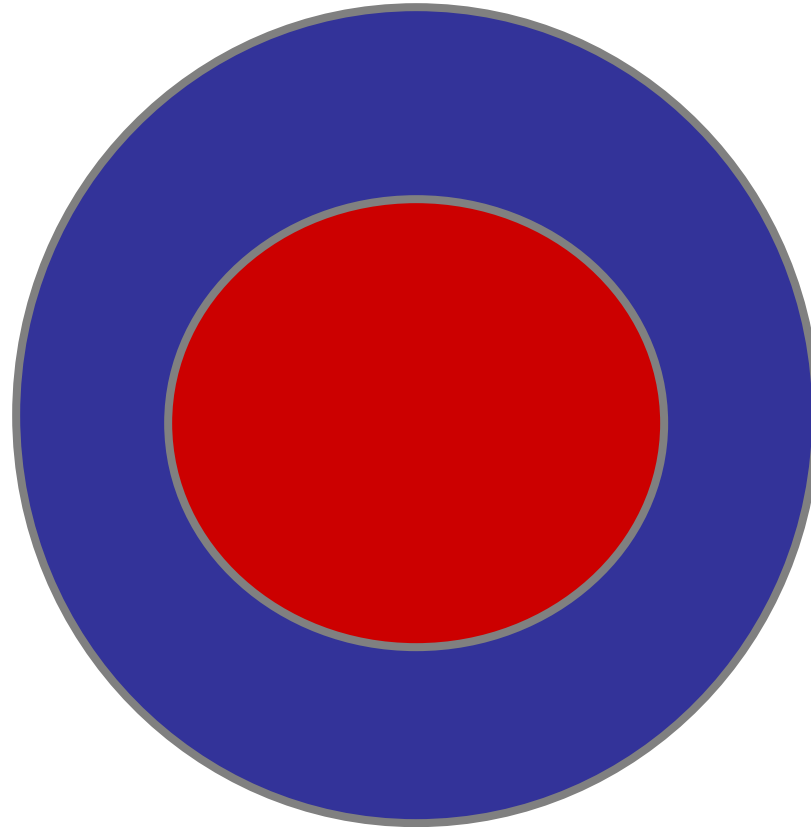
**AMPHICRIBAL CONCENTRIC ○
VASCULAR BUNDLE**

**PHLOEM
SURROUNDS
XYLEM**

**AMPHICRIBAL CONCENTRIC
VASCULAR BUNDLE**



CONCENTRIC VASCULAR BUNDLE



 = ~1 PHLOEM

 = ~1 XYLEM

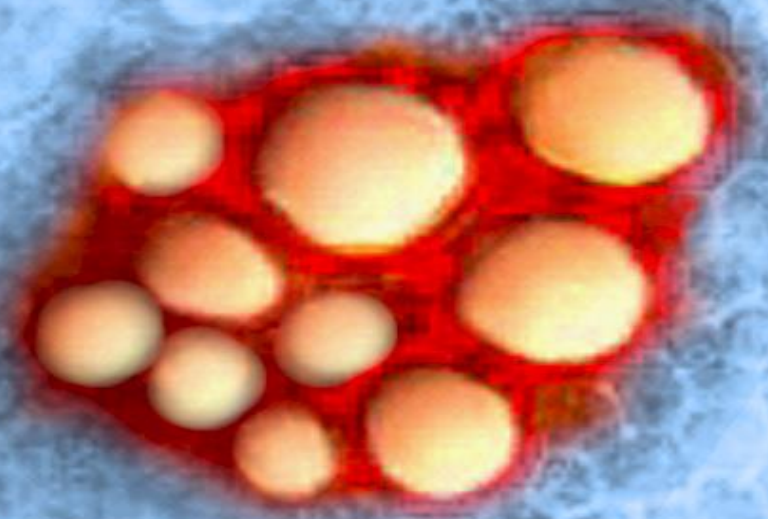
AMPHICRIBRAL

STEM

C.S.

AMPHICRIBRAL

~P



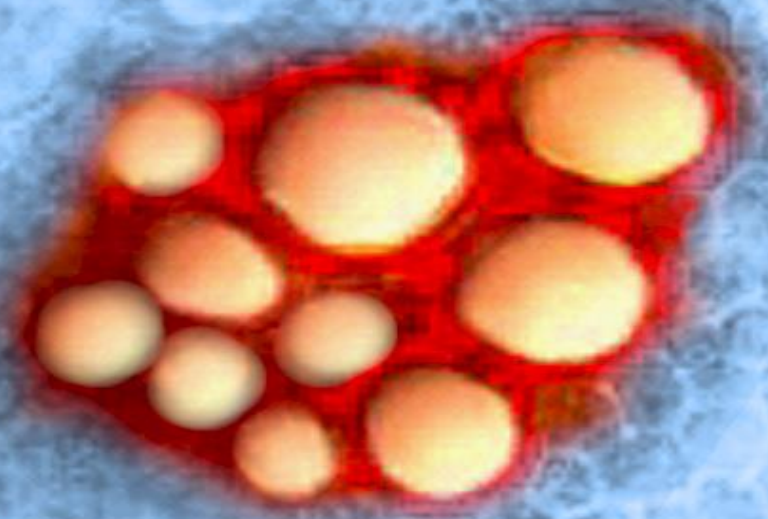
STEM

C.S.

AMPHICRIBRAL

~X

~1 PHLOEM



~1 PHLOEM

STEM

C.S.

AMPHICRIBRAL

^

AV

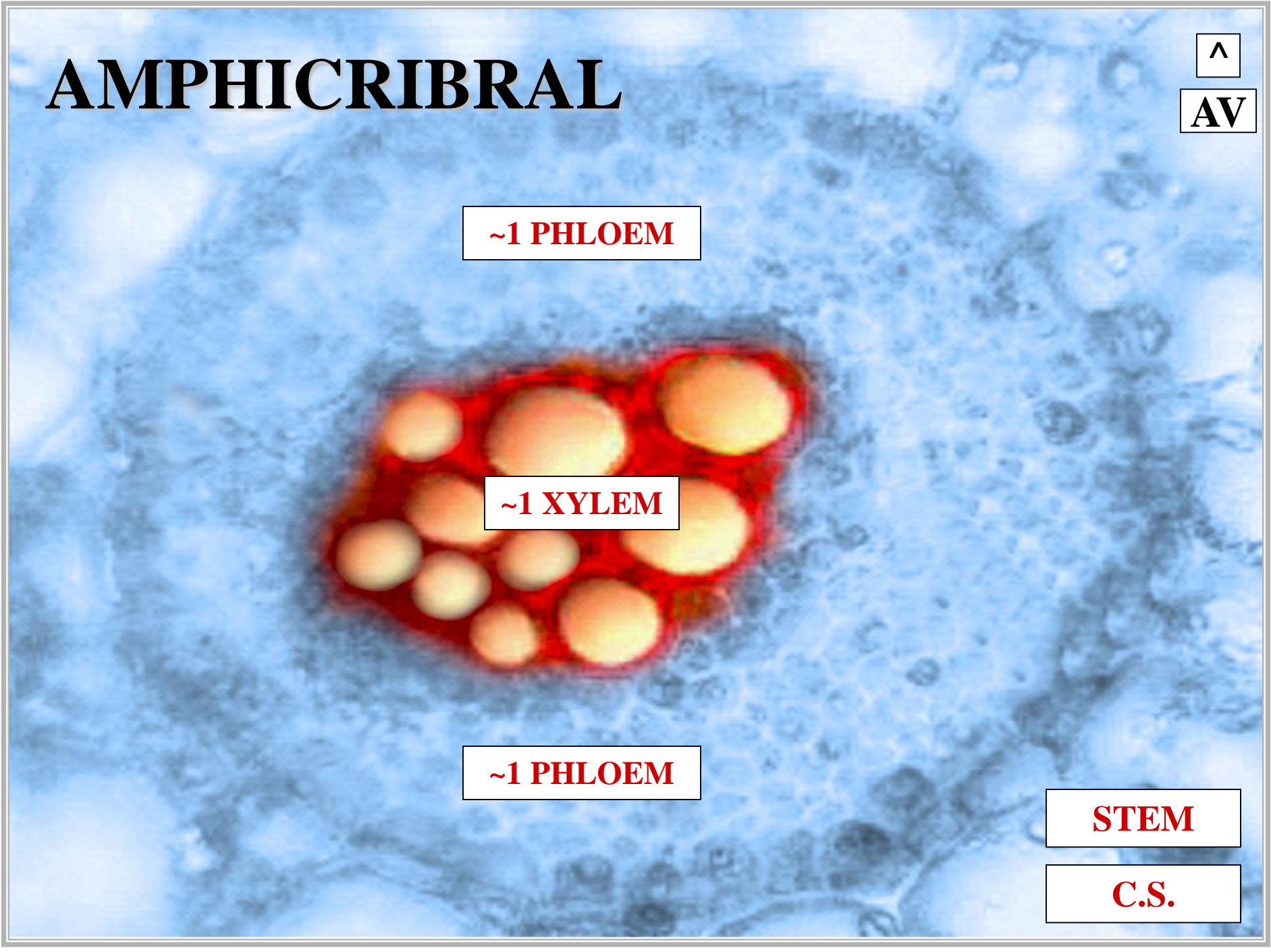
~1 PHLOEM

~1 XYLEM

~1 PHLOEM

STEM

C.S.



**AMPHIVASAL
CONCENTRIC
VASCULAR
BUNDLE**

AMPHIVASAL CONCENTRIC ○
VASCULAR BUNDLE

XYLEM

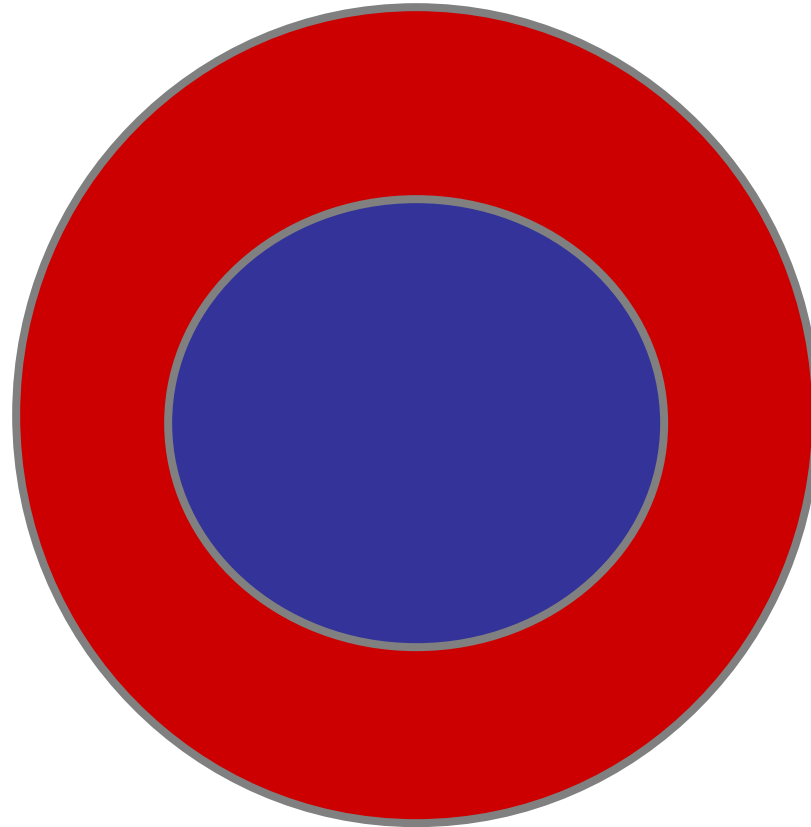
SURROUNDS

PHLOEM

AMPHIVASAL CONCENTRIC
VASCULAR BUNDLE



CONCENTRIC VASCULAR BUNDLE



 = ~1 PHLOEM

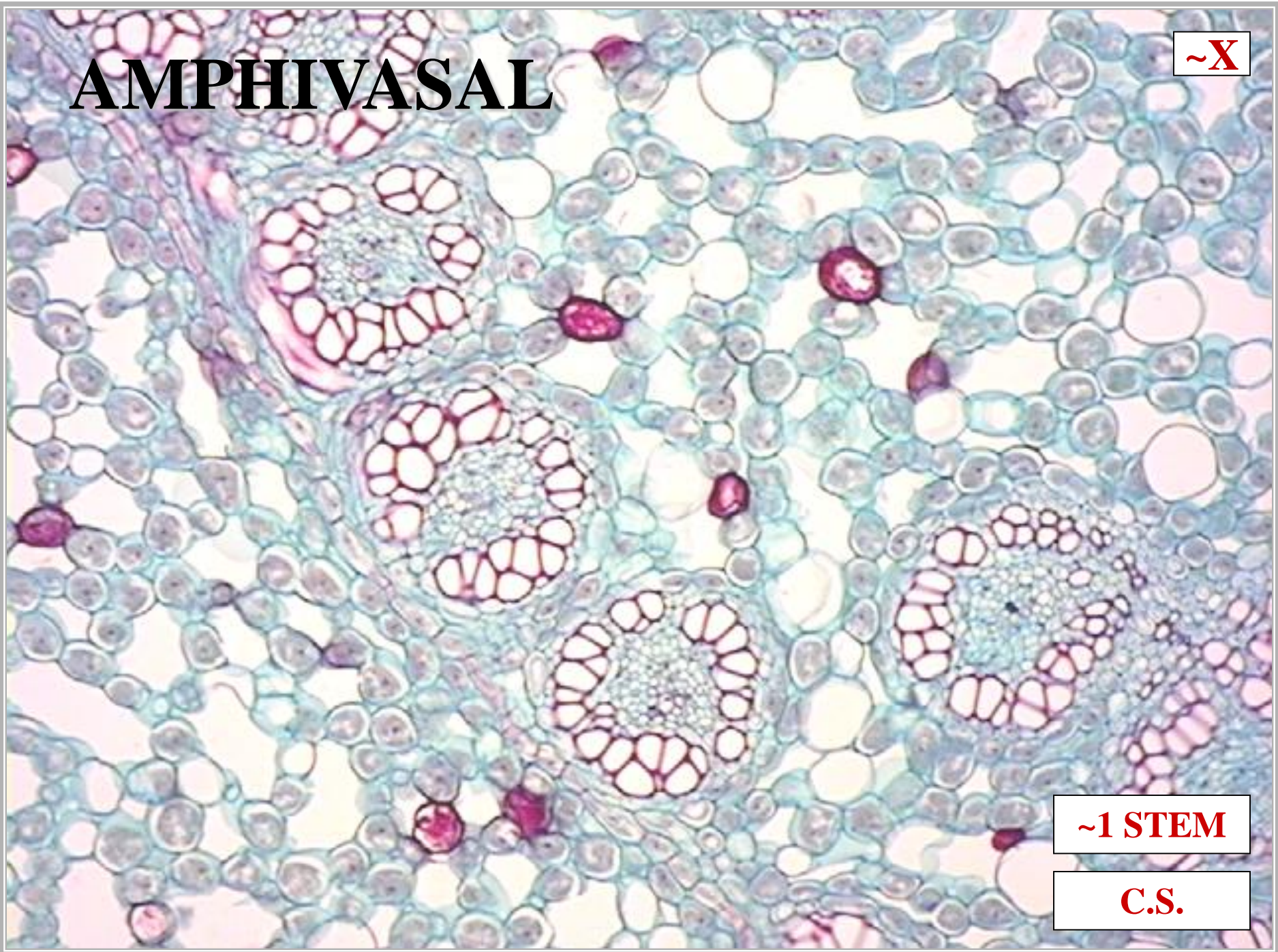
 = ~1 XYLEM

AMPHIVASAL

C.S.

AMPHIVASAL

~X



~1 STEM

C.S.

