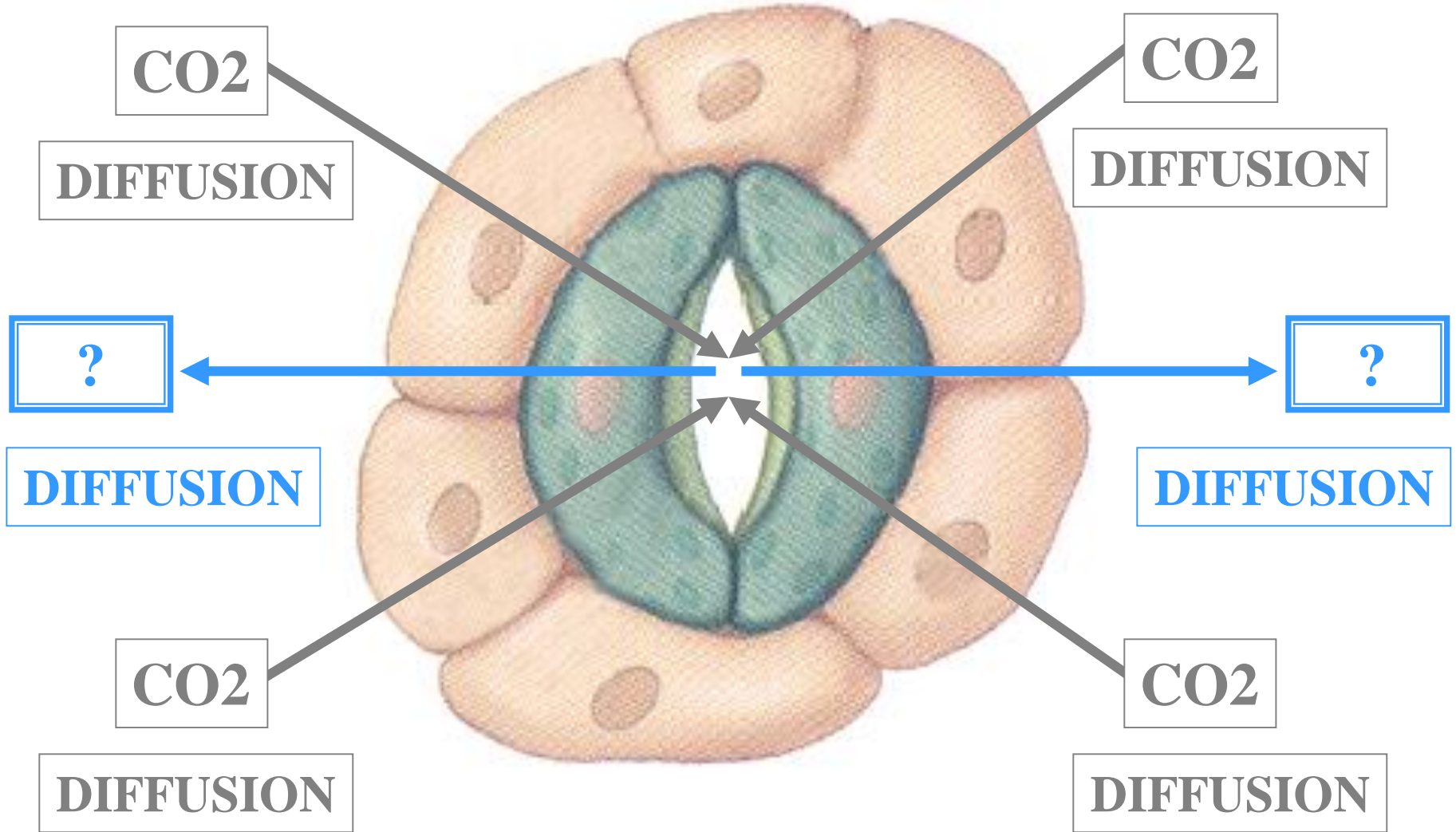


# LEAF STOMATE

ATMOSPHERE

ATMOSPHERE



CO<sub>2</sub>

DIFFUSION

?

DIFFUSION

CO<sub>2</sub>

DIFFUSION

CO<sub>2</sub>

DIFFUSION

?

DIFFUSION

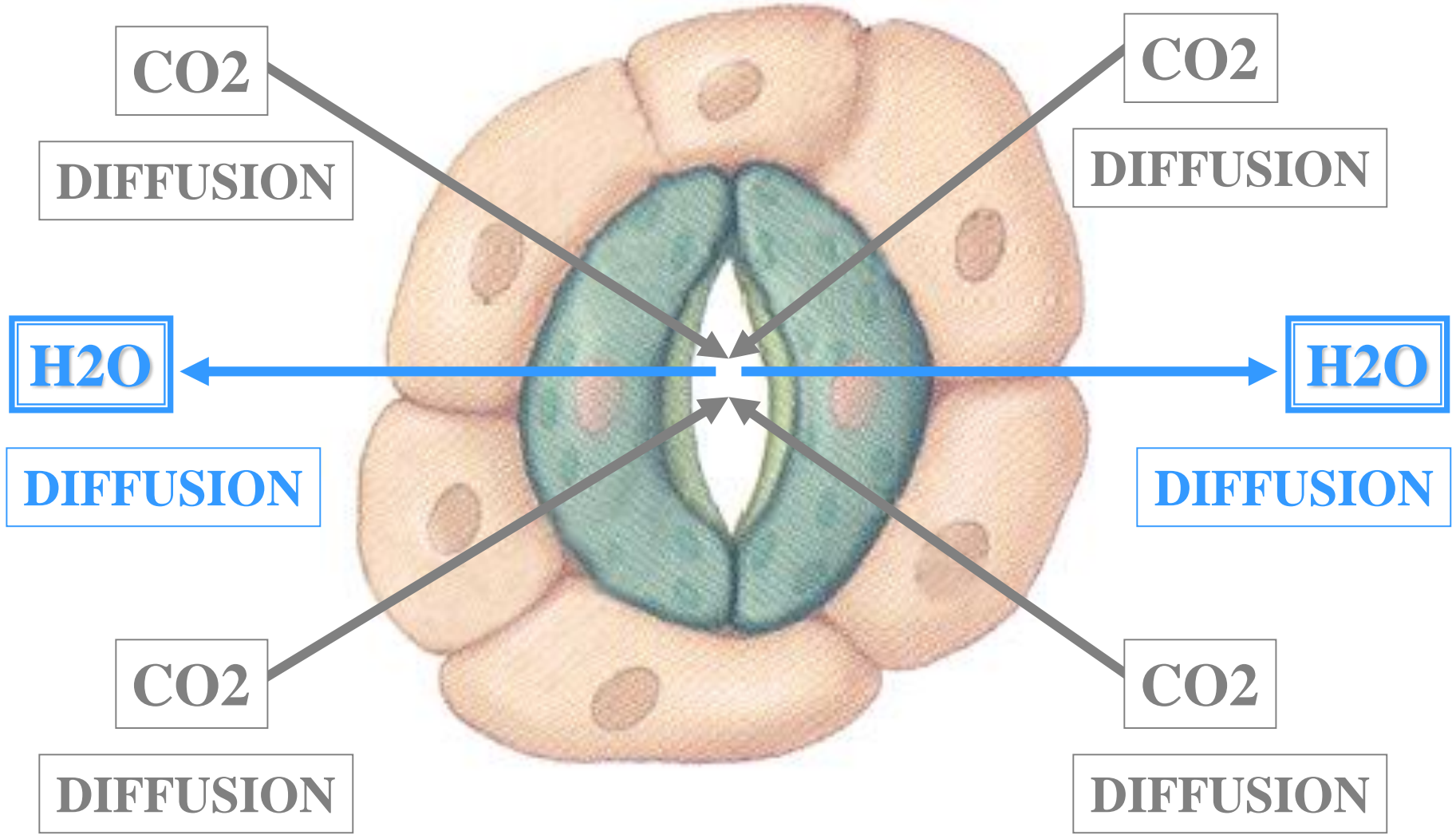
CO<sub>2</sub>

DIFFUSION

# LEAF STOMATE

ATMOSPHERE

ATMOSPHERE



CO<sub>2</sub>

DIFFUSION

CO<sub>2</sub>

DIFFUSION

H<sub>2</sub>O

DIFFUSION

H<sub>2</sub>O

DIFFUSION

CO<sub>2</sub>

DIFFUSION

CO<sub>2</sub>

DIFFUSION



# LEAF STOMATE

ATMOSPHERE

ATMOSPHERE

CO<sub>2</sub>

DIFFUSION

CO<sub>2</sub>

DIFFUSION

H<sub>2</sub>O

DIFFUSION

TRANSPIRATION

H<sub>2</sub>O

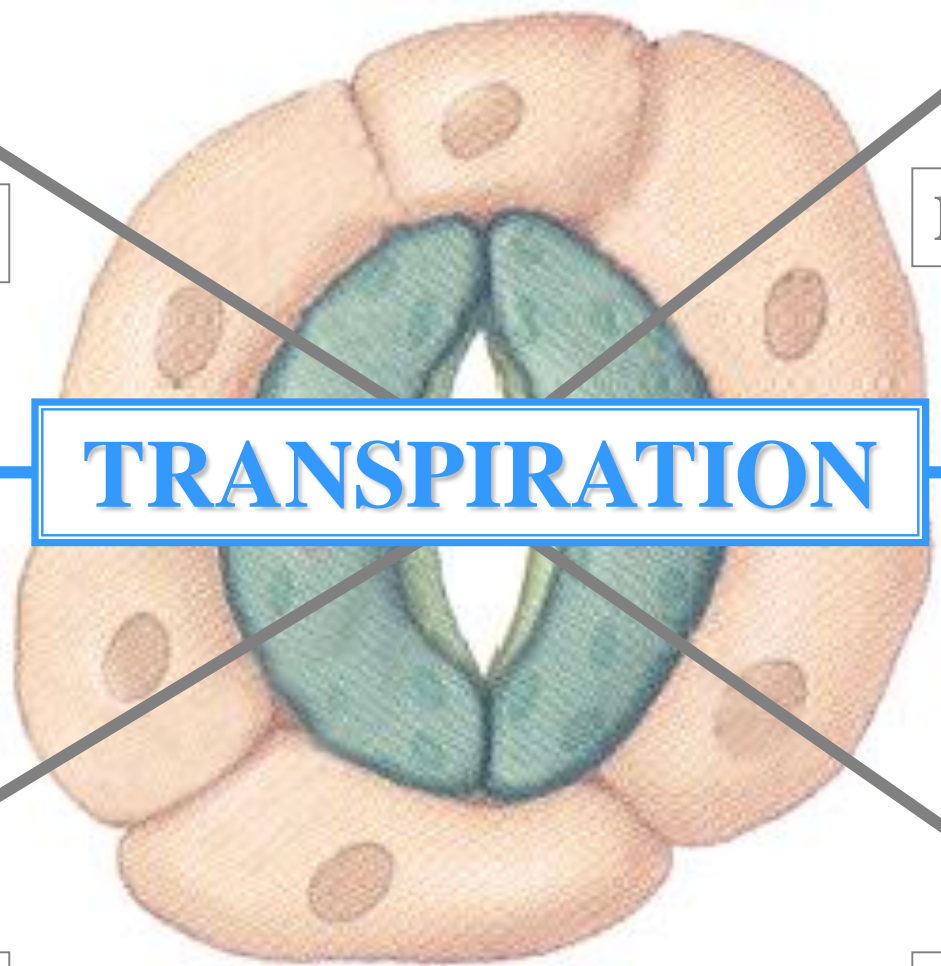
DIFFUSION

CO<sub>2</sub>

DIFFUSION

CO<sub>2</sub>

DIFFUSION







***WATER  
RETENTION  
VITAL***

**C4**

**CORN**







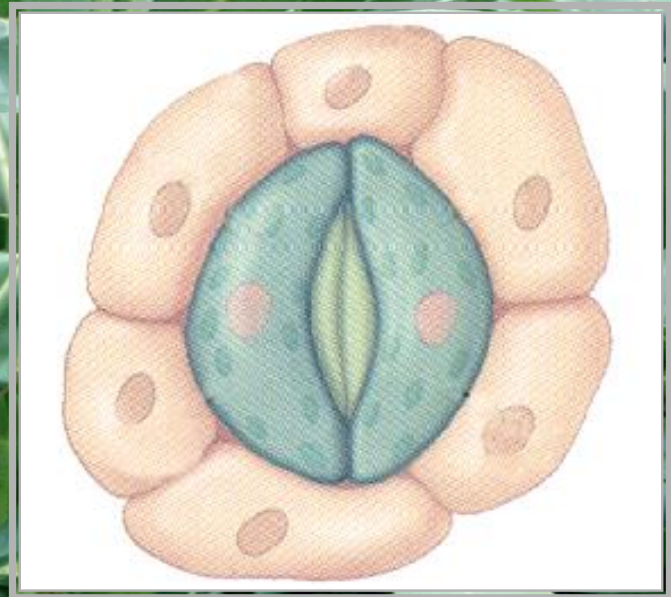
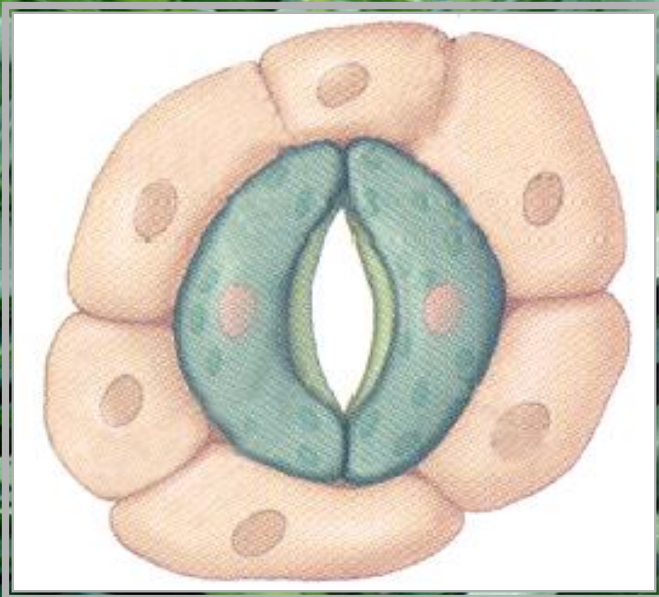
# C4