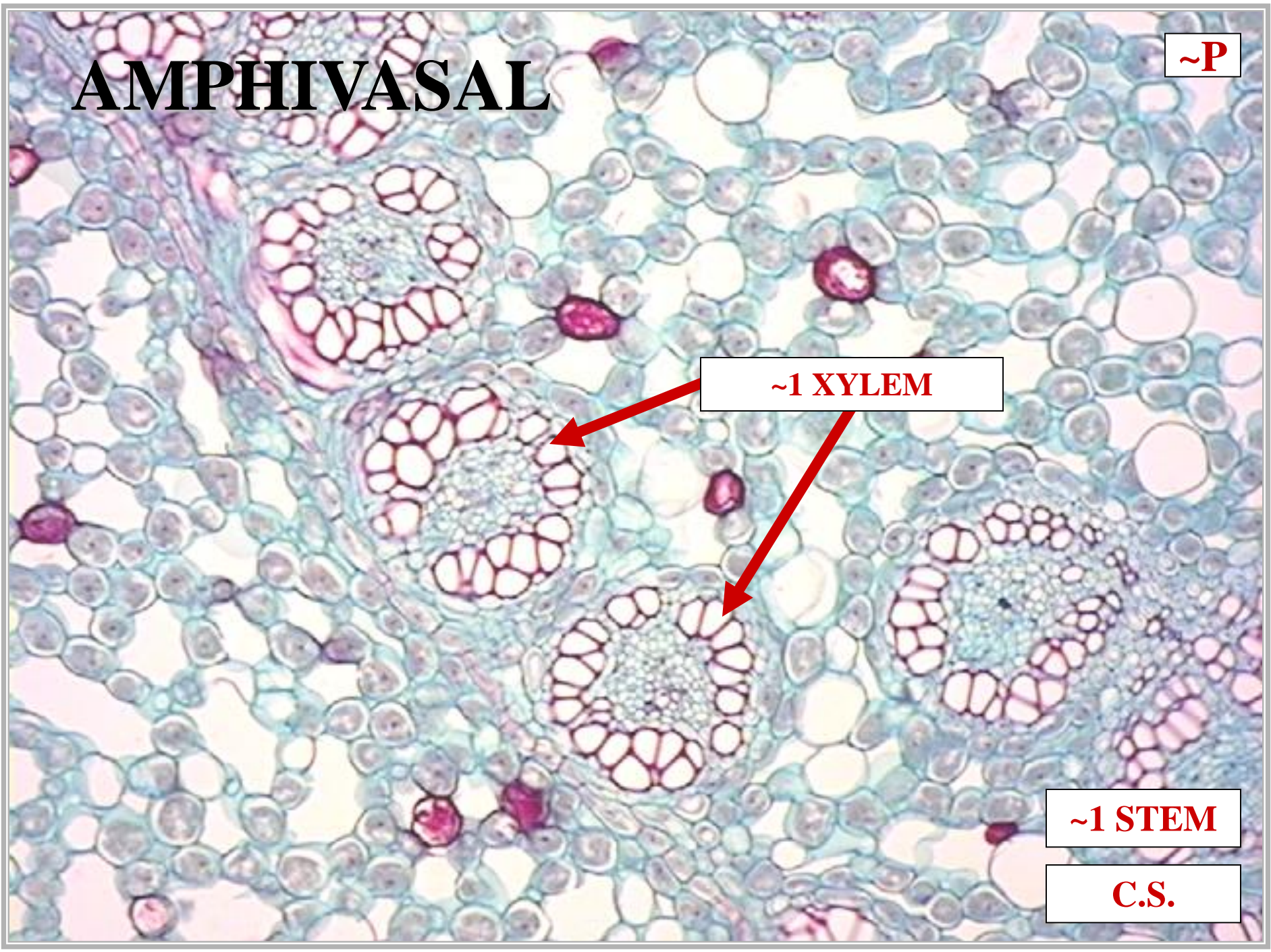
AMPHIVASAL

~P

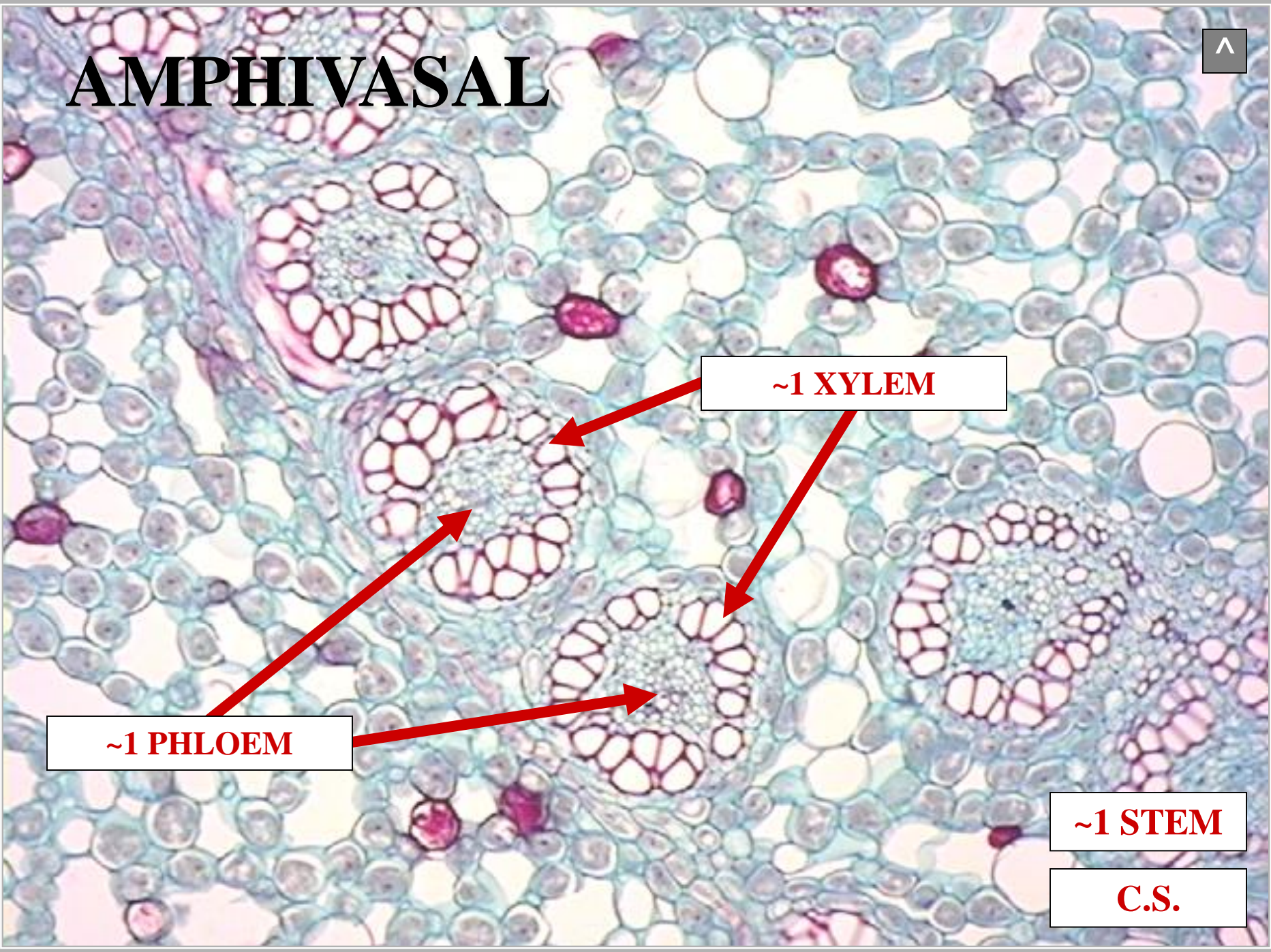
~1 XYLEM

~1 STEM

C.S.



AMPHIVASAL



~1 XYLEM

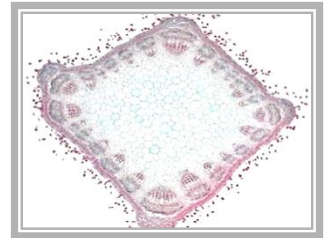
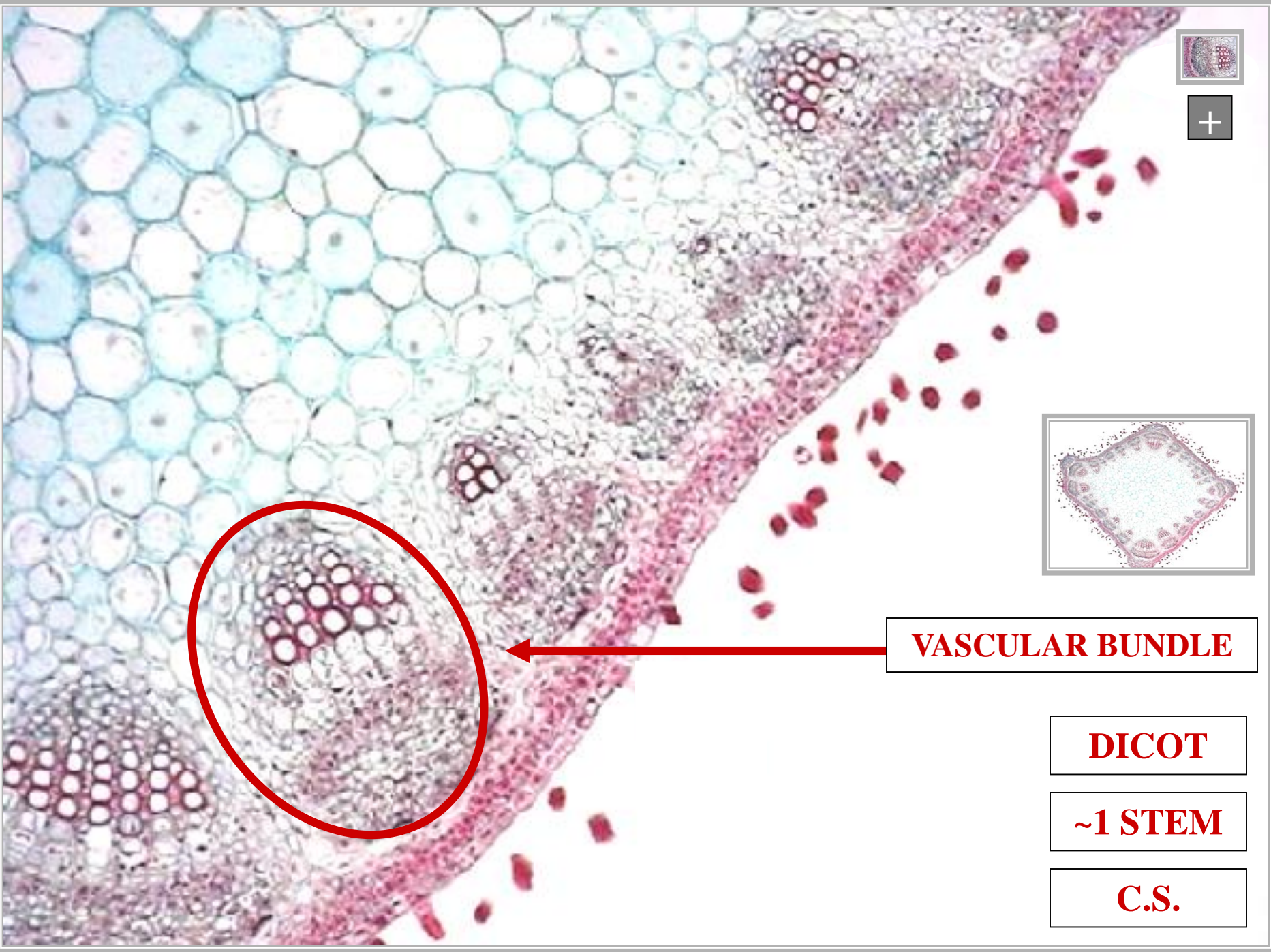
~1 PHLOEM

~1 STEM

C.S.



DICOT STEM TYPICAL VASCULAR BUNDLE

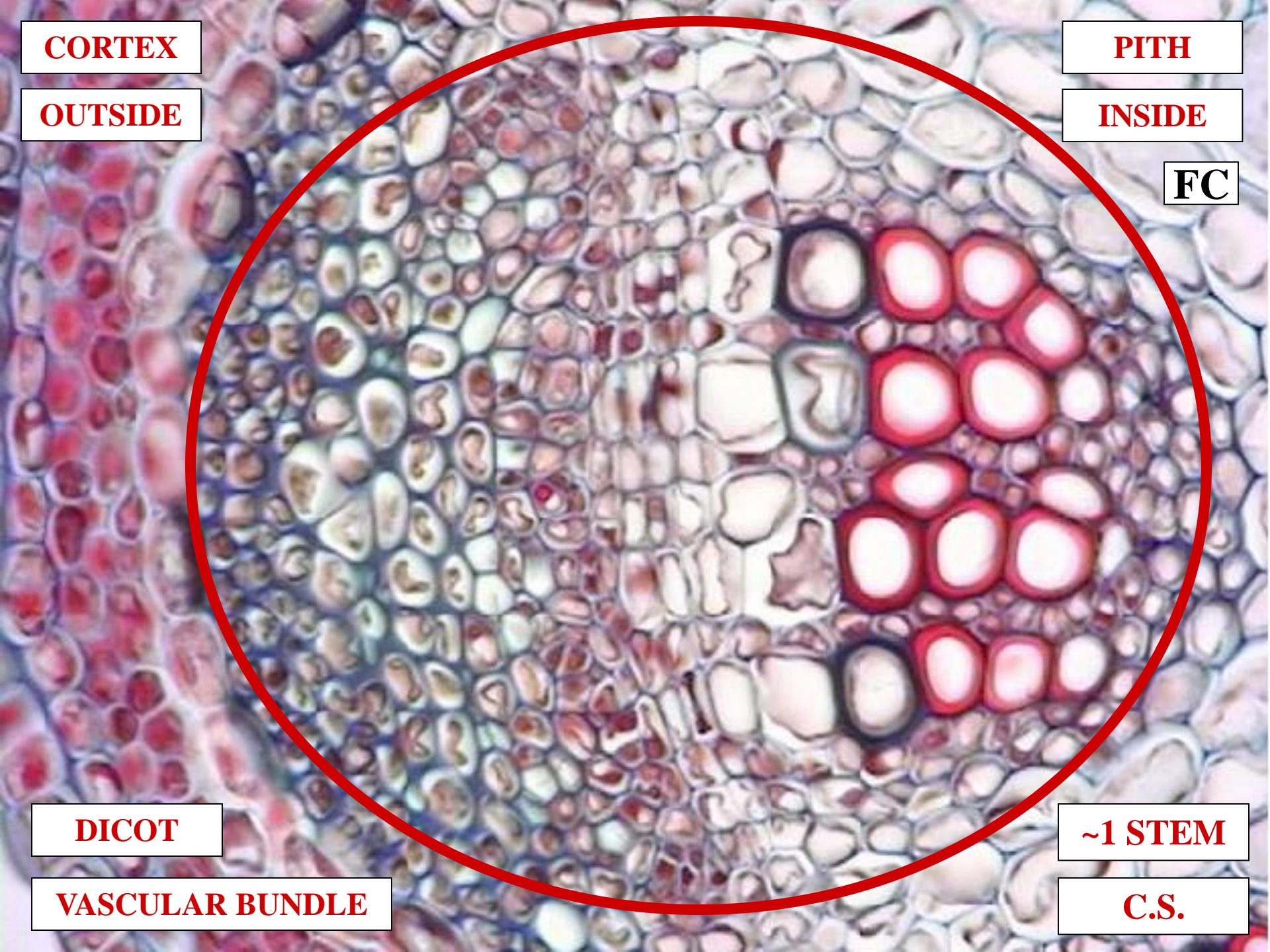


VASCULAR BUNDLE

DICOT

~1 STEM

C.S.



CORTEX

OUTSIDE

PITH

INSIDE

FC

DICOT

VASCULAR BUNDLE

~1 STEM

C.S.

FIBER CAP

**TYPICAL DICOT
VASCULAR BUNDLE
FIBER CAP**



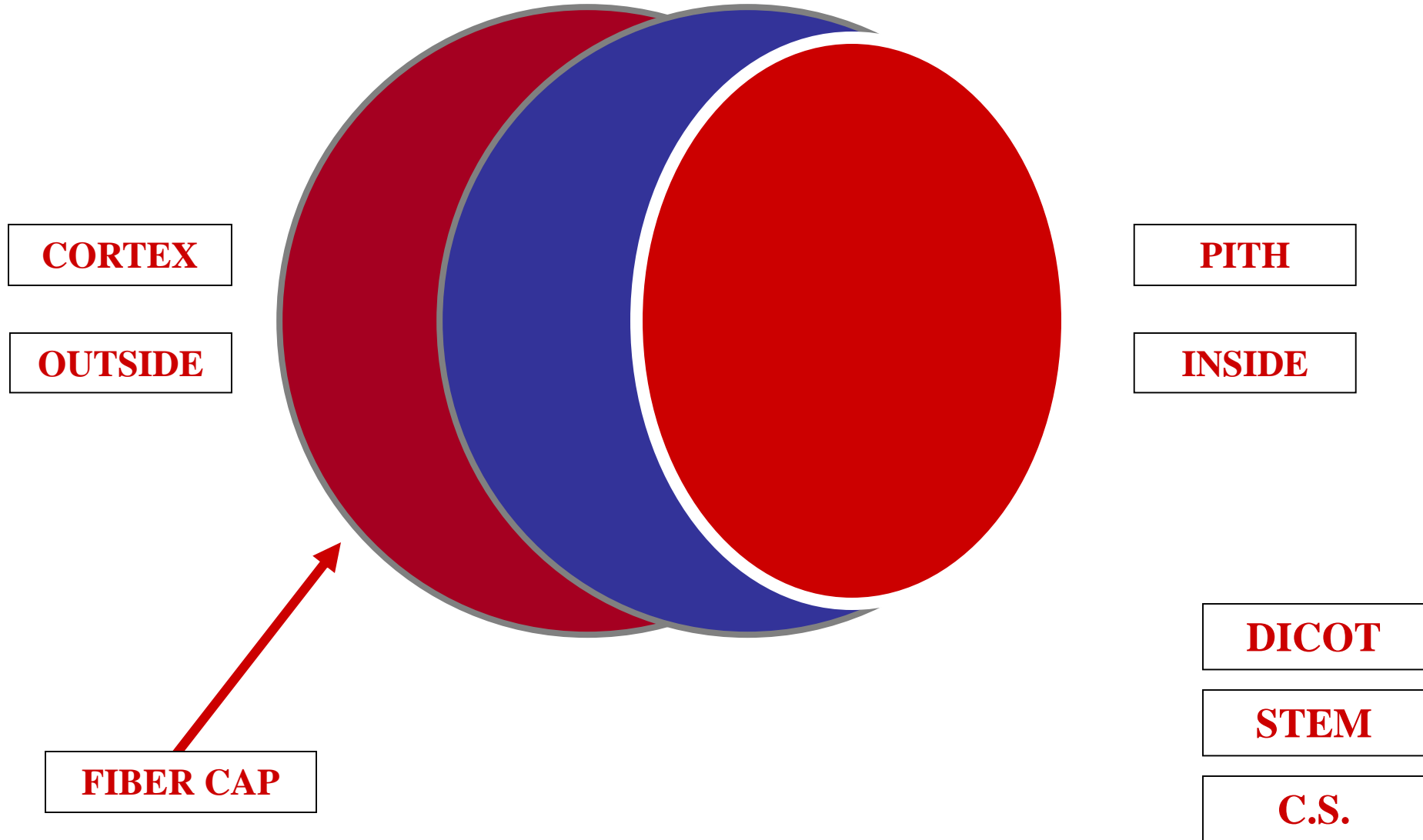
SUPPORT FIBERS

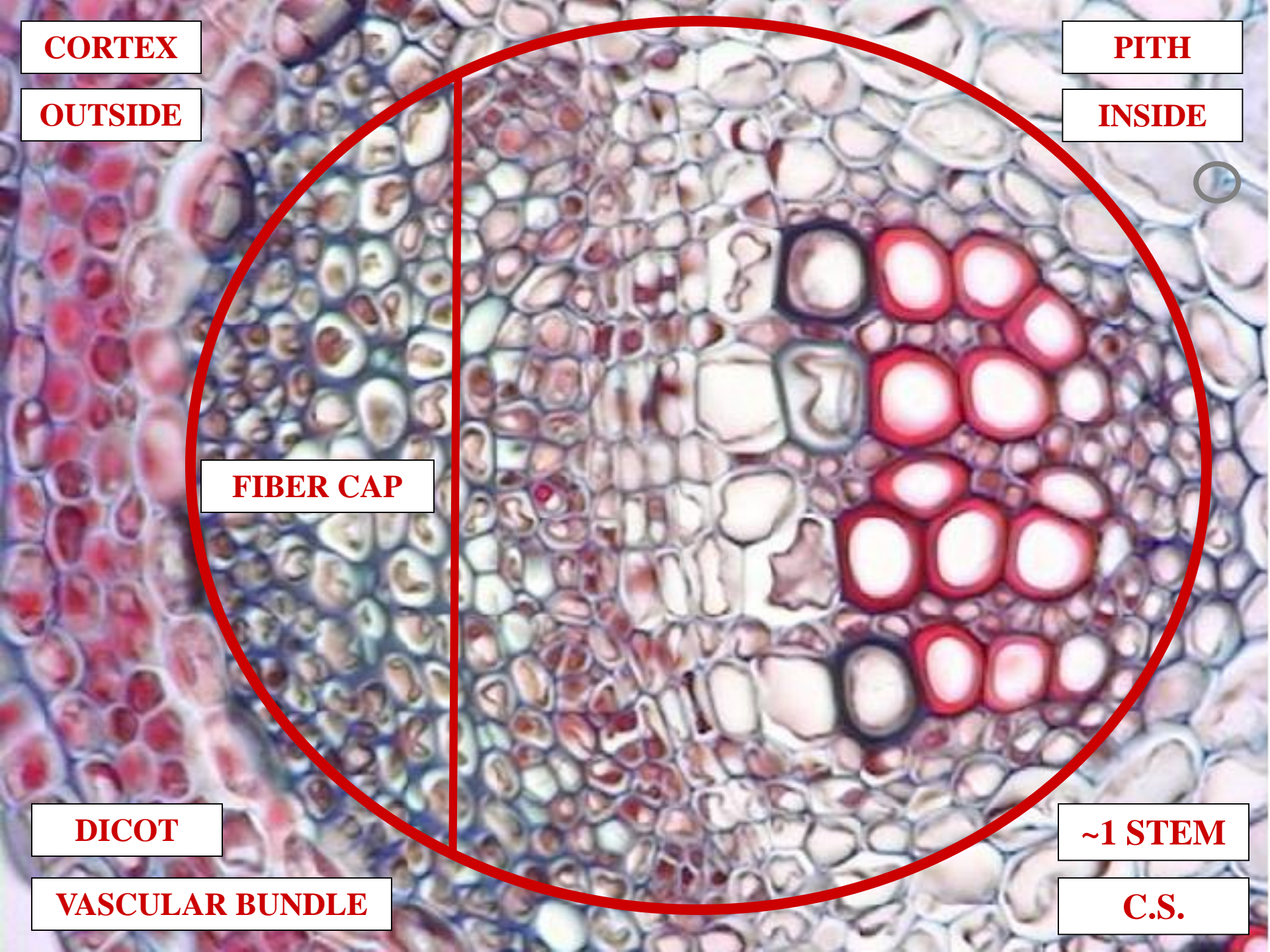
**TYPICAL DICOT
VASCULAR BUNDLE
FIBER CAP**

TYPICAL DICOT VASCULAR BUNDLE



FC





CORTEX

OUTSIDE

PITH

INSIDE

FIBER CAP

DICOT

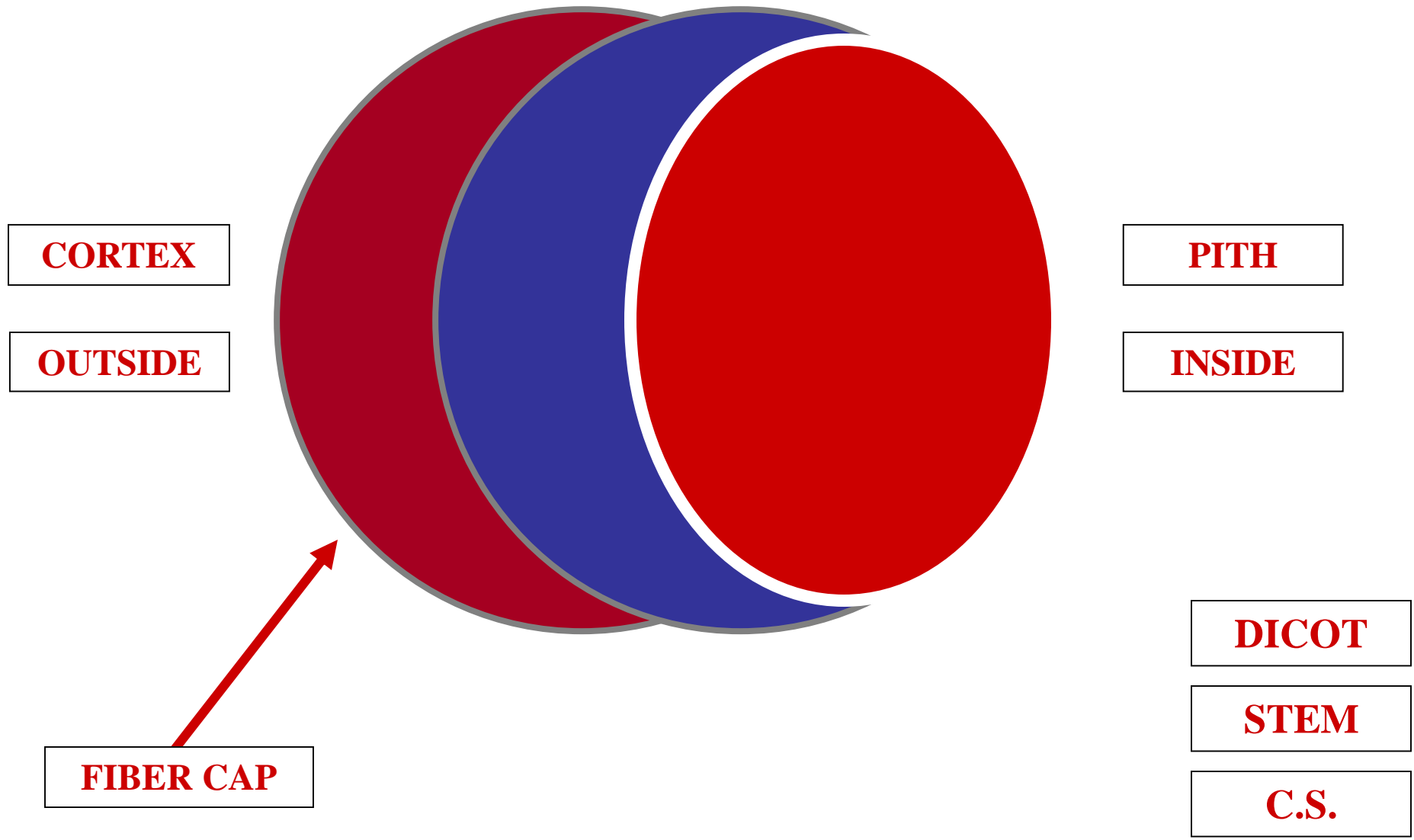
VASCULAR BUNDLE

~1 STEM

C.S.

TYPICAL DICOT VASCULAR BUNDLE

~P



CORTEX

OUTSIDE

PITH

INSIDE

FIBER CAP

DICOT

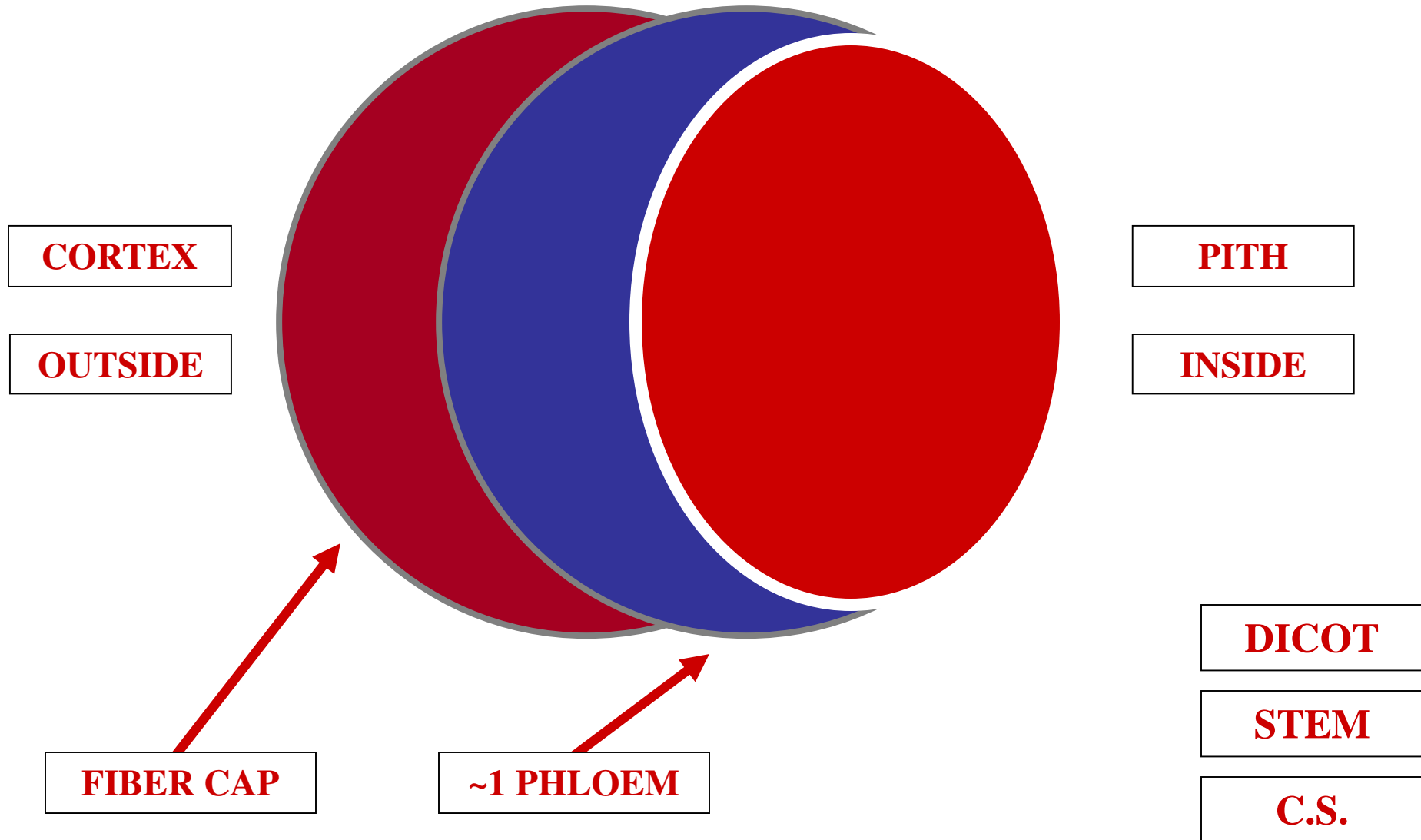
STEM

C.S.

TYPICAL DICOT VASCULAR BUNDLE



~P



CORTEX

OUTSIDE

PITH

INSIDE

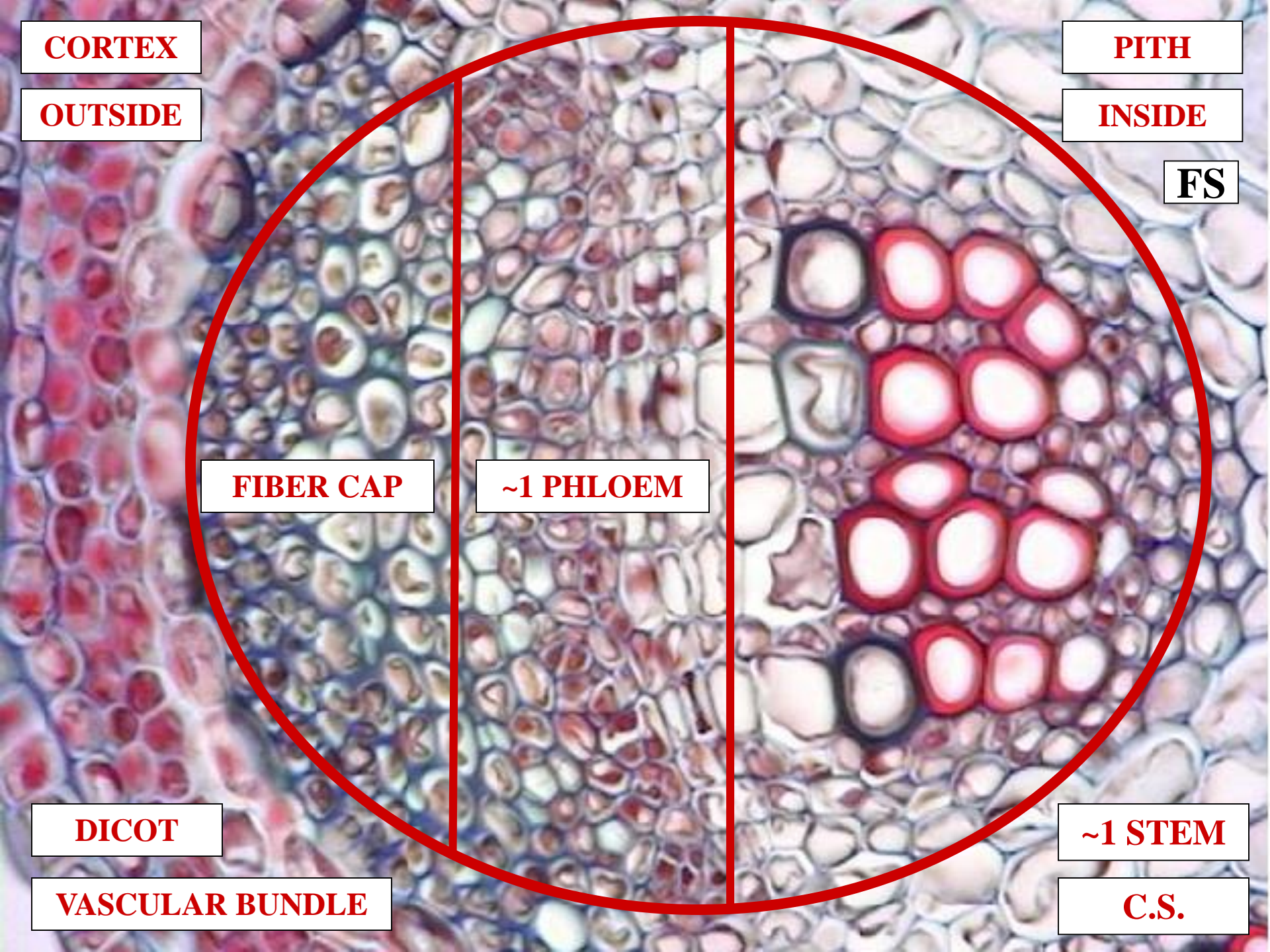
FIBER CAP

~1 PHLOEM

DICOT

STEM

C.S.



CORTEX

OUTSIDE

PITH

INSIDE

FS

FIBER CAP

~1 PHLOEM

DICOT

VASCULAR BUNDLE

~1 STEM

C.S.

FASCICULAR CAMBIUM



**TYPICAL DICOT
VASCULAR BUNDLE
FASCICULAR CAMBIUM**

**WITHIN FASCICLE
SINGLE PARENCHYMA CELL LAYER**

**DICOT
VASCULAR BUNDLE
FASCICULAR CAMBIUM**

**TYPICAL DICOT
VASCULAR BUNDLE
FASCICULAR CAMBIUM**

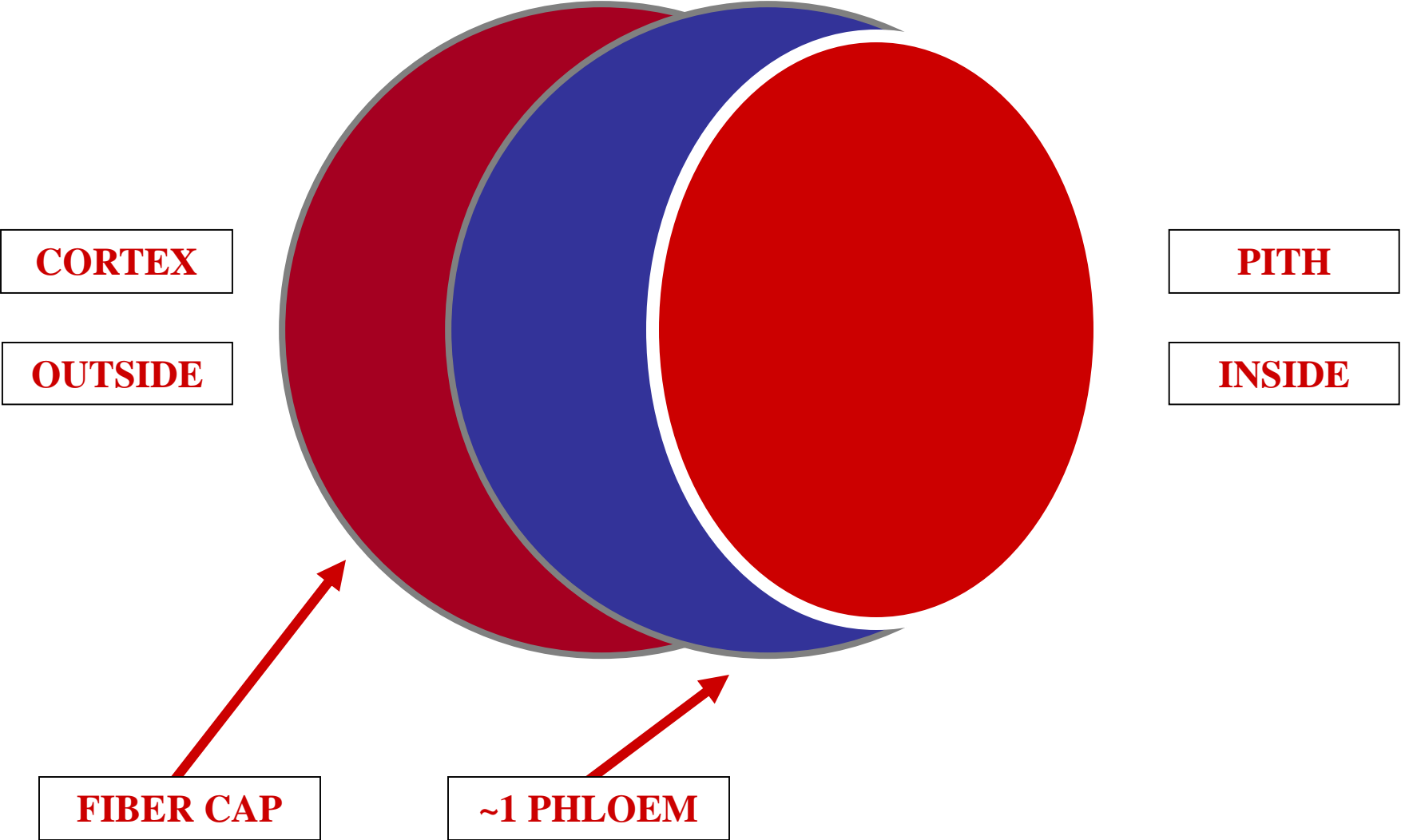
**WITHIN FASCICLE
SINGLE PARENCHYMA CELL LAYER**

POTENTIALLY MERISTEMATIC

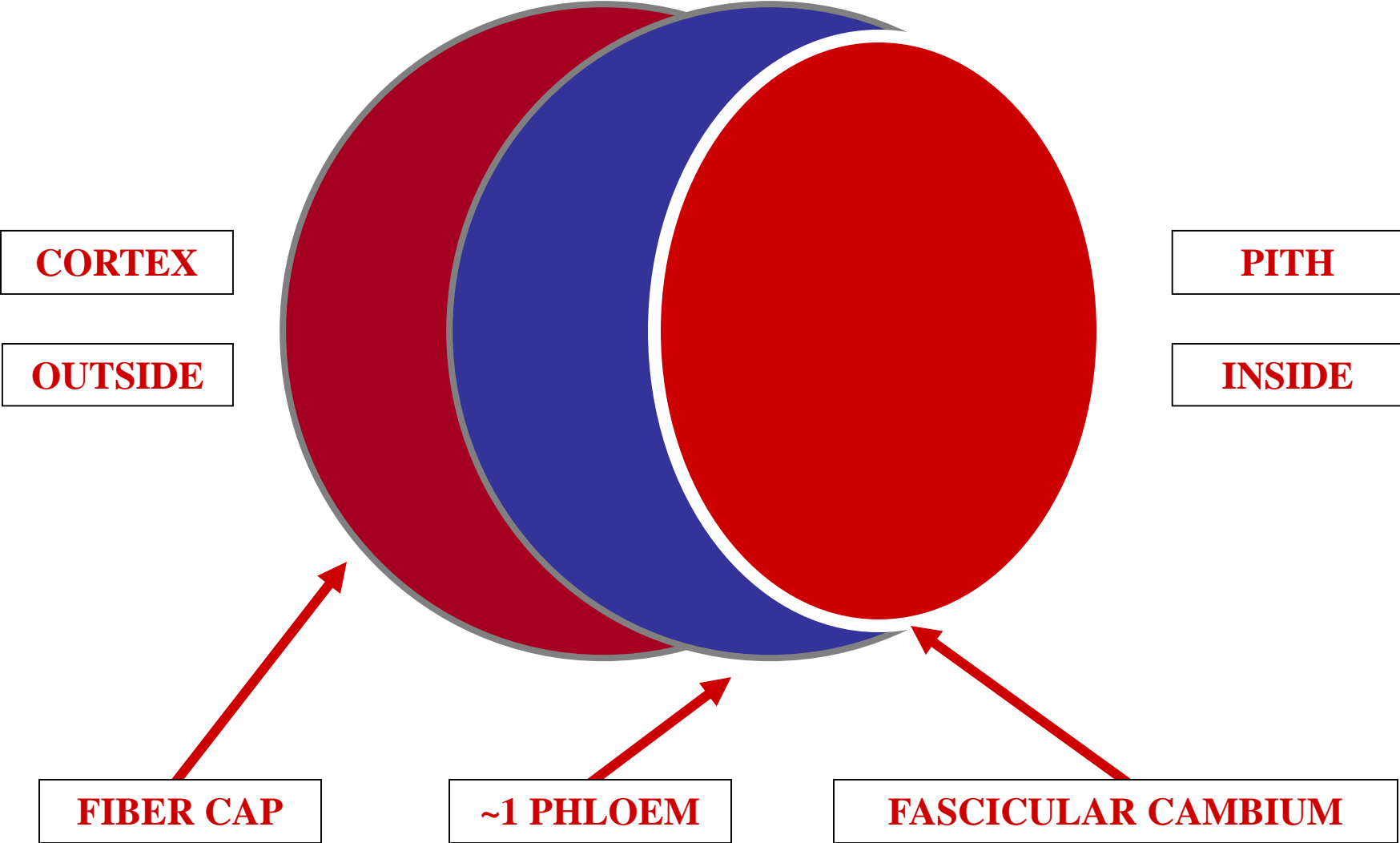
**DICOT
VASCULAR BUNDLE
FASCICULAR CAMBIUM**