# WATER

# RETENTION

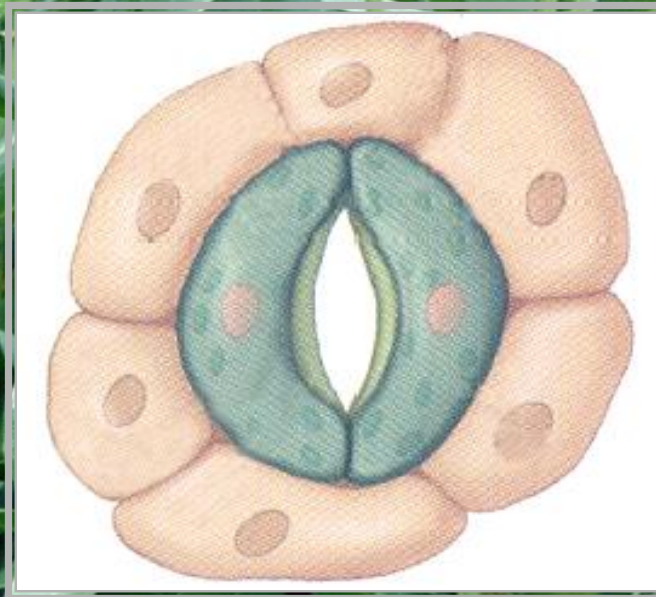
# APPLIED

# *COOL HUMID DAY*





# *COOL HUMID DAY*





ATMOSPHERE

# STOMATE OPEN

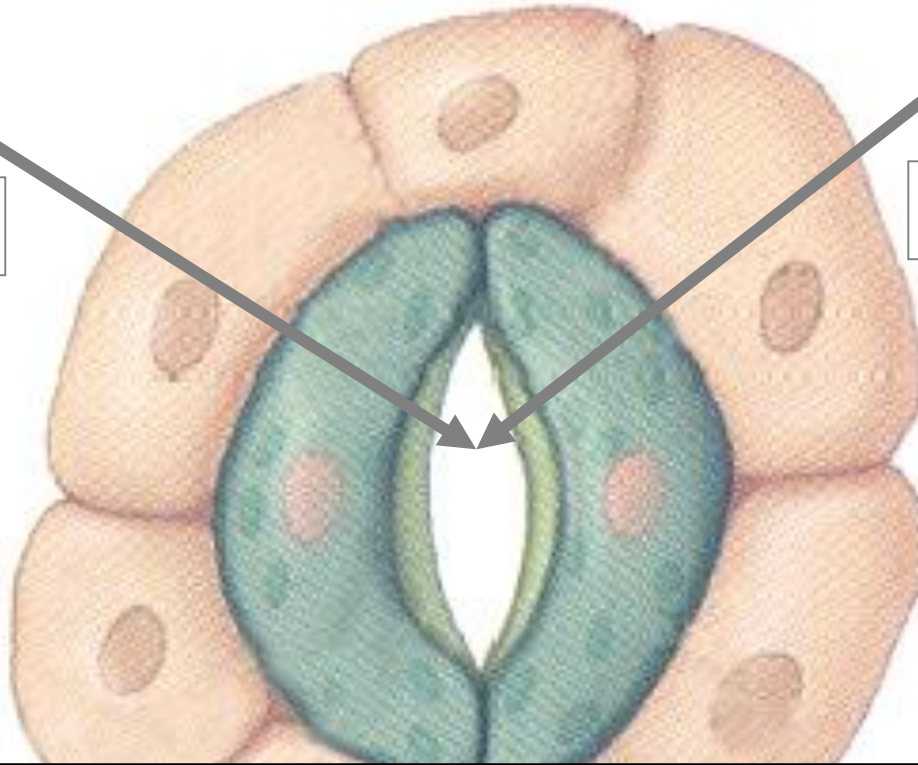
ATMOSPHERE

CO<sub>2</sub>

DIFFUSION

CO<sub>2</sub>

DIFFUSION



***COOL HUMID DAY***



**PLANT**

**ATMOSPHERE**

**SH**

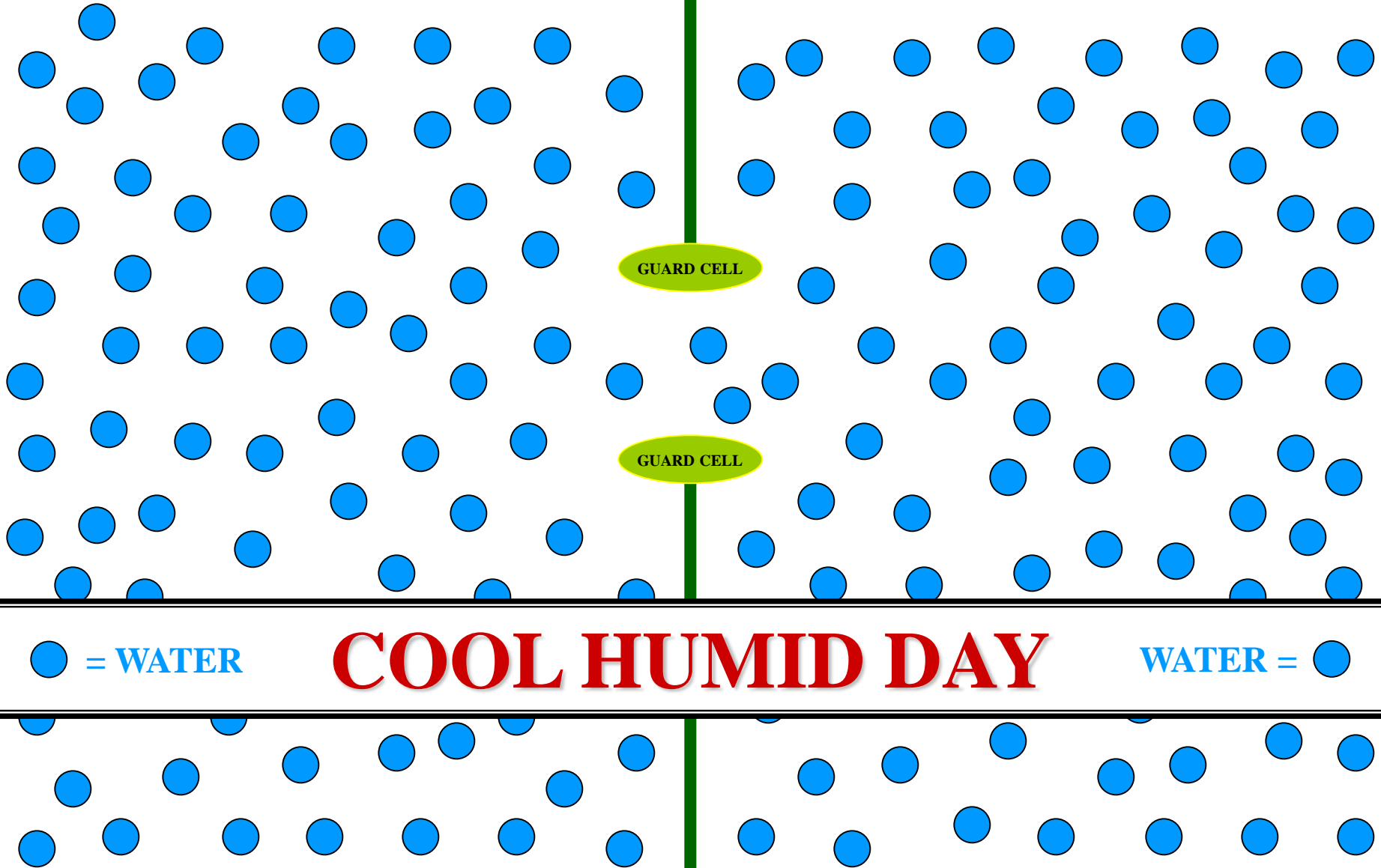
GUARD CELL

GUARD CELL

● = WATER

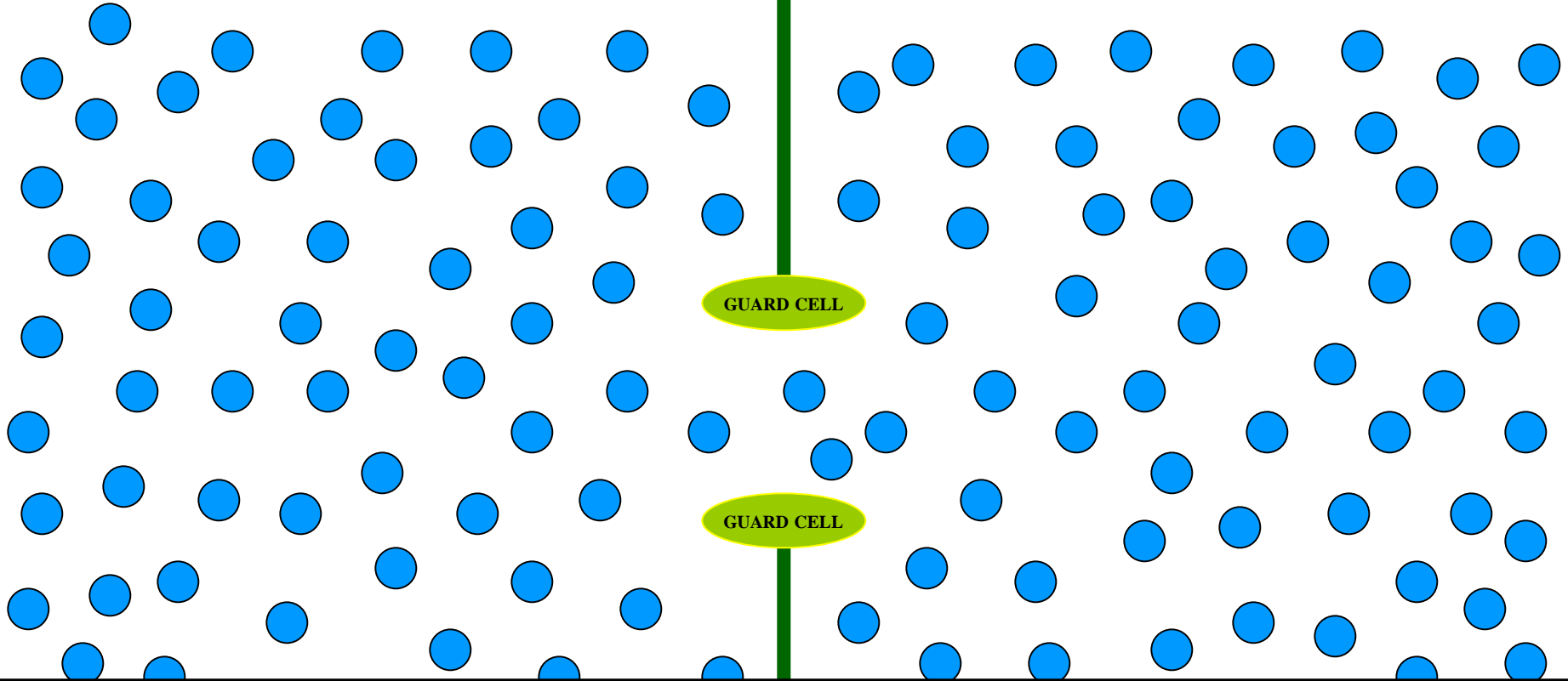
**COOL HUMID DAY**

WATER = ●

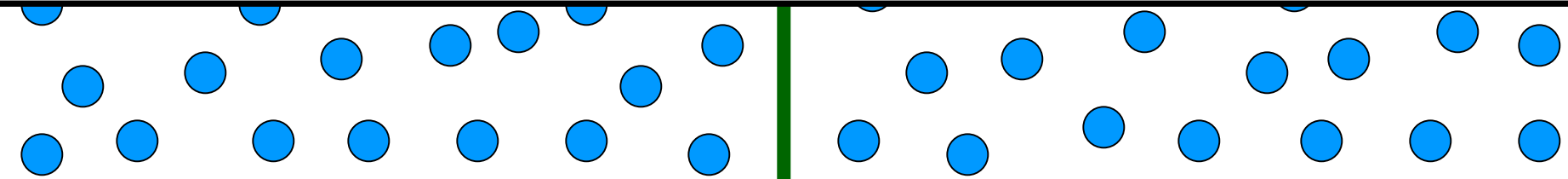


# PLANT

# ATMOSPHERE



● = WATER **SHALLOW GRADIENT** WATER = ●





# LEAF STOMATE

ATMOSPHERE

ATMOSPHERE

CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION

H<sub>2</sub>O

TRANSPIRATION

H<sub>2</sub>O

DIFFUSION

DIFFUSION

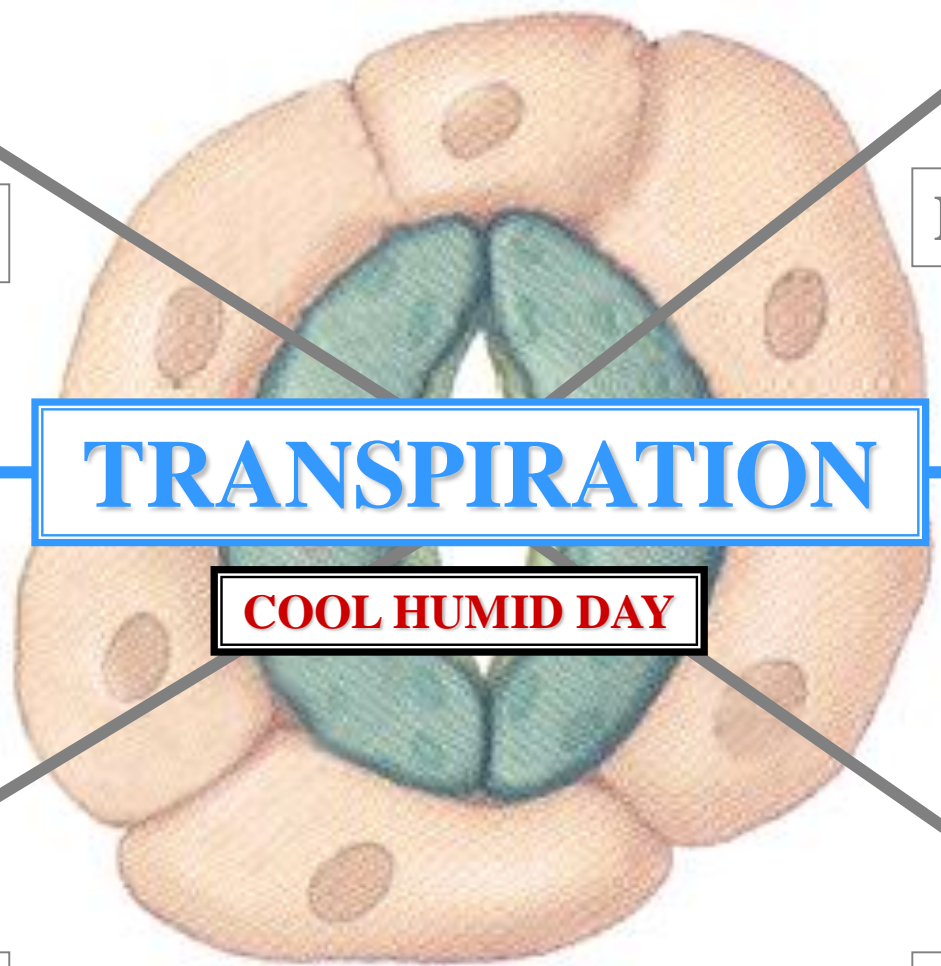
COOL HUMID DAY

CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION





ATMOSPHERE

# LEAF STOMATE

ATMOSPHERE

CO<sub>2</sub>

CO<sub>2</sub>

COOL HUMID DAY

## LOW

COOL HUMID DAY

# TRANSPIRATION POTENTIAL

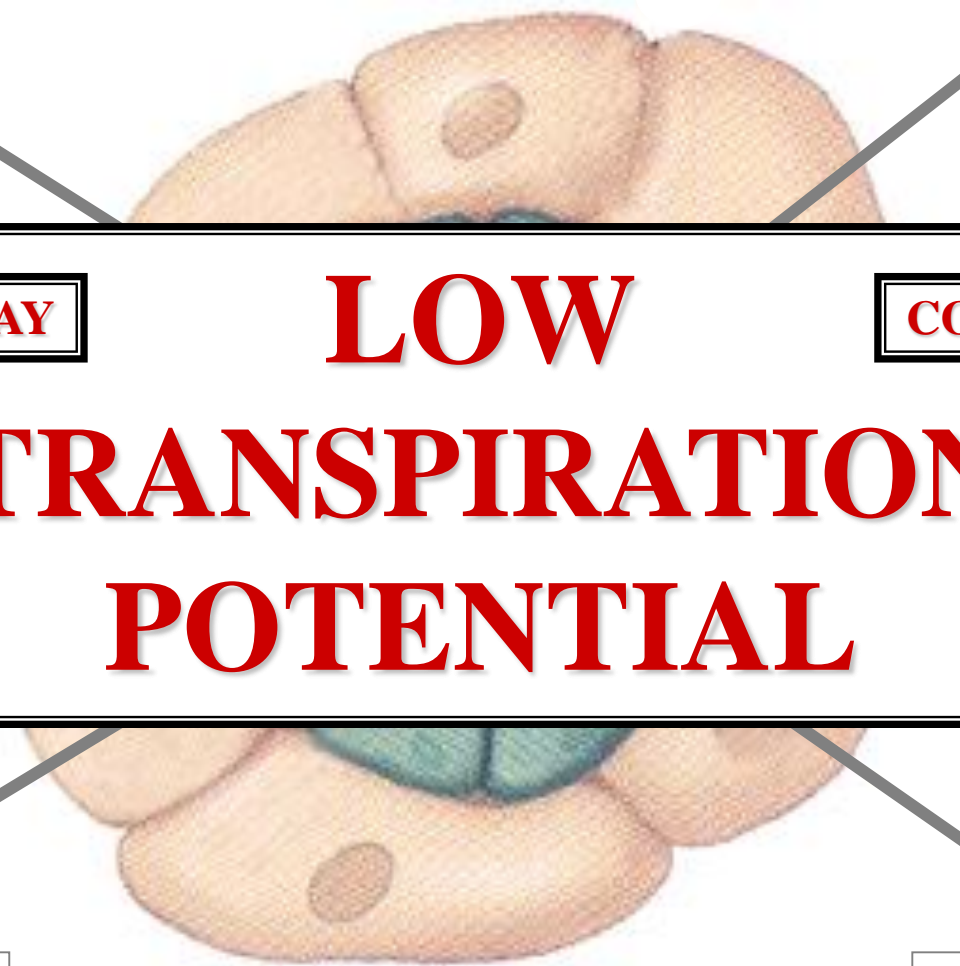


CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION



ATMOSPHERE

# STOMATE OPEN

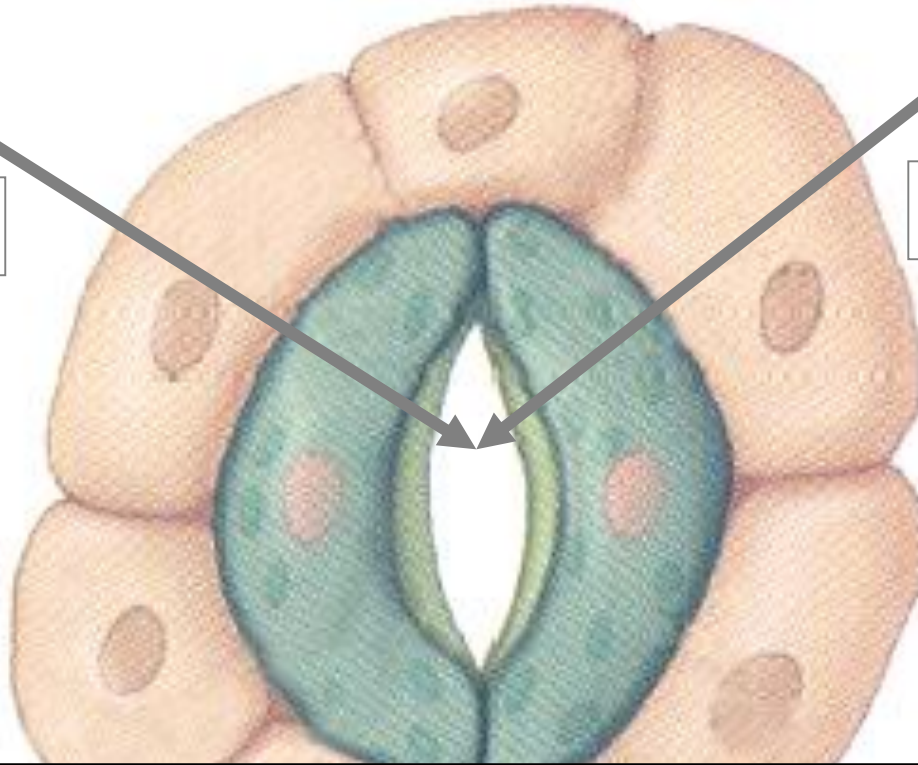
ATMOSPHERE

CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

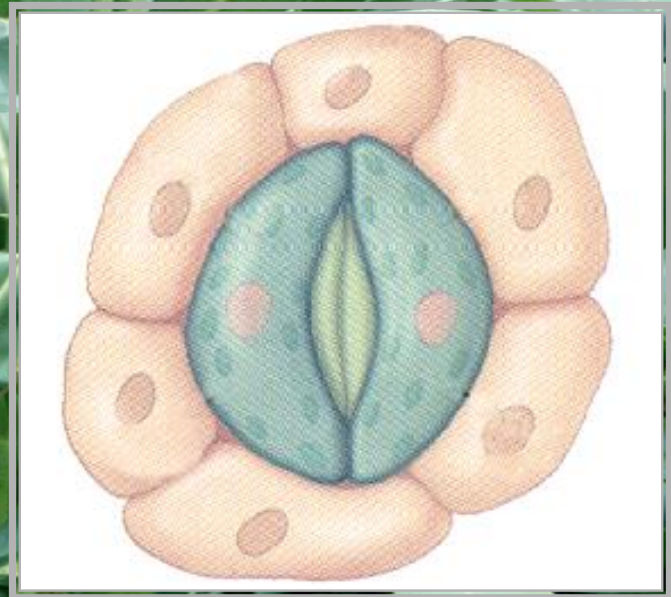
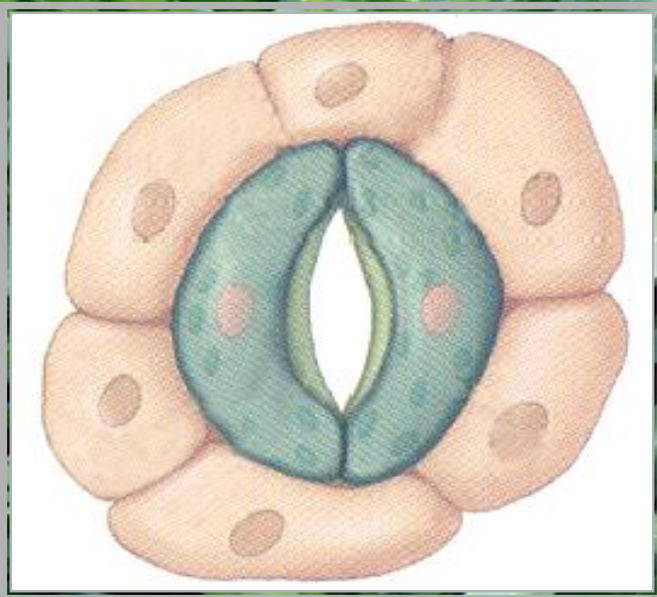
DIFFUSION



***COOL HUMID DAY***

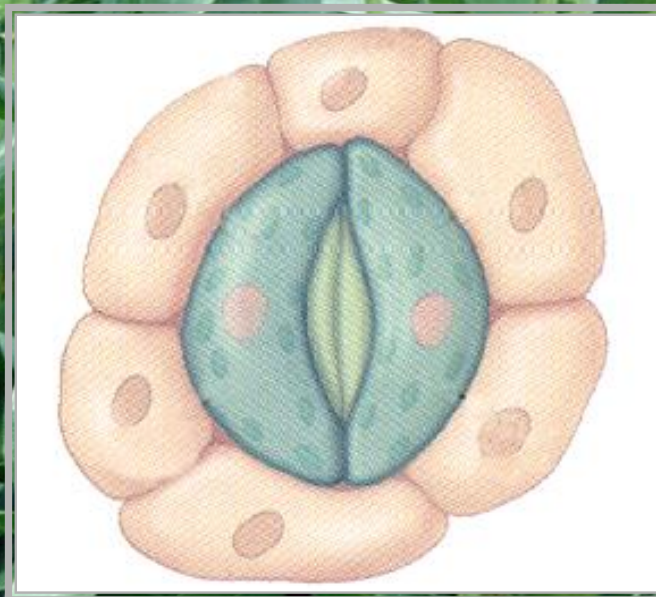


# ***HOT DRY DAY***





# ***HOT DRY DAY***





ATMOSPHERE

# STOMATE CLOSED

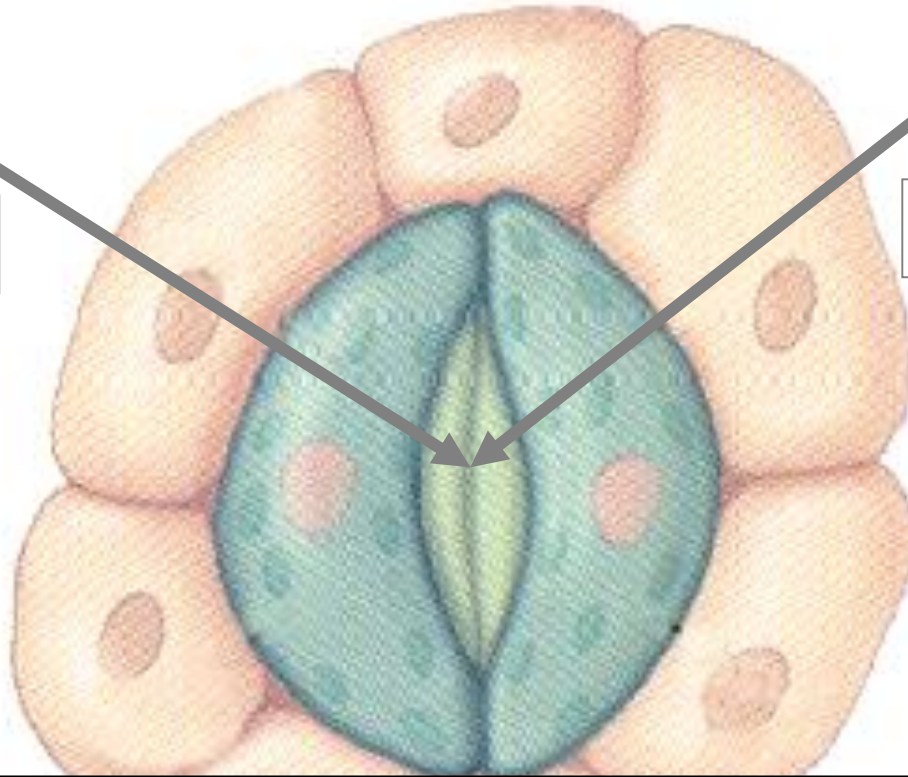
ATMOSPHERE

CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION



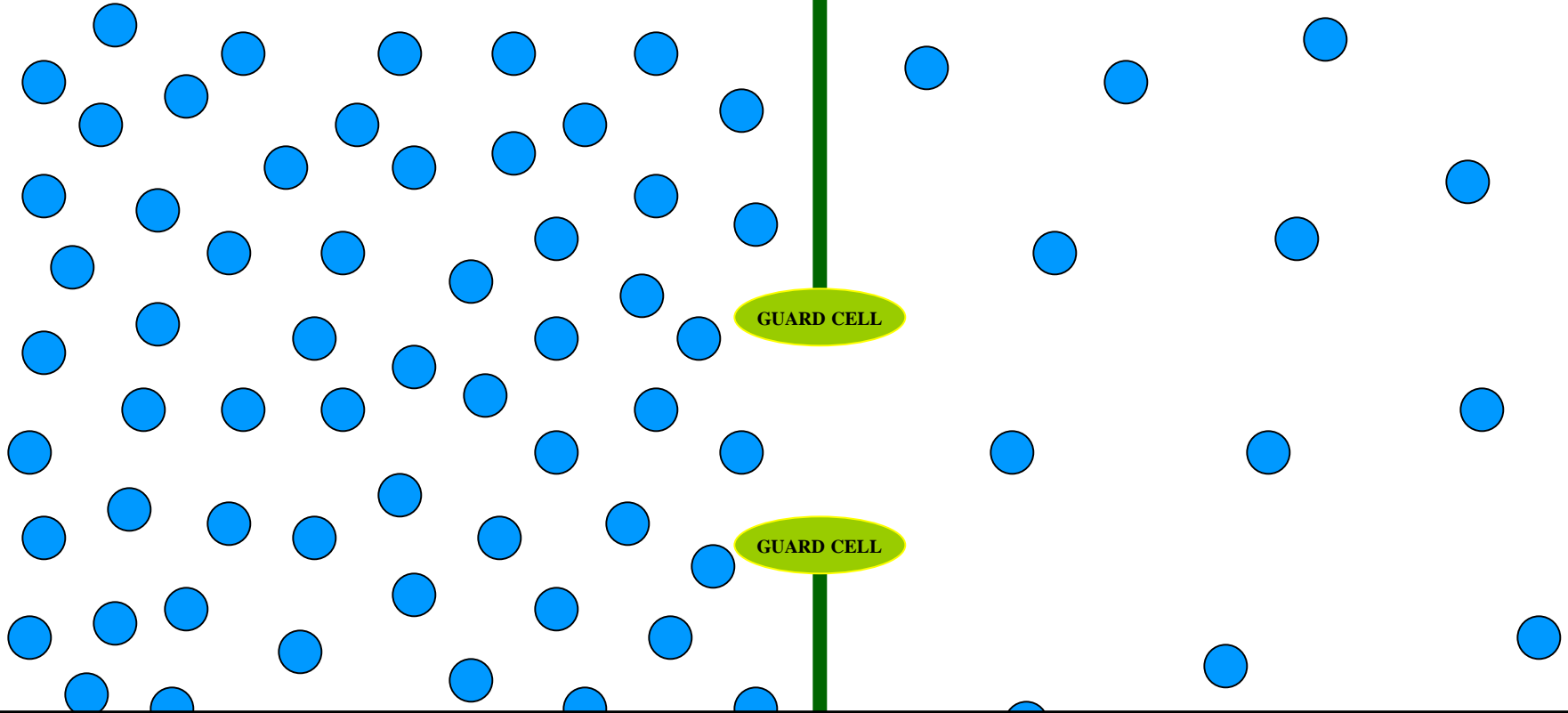
***HOT DRY DAY***



**PLANT**

**ATMOSPHERE**

**ST**



● = WATER

**DRY HOT DAY**

WATER = ●

**PLANT**

**ATMOSPHERE**

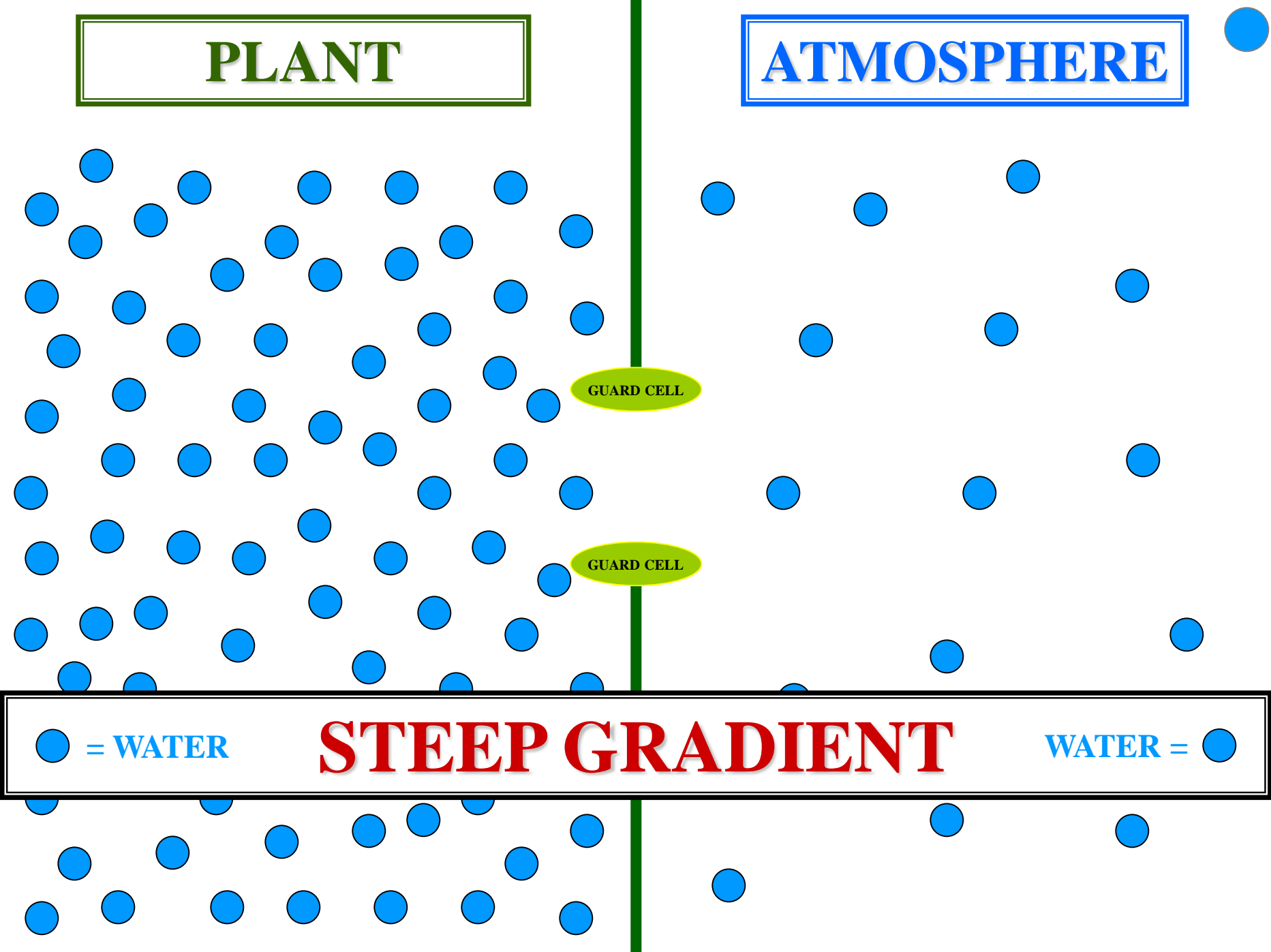
GUARD CELL

GUARD CELL

● = WATER

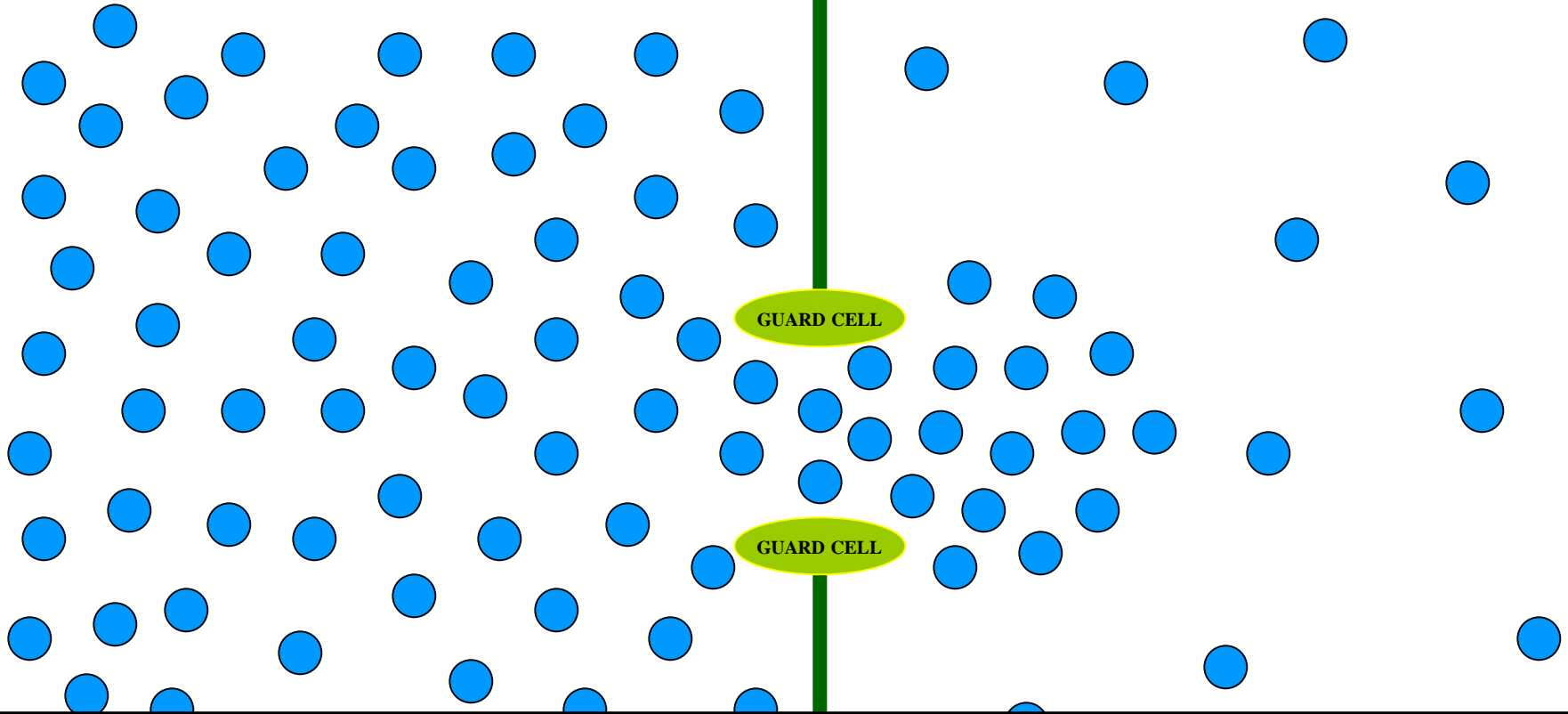
**STEEP GRADIENT**

WATER = ●



**PLANT**

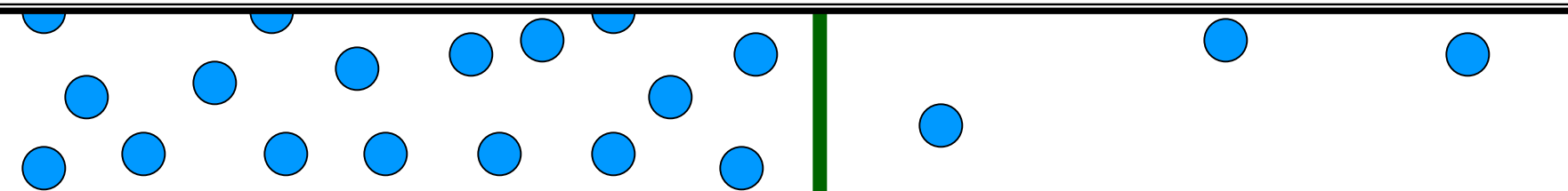
**ATMOSPHERE**



● = WATER

**STEEP GRADIENT**

WATER = ●





# LEAF STOMATE

ATMOSPHERE

ATMOSPHERE

CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION

H<sub>2</sub>O

TRANSPIRATION

H<sub>2</sub>O

DIFFUSION

DIFFUSION

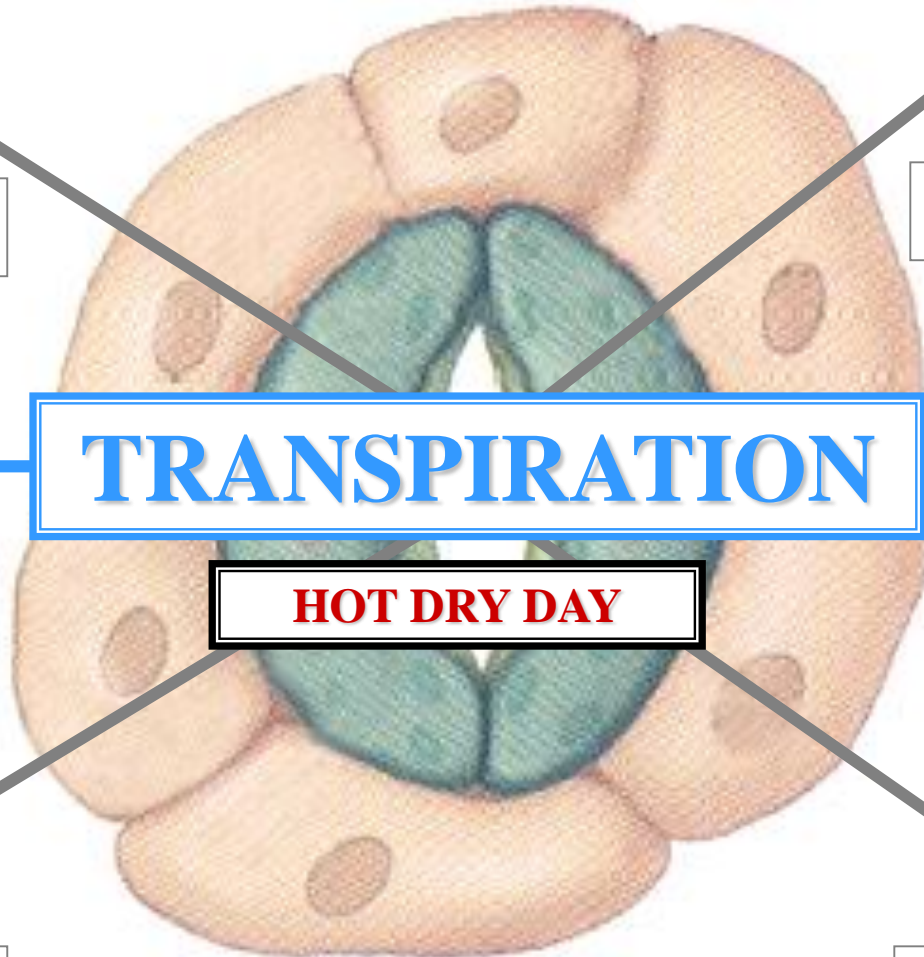
HOT DRY DAY

CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION



ATMOSPHERE

# LEAF STOMATE

ATMOSPHERE

CO<sub>2</sub>

CO<sub>2</sub>

HOT DRY DAY

## HIGH

HOT DRY DAY

# TRANSPIRATION POTENTIAL



CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION

ATMOSPHERE

# STOMATE CLOSED

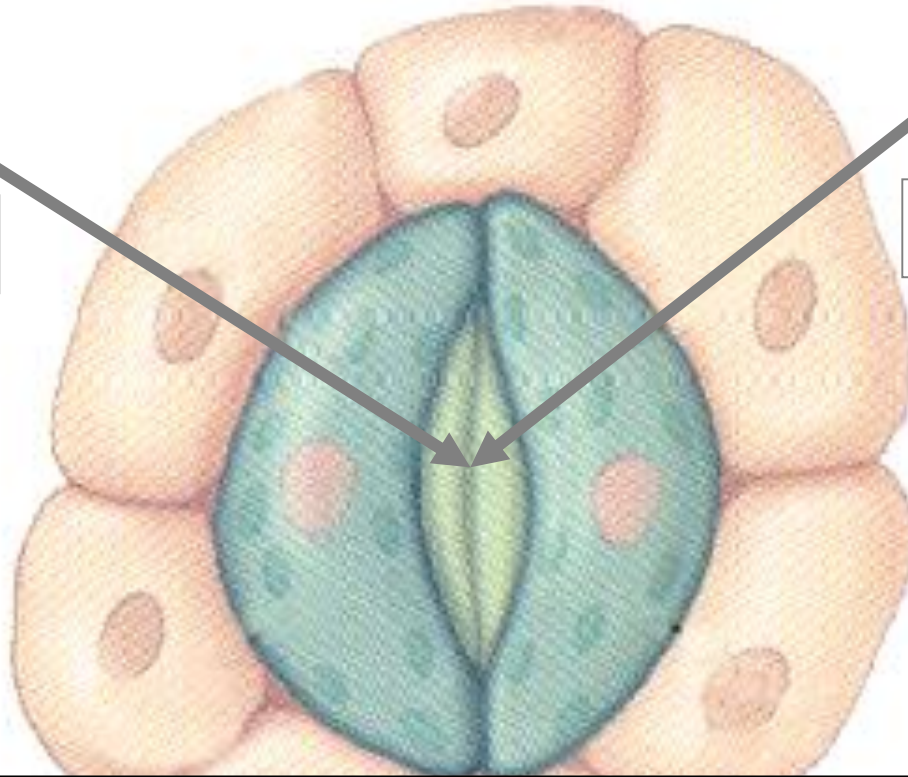
ATMOSPHERE

CO<sub>2</sub>

DIFFUSION

CO<sub>2</sub>

DIFFUSION



***HOT DRY DAY***





# *C4 PLANTS*



**C4**

**CORN**





*C4 PLANTS'  
STOMATES OPEN  
SHORTER PERIODS'  
THAN C3 PLANTS'*





*C4 PLANTS  
MUCH LOWER  
TRANSPIRATION  
THAN C3 PLANTS*



*C4 PLANTS  
REQUIRE MORE  
ATP EXPENSE  
THAN C3 PLANTS*



# **C4**

# **CO<sub>2</sub> DIFFUSION**

# **SUMMARY**

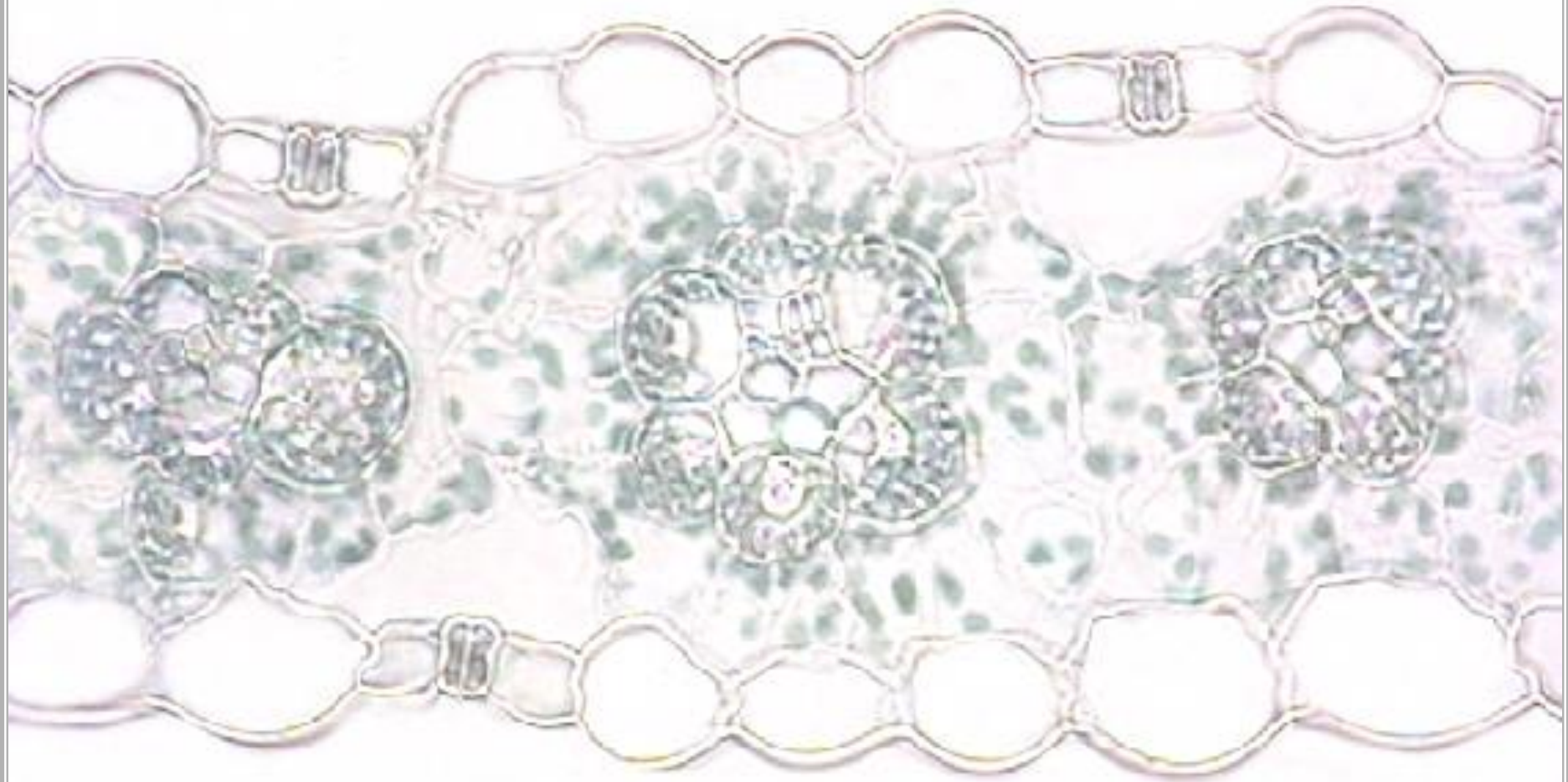


CO<sub>2</sub>

**ATMOSPHERE**

CO<sub>2</sub>

**D**





CO<sub>2</sub>

**ATMOSPHERE**

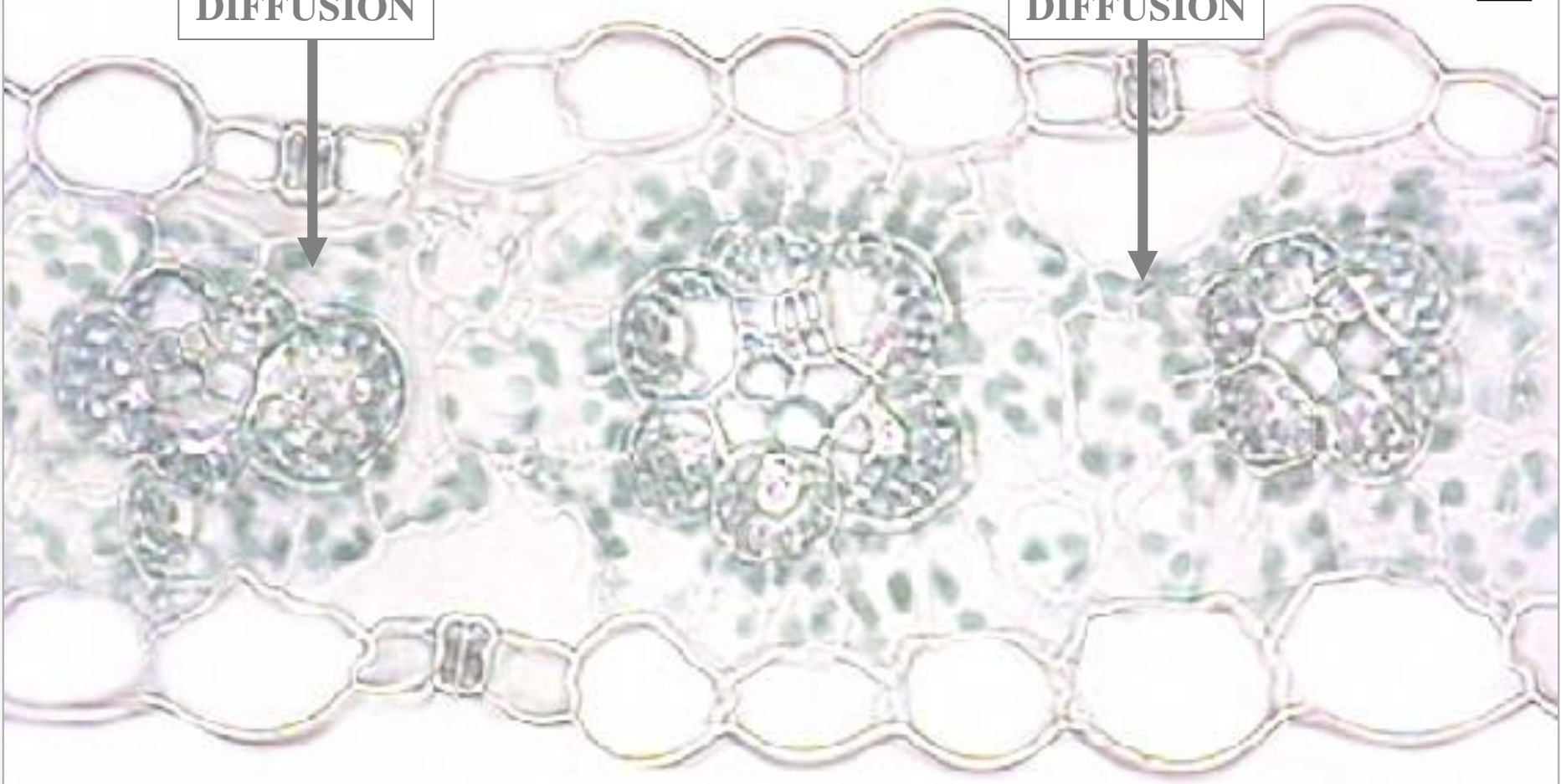
CO<sub>2</sub>

C

DIFFUSION

DIFFUSION

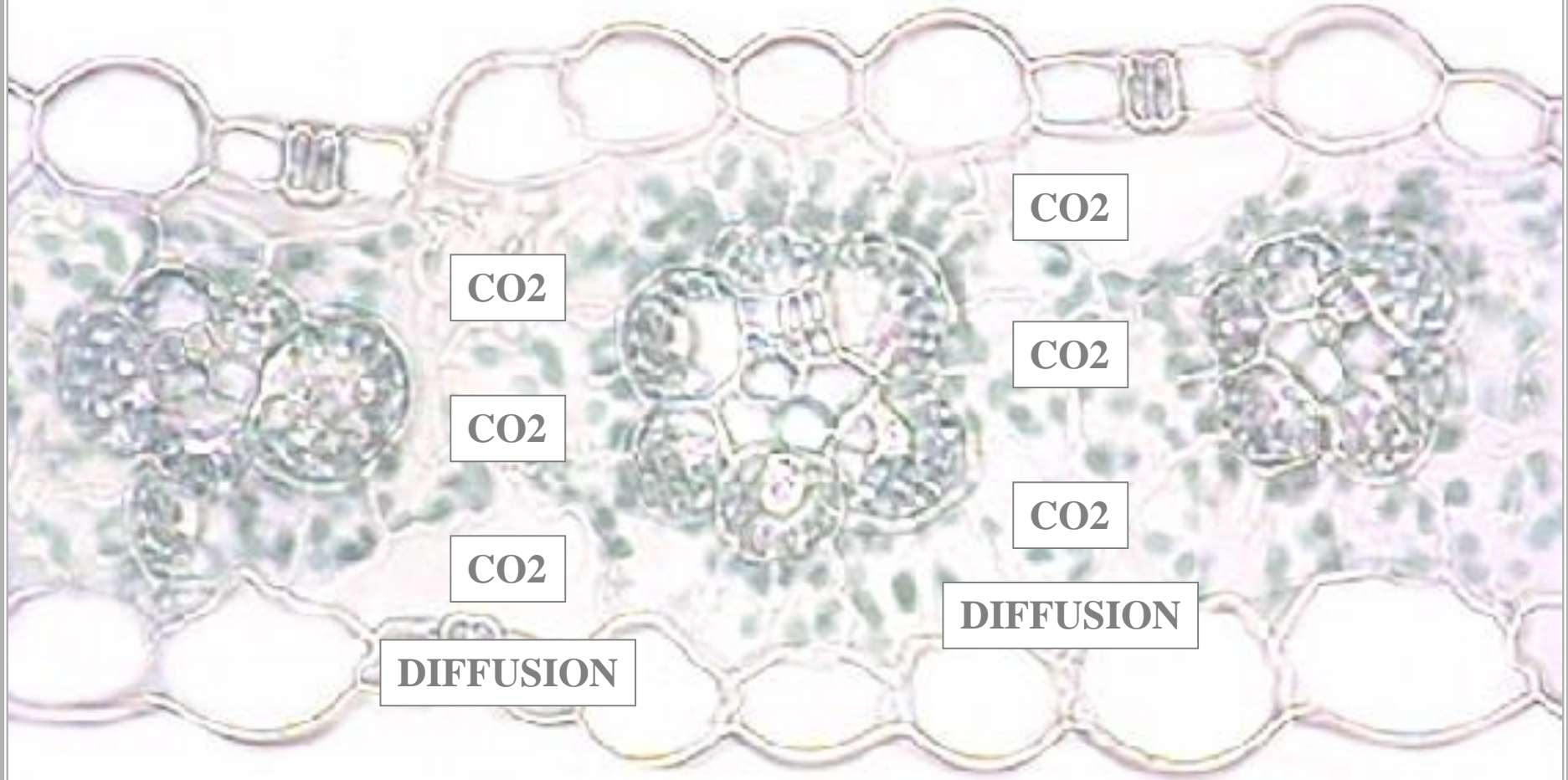
+



**MESOPHYLL**

**ATMOSPHERE**

^



CO2

CO2

CO2

CO2

CO2

CO2

DIFFUSION

DIFFUSION

**MESOPHYLL CELL - CYTOSOL**



# MESOPHYLL CELL CYTOSOL



# C4 LEAF



**HIGH CO<sub>2</sub>**

CO<sub>2</sub>

CO<sub>2</sub>

CO<sub>2</sub>

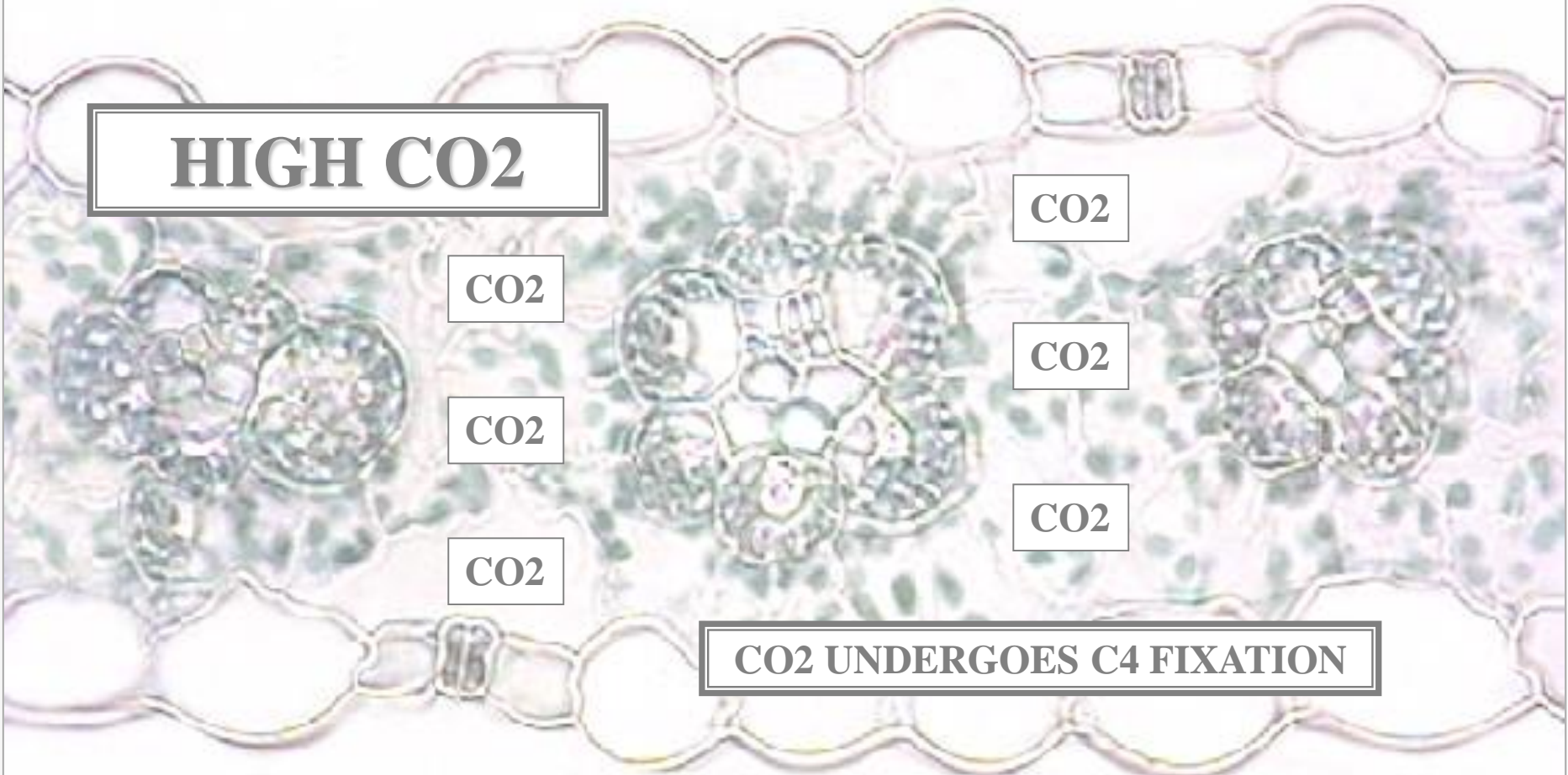
CO<sub>2</sub>

CO<sub>2</sub>

CO<sub>2</sub>

**CO<sub>2</sub> UNDERGOES C4 FIXATION**

**MESOPHYLL CELL - CYTOSOL**

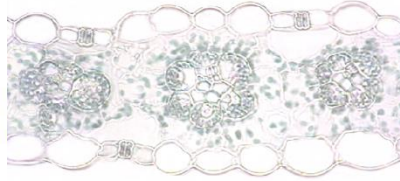




**C4  
PATHWAY  
CO<sub>2</sub> FIXATION**

**C4**

**CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL**



**C P**

# **HATCH & SLACK CYCLE**



**C4**

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL



CO<sub>2</sub> + **PHOSPHOENOLPYRUVATE / (PEP)**



**0**

# HATCH & SLACK CYCLE

# C4

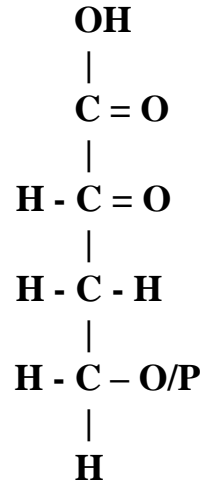
CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)

OXALOACETATE

1<sup>ST</sup> STABLE CMP = OXALOACETATE

## HATCH & SLACK CYCLE



OXALOACETATE



?

#

# C4

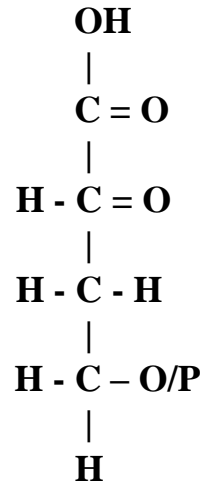
CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)

OXALOACETATE

1<sup>ST</sup> STABLE CMP = OXALOACETATE

## HATCH & SLACK CYCLE



4 CARBON CMP



C4



# C4

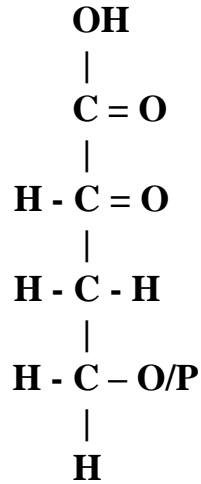
CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)

OXALOACETATE

1<sup>ST</sup> STABLE CMP = OXALOACETATE

## HATCH & SLACK CYCLE C4 PATHWAY



4 CARBON CMP



FXR



**C4**

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)

C4 CO<sub>2</sub> FIXATION RXT

OXALOACETATE



**C3**

?

# HATCH & SLACK CYCLE

## C4 CO<sub>2</sub> FIXATION REACTION

**C3**

CO<sub>2</sub>  
ENTERS  
STROMA

CO<sub>2</sub> + **RIBULOSE BIPHOSPHATE / (RUBP)**

**C3** CO<sub>2</sub> FIXATION RXT

**2 PHOSPHOGLYCERATE / (PGA)**



**C4**

?

# CALVIN CYCLE

## **C3** CO<sub>2</sub> FIXATION REACTION



**C4**

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)

**C4** CO<sub>2</sub> FIXATION RXT

OXALOACETATE



**EZ**

**HATCH & SLACK CYCLE**

**C4** CO<sub>2</sub> FIXATION REACTION

# C4

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)

ENZYME

OXALOACETATE



# HATCH & SLACK CYCLE

## C4 CO<sub>2</sub> FIXATION REACTION



# C4 PATHWAY CO<sub>2</sub> FIXATION ENZYME



**ENZYMIE**

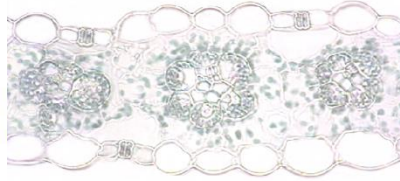


**PHOSPHOENOLPYRUVATE  
CARBOXYLASE  
(PEP-ASE)**

**ENZYMIE**

**C4**

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL



**C** **P**

**PHOSPHOENOLPYRUVATE  
CARBOXYLASE  
(PEP-ASE)**

**C4**

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL



CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)



**EZ**

**PHOSPHOENOLPYRUVATE  
CARBOXYLASE  
(PEP-ASE)**



**C4**

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + **PHOSPHOENOLPYRUVATE / (PEP)**

**PHOSPHOENOLPYRUVATE  
CARBOXYLASE  
(PEP-CARBOXYLASE)**



**O**

**PHOSPHOENOLPYRUVATE  
CARBOXYLASE  
(PEP-ASE)**

**C4**

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)

PHOSPHOENOLPYRUVATE  
CARBOXYLASE  
(PEP-CARBOXYLASE)

OXALOACETATE

C4 CO<sub>2</sub> FIXATION RXT



FXE

>

# PHOSPHOENOLPYRUVATE CARBOXYLASE (PEP-ASE)

**C4**

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)

PHOSPHOENOLPYRUVATE  
CARBOXYLASE  
(PEP-CARBOXYLASE)

OXALOACETATE

**C4** CO<sub>2</sub> FIXATION RXT



**C3**

?