TYPICAL DICOT VASCULAR BUNDLE



TYPICAL DICOT VASCULAR BUNDLE



CORTEX

OUTSIDE

PITH

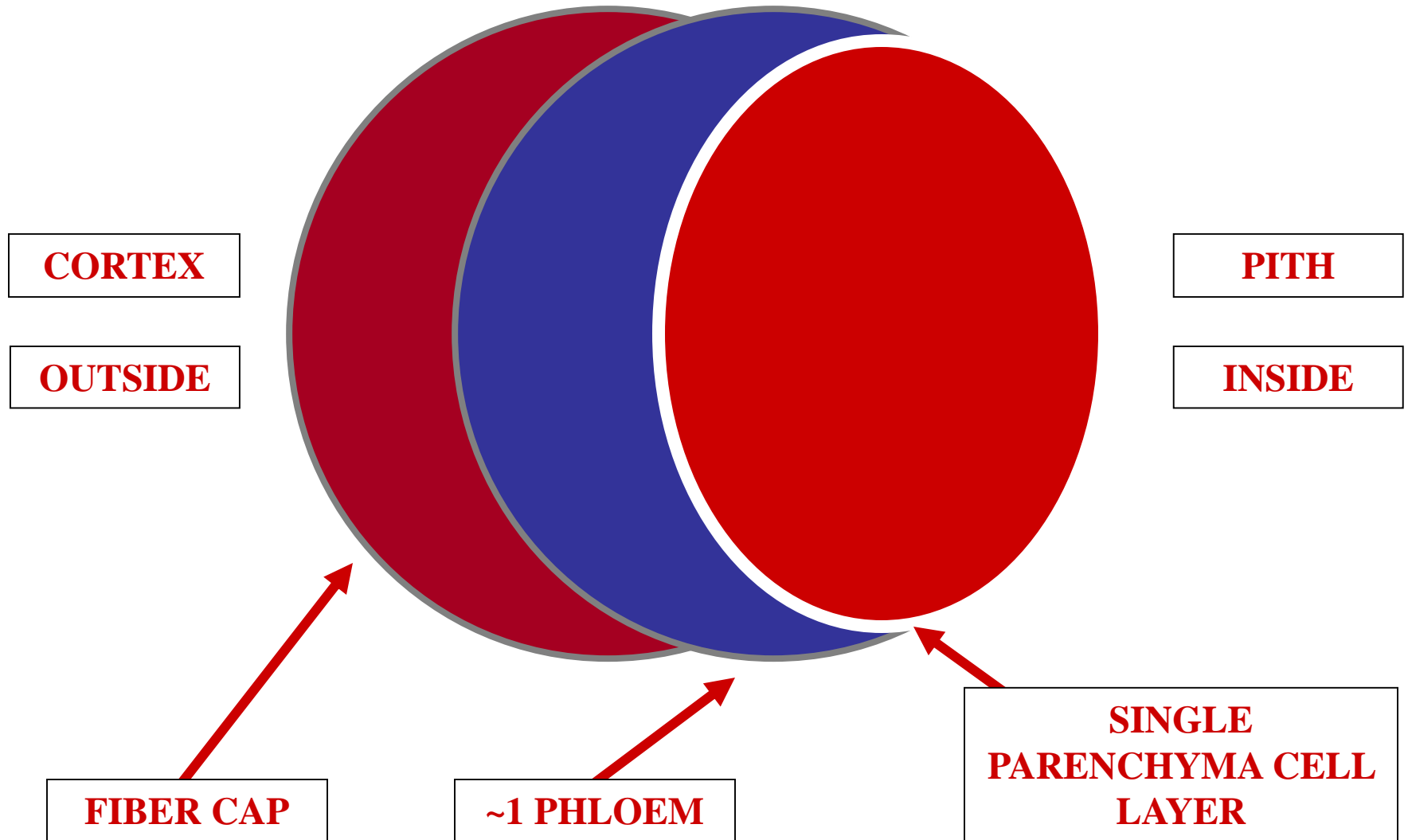
INSIDE

FIBER CAP

~1 PHLOEM

FASCICULAR CAMBIUM

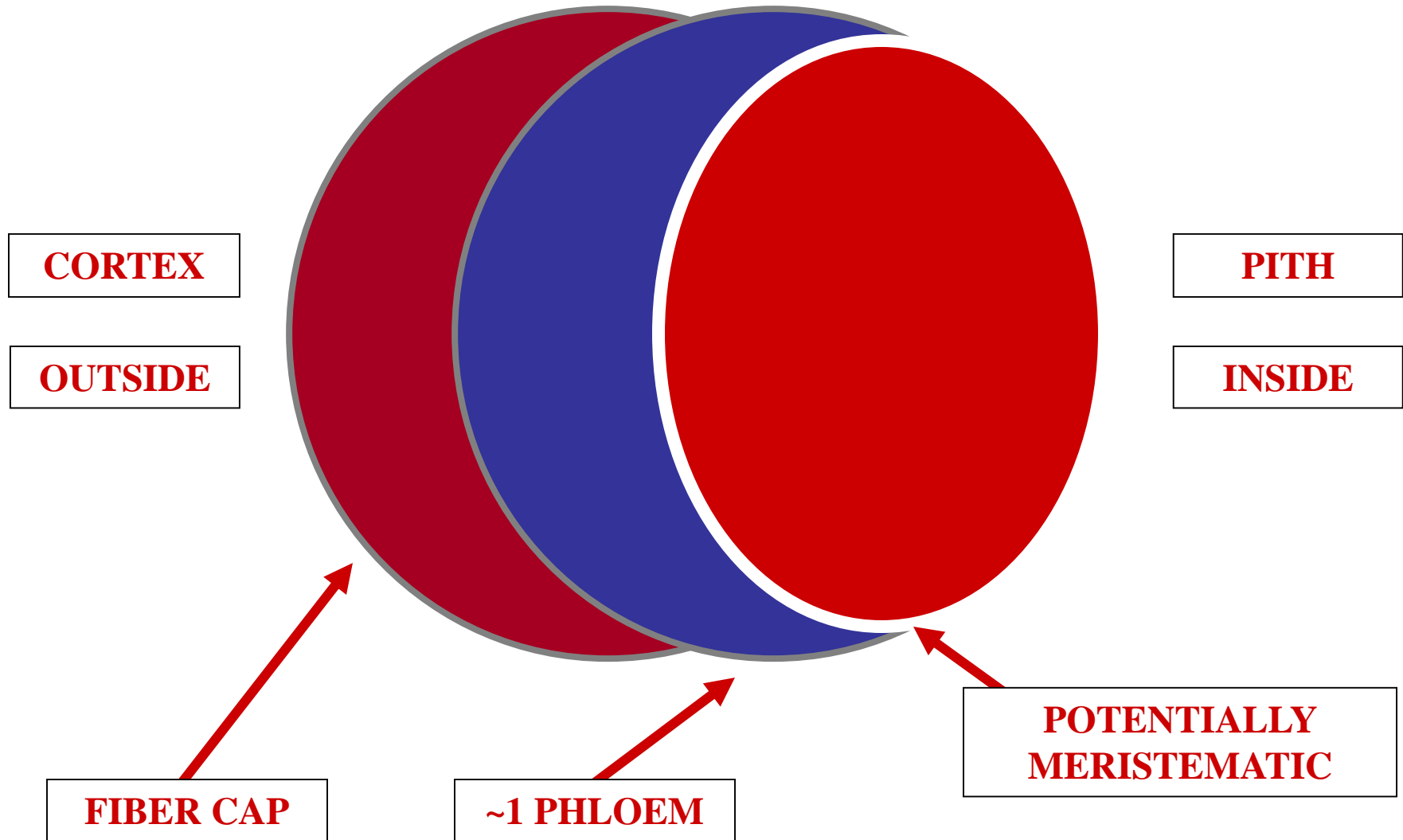
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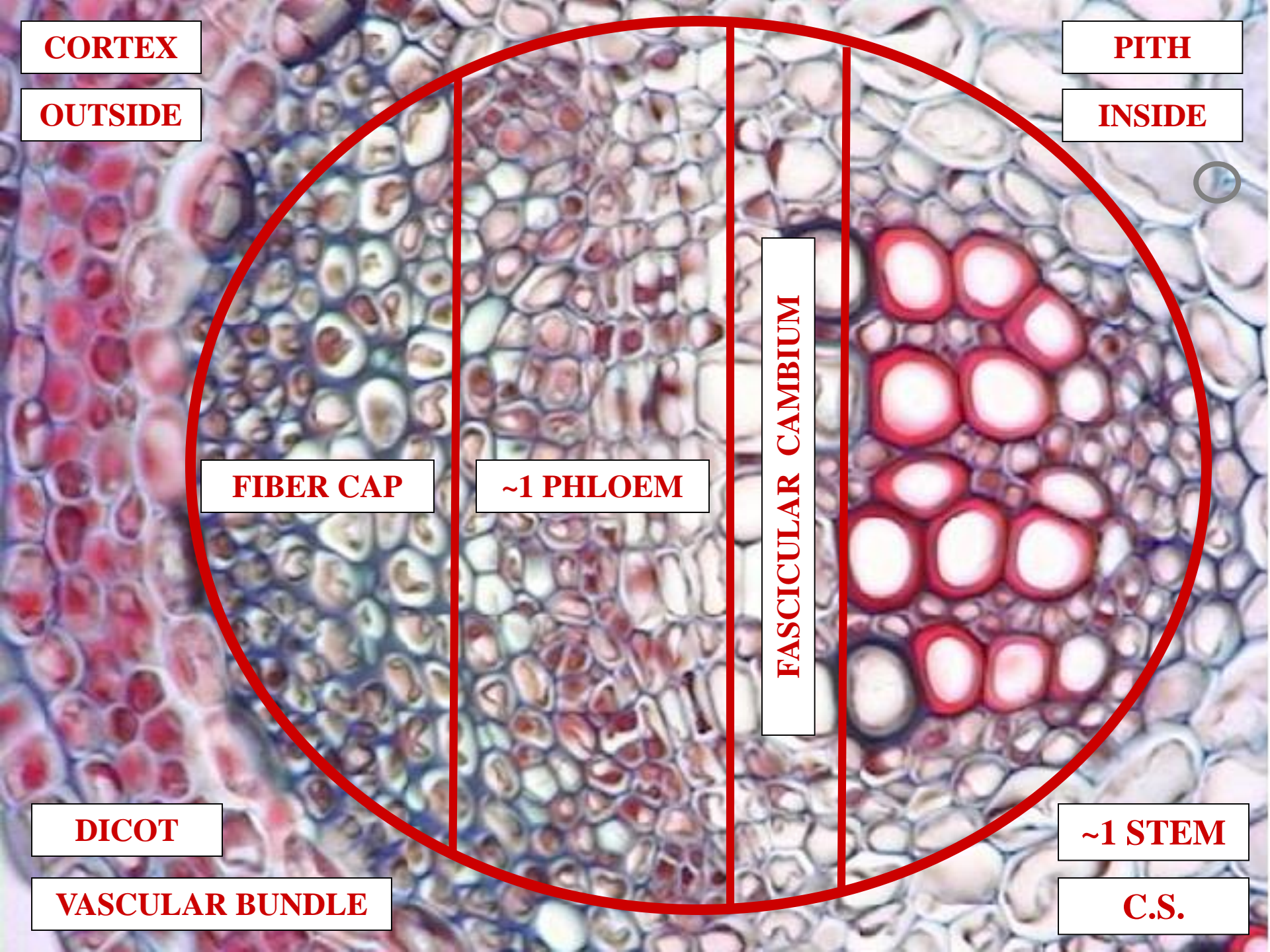


TYPICAL DICOT VASCULAR BUNDLE



FS





CORTEX

OUTSIDE

PITH

INSIDE

FIBER CAP

~1 PHLOEM

FASCICULAR CAMBIUM

~1 STEM

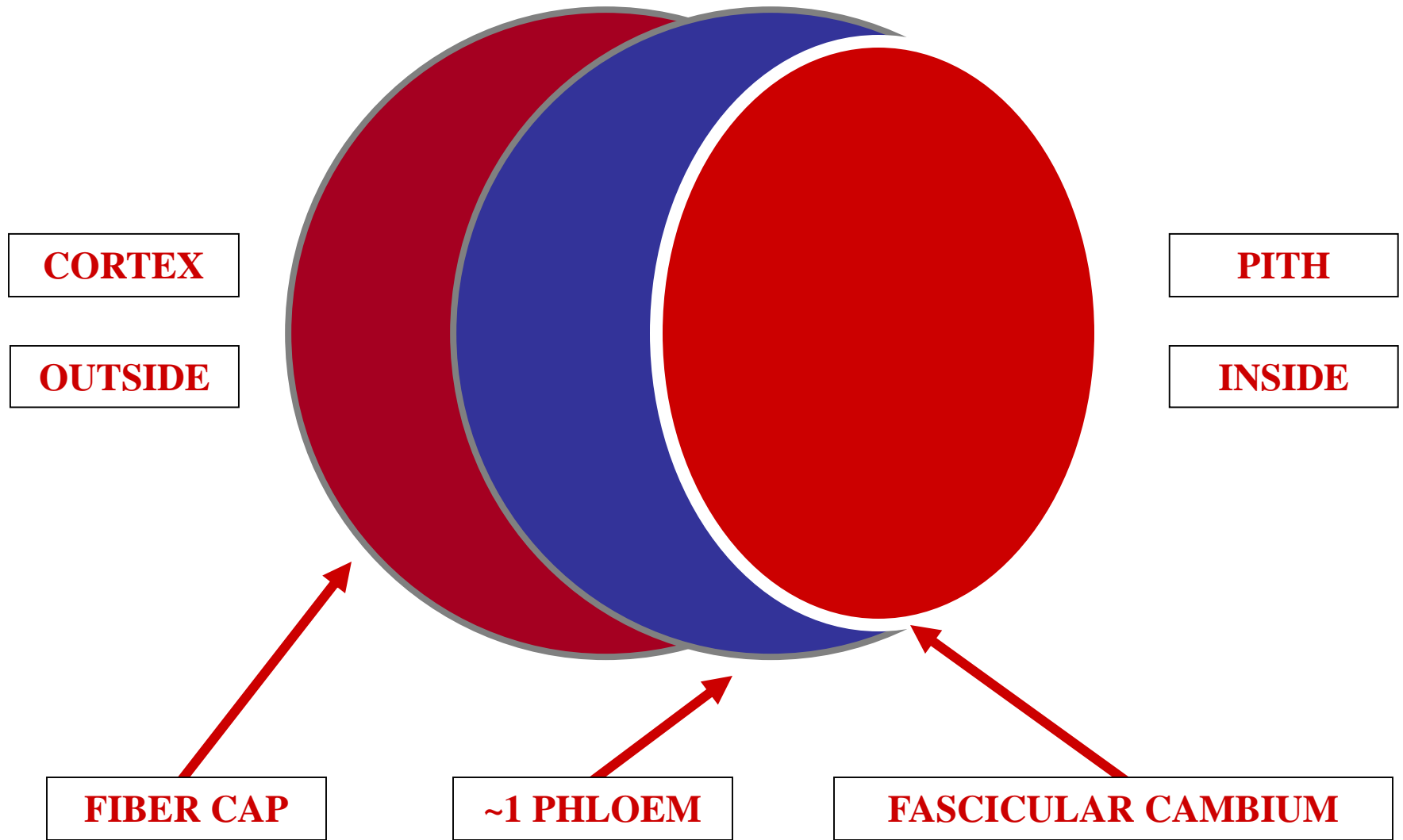
DICOT

VASCULAR BUNDLE

C.S.

TYPICAL DICOT VASCULAR BUNDLE

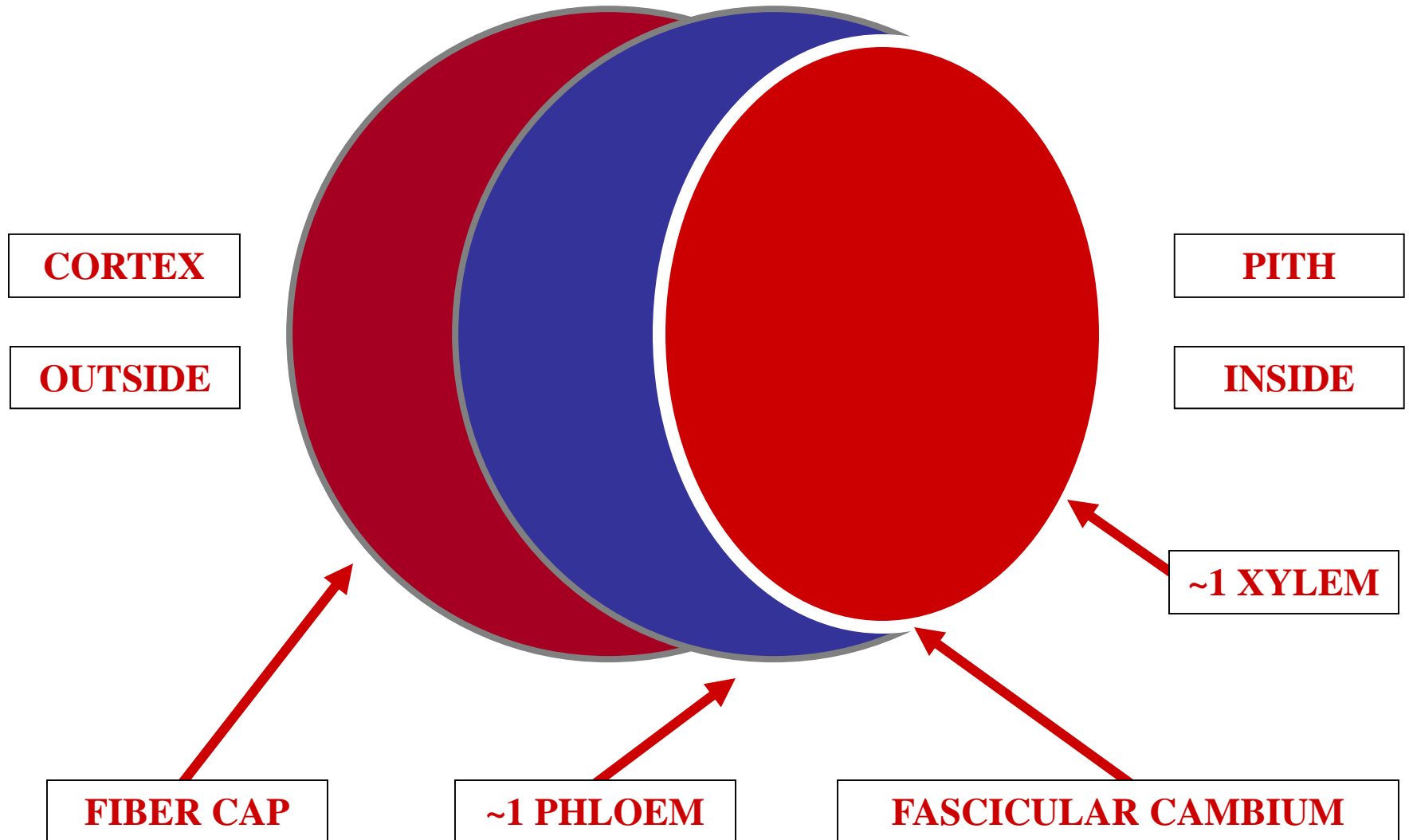
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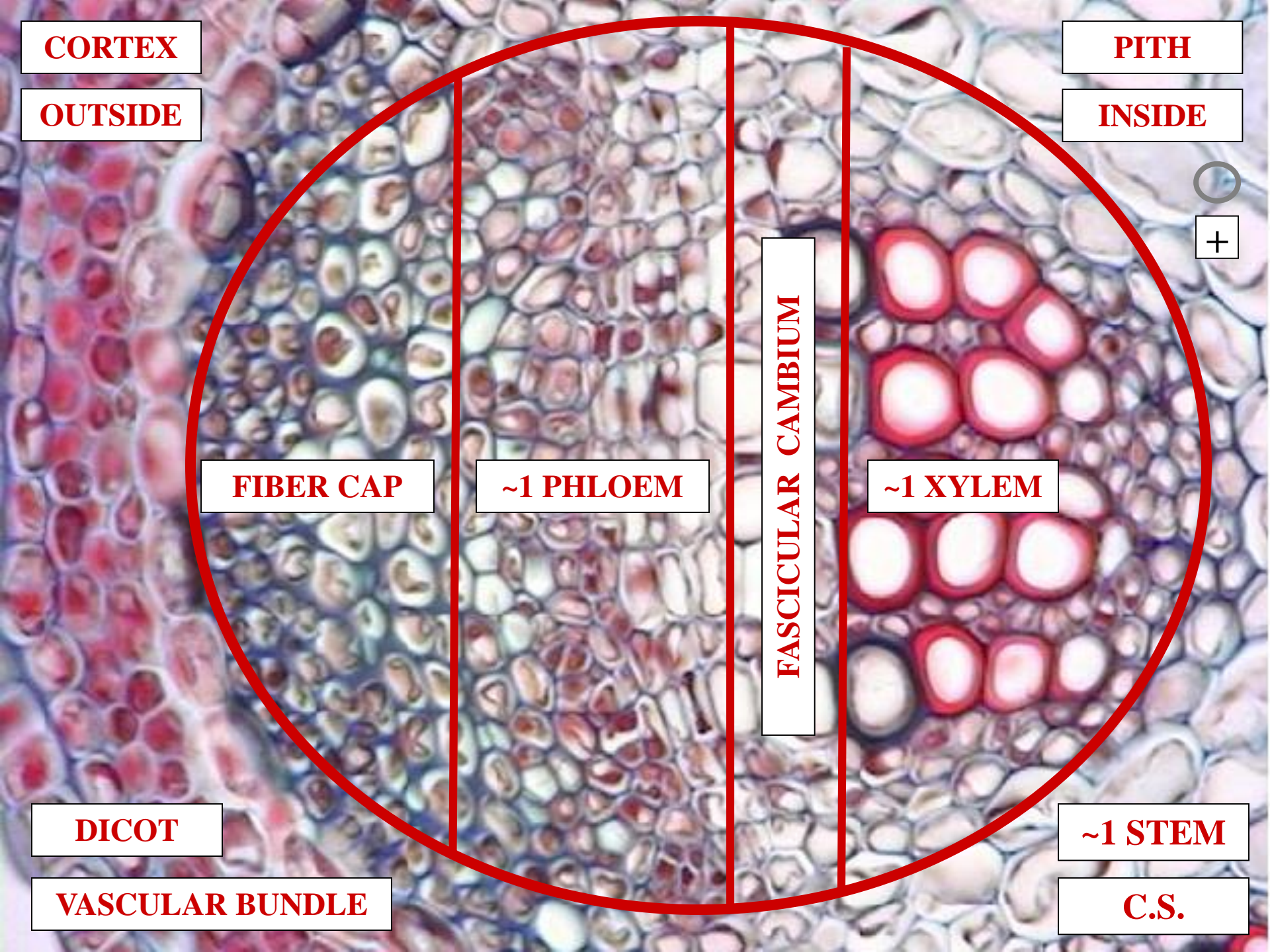