**EZ**

**PHOSPHOENOLPYRUVATE  
CARBOXYLASE**

**C4** CO<sub>2</sub> FIXATION ENZYME



**C3**

CO<sub>2</sub>  
ENTERS  
STROMA



CO<sub>2</sub> + **RIBULOSE BISPHOSEPHATE / (RUBP)**

**RIBULOSE BISPHOSEPHATE  
CARBOXYLASE  
(RUBP-CARBOXYLASE)**

**2 PHOSPHOGLYCERATE / (PGA)**

**C3** CO<sub>2</sub> FIXATION RXT



**RIBULOSE BISPHOSEPHATE  
CARBOXYLASE**

**C3** CO<sub>2</sub> FIXATION ENZYME

**C3**

CO<sub>2</sub>  
ENTERS  
STROMA



CO<sub>2</sub> + **RIBULOSE BISPHOSEPHATE / (RUBP)**

**RIBULOSE BISPHOSEPHATE  
CARBOXYLASE  
(RUBP-CARBOXYLASE)**

**C4**

**EZ**

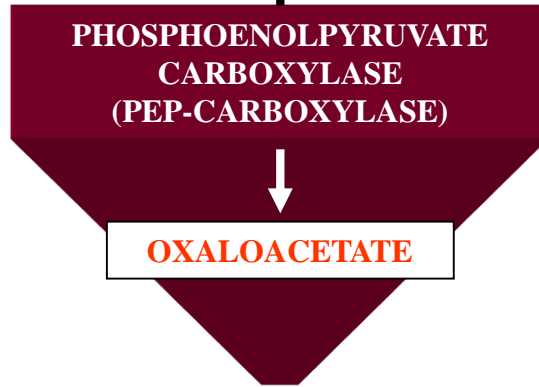
**2 PHOSPHOGLYCERATE / (PGA)**

**INEFFICIENT  
ENZYME**

**C4**

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)



**E**

**>**

**PHOSPHOENOLPYRUVATE  
CARBOXYLASE**

**C4 CO<sub>2</sub> FIXATION ENZYME**



# C4

CO<sub>2</sub>  
ENTERS  
MESOPHYLL CYTOSOL

CO<sub>2</sub> + PHOSPHOENOLPYRUVATE / (PEP)

PHOSPHOENOLPYRUVATE  
CARBOXYLASE  
(PEP-CARBOXYLASE)

OXALOACETATE



# EFFICIENT ENZYME



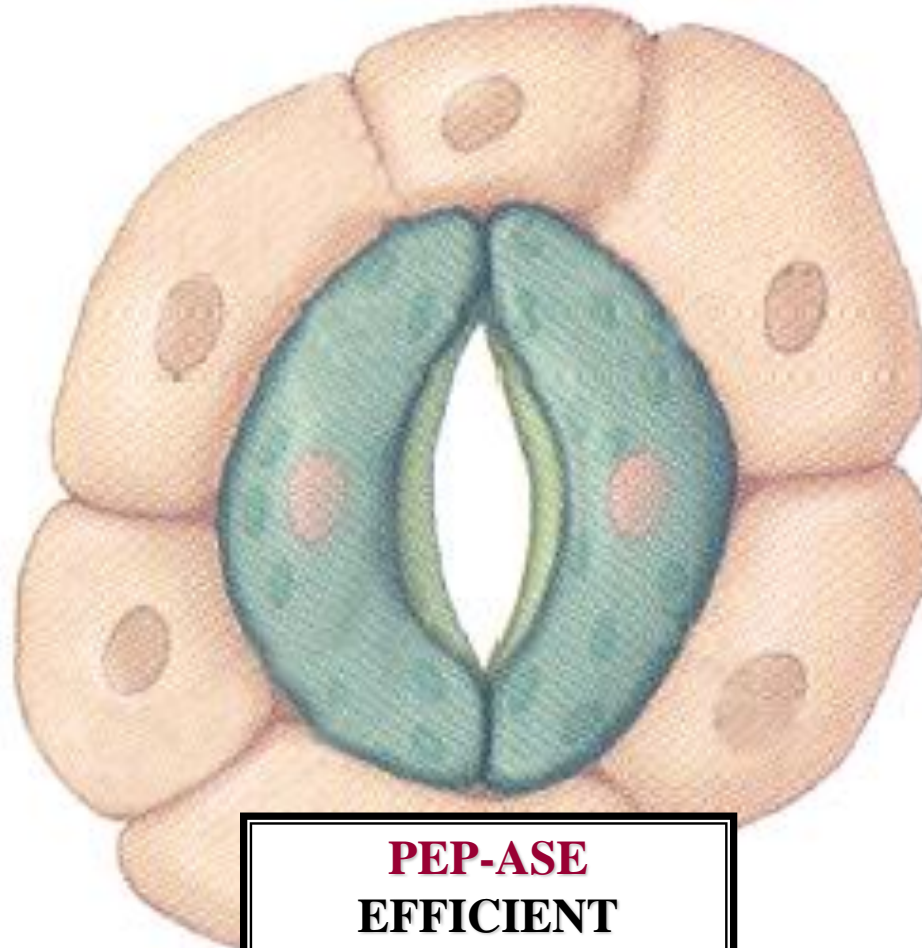
ATMOSPHERE

# LEAF STOMATE

ATMOSPHERE

CO<sub>2</sub>

CO<sub>2</sub>



CO<sub>2</sub>

CO<sub>2</sub>

**PEP-ASE**  
**EFFICIENT**  
**ENZYME**



# LEAF STOMATE

ATMOSPHERE

ATMOSPHERE

CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION

H<sub>2</sub>O

H<sub>2</sub>O

DIFFUSION

DIFFUSION

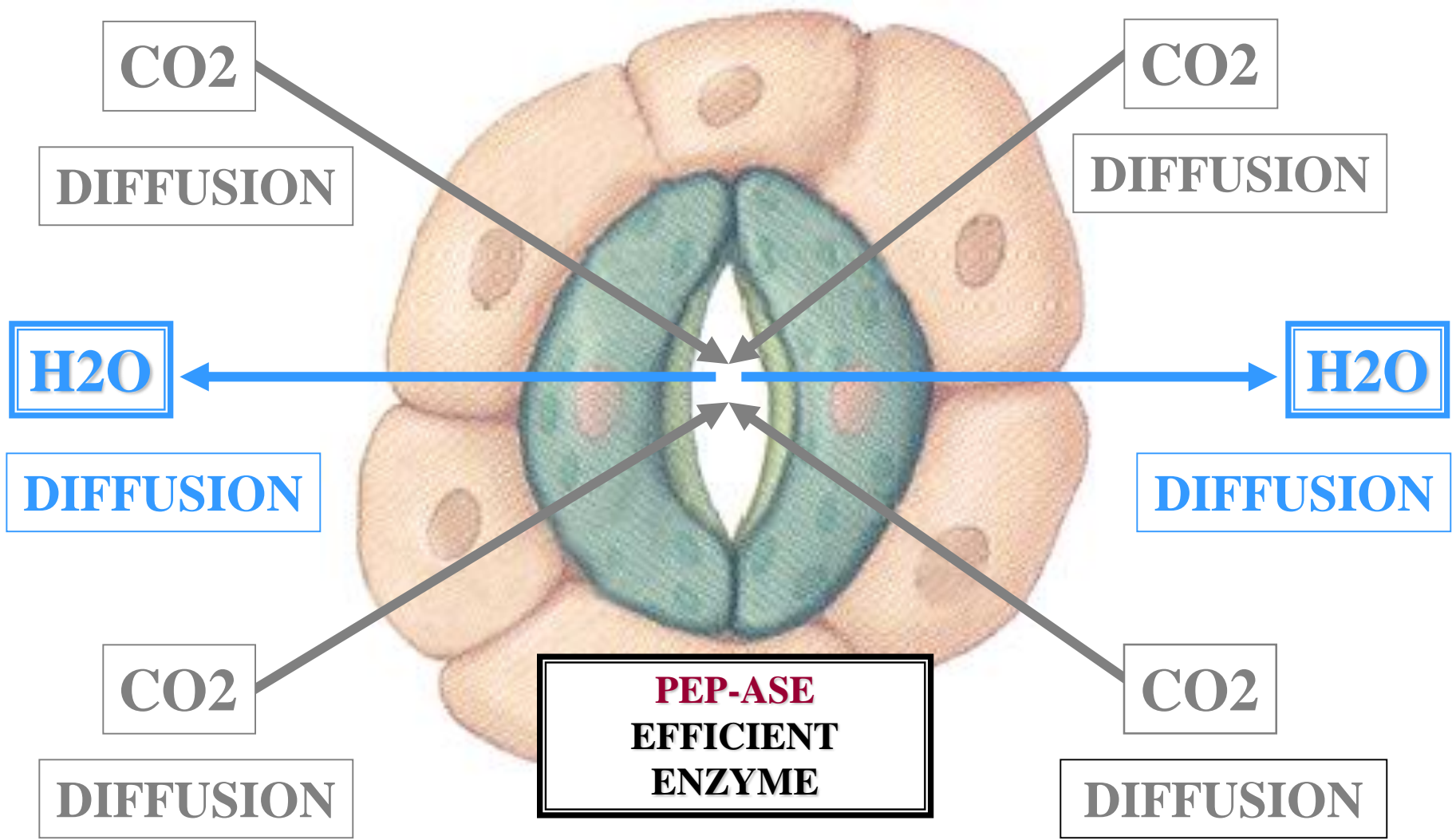
CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION

**PEP-ASE**  
EFFICIENT  
ENZYME





# LEAF STOMATE

ATMOSPHERE

ATMOSPHERE + →

CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION

H<sub>2</sub>O

H<sub>2</sub>O

DIFFUSION

DIFFUSION

CO<sub>2</sub>

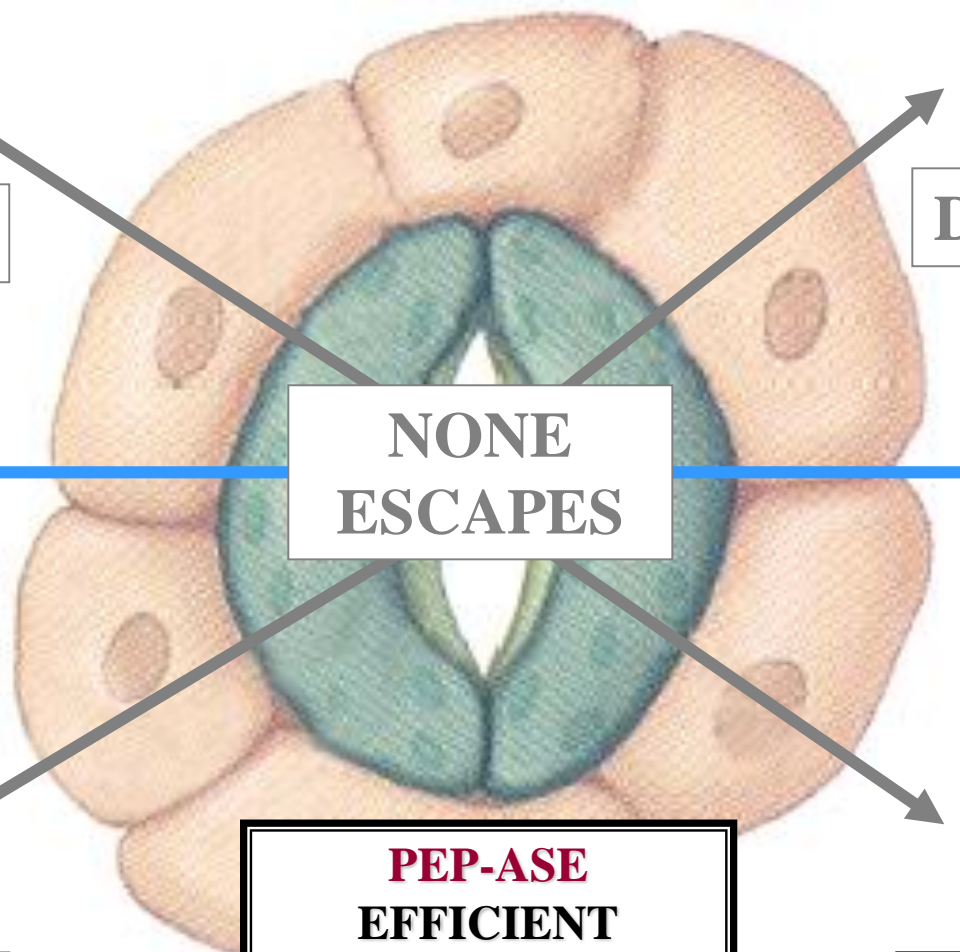
CO<sub>2</sub>

DIFFUSION

DIFFUSION

NONE  
ESCAPES

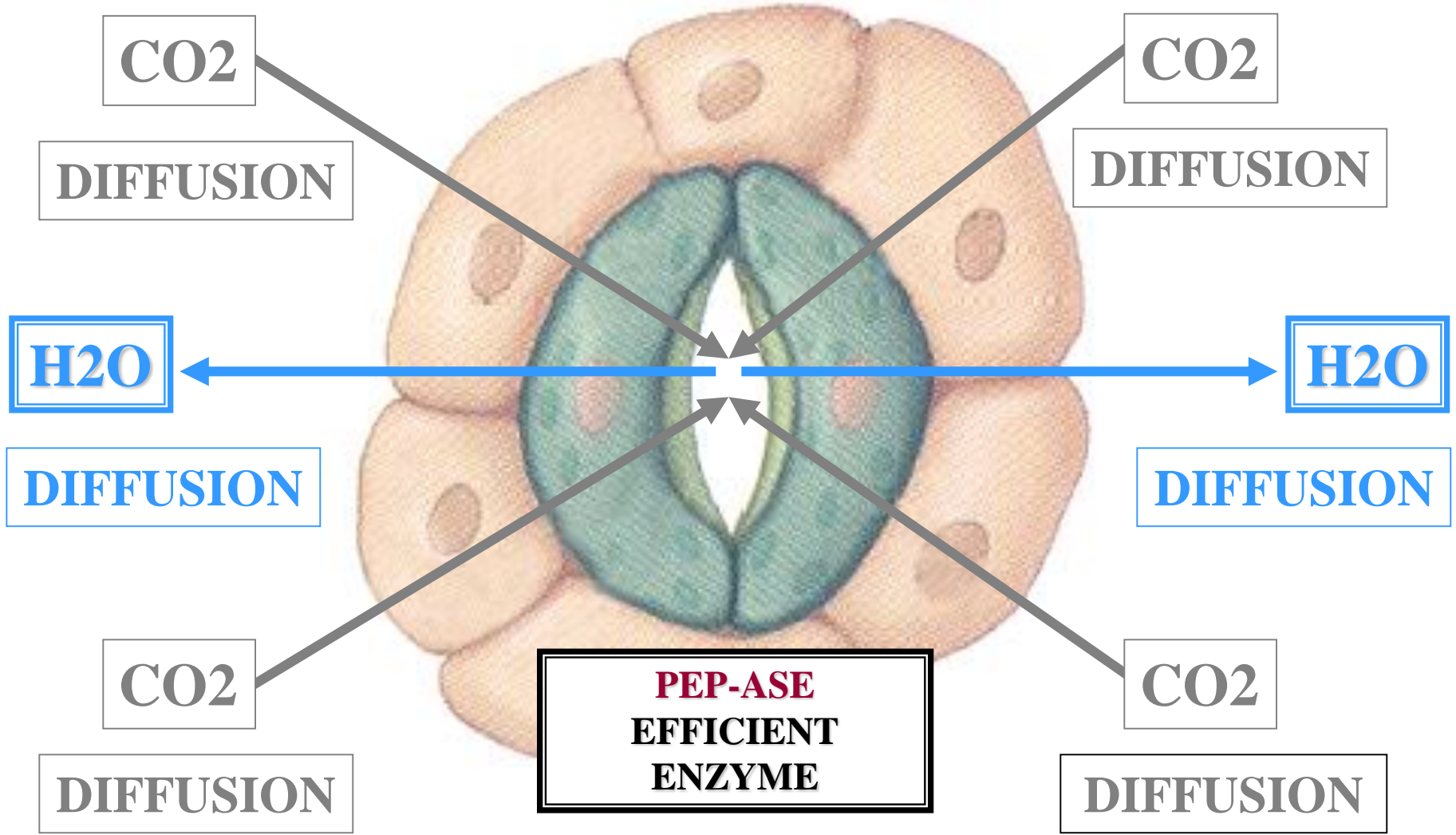
**PEP-ASE**  
EFFICIENT  
ENZYME



# LEAF STOMATE

ATMOSPHERE

ATMOSPHERE



CO<sub>2</sub>

DIFFUSION

CO<sub>2</sub>

DIFFUSION

H<sub>2</sub>O

DIFFUSION

H<sub>2</sub>O

DIFFUSION

CO<sub>2</sub>

DIFFUSION

CO<sub>2</sub>

DIFFUSION

**PEP-ASE**  
**EFFICIENT**  
**ENZYME**

ATMOSPHERE

# LEAF STOMATE

ATMOSPHERE

CO<sub>2</sub>

CO<sub>2</sub>

**OPEN SHORT PERIODS**

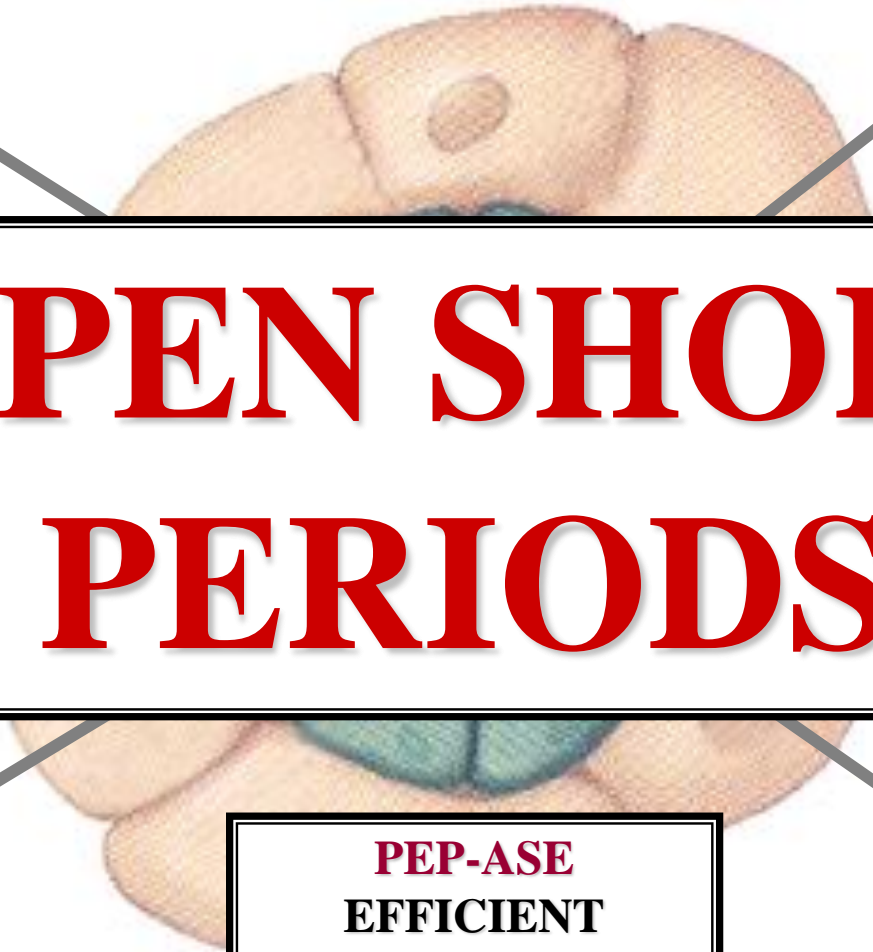
C<sub>4</sub>

C<sub>4</sub>

CO<sub>2</sub>

CO<sub>2</sub>

**PEP-ASE  
EFFICIENT  
ENZYME**

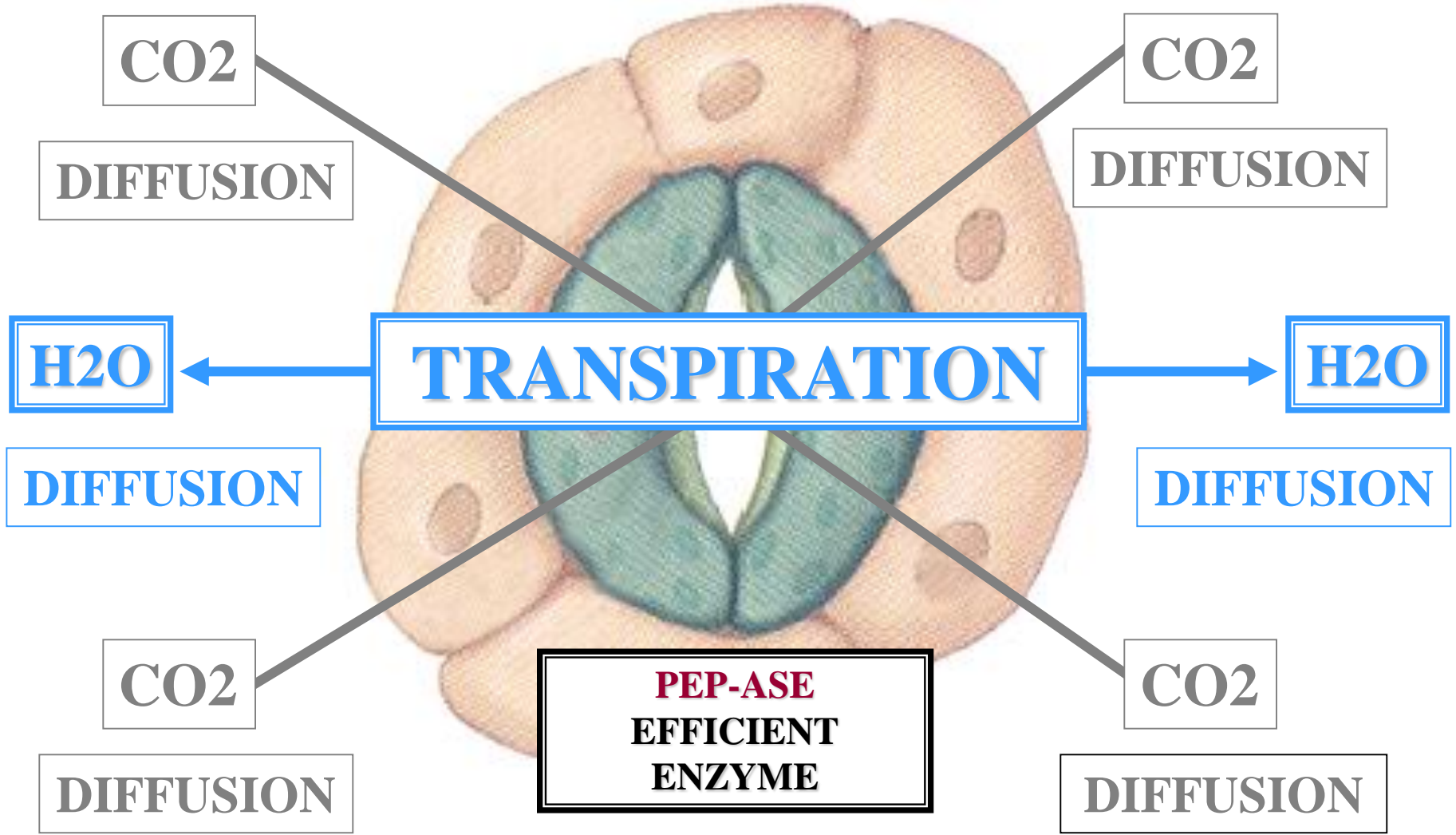




# LEAF STOMATE

ATMOSPHERE

ATMOSPHERE



CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION

H<sub>2</sub>O

TRANSPIRATION

H<sub>2</sub>O

DIFFUSION

DIFFUSION

CO<sub>2</sub>

CO<sub>2</sub>

DIFFUSION

DIFFUSION

**PEP-ASE**  
EFFICIENT  
ENZYME



**ATMOSPHERE**

**ATMOSPHERE**

# LEAF STOMATE

CO<sub>2</sub>

CO<sub>2</sub>

**C4**

**C4**

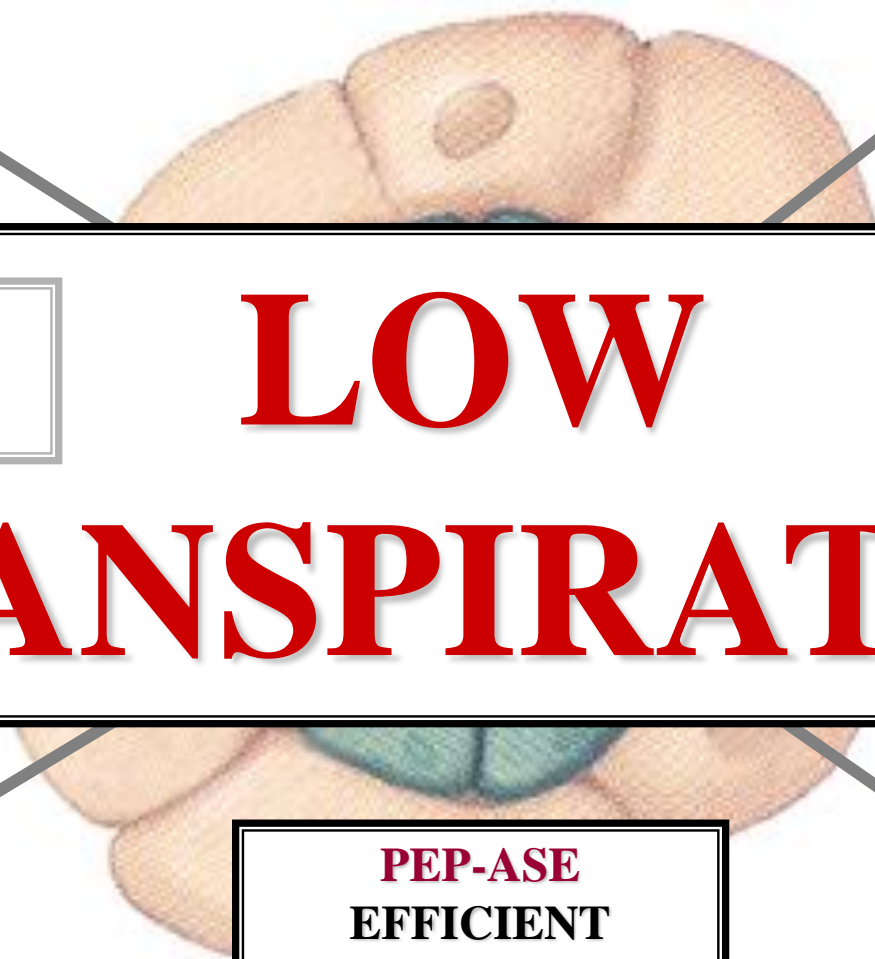
**LOW**

**TRANSPIRATION**

CO<sub>2</sub>

CO<sub>2</sub>

**PEP-ASE  
EFFICIENT  
ENZYME**





# *C4 PLANTS REQUIRE*



**CORN**





**FX**

*C4 PLANTS  
REQUIRE LESS  
WATER  
THAN C3 PLANTS*



# C4

# CO<sub>2</sub> FIXATION

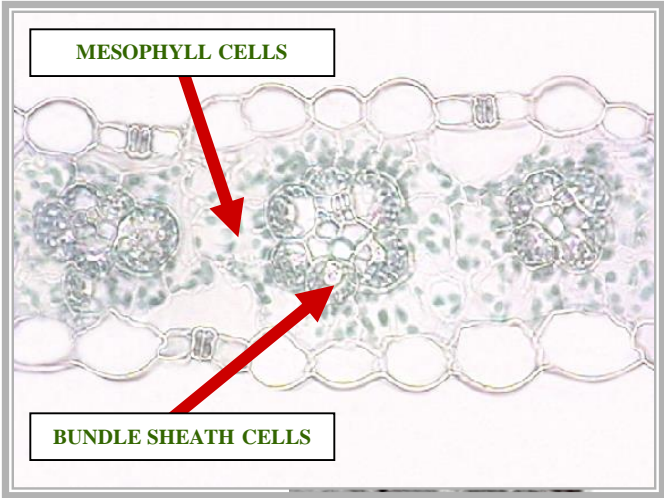
## SUMMARY

# HATCH & SLACK CYCLE



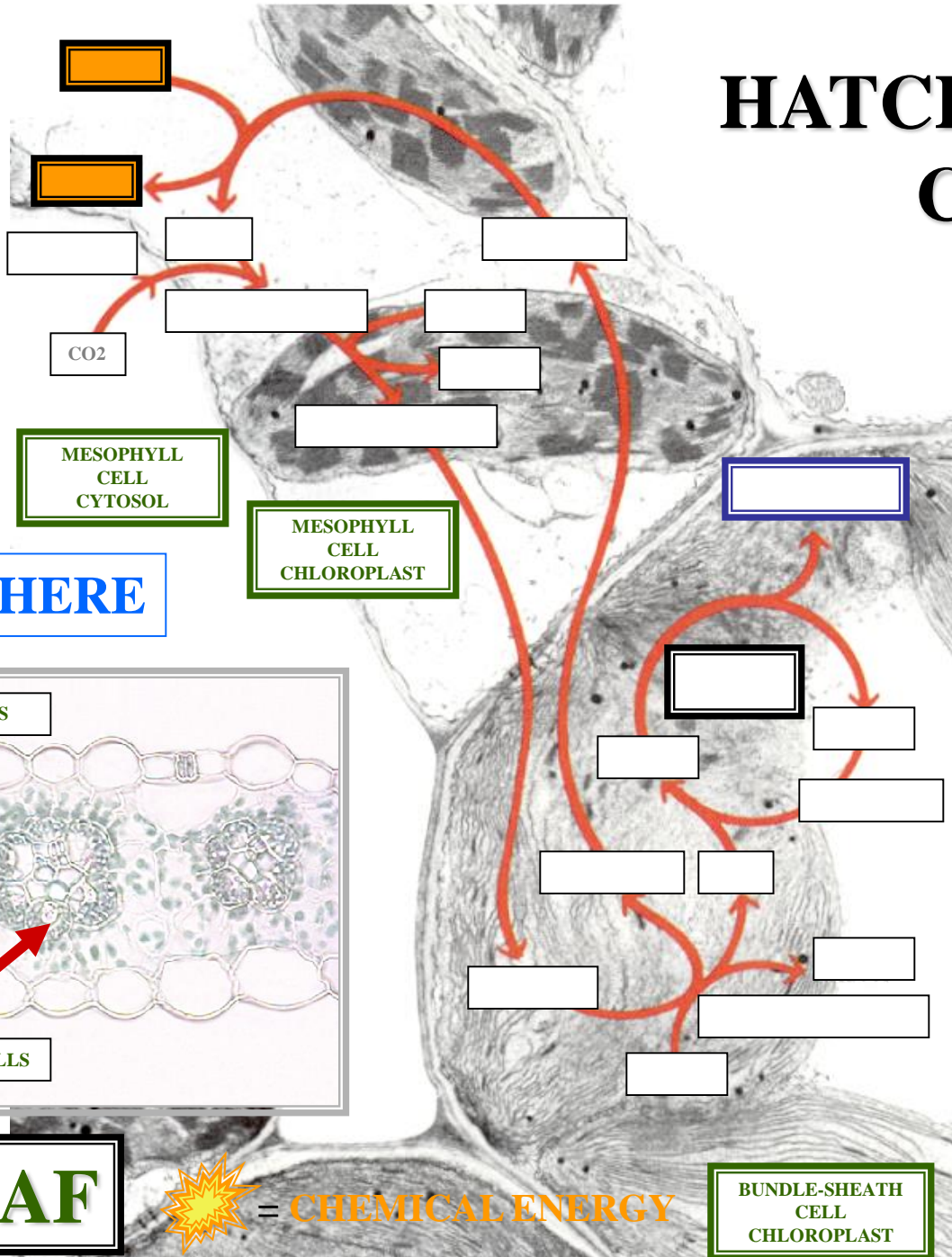
**CORN**

**ATMOSPHERE**



**C4 LEAF**

 = CHEMICAL ENERGY



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

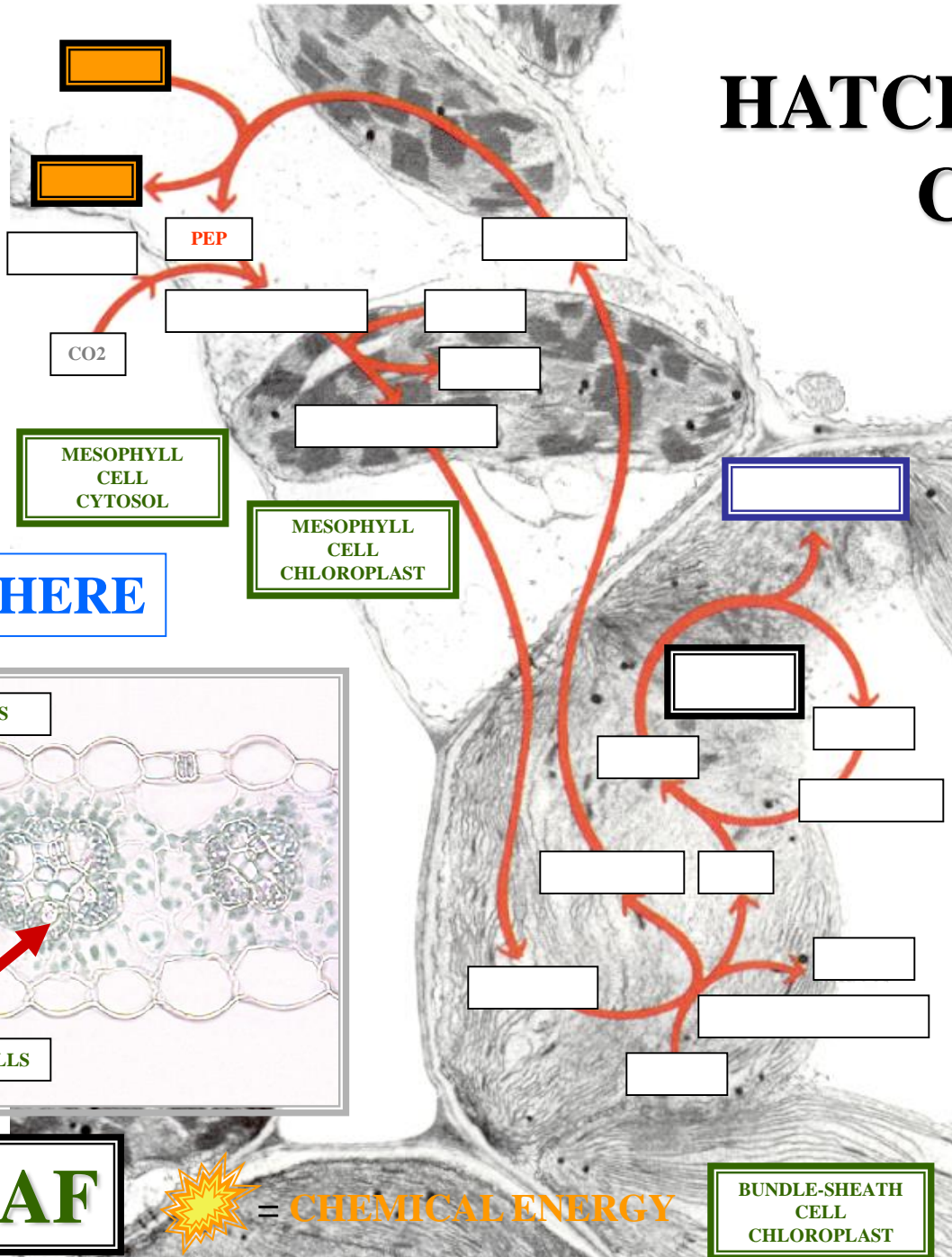
**C4**

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

# HATCH & SLACK CYCLE



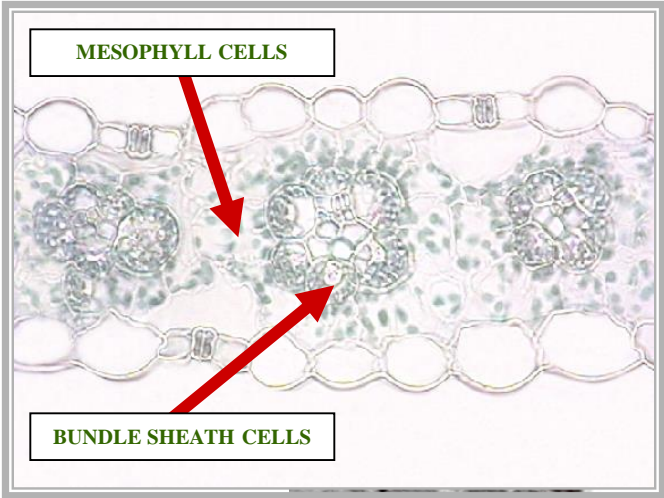
**CORN**



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

**ATMOSPHERE**



**C4 LEAF**

**= CHEMICAL ENERGY**

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

**EZ**

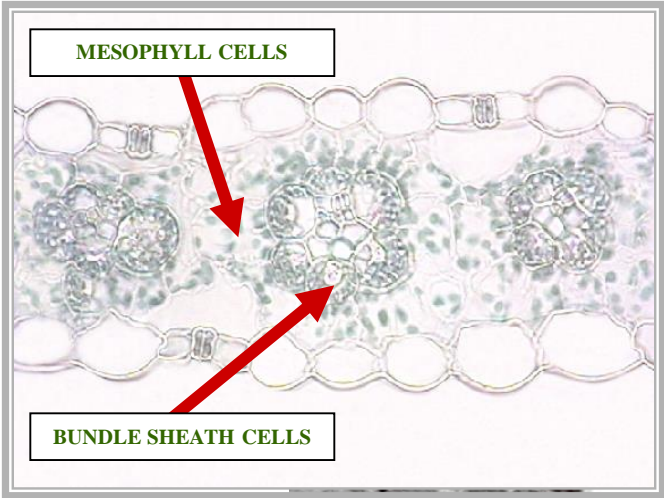