TYPICAL DICOT VASCULAR BUNDLE



~X





CORTEX

OUTSIDE

PITH

INSIDE



FIBER CAP

~1 PHLOEM

FASCICULAR CAMBIUM

~1 XYLEM

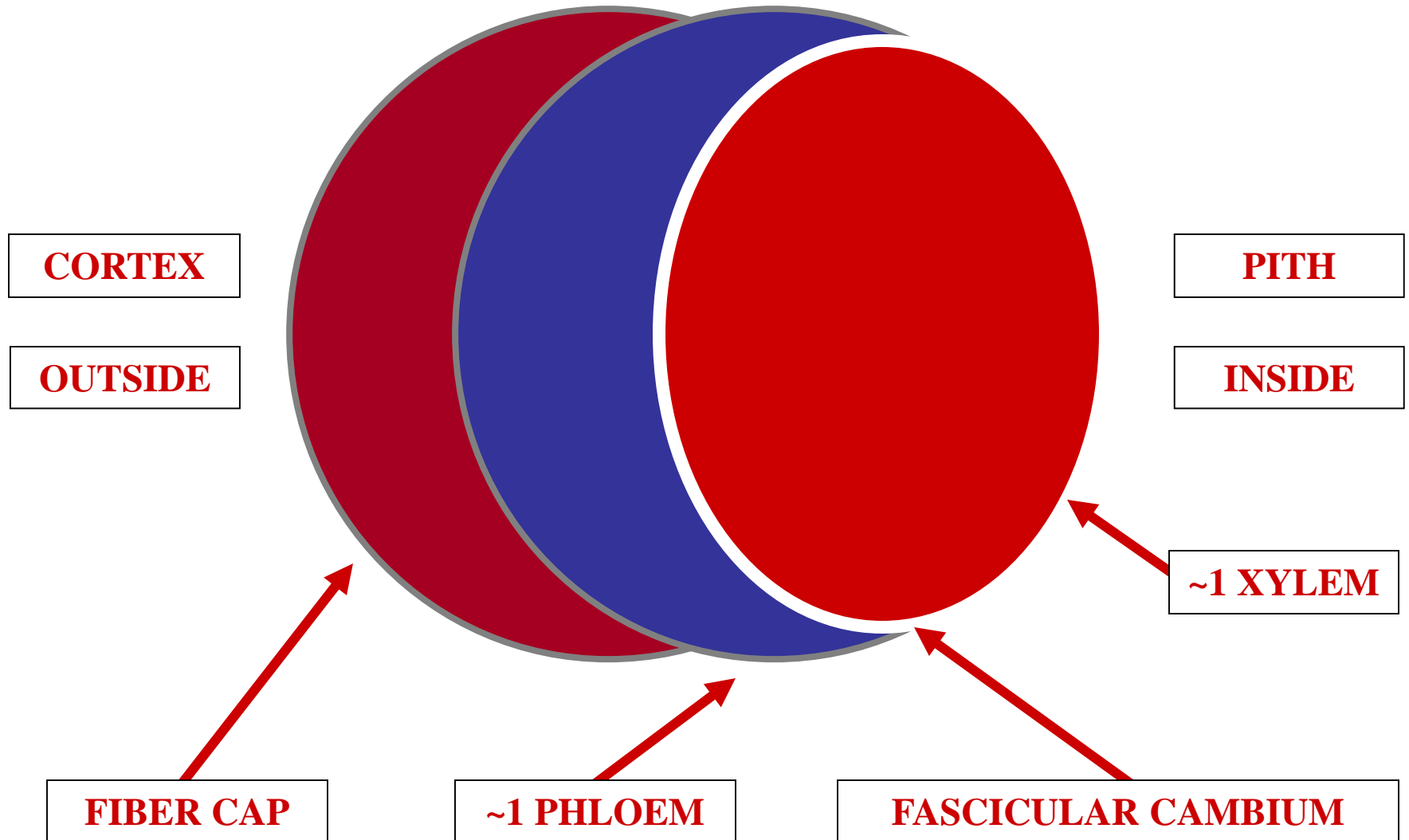
DICOT

VASCULAR BUNDLE

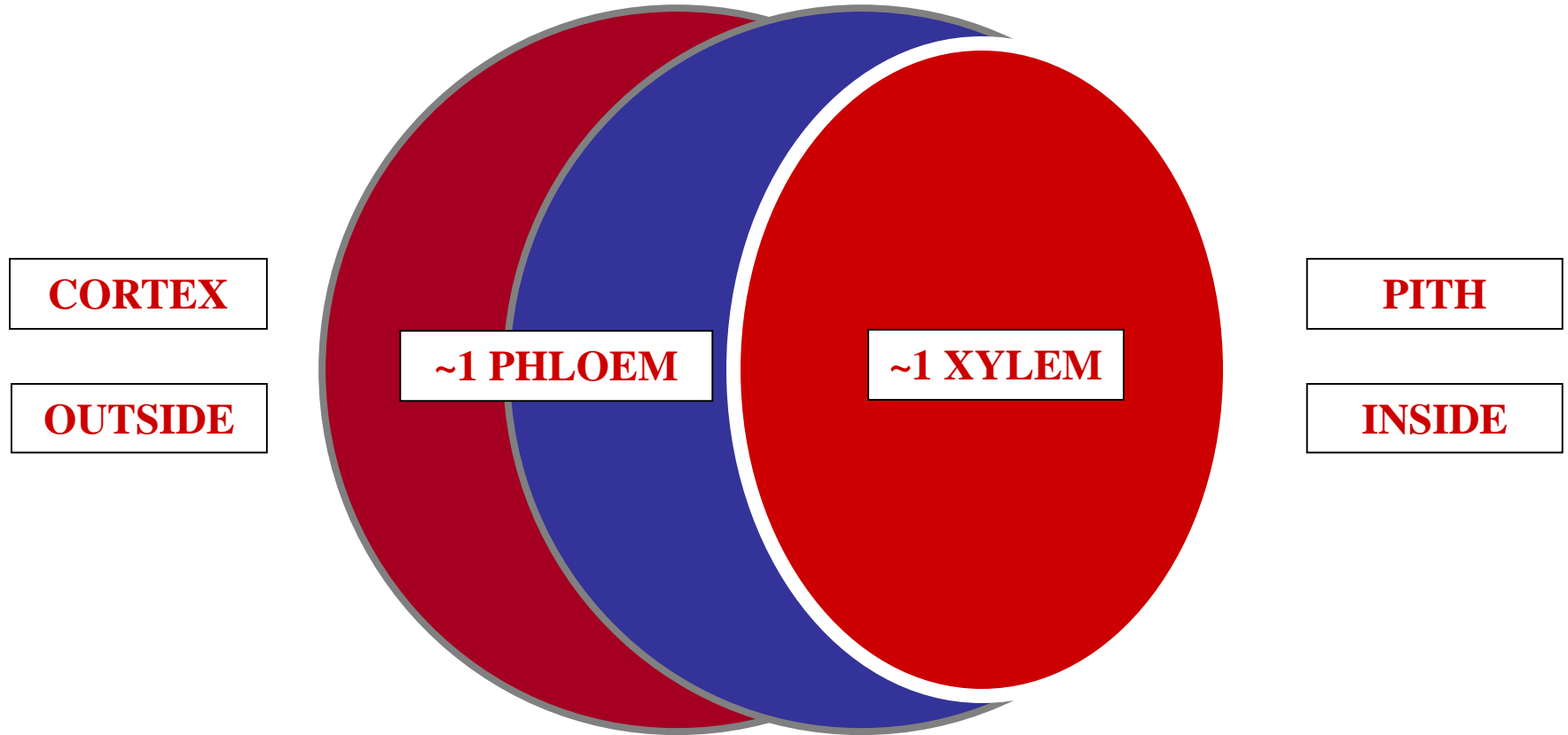
~1 STEM

C.S.

TYPICAL DICOT VASCULAR BUNDLE



TYPICAL DICOT VASCULAR BUNDLE

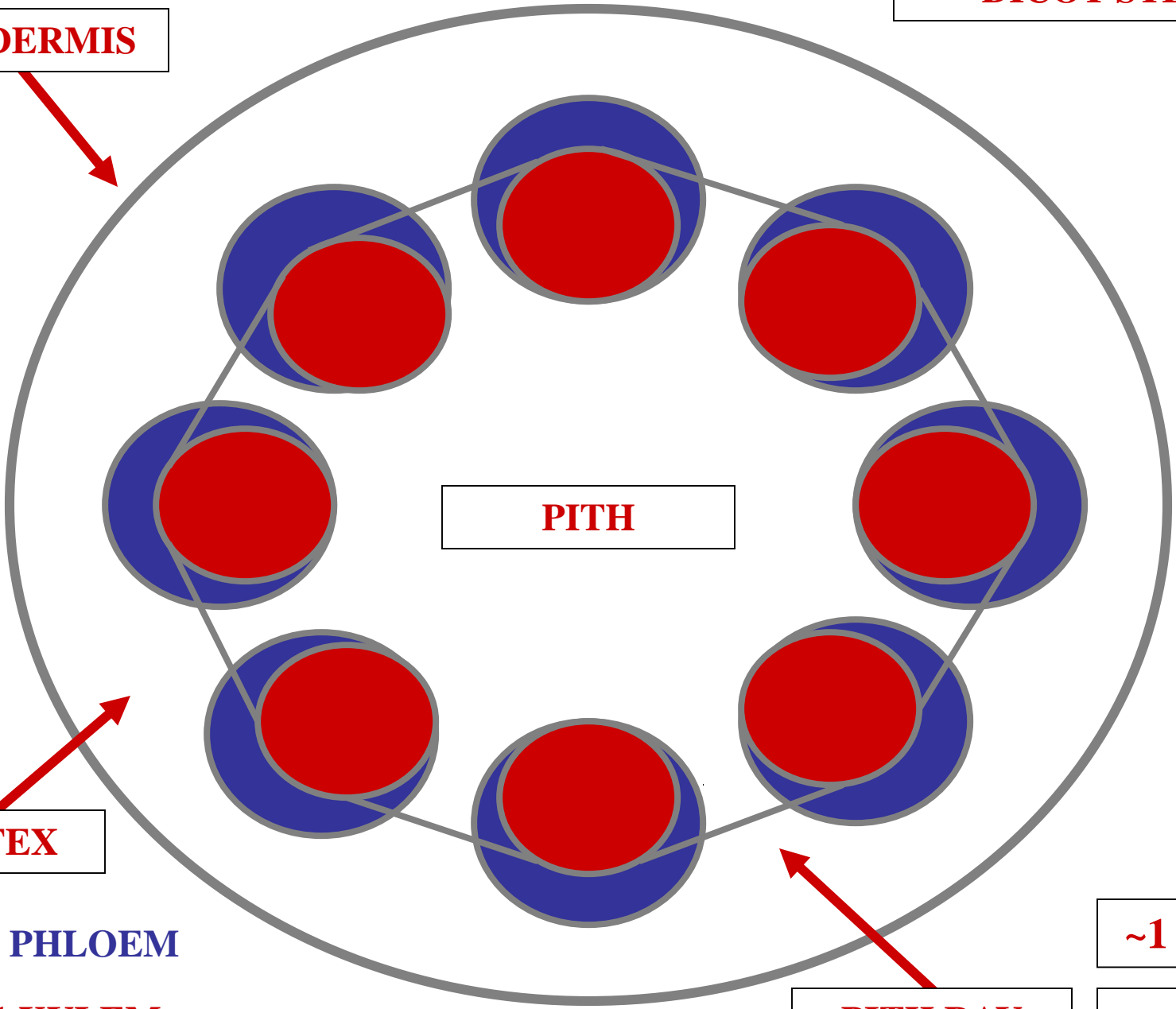




DICOT STEM STELE

DICOT STELE

EPIDERMIS



PITH

CORTEX

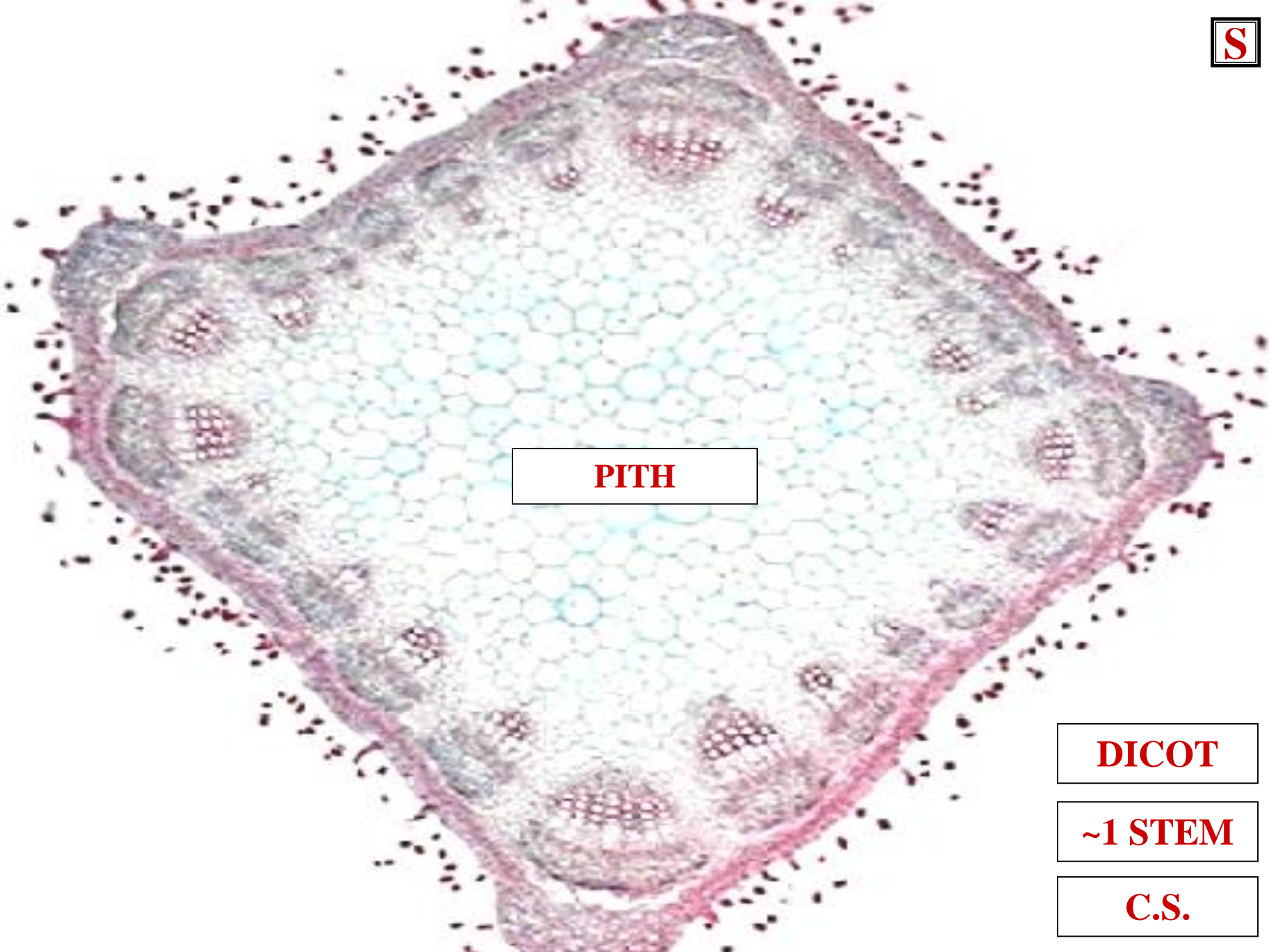
= ~1 PHLOEM

= ~1 XYLEM

~1 STEM

PITH RAY

C.S.

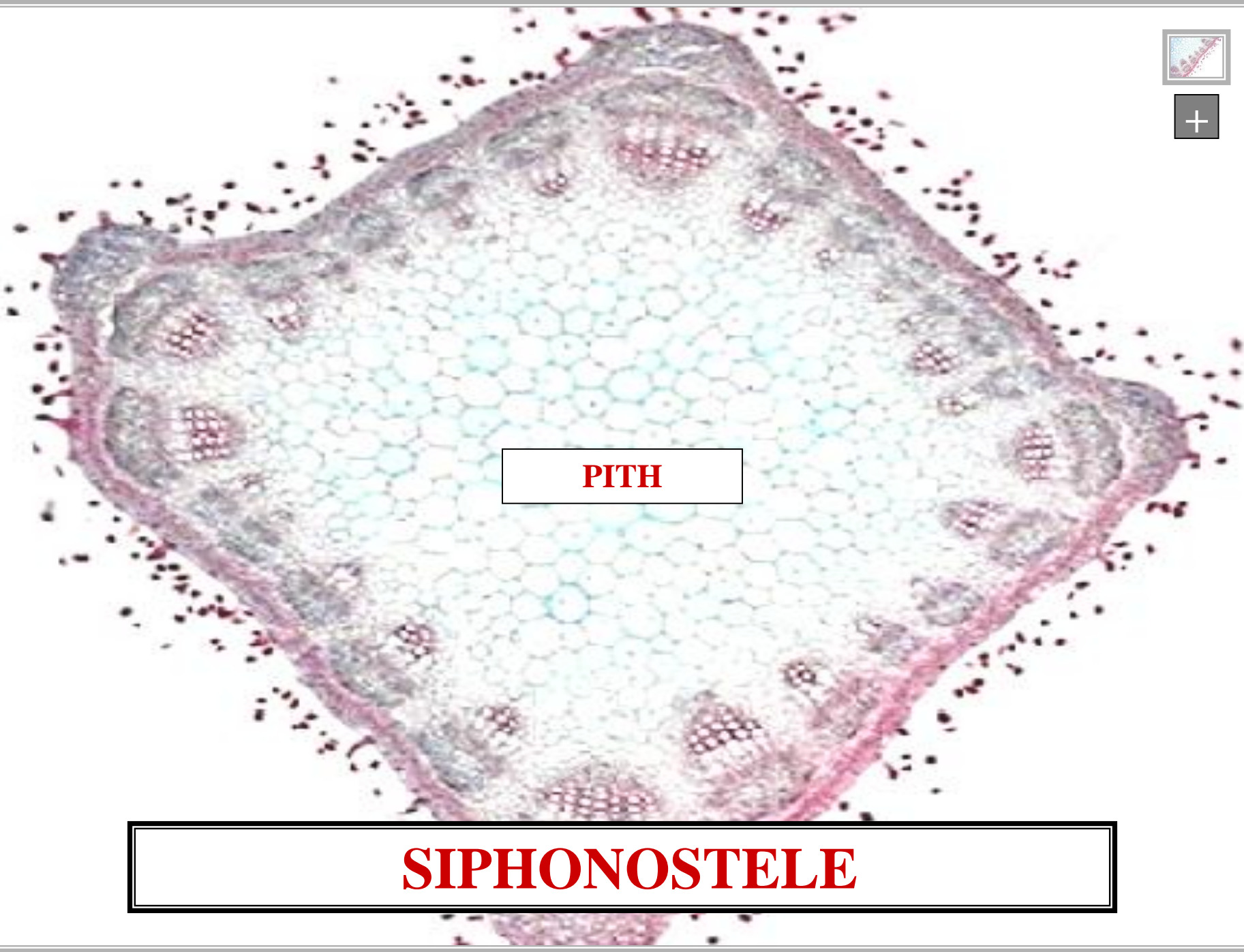


PITH

DICOT

~1 STEM

C.S.



PITH

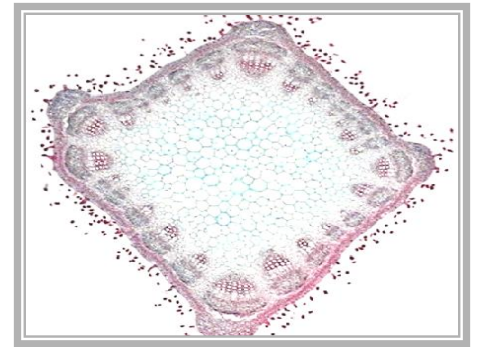
SIPHONOSTELE

SIPHONOSTELE

PITH

VASCULAR BUNDLE

E



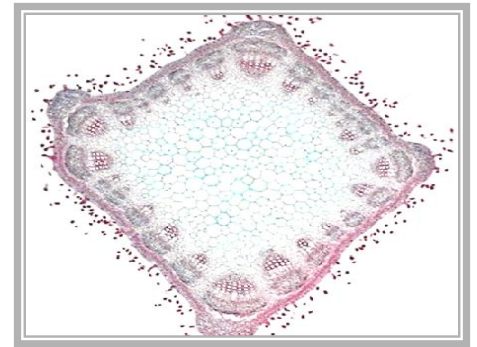
C.S.

SIPHONOSTELE / EUSTELE

PITH

VASCULAR BUNDLE

?



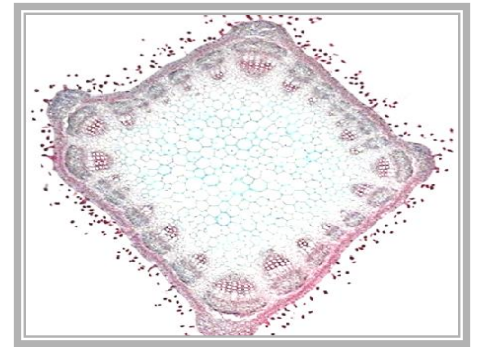
C.S.

SIPHONOSTELE / EUSTELE

PITH

CL

?
VASCULAR BUNDLE



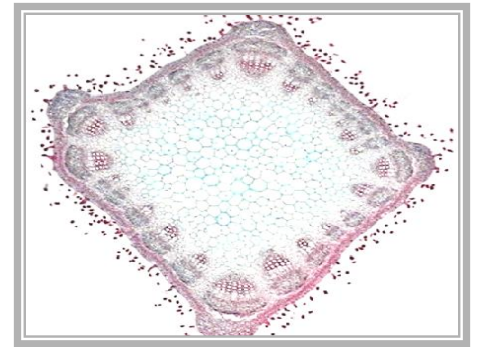
C.S.

SIPHONOSTELE / EUSTELE

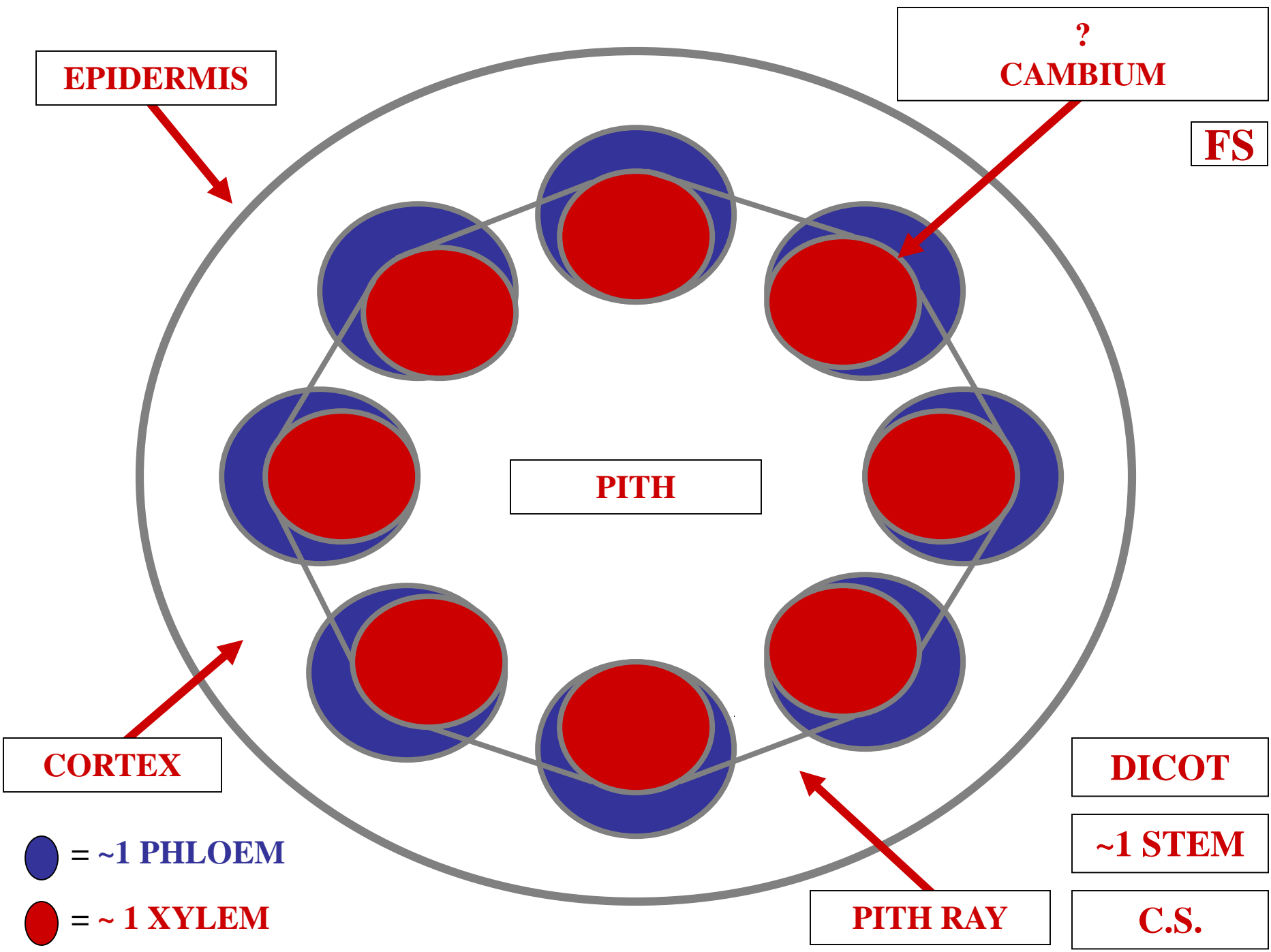
PITH

VASCULAR BUNDLE

?



C.S.



EPIDERMIS

**?
CAMBIUM**

FS

PITH

CORTEX

DICOT

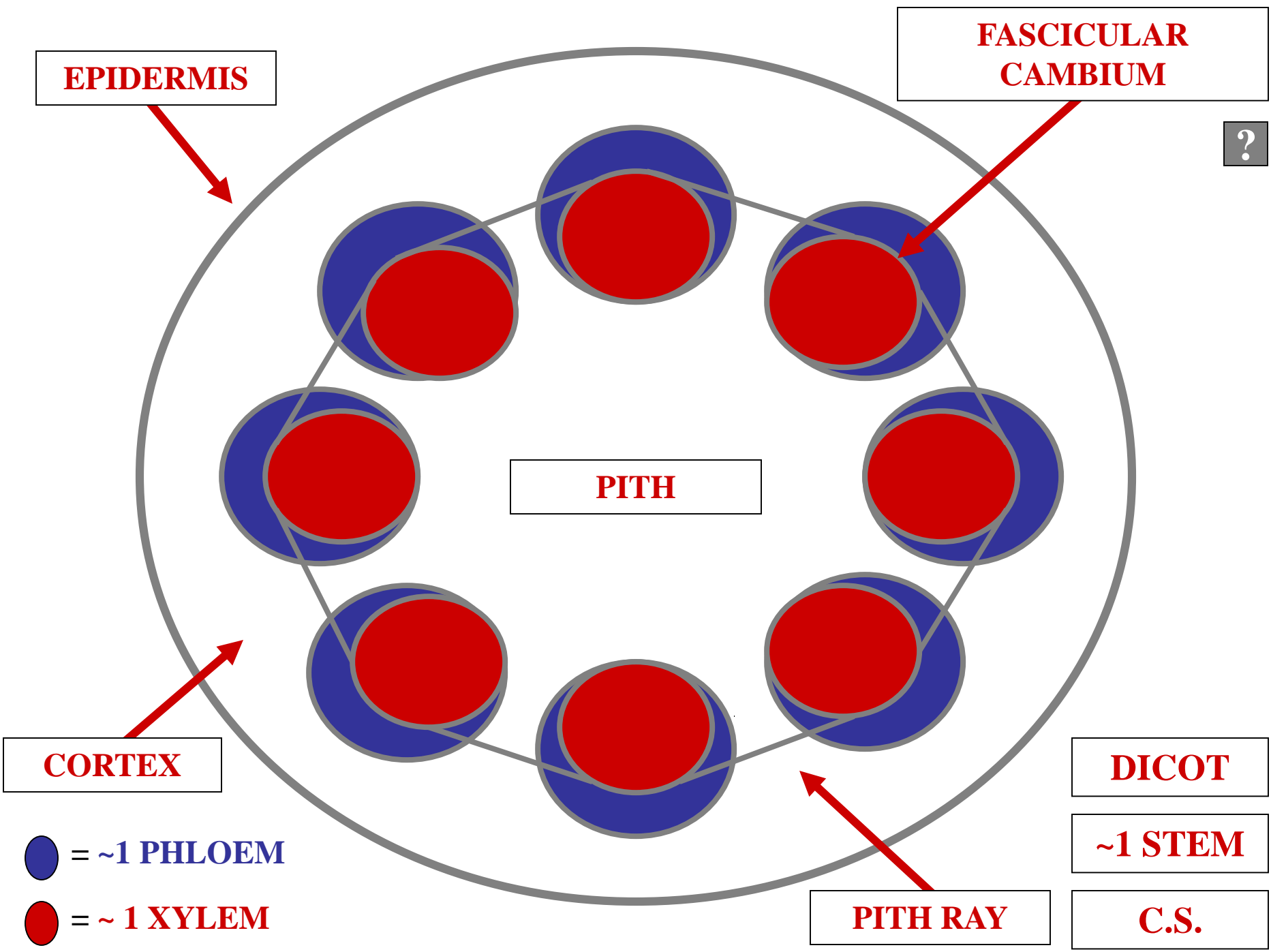
~1 STEM

● = ~1 PHLOEM

● = ~1 XYLEM

PITH RAY

C.S.



EPIDERMIS

FASCICULAR CAMBIUM

?

PITH

CORTEX

DICOT

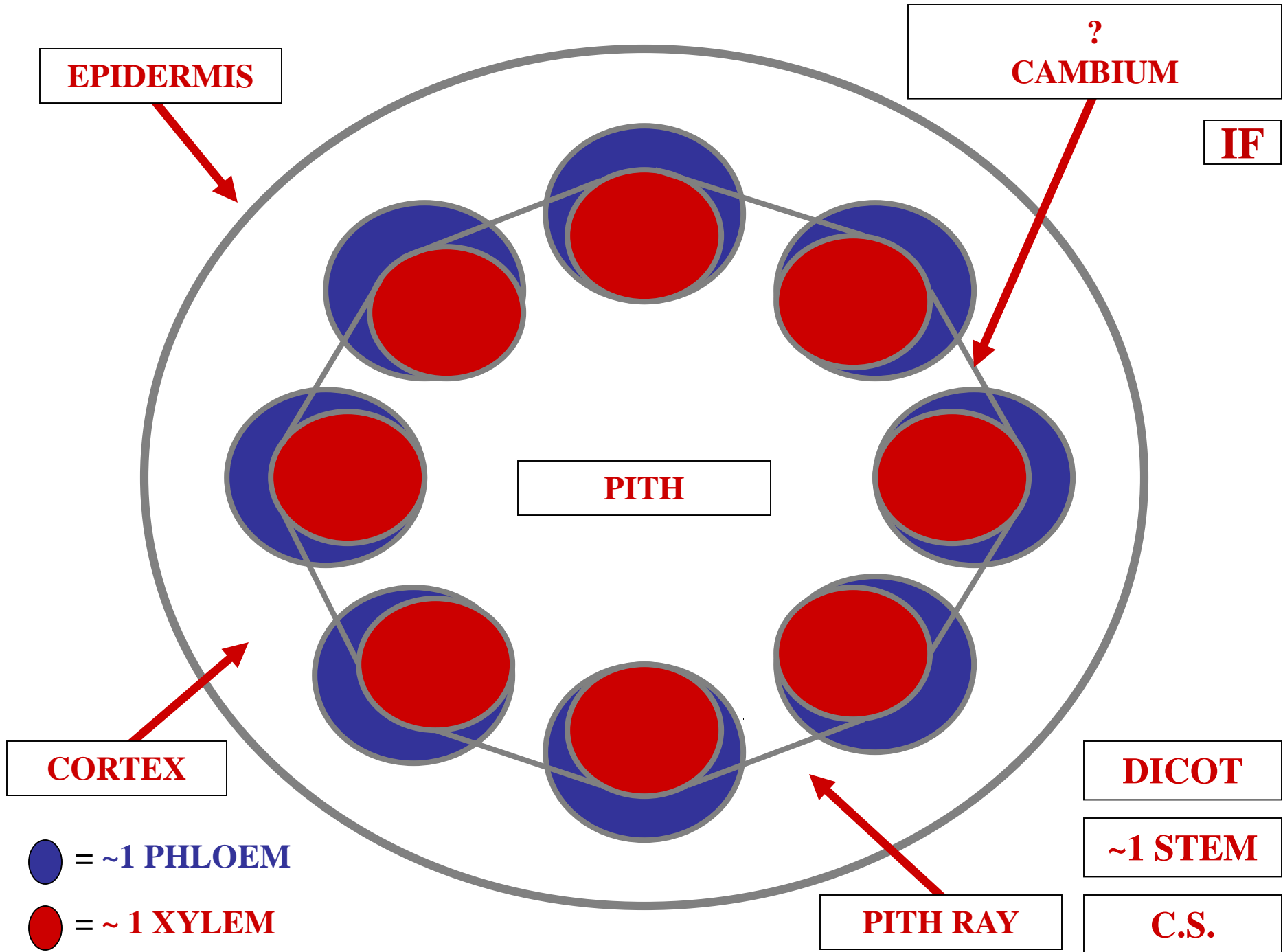
~1 STEM

= ~1 PHLOEM

= ~1 XYLEM

PITH RAY

C.S.



EPIDERMIS

? CAMBIUM

IF

PITH

CORTEX

DICOT

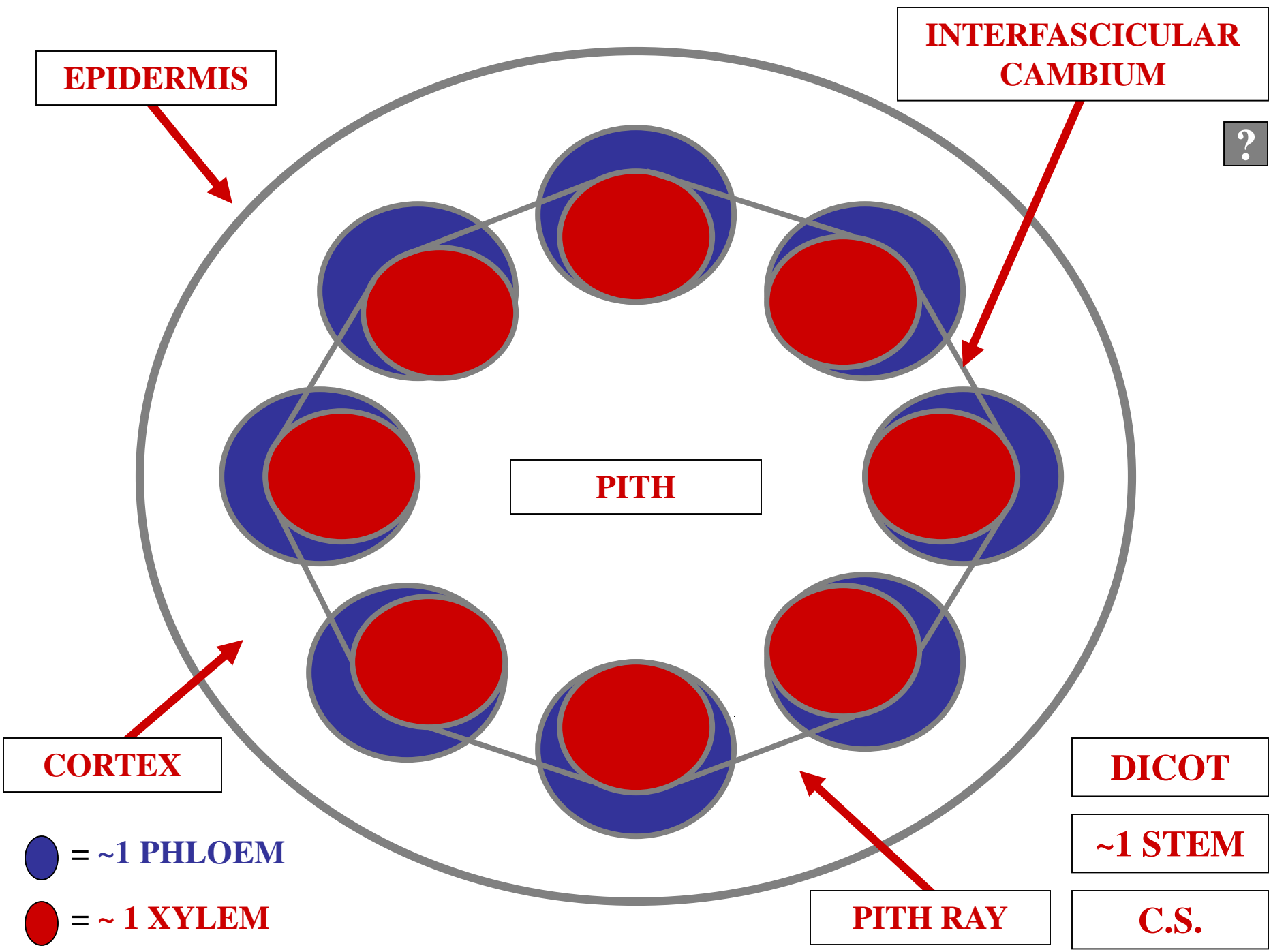
~1 STEM

PITH RAY

C.S.