# HATCH & SLACK CYCLE

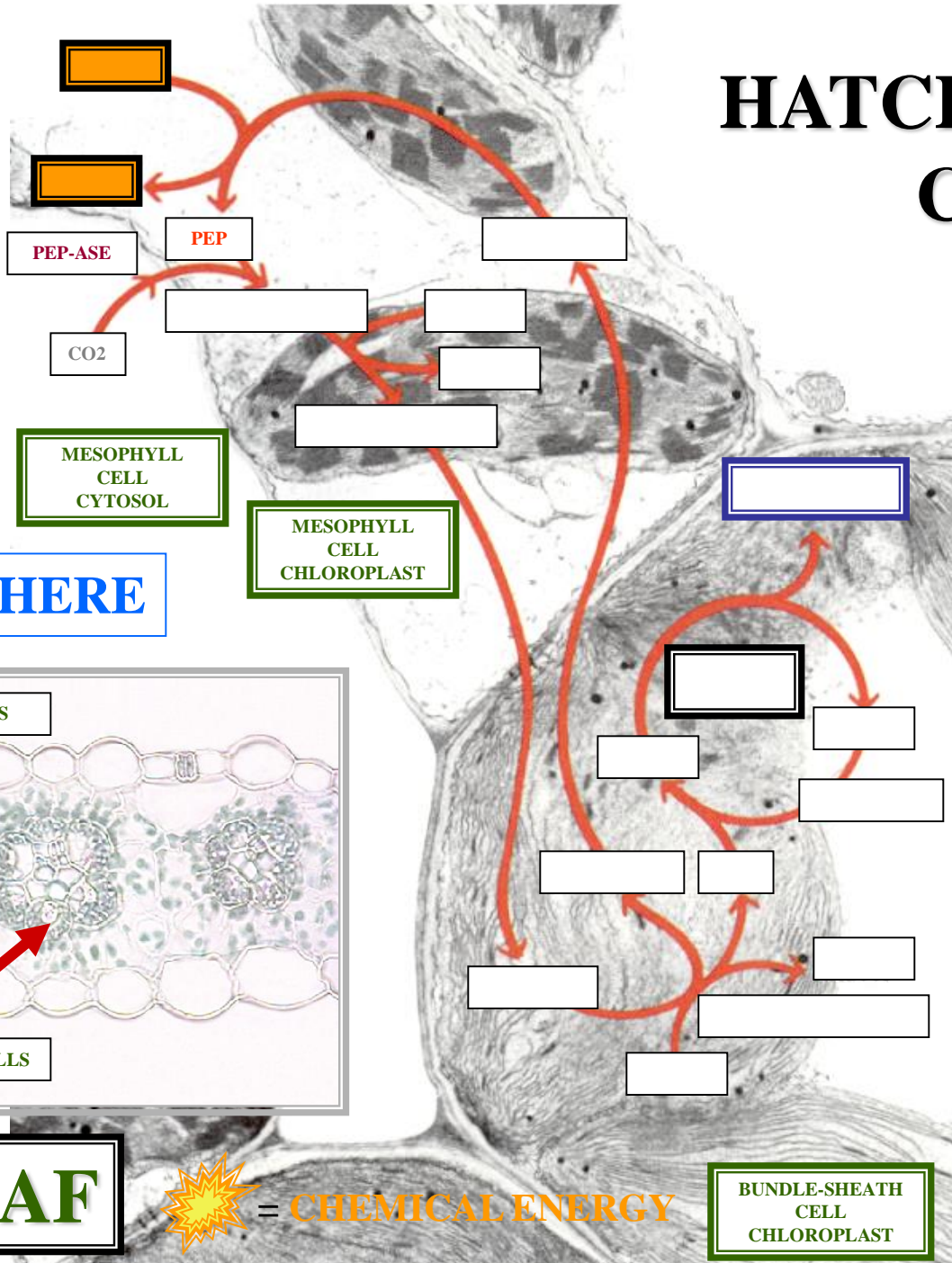


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

= CHEMICAL ENERGY

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

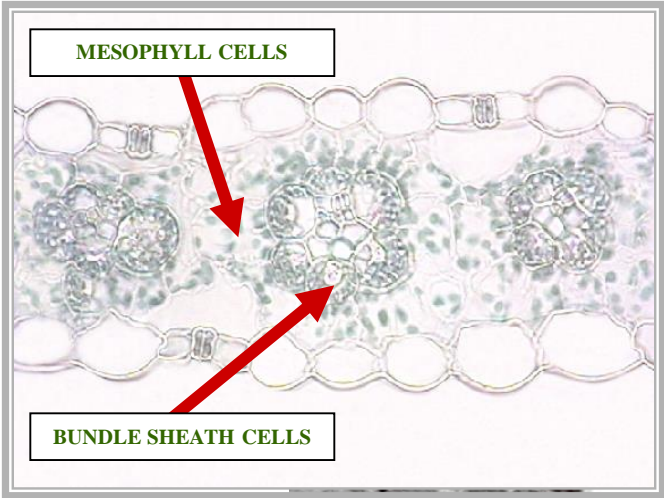


# HATCH & SLACK CYCLE



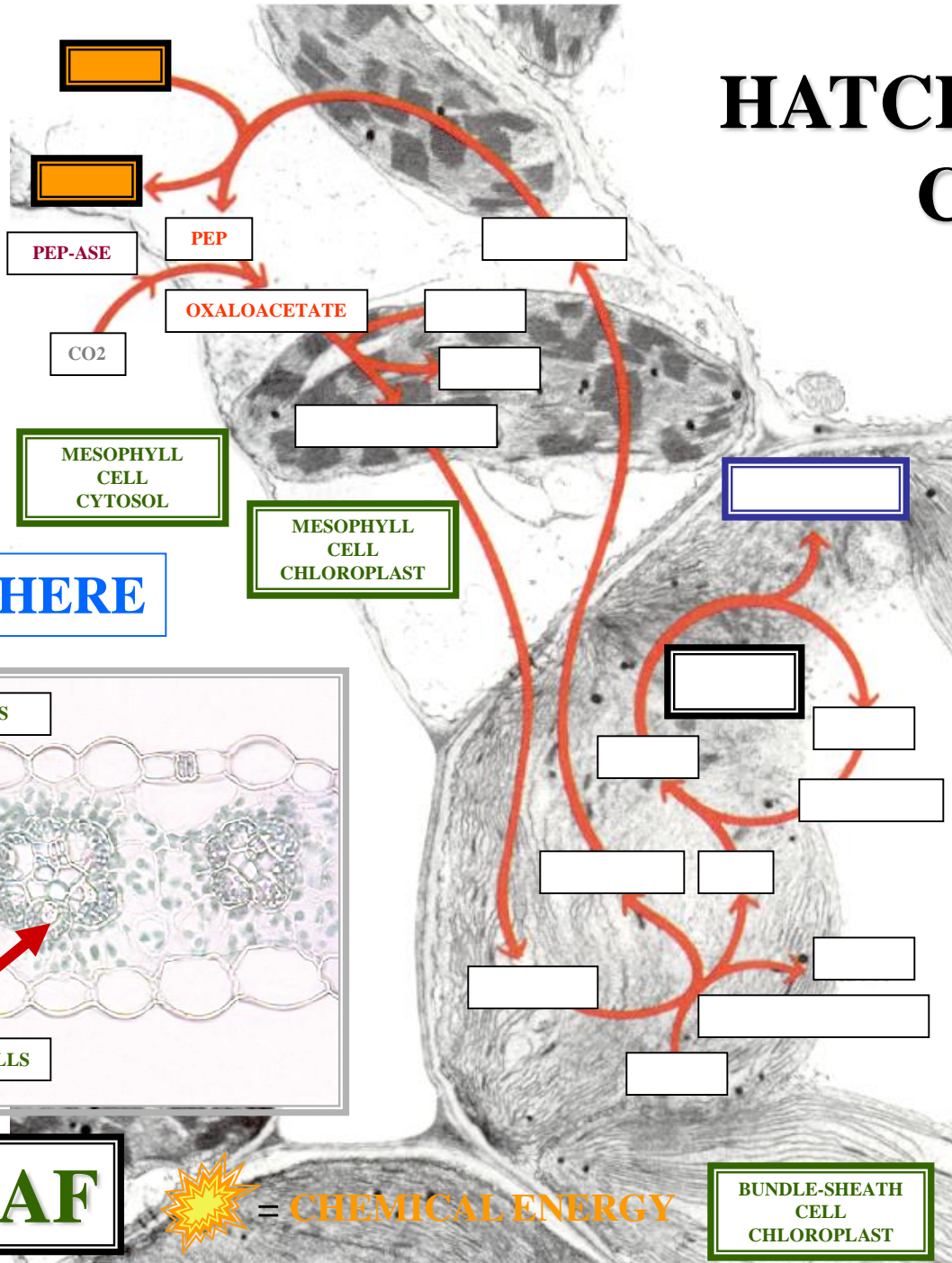
**CORN**

**ATMOSPHERE**



**C4 LEAF**

= CHEMICAL ENERGY



**ALL RXTS REQUIRE A SPECIFIC ENZYME**

**C4**

**BUNDLE-SHEATH CELL CHLOROPLAST**

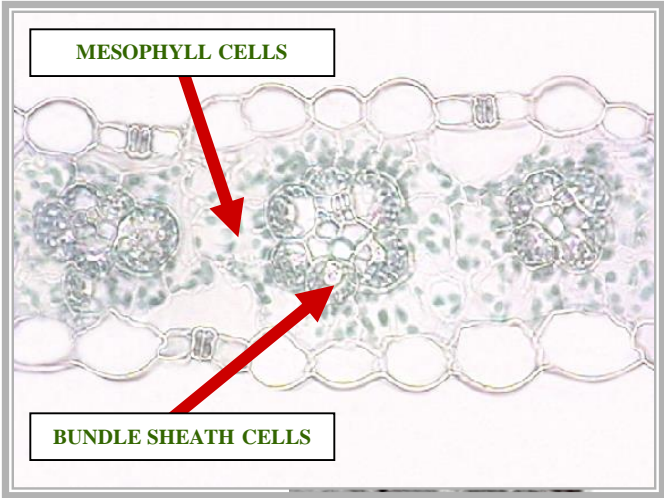


# HATCH & SLACK CYCLE

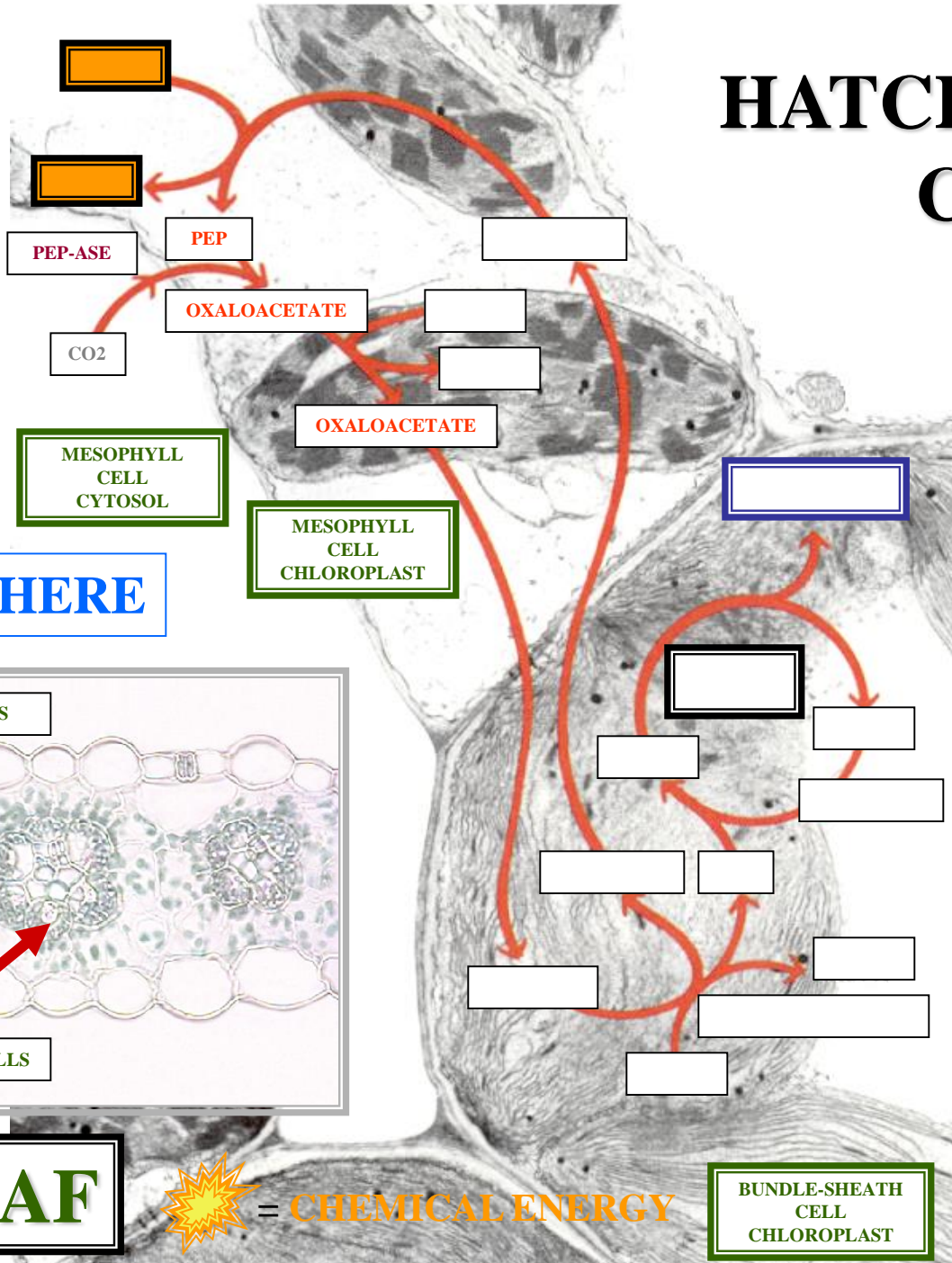


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

= CHEMICAL ENERGY

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**



# MESOPHYLL CELL CHLOROPLAST

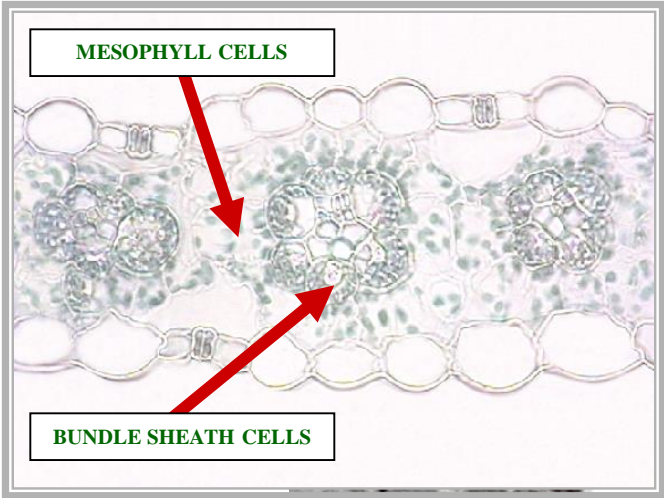


# HATCH & SLACK CYCLE

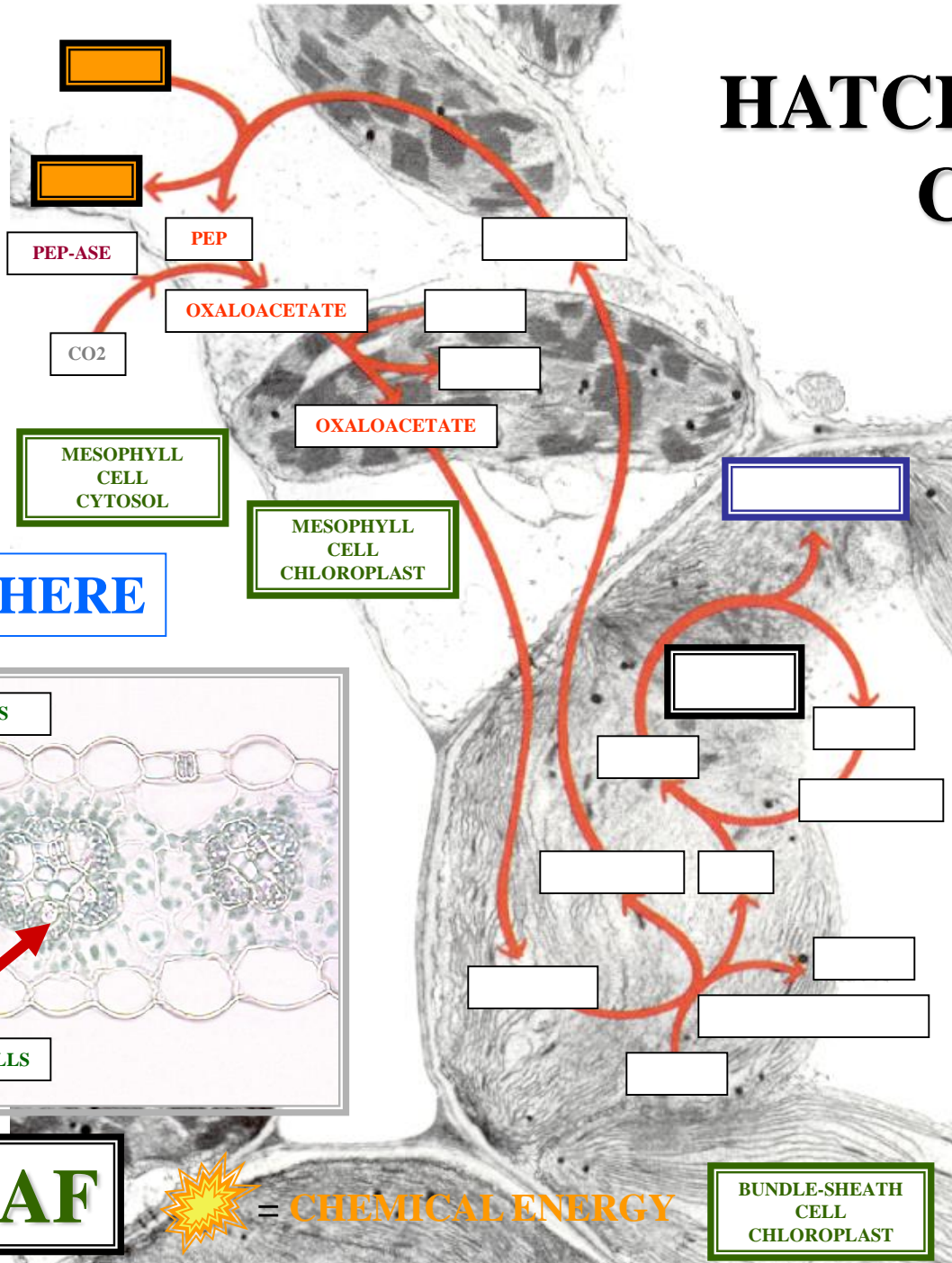


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

= CHEMICAL ENERGY

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

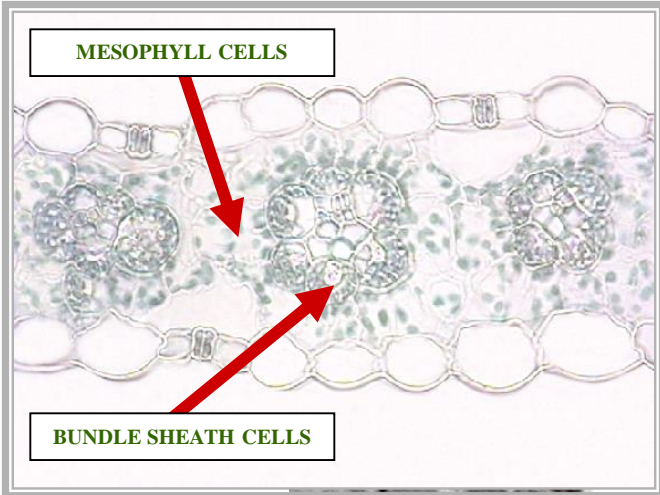


# HATCH & SLACK CYCLE



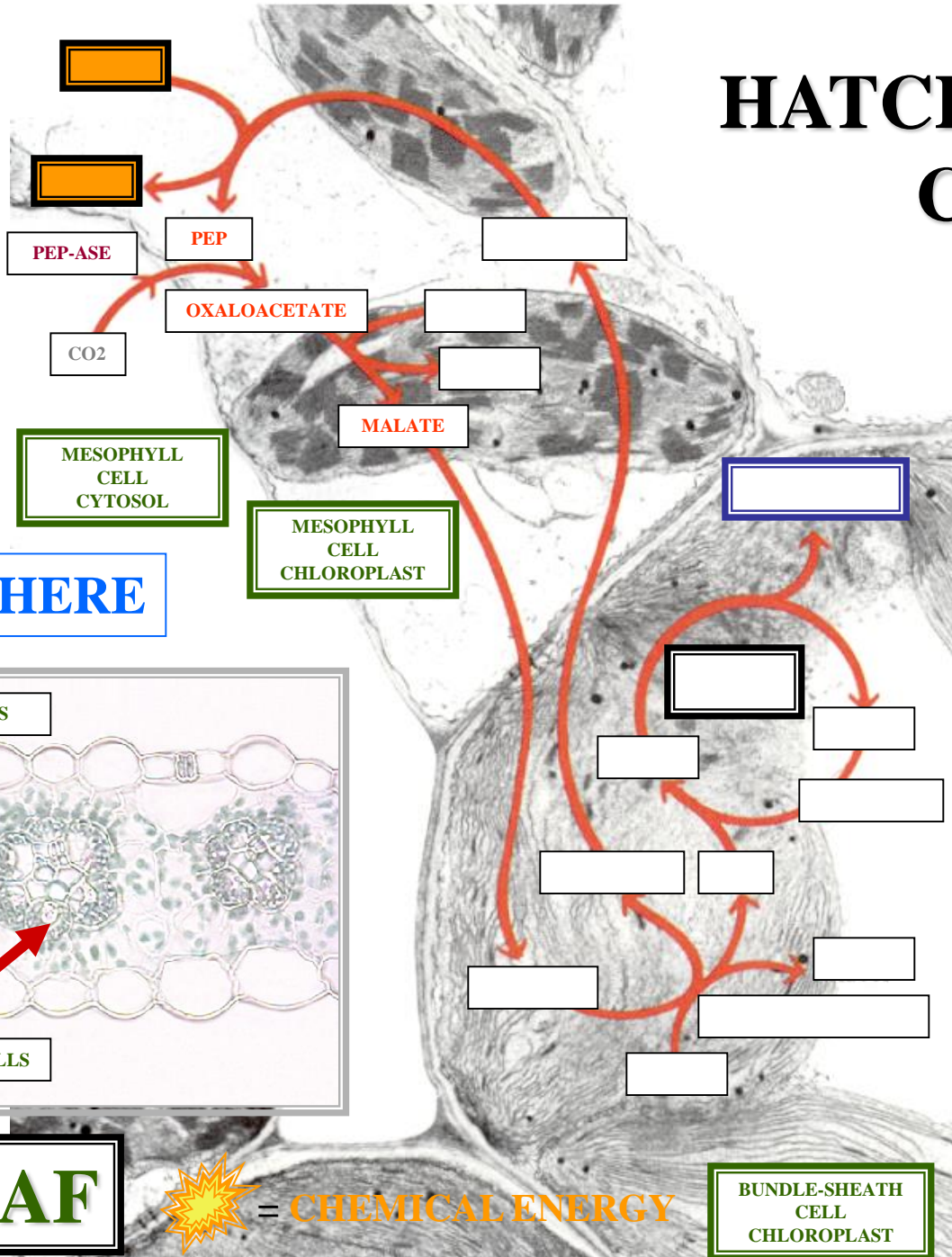
**CORN**

**ATMOSPHERE**



**C4 LEAF**

 = CHEMICAL ENERGY



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

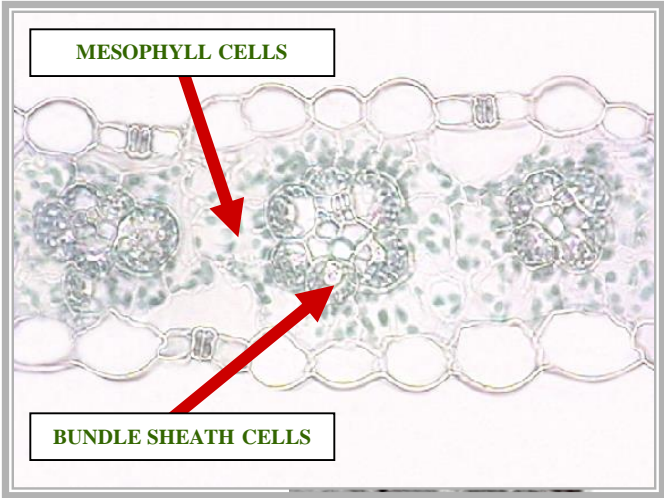


# HATCH & SLACK CYCLE

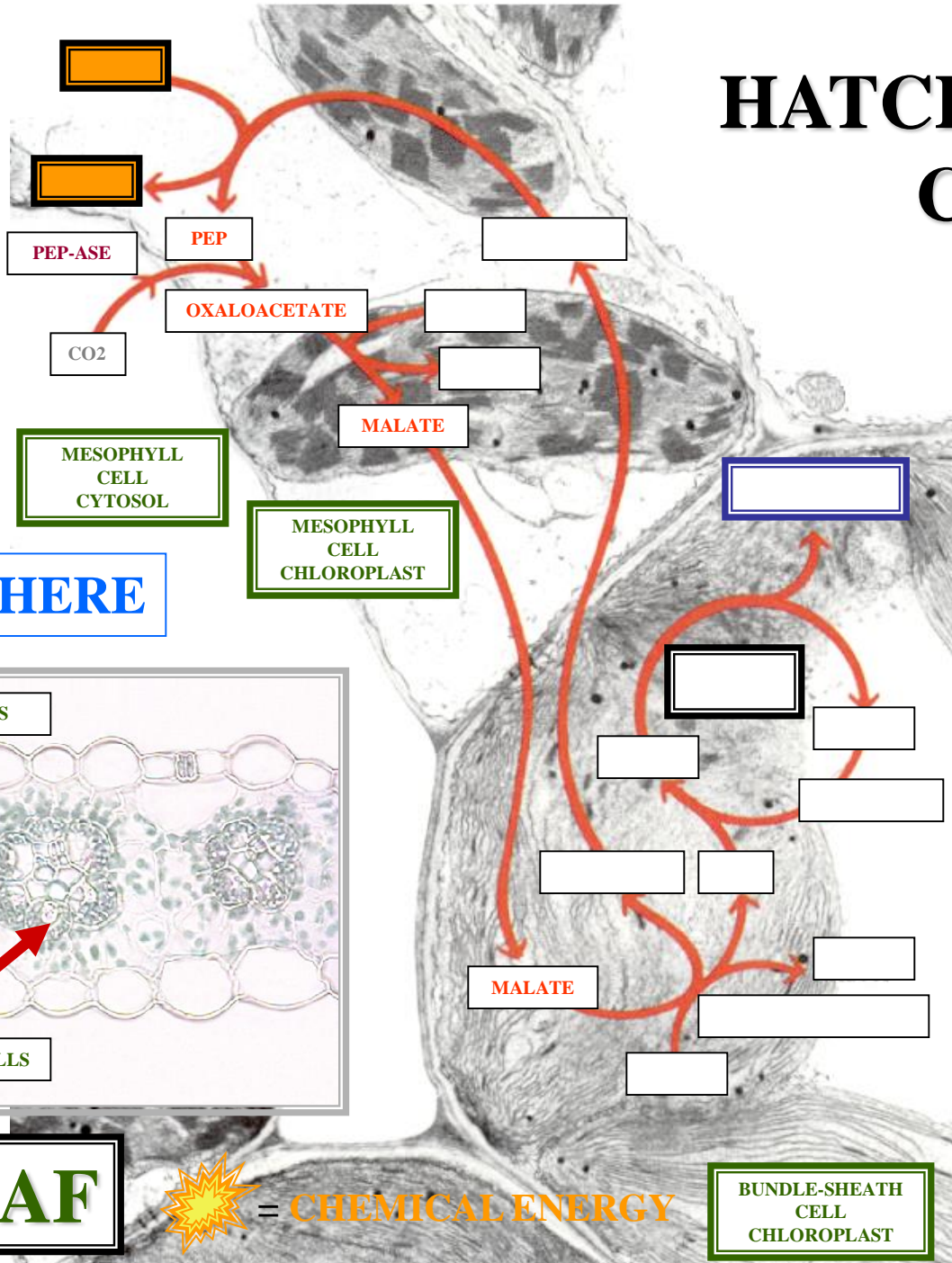


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**





# BUNDLE-SHEATH CELL CHLOROPLAST

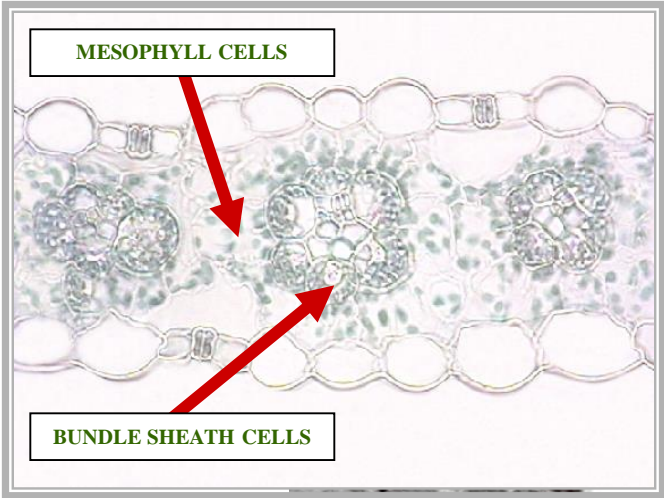


# HATCH & SLACK CYCLE



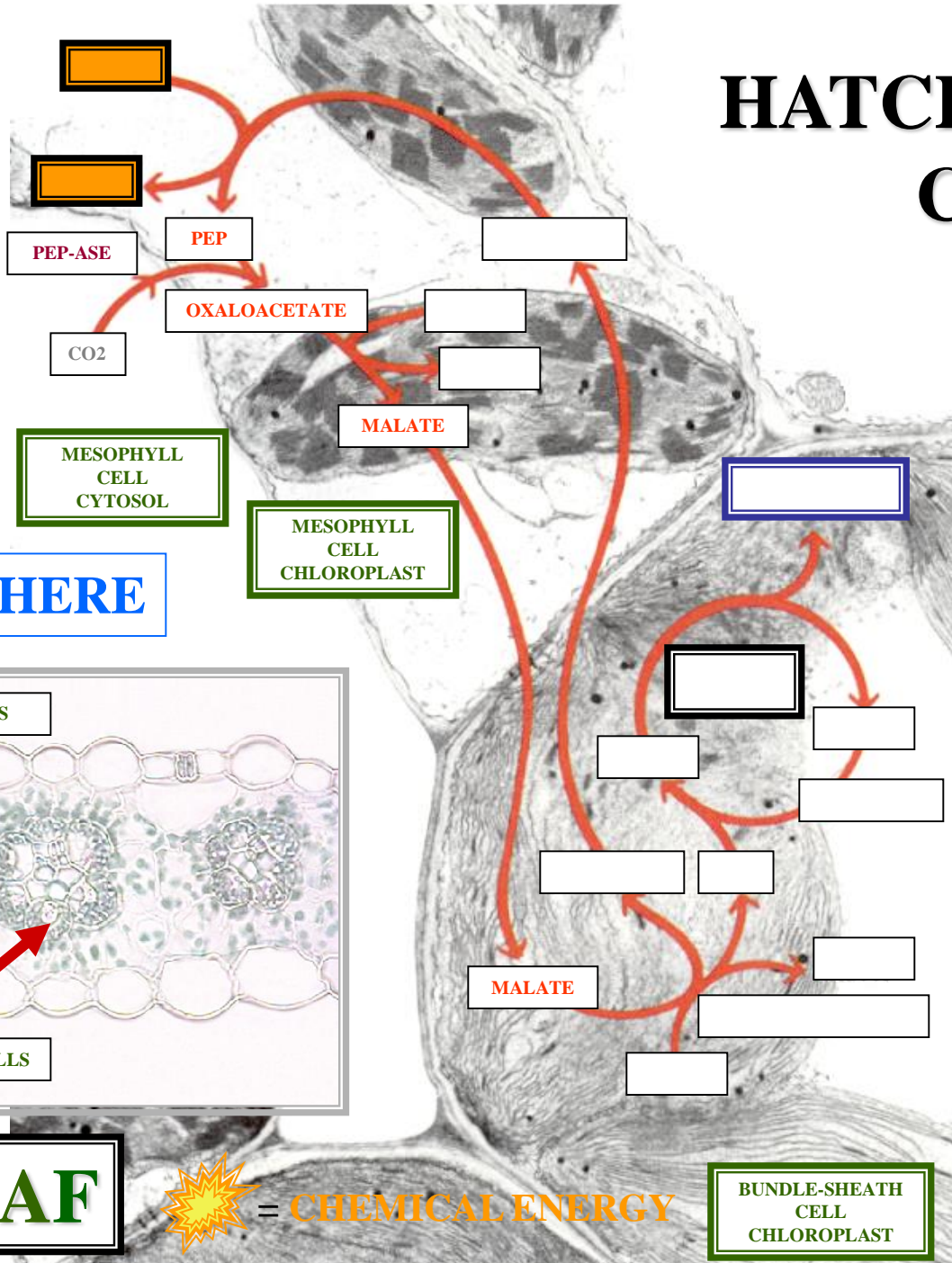
**CORN**

**ATMOSPHERE**



**C4 LEAF**

 = CHEMICAL ENERGY



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

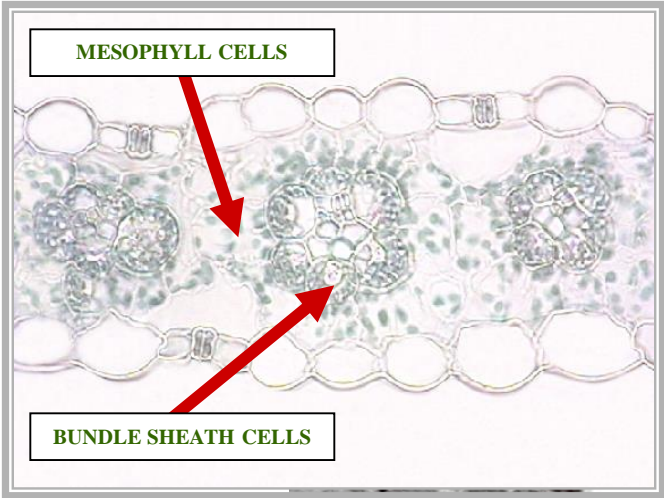


# HATCH & SLACK CYCLE

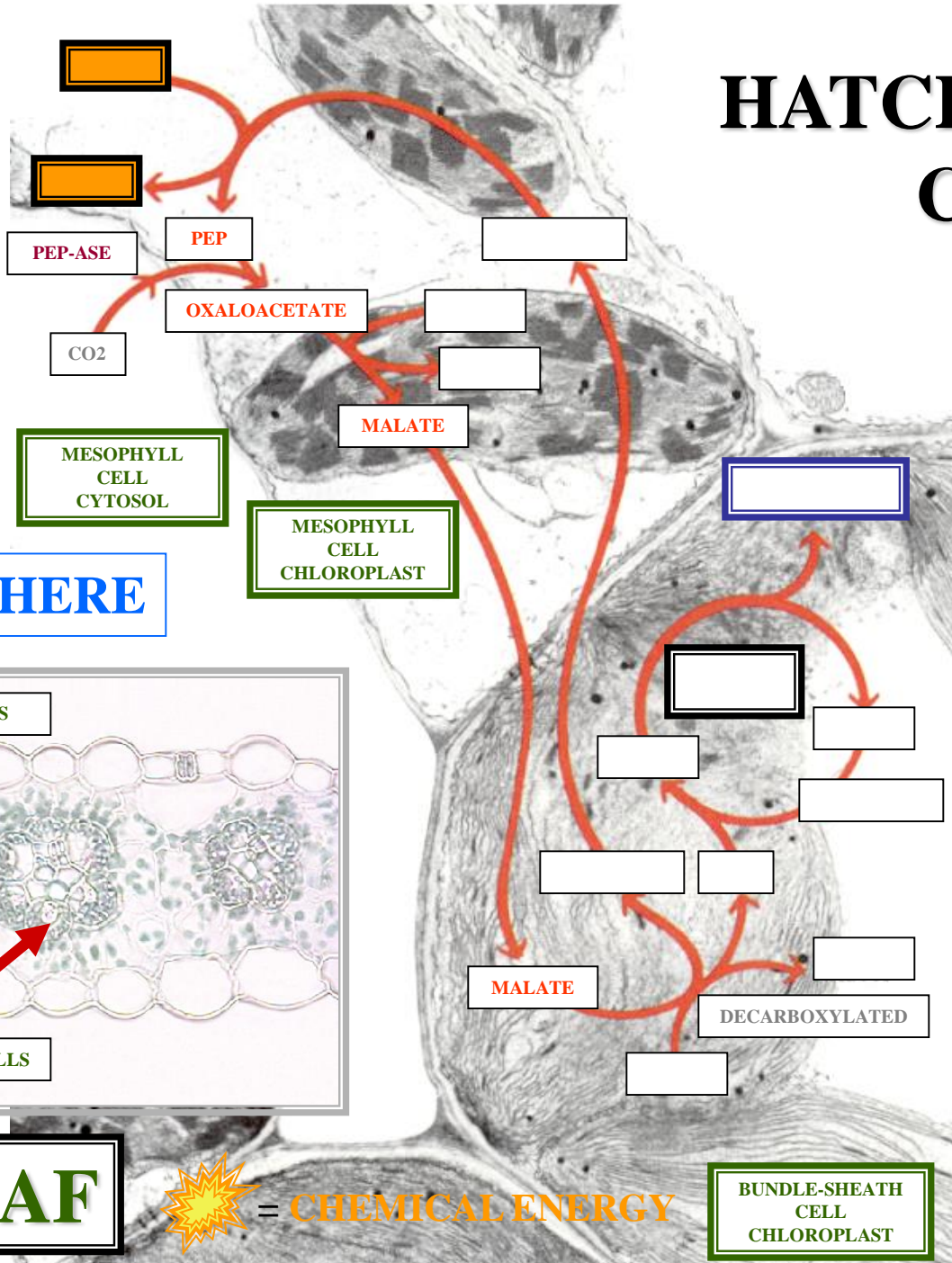


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

**DECARBOXYLATED**



**DECARBOXYLATED**

**CO<sub>2</sub> IS RELEASED  
FROM  
COMPOUND**

**DECARBOXYLATED**

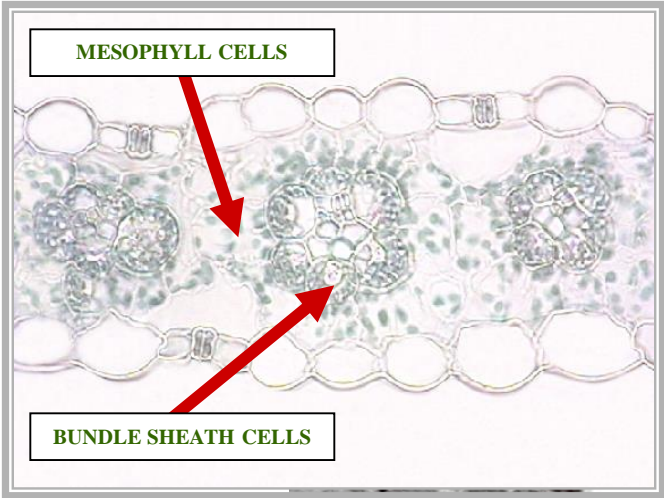


# HATCH & SLACK CYCLE



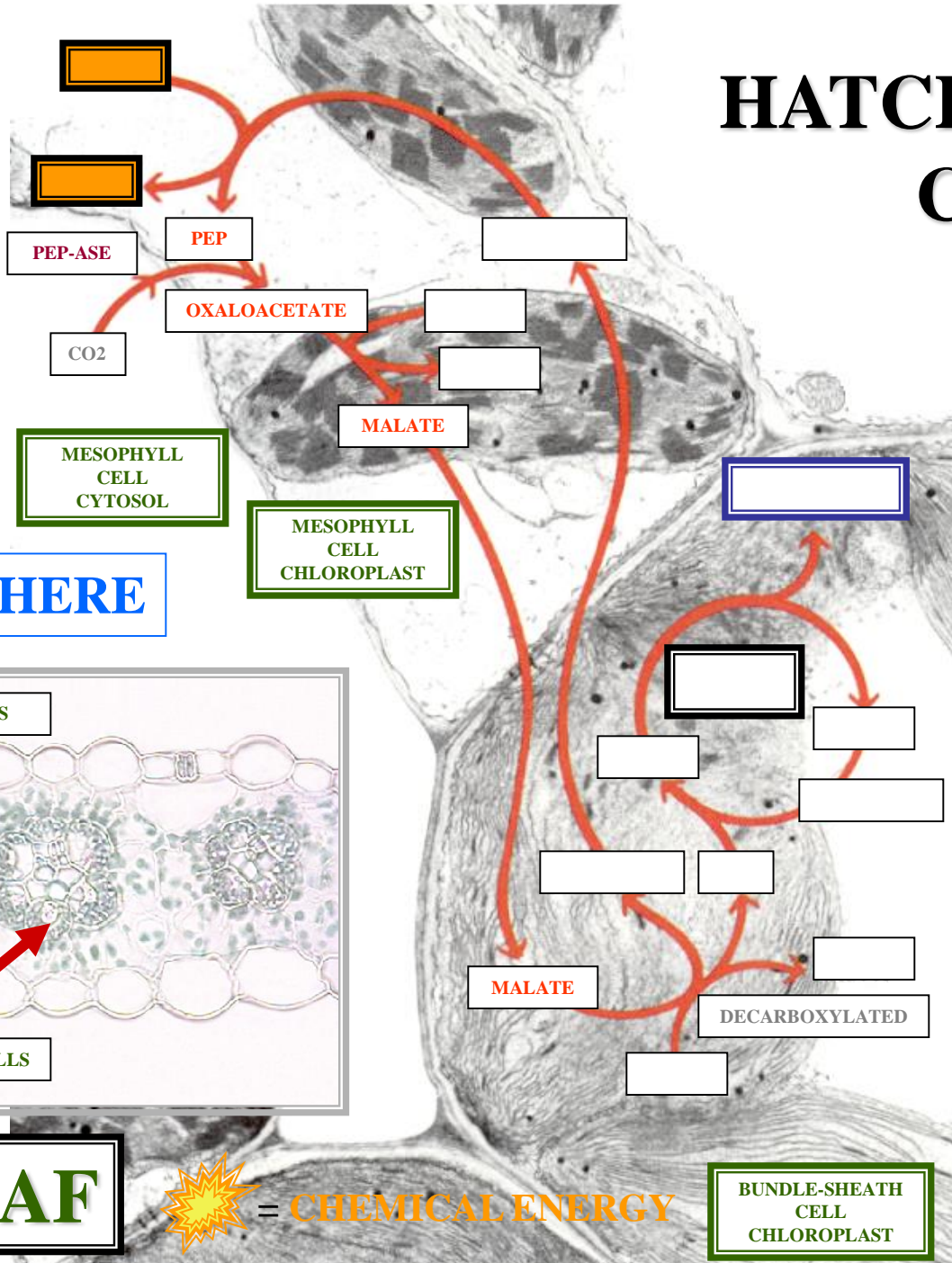
**CORN**

**ATMOSPHERE**



**C4 LEAF**

= CHEMICAL ENERGY



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

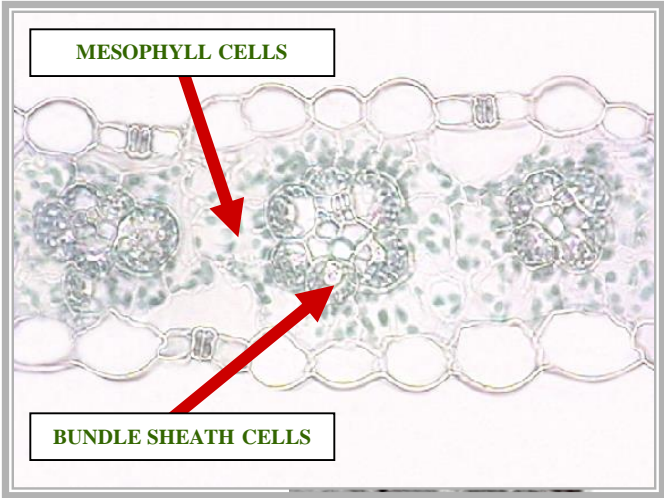
**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