= ~1 PHLOEM

= ~1 XYLEM



EPIDERMIS

INTERFASCICULAR CAMBIUM



PITH

CORTEX

DICOT

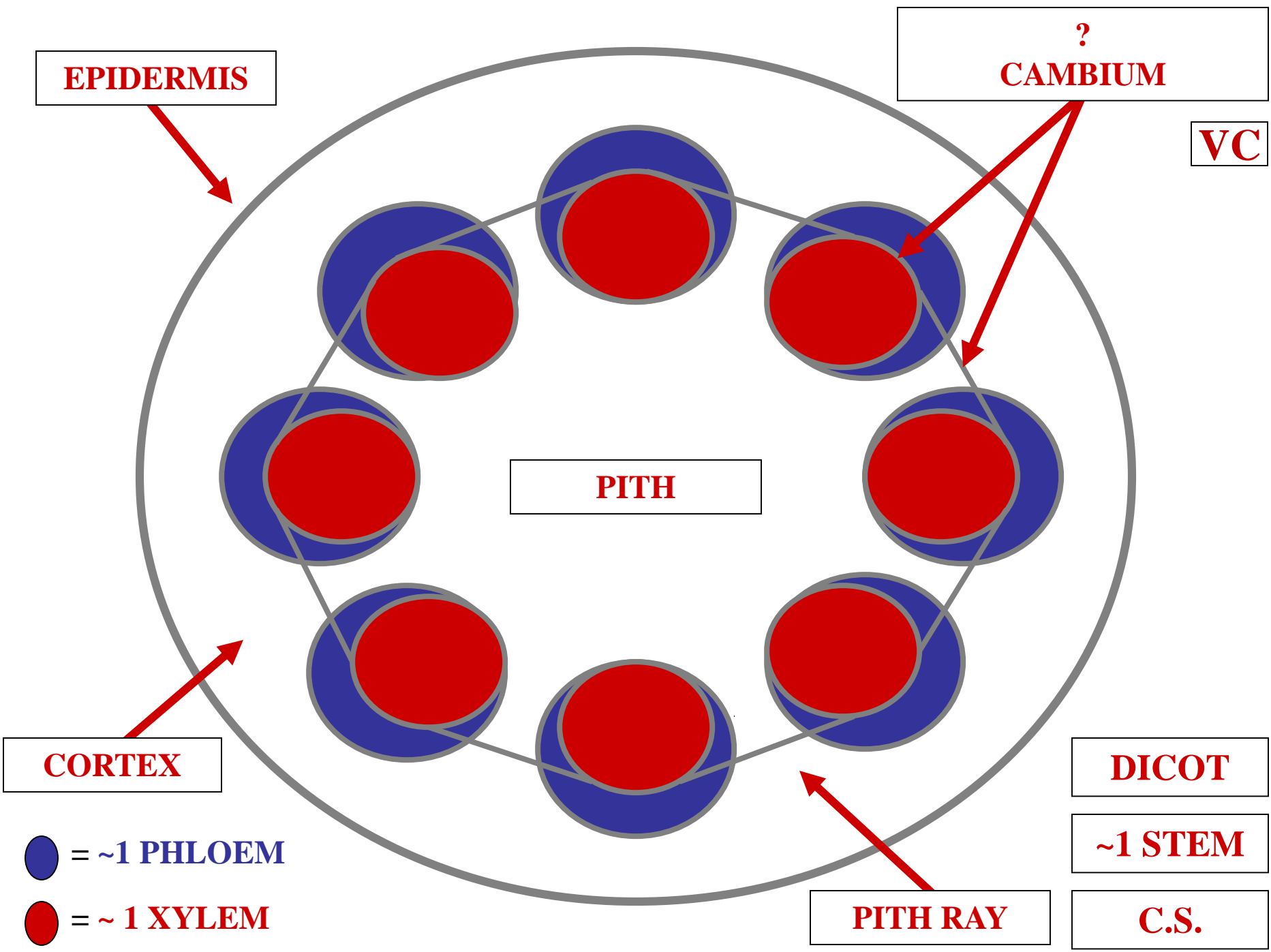
~1 STEM

= ~1 PHLOEM

= ~1 XYLEM

PITH RAY

C.S.



EPIDERMIS

**?
CAMBIUM**

VC

PITH

CORTEX

DICOT

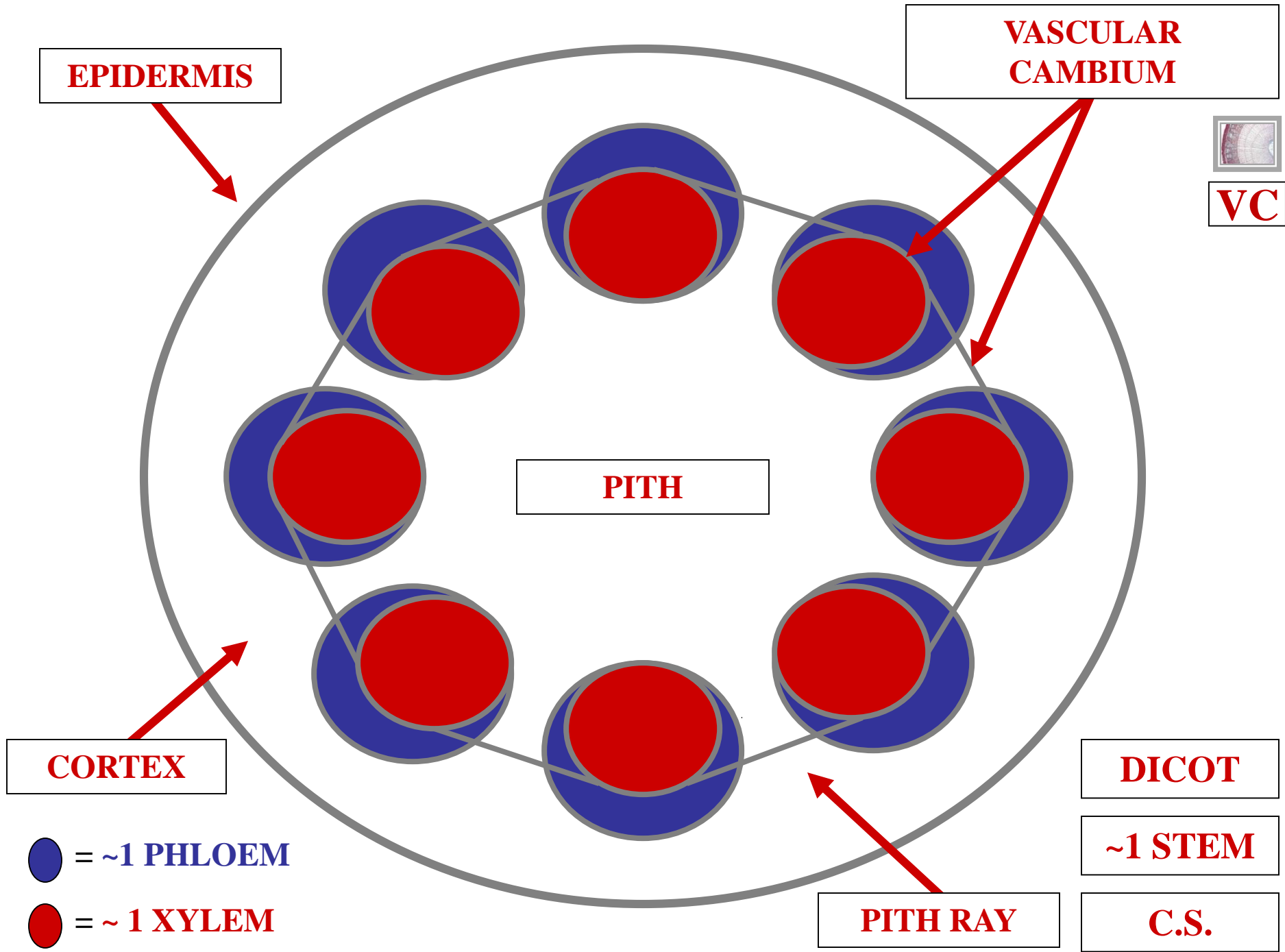
~1 STEM

● = ~1 PHLOEM

● = ~1 XYLEM

PITH RAY

C.S.



~2

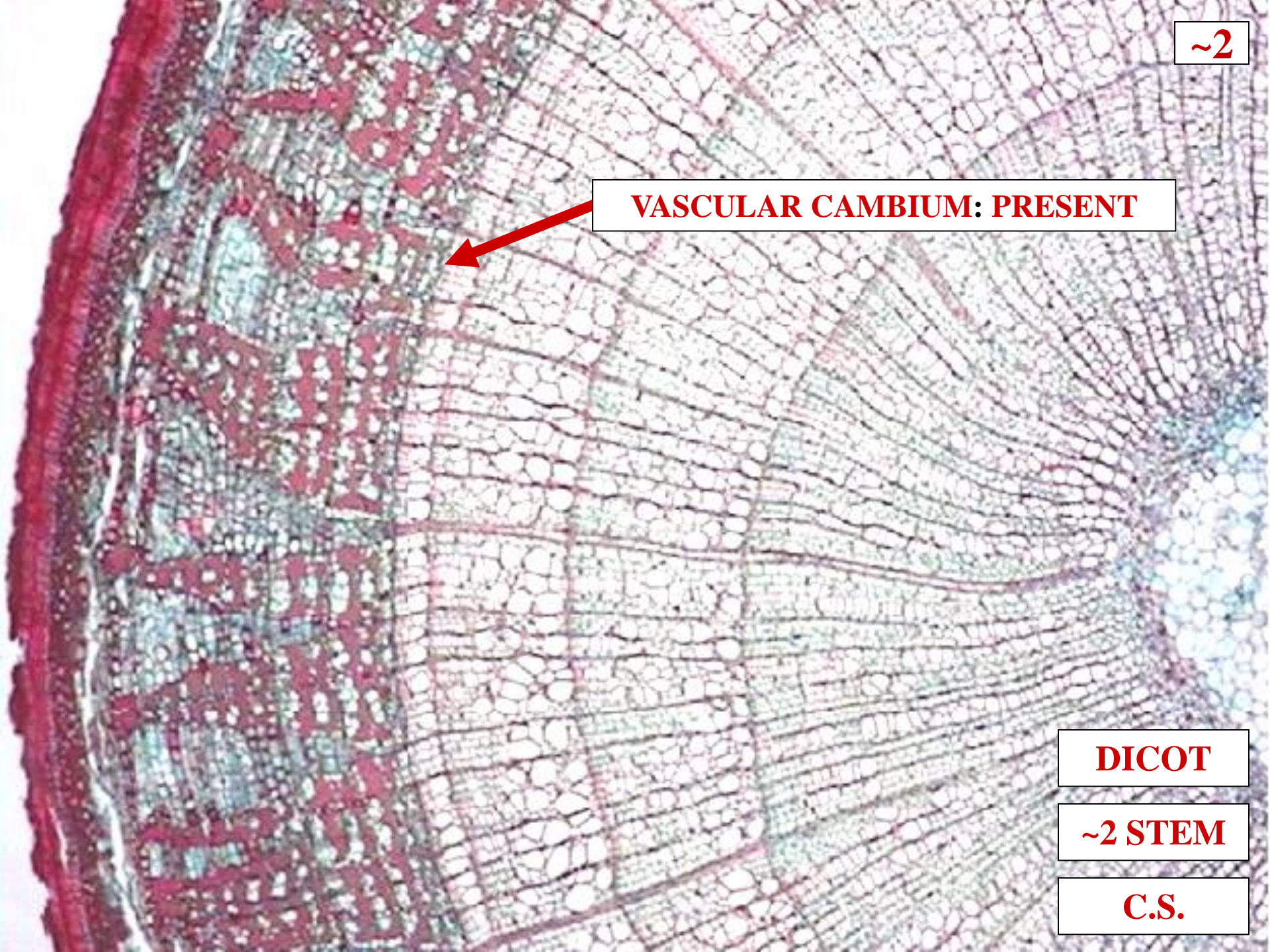
VASCULAR CAMBIUM: PRESENT



DICOT

~2 STEM

C.S.





VASCULAR CAMBIUM: PRESENT

SECONDARY GROWTH: PRESENT

DICOT

~2 STEM

C.S.



MONOCOT STEM PRIMARY GROWTH



MONOCOT STEM DERMAL TISSUE



MONOCOT STEM

DERMAL TISSUE

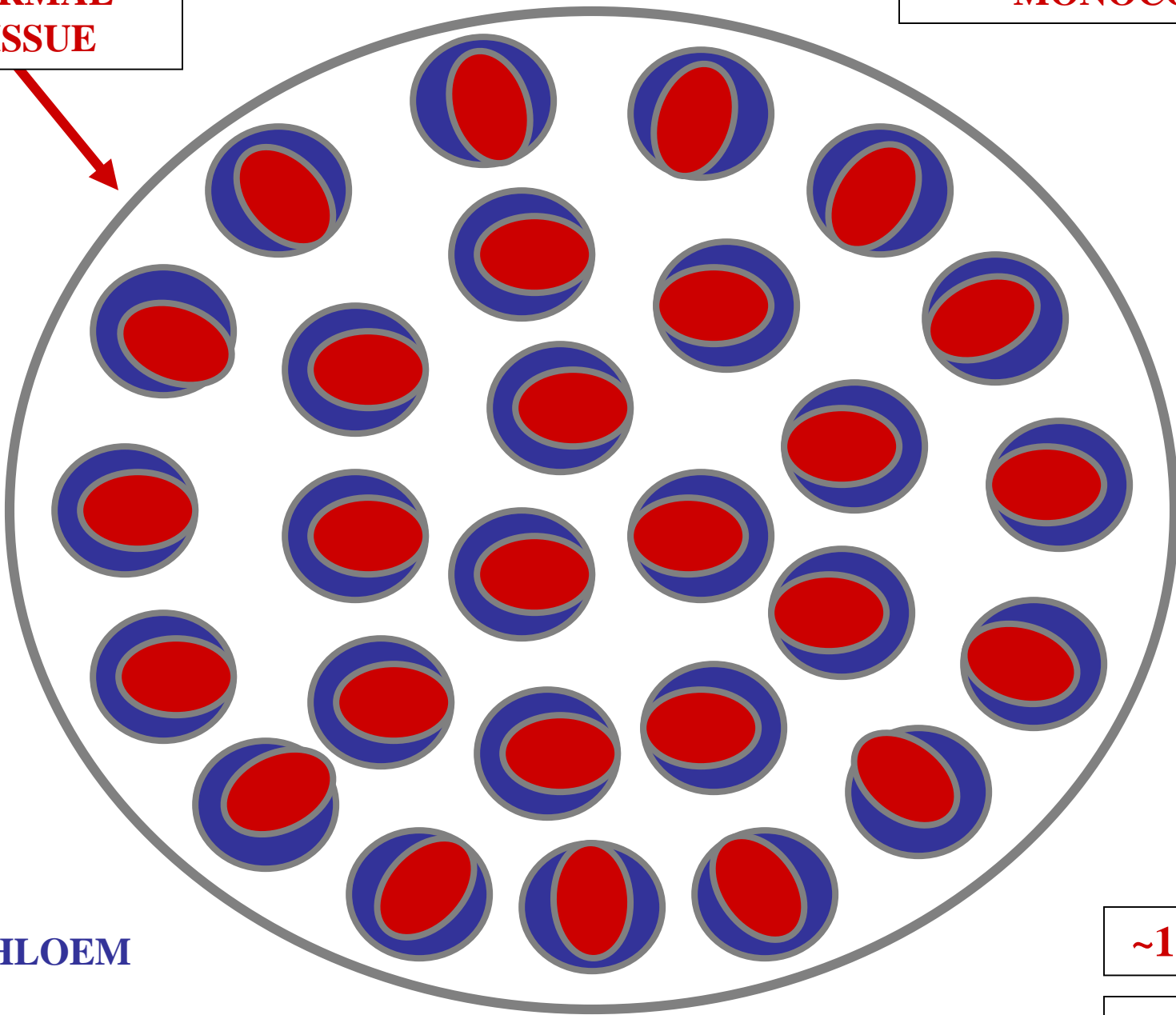
PRIMARY

MERISTEM

**DERMAL
TISSUE**

MONOCOT

?



● = PHLOEM

● = XYLEM

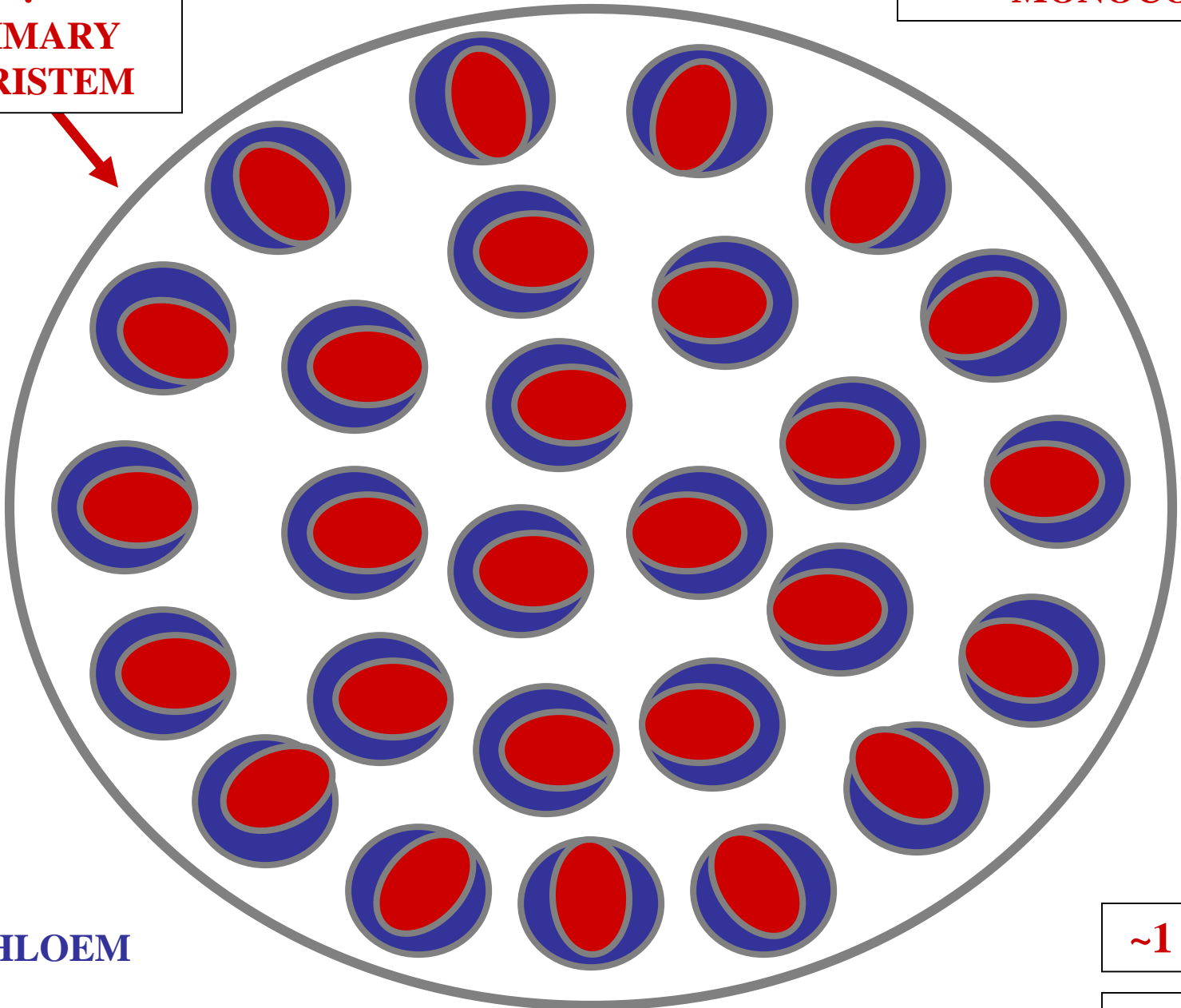
~1 STEM

C.S.

MONOCOT

P

**?
PRIMARY
MERISTEM**



● = PHLOEM

● = XYLEM

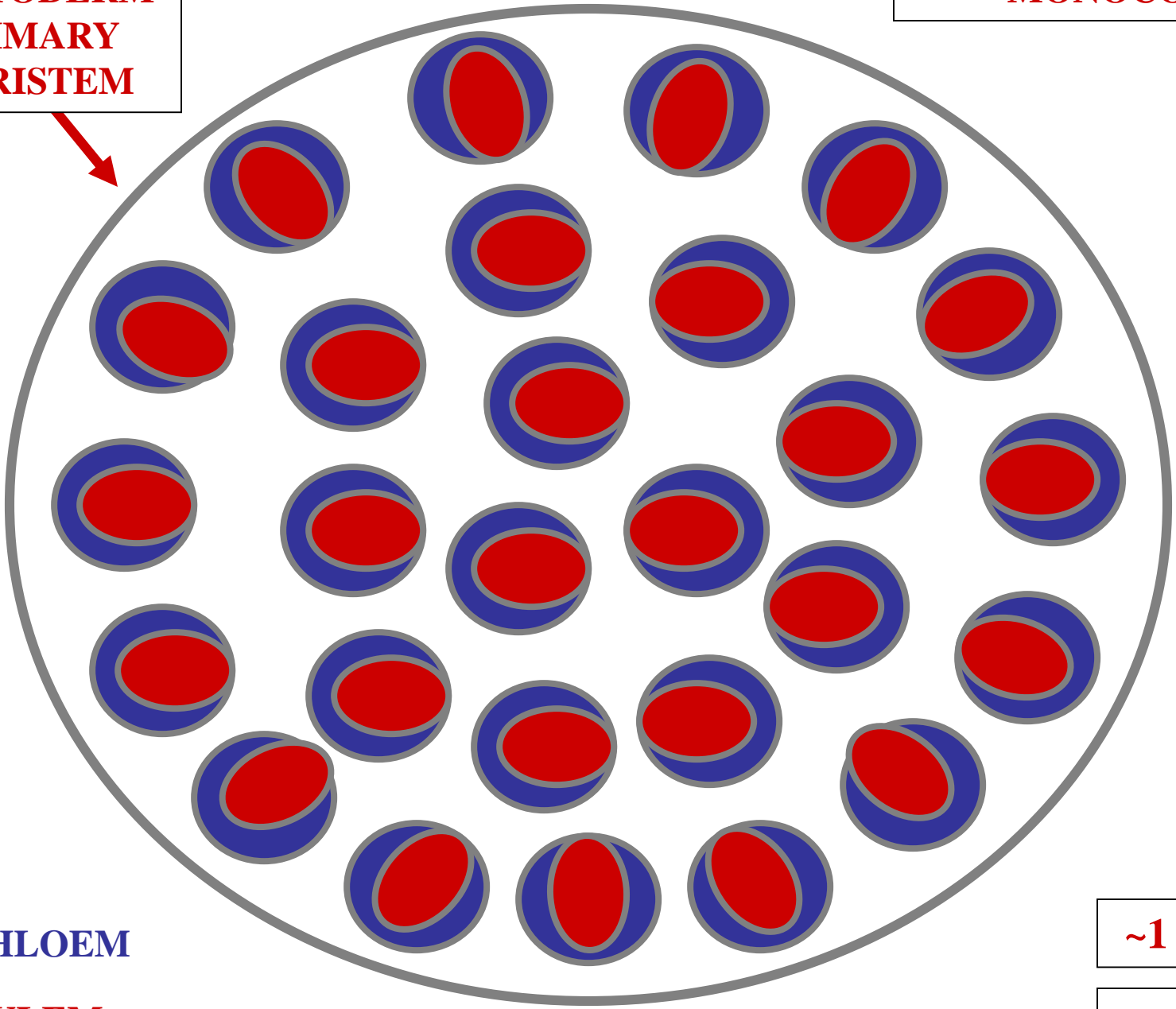
~1 STEM

C.S.

**PROTODERM
PRIMARY
MERISTEM**

MONOCOT

~



● = PHLOEM

● = XYLEM

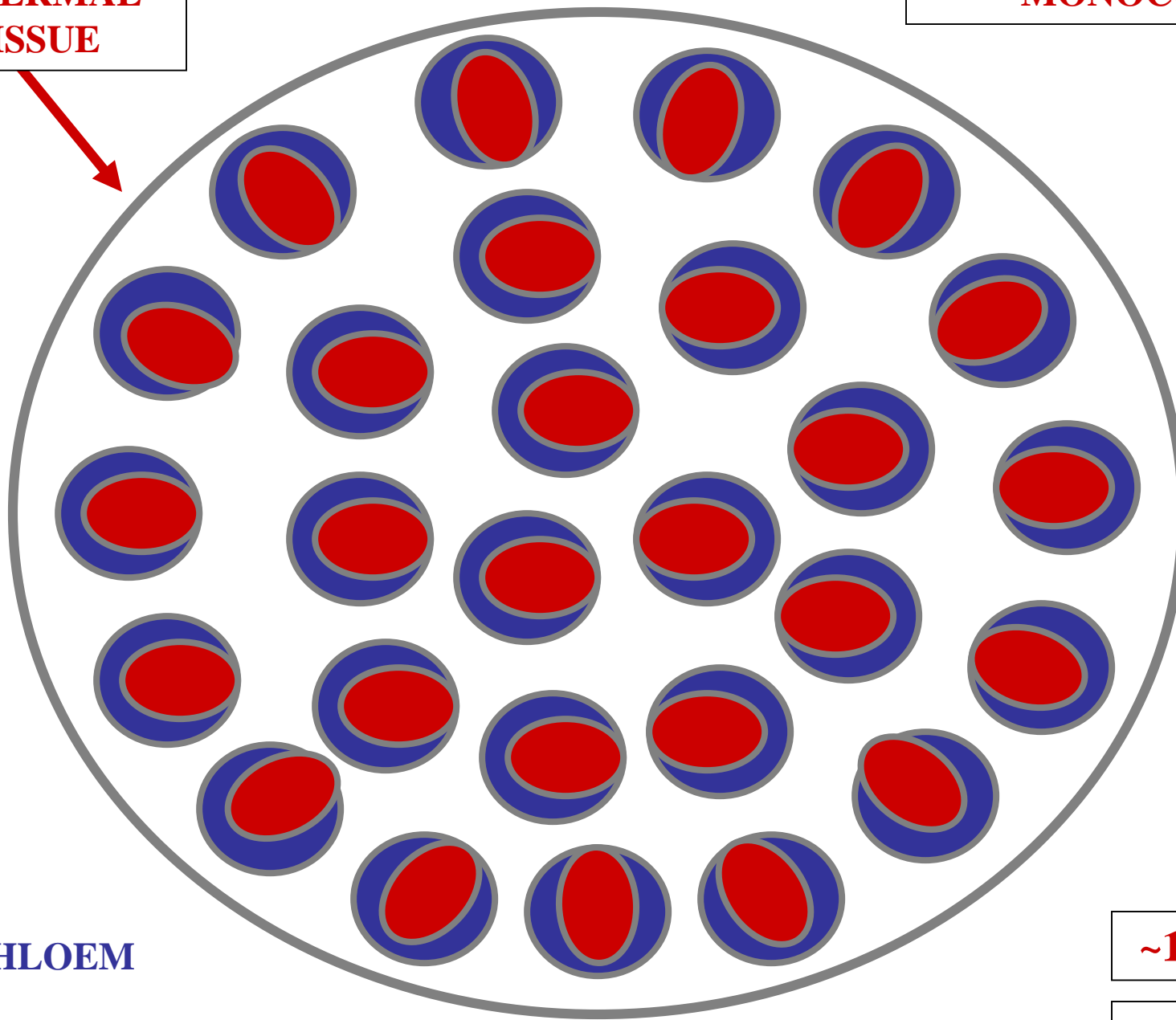
~1 STEM

C.S.

**~1 DERMAL
TISSUE**

MONOCOT

E



● = PHLOEM

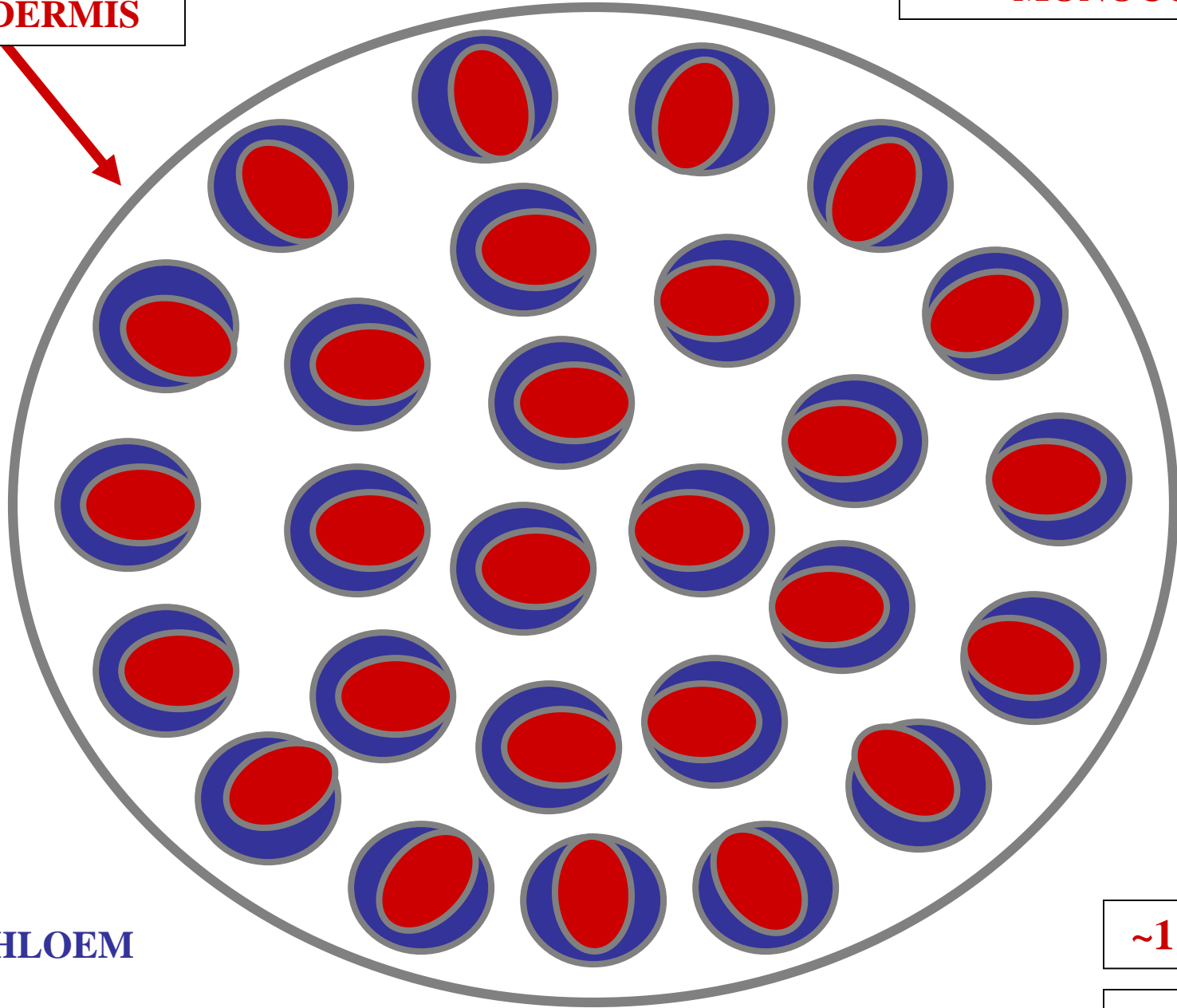
● = XYLEM

~1 STEM

C.S.

EPIDERMIS

MONOCOT

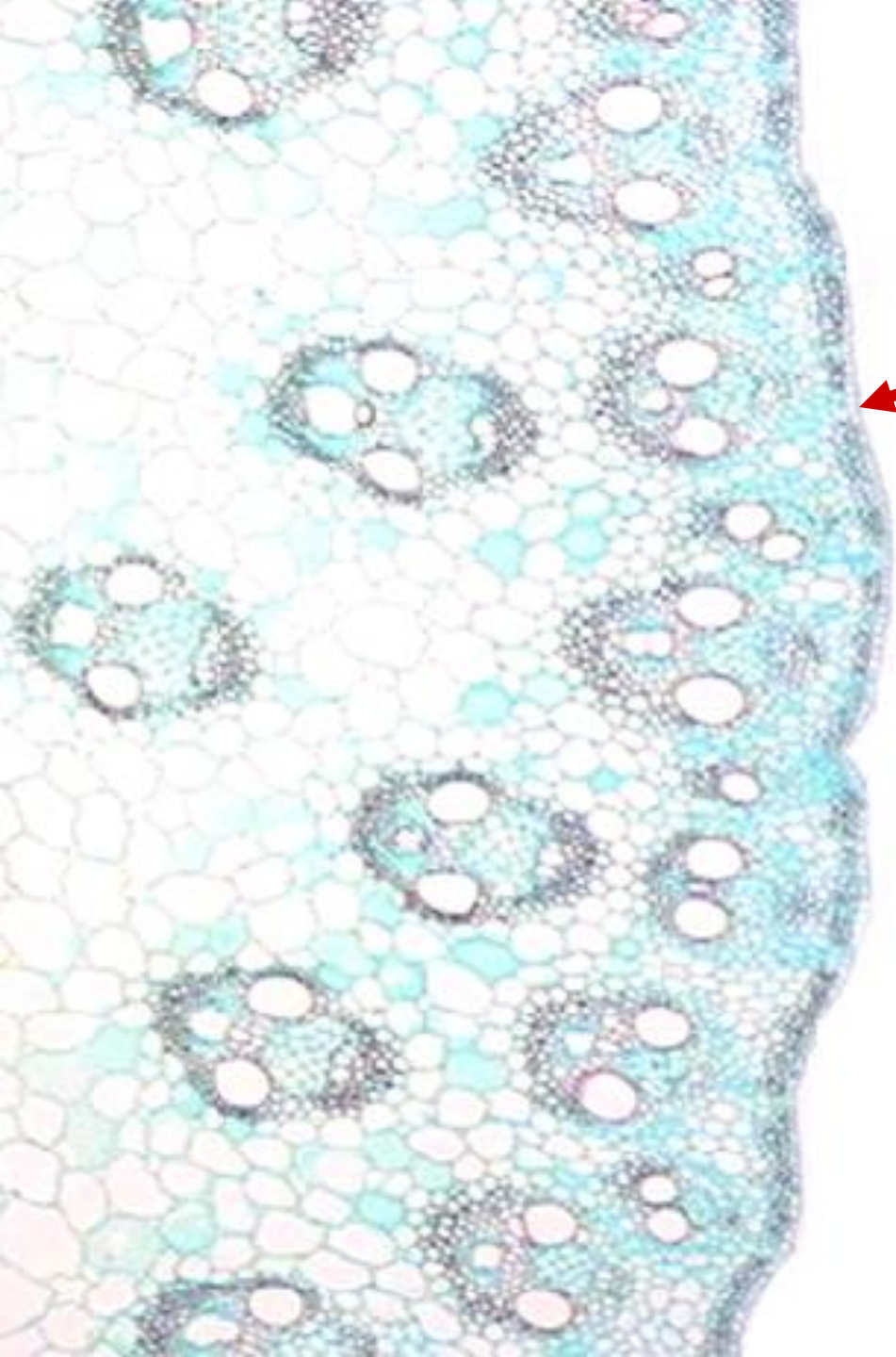


● = PHLOEM

● = XYLEM

~1 STEM

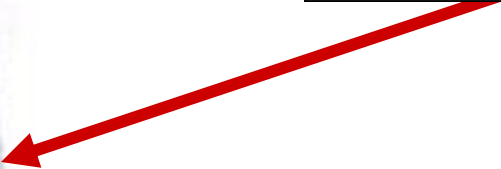
C.S.



MONOCOT



EPIDERMIS



~1 STEM

C.S.



MONOCOT STEM GROUND TISSUE

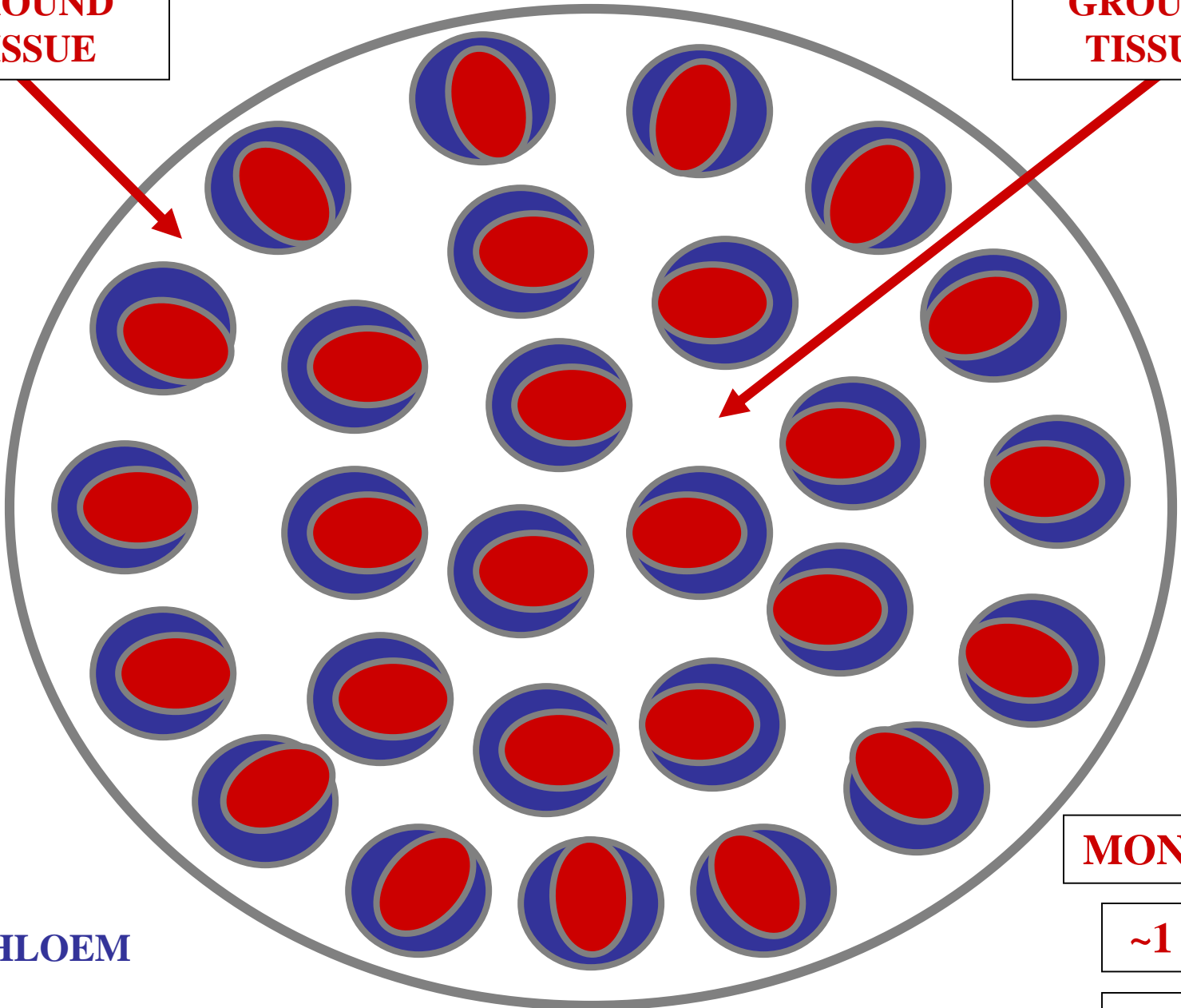


MONOCOT STEM
GROUND TISSUE
PRIMARY
MERISTEM

**GROUND
TISSUE**

**GROUND
TISSUE**

?



● = PHLOEM

● = XYLEM

MONOCOT

~1 STEM

C.S.