# HATCH & SLACK CYCLE



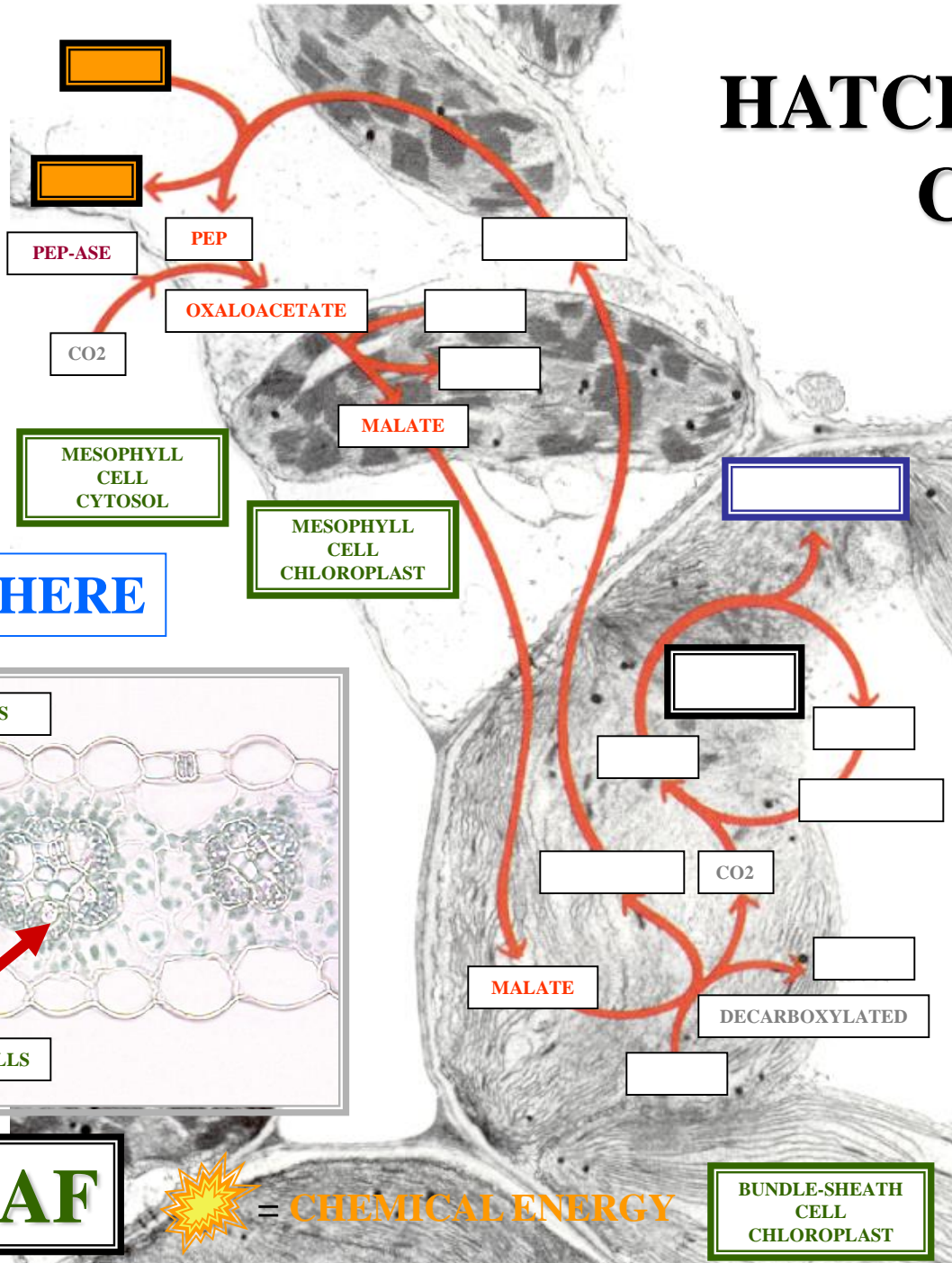
**CORN**

**ATMOSPHERE**



**C4 LEAF**

= CHEMICAL ENERGY



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

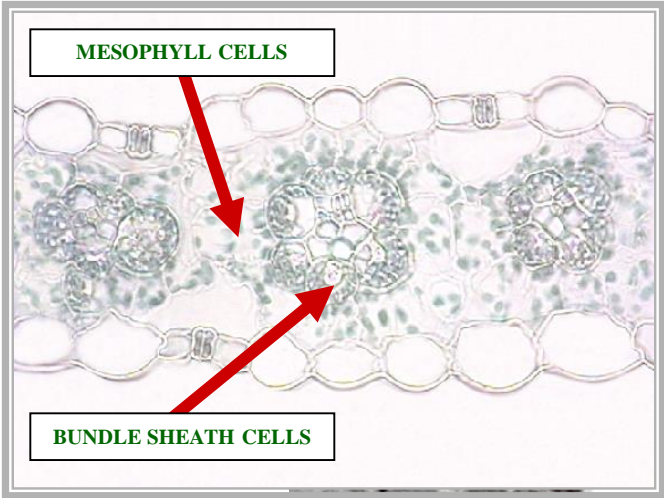


# HATCH & SLACK CYCLE

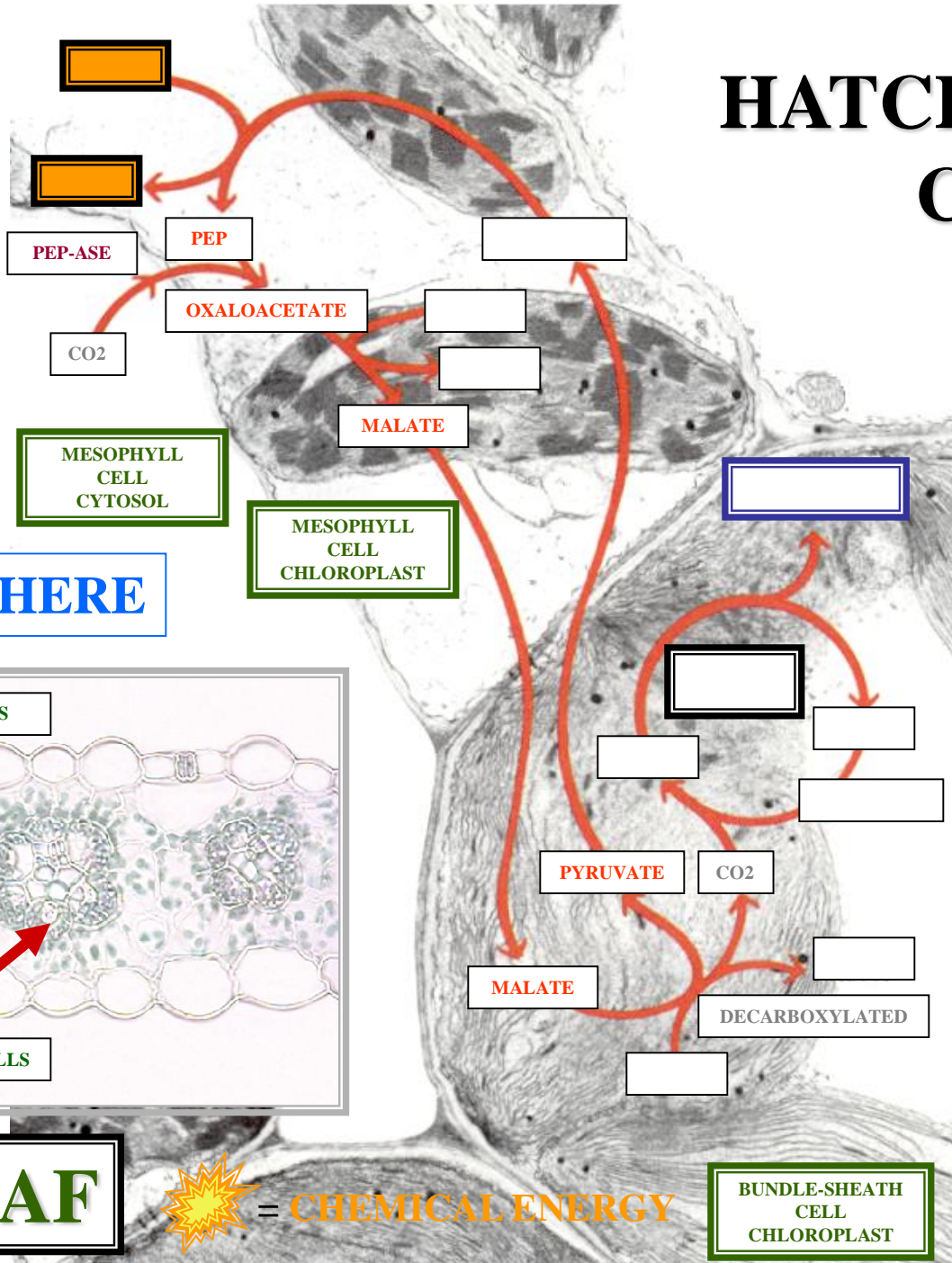


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

= CHEMICAL ENERGY

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**





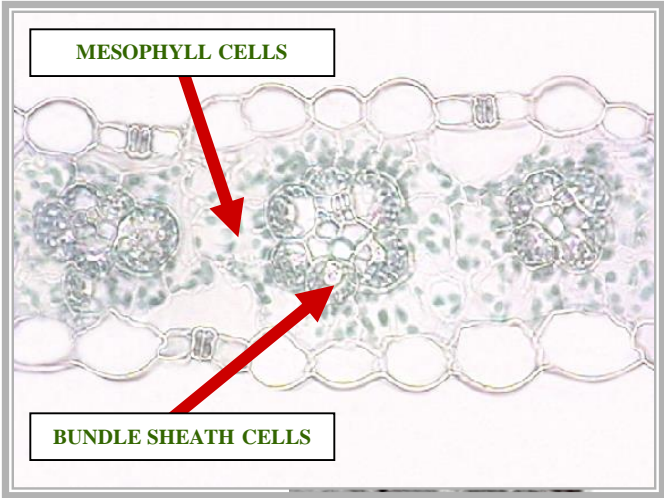
**CO<sub>2</sub>**

# HATCH & SLACK CYCLE

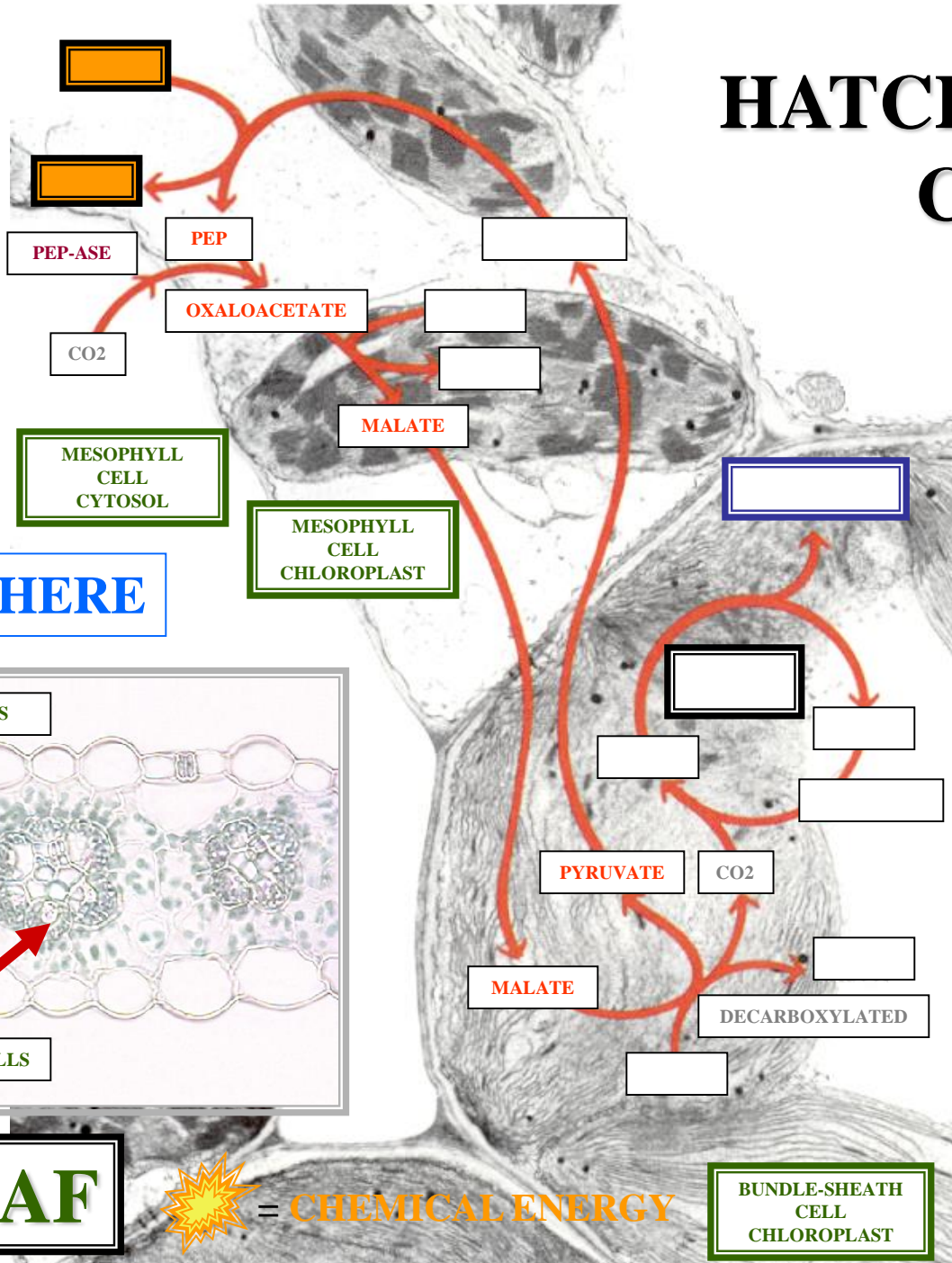


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

= CHEMICAL ENERGY

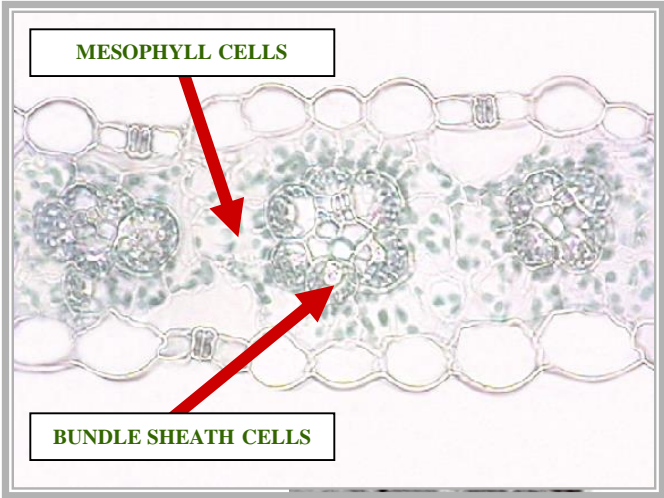
**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

# HATCH & SLACK CYCLE

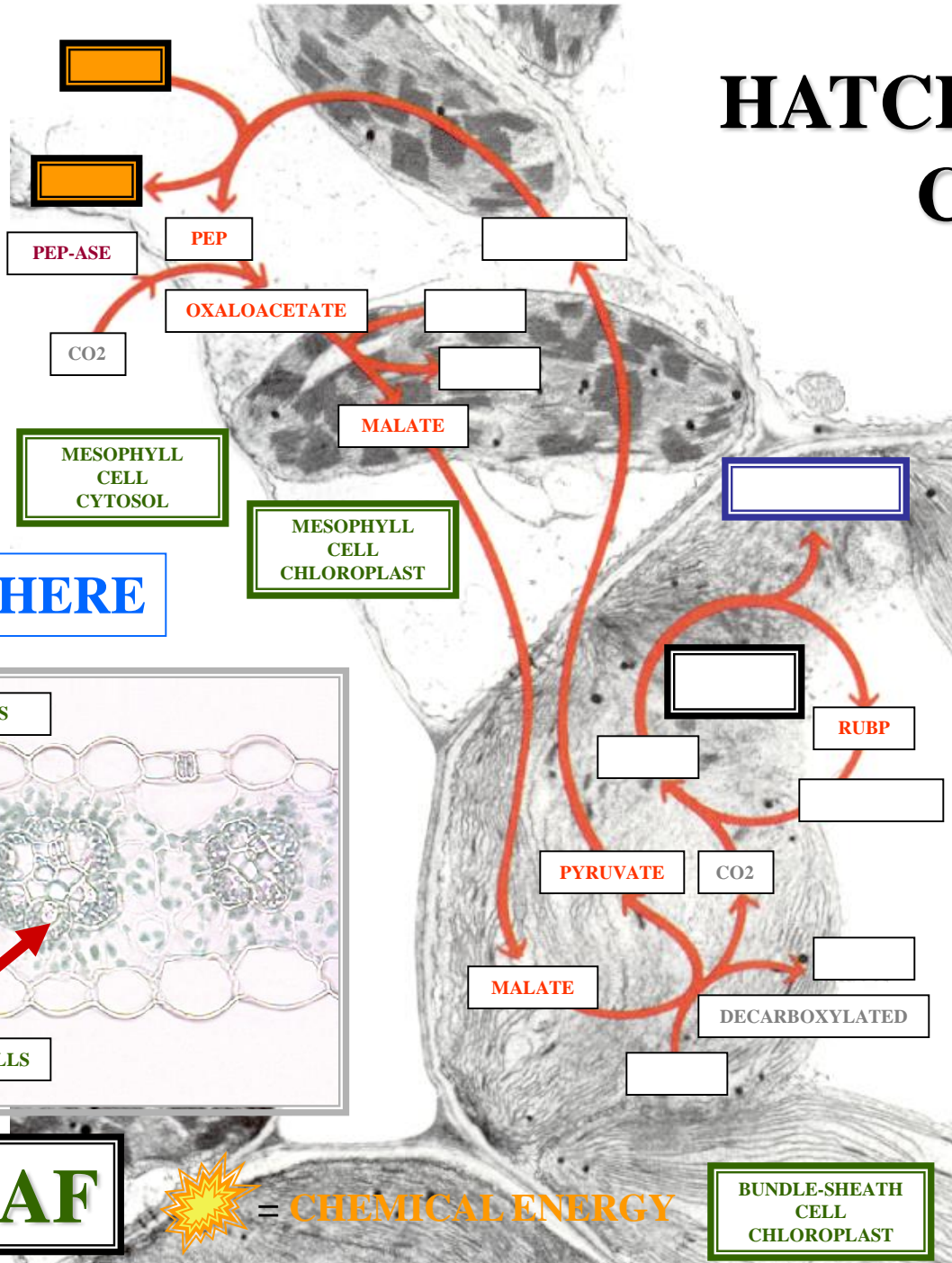


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

= **CHEMICAL ENERGY**

**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

**EZ**

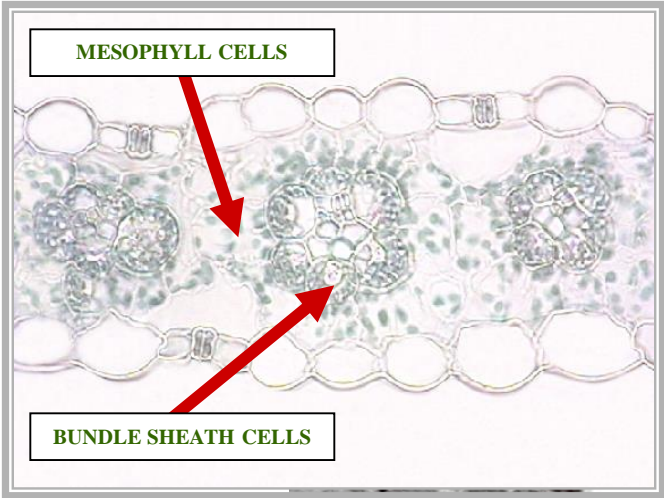


# HATCH & SLACK CYCLE

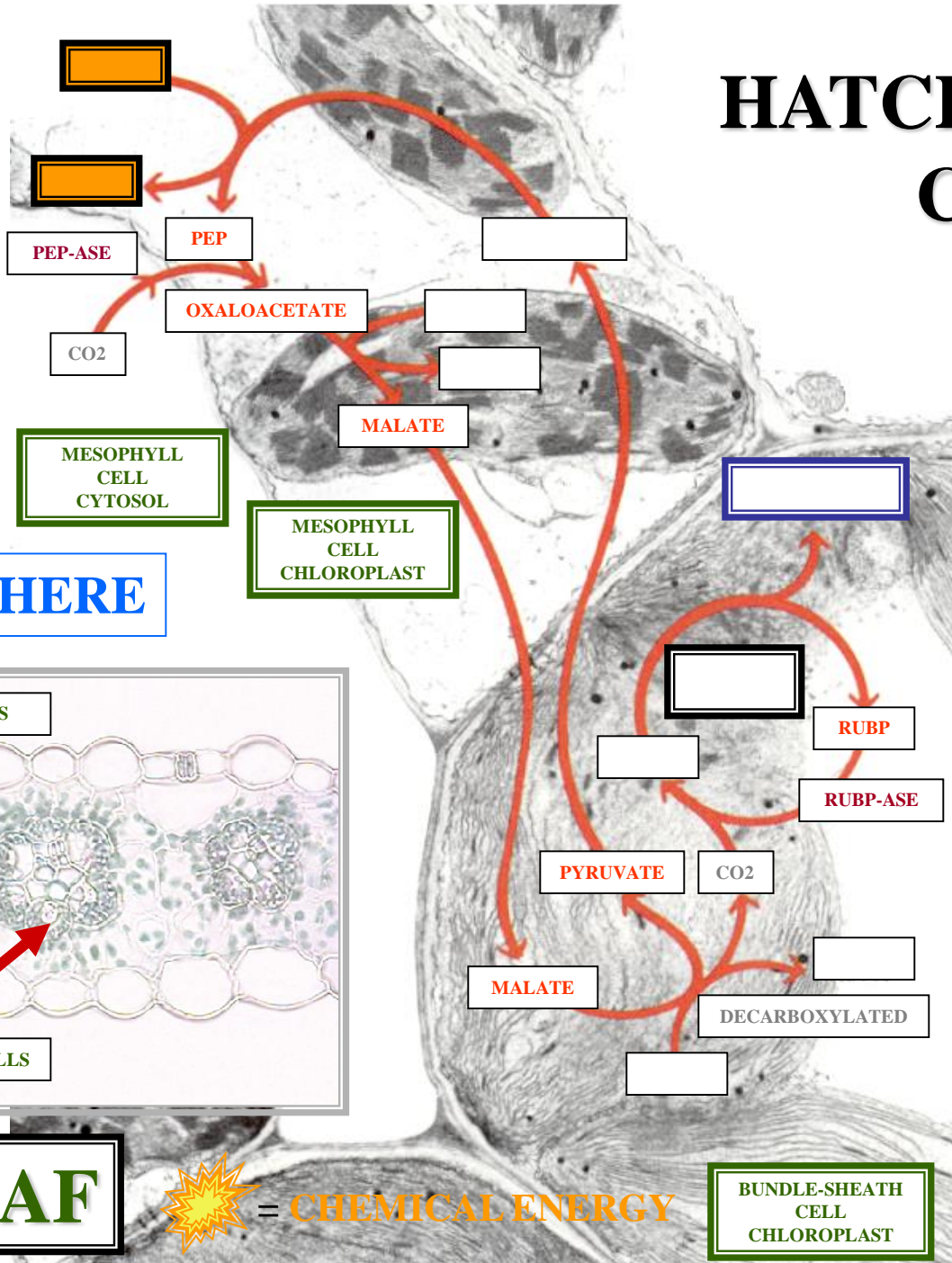


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS  
REQUIRE  
A SPECIFIC  
ENZYME**

**C4**

= **CHEMICAL ENERGY**

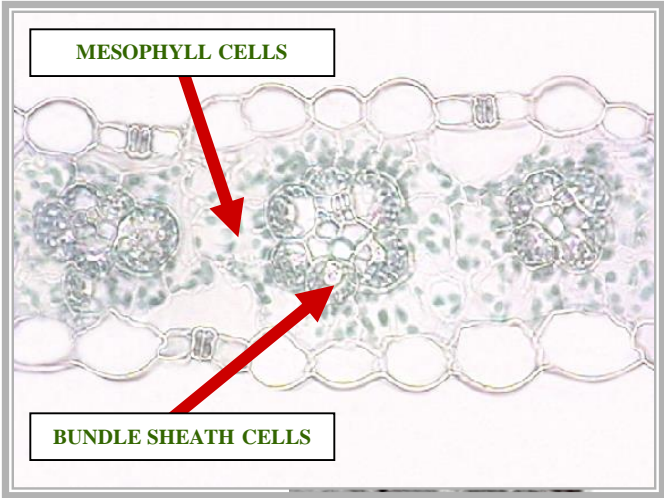
**BUNDLE-SHEATH  
CELL  
CHLOROPLAST**

# HATCH & SLACK CYCLE

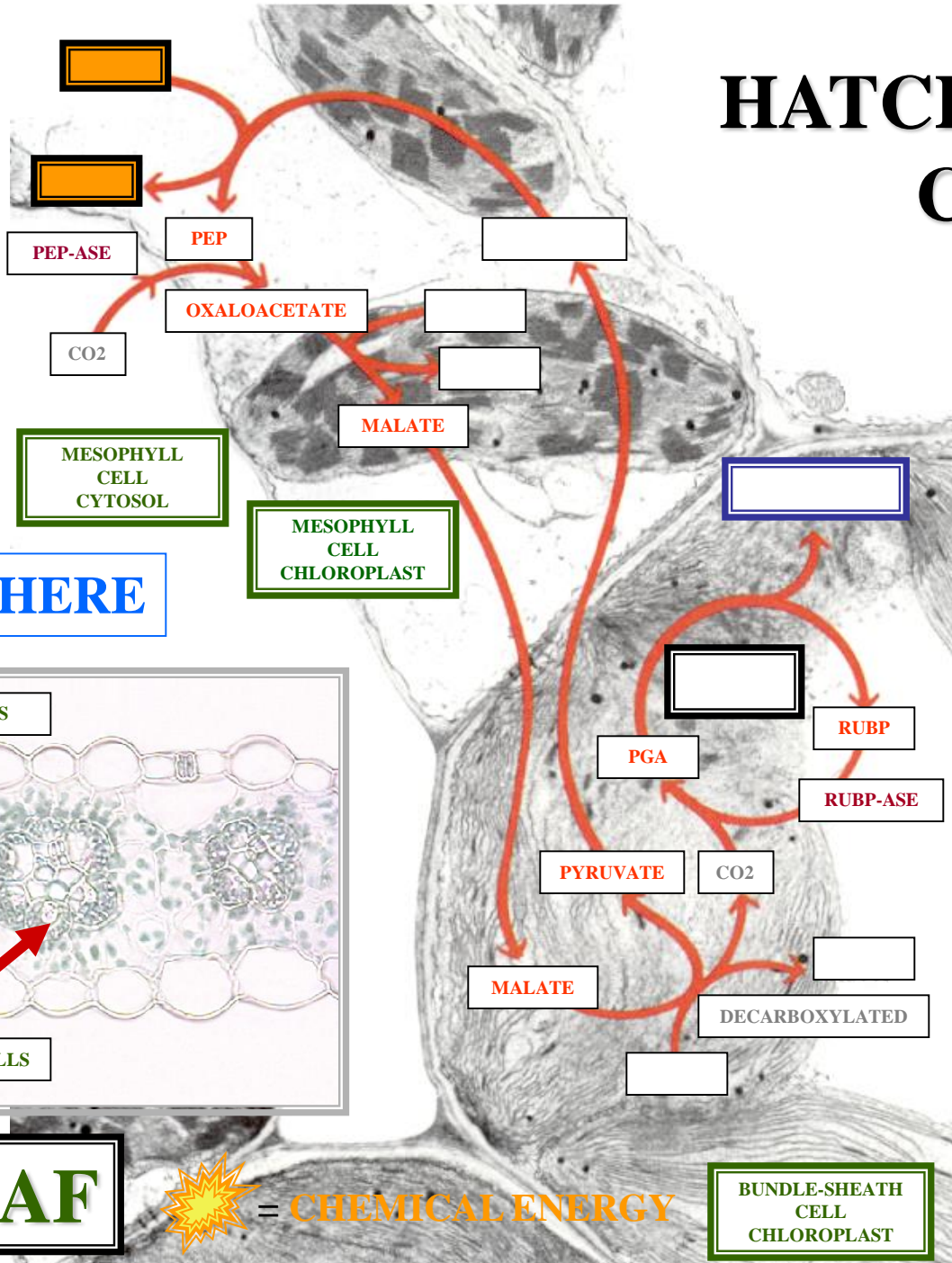


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS REQUIRE A SPECIFIC ENZYME**

**C4**

+

**RXT**

?

**BUNDLE-SHEATH CELL CHLOROPLAST**

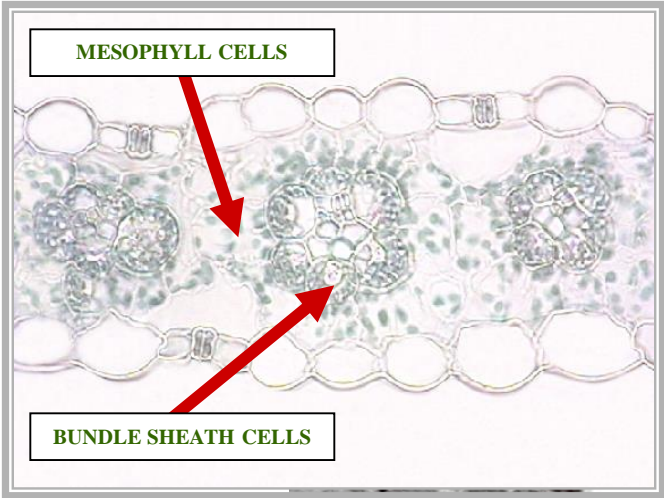


# HATCH & SLACK CYCLE

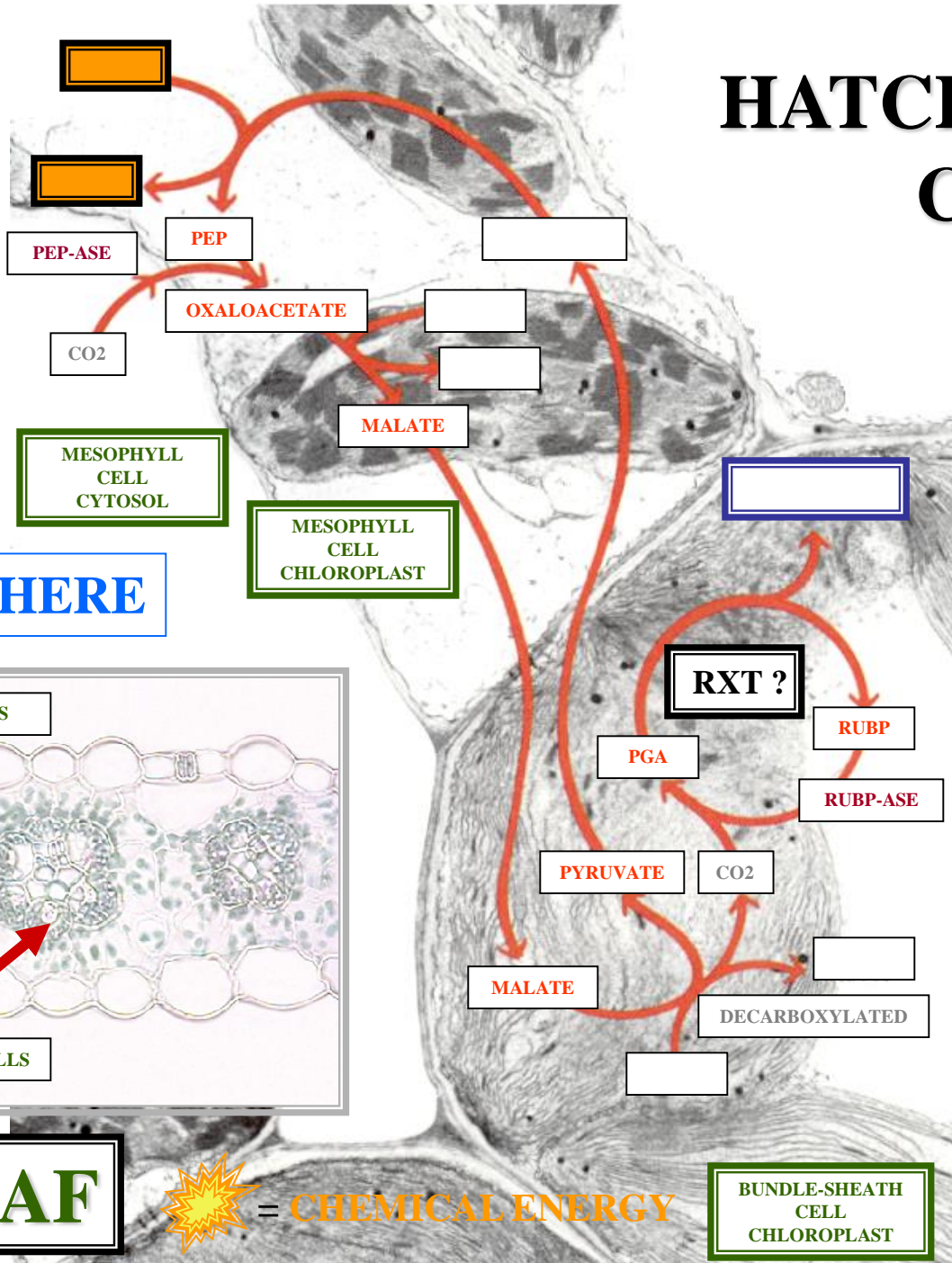


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS REQUIRE A SPECIFIC ENZYME**

**C4**

**BUNDLE-SHEATH CELL CHLOROPLAST**

**C3**

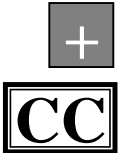
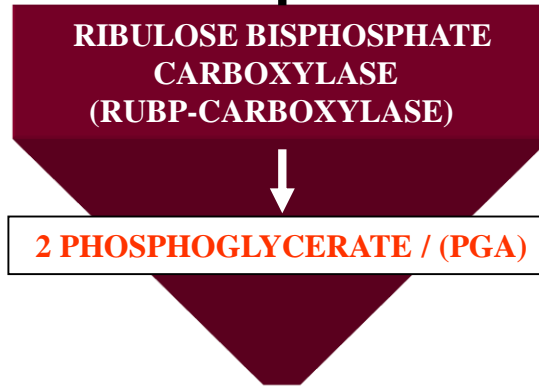


**C3**

CO<sub>2</sub>  
ENTERS  
STROMA



CO<sub>2</sub> + **RIBULOSE BISPHOSEPHATE / (RUBP)**



# CALVIN CYCLE

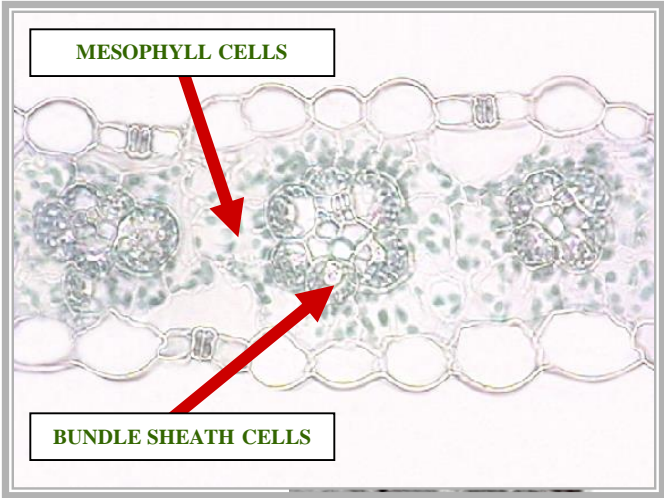
## **C3** CO<sub>2</sub> FIXATION REACTION

# HATCH & SLACK CYCLE

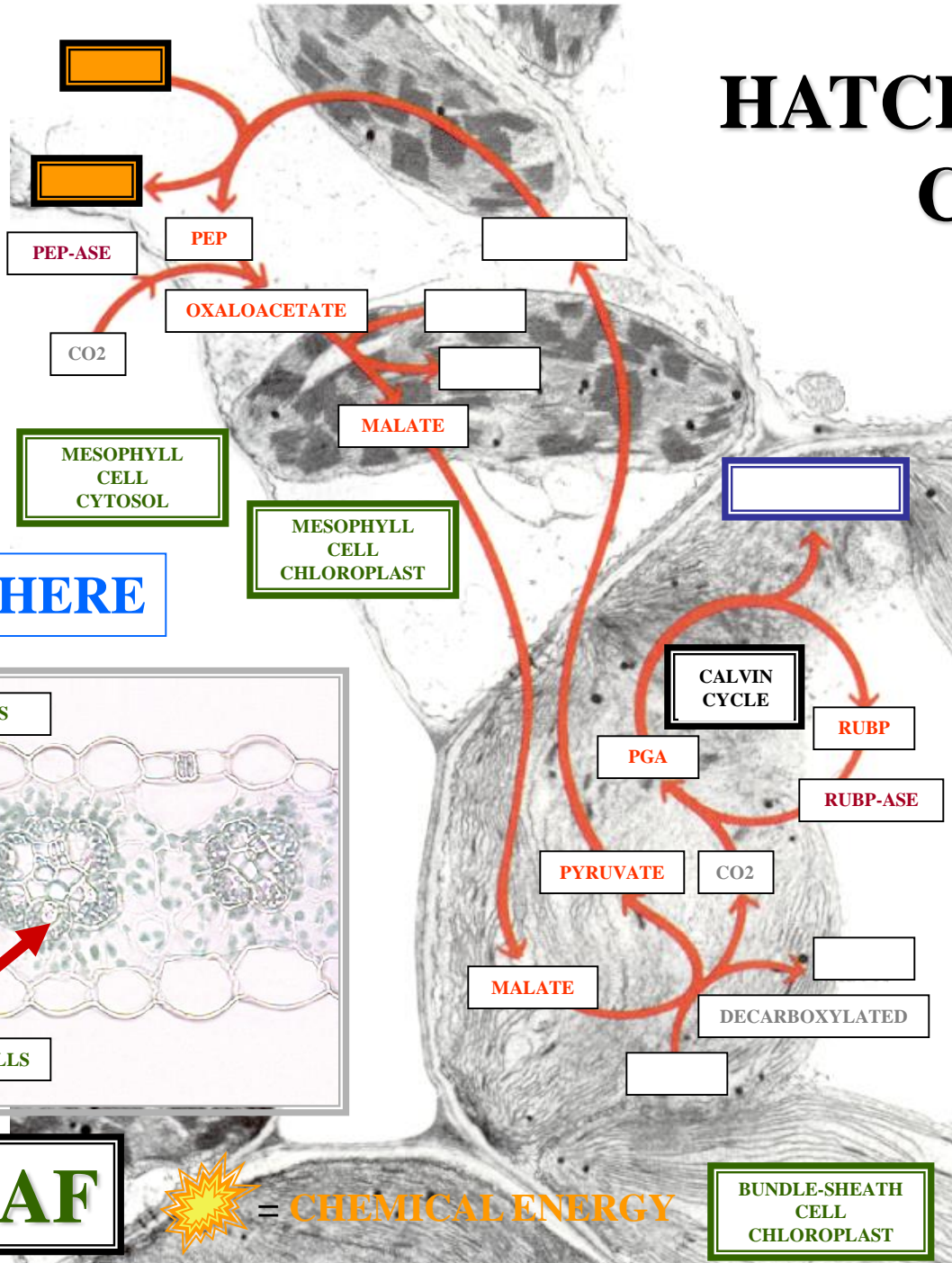


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS REQUIRE A SPECIFIC ENZYME**

**C4**

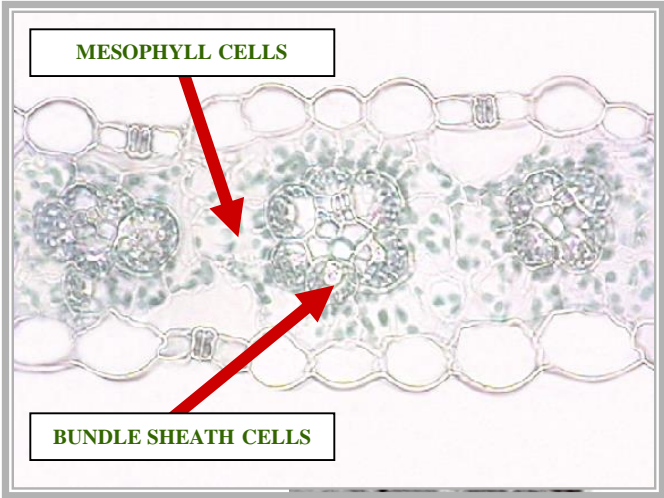
**C3**

# HATCH & SLACK CYCLE

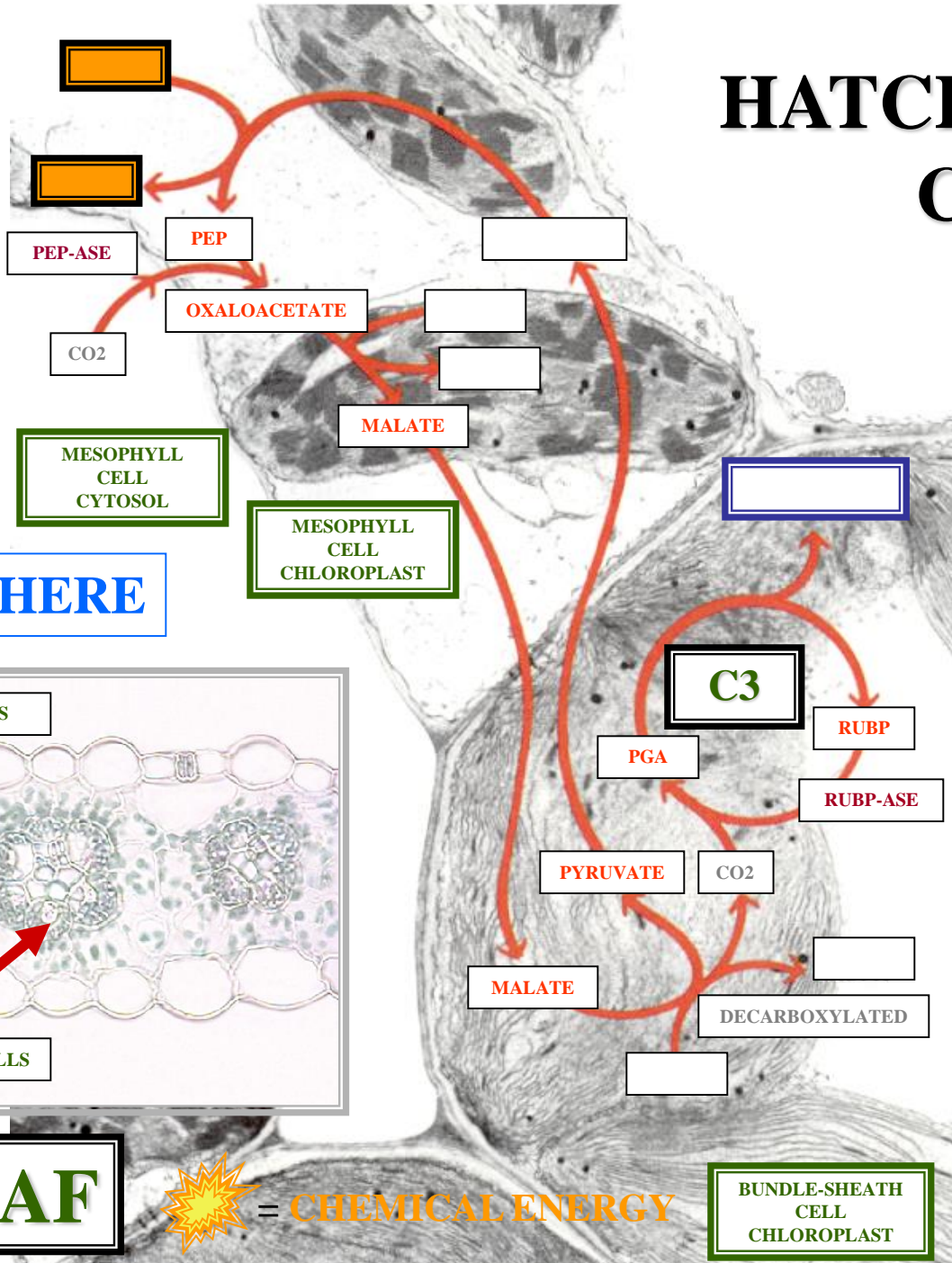


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS REQUIRE A SPECIFIC ENZYME**

**C4**





CO<sub>2</sub> + **RIBULOSE BIPHOSPHATE / (RUBP)**

**FEEDBACK**

**RIBULOSE BIPHOSPHATE  
CARBOXYLASE  
(RUBP-CARBOXYLASE)**

**G**

**+**

**PHOSPHOGLYCERATE / (PGA)**

**UNSTABLE 6C COMPOUND**

**PHOSPHOGLYCERATE / (PGA)**

**ATP**

**ATP**

**BIPHOSPHOGLYCERATE / (BIPGA)**

**BIPHOSPHOGLYCERATE / (BIPGA)**

**NADPH**

**NADPH**

**PHOSPHOGLYCERALDEHYDE / (PGAL)**

**PHOSPHOGLYCERALDEHYDE / (PGAL)**

**C<sub>3</sub>**

**COMPLEX SERIES  
CHEMICAL RXTS  
(CSCR)**

**COMPLEX SERIES  
CHEMICAL RXTS  
(CSCR)**

**GLUCOSE**

**C<sub>3</sub> PATHWAY  
CALVIN CYCLE**

**ATP**

**RIBULOSE BIPHOSPHATE / (RUBP)**

**= CHEMICAL ENERGY**

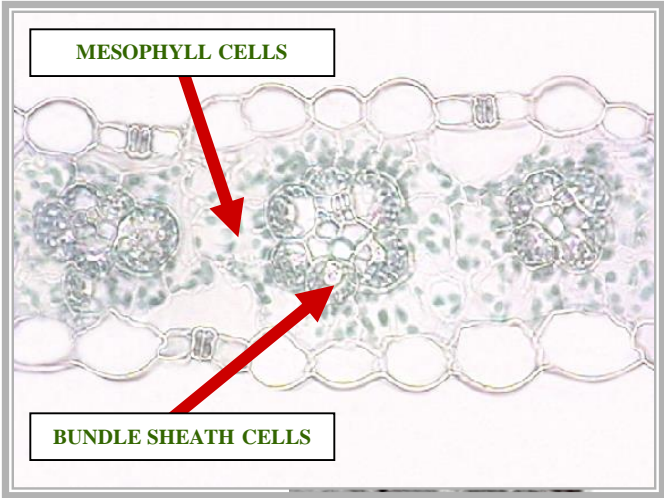


# HATCH & SLACK CYCLE

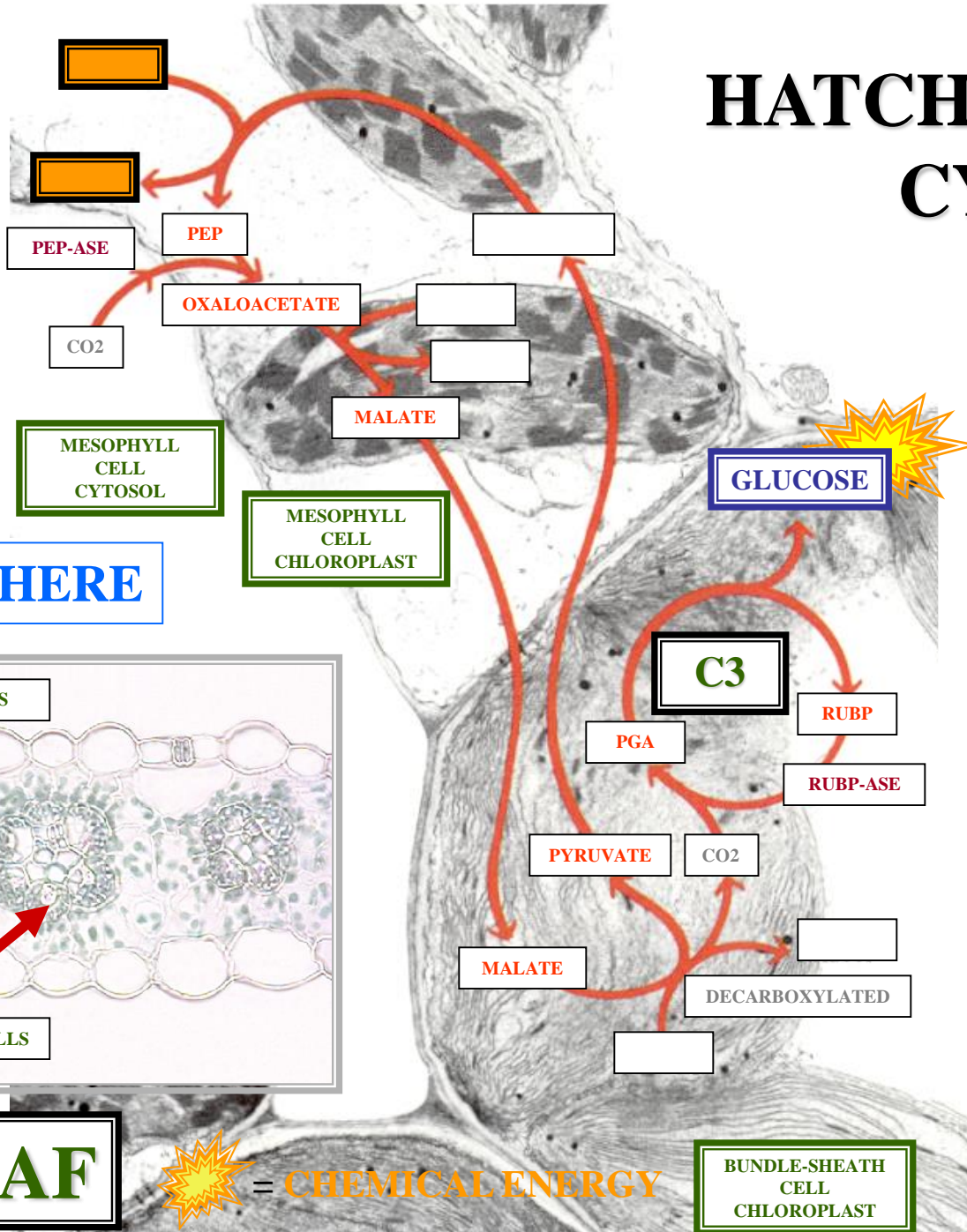


**CORN**

**ATMOSPHERE**



**C4 LEAF**



**ALL RXTS REQUIRE A SPECIFIC ENZYME**

**C4**

**GLUCOSE** = CHEMICAL ENERGY

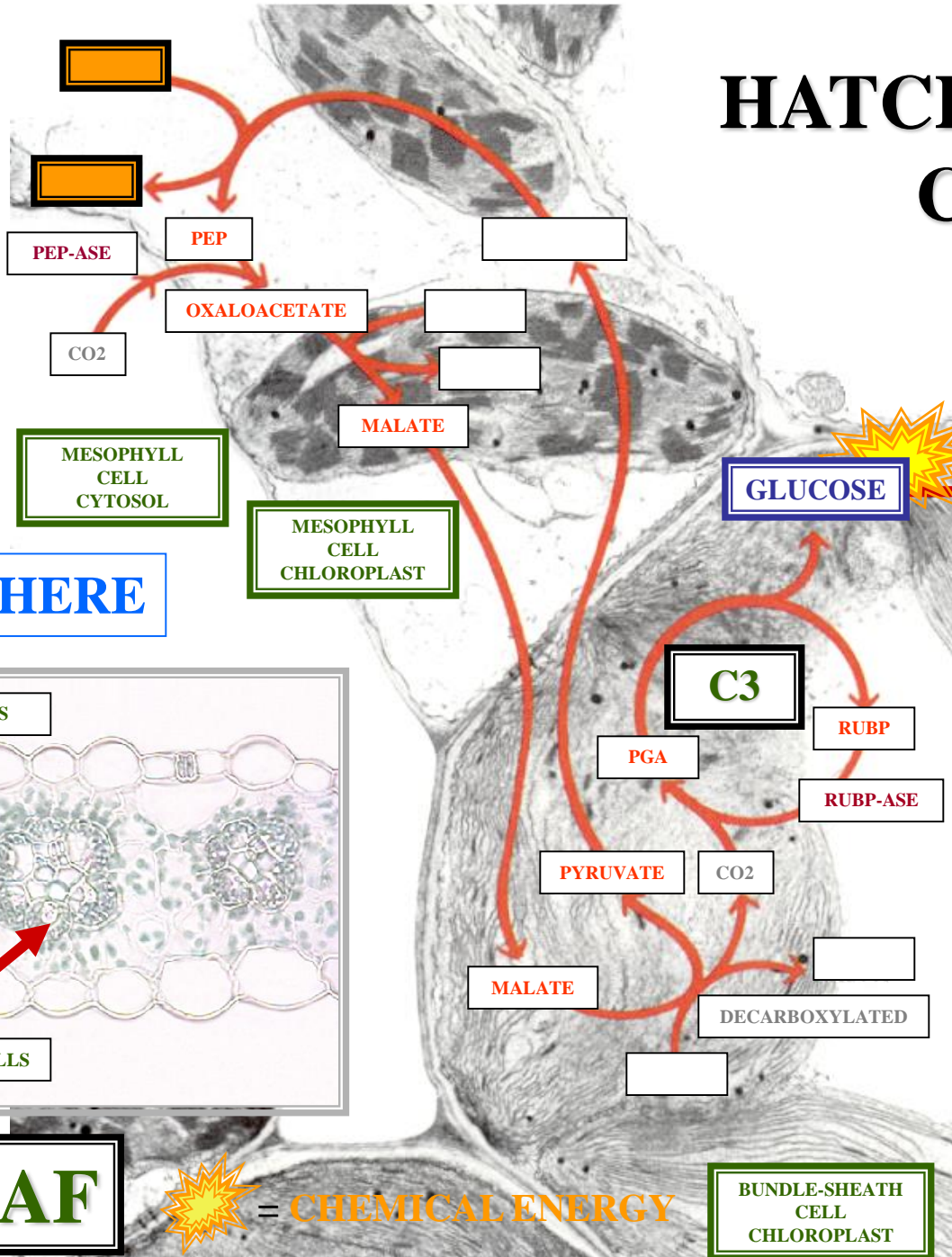
**BUNDLE-SHEATH CELL CHLOROPLAST**



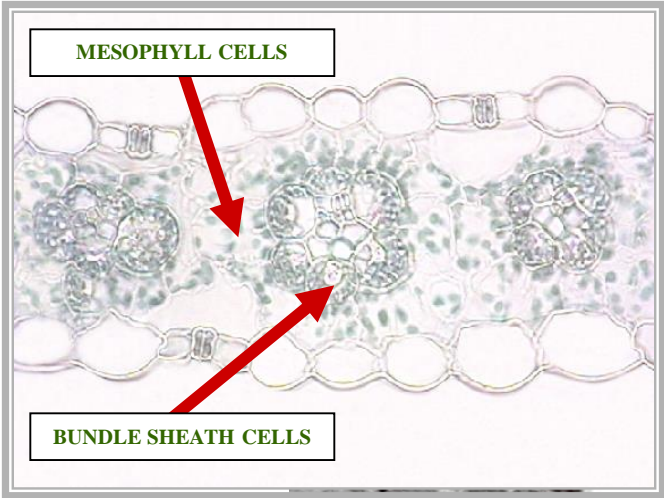
# HATCH & SLACK CYCLE



**CORN**



**ATMOSPHERE**



**C4 LEAF**

**CHEMICAL ENERGY**

**C4**

**BUNDLE-SHEATH CELL CHLOROPLAST**





# QUESTION

DOES A C4 PLANT  
ALSO CONDUCT C3?

# QUESTION

**ANSWER**

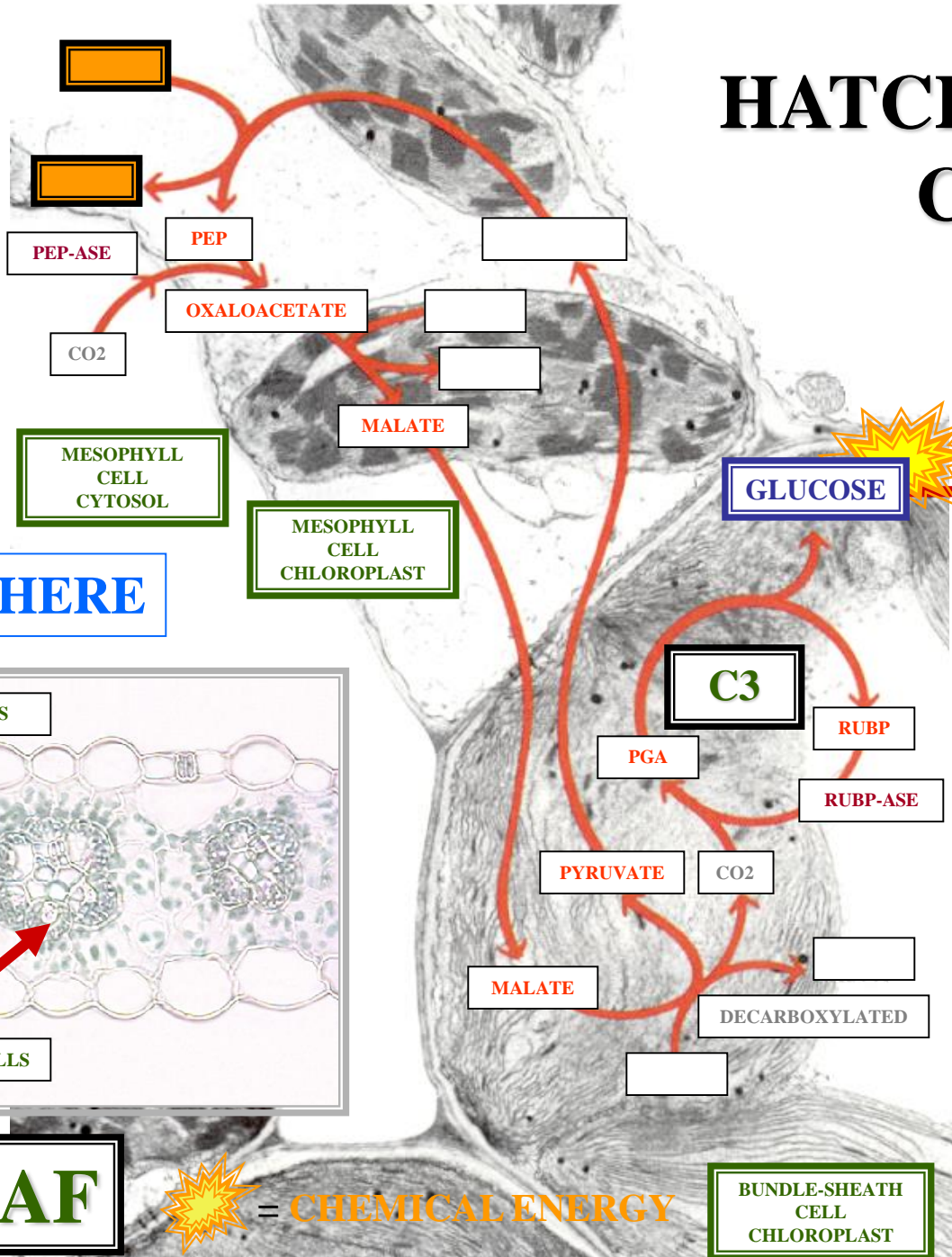
**YES**

**ANSWER**

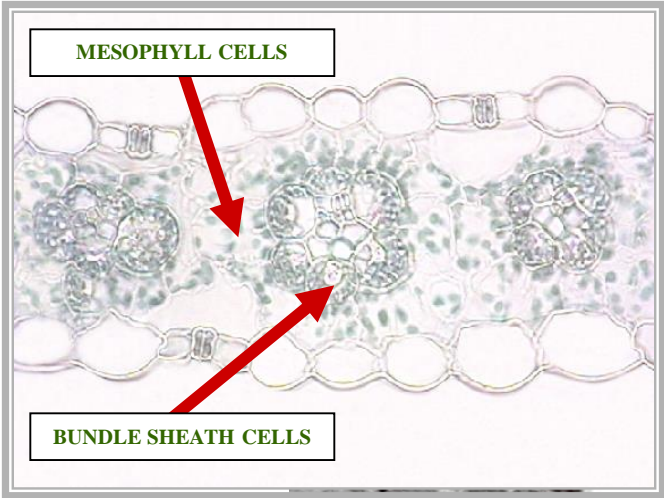
# HATCH & SLACK CYCLE



**CORN**



**ATMOSPHERE**



**C4 LEAF**

**CHEMICAL ENERGY**

**C4**

**BUNDLE-SHEATH CELL CHLOROPLAST**





A photograph of a cornfield with green stalks and tassels. The text is overlaid on the image.

*C4 PLANTS*

----

*C4 PATHWAY*

&

*C3 PATHWAY*

?

?



**CATABOLIC  
METABOLISM  
&  
ANABOLIC  
METABOLISM  
?**



**EXERERGONIC  
REACTIONS  
&  
ENDERERGONIC  
REACTIONS  
?**



**REDUCTION  
REACTIONS  
&  
OXIDATION  
REACTIONS  
?**



**LIGHT  
REACTION  
&  
DARK  
REACTION  
?**

