

***EFFICIENT
METABOLISM***

An electron micrograph showing a cross-section of a cell. The image is dominated by several large, dark, elongated structures with internal striations, which are mitochondria. These mitochondria are arranged in a somewhat circular pattern around a central, lighter-colored region. The central region contains a nucleus with a prominent nucleolus. The cytoplasm is filled with various organelles, including smaller vesicles and a network of membranes. The overall appearance is that of a highly organized, metabolically active cell.

HOMEOSTASIS

ORGANELLES



ORGANELLES

**SPECIALIZED ENTITIES
WITHIN CYTOSOL**

ORGANELLES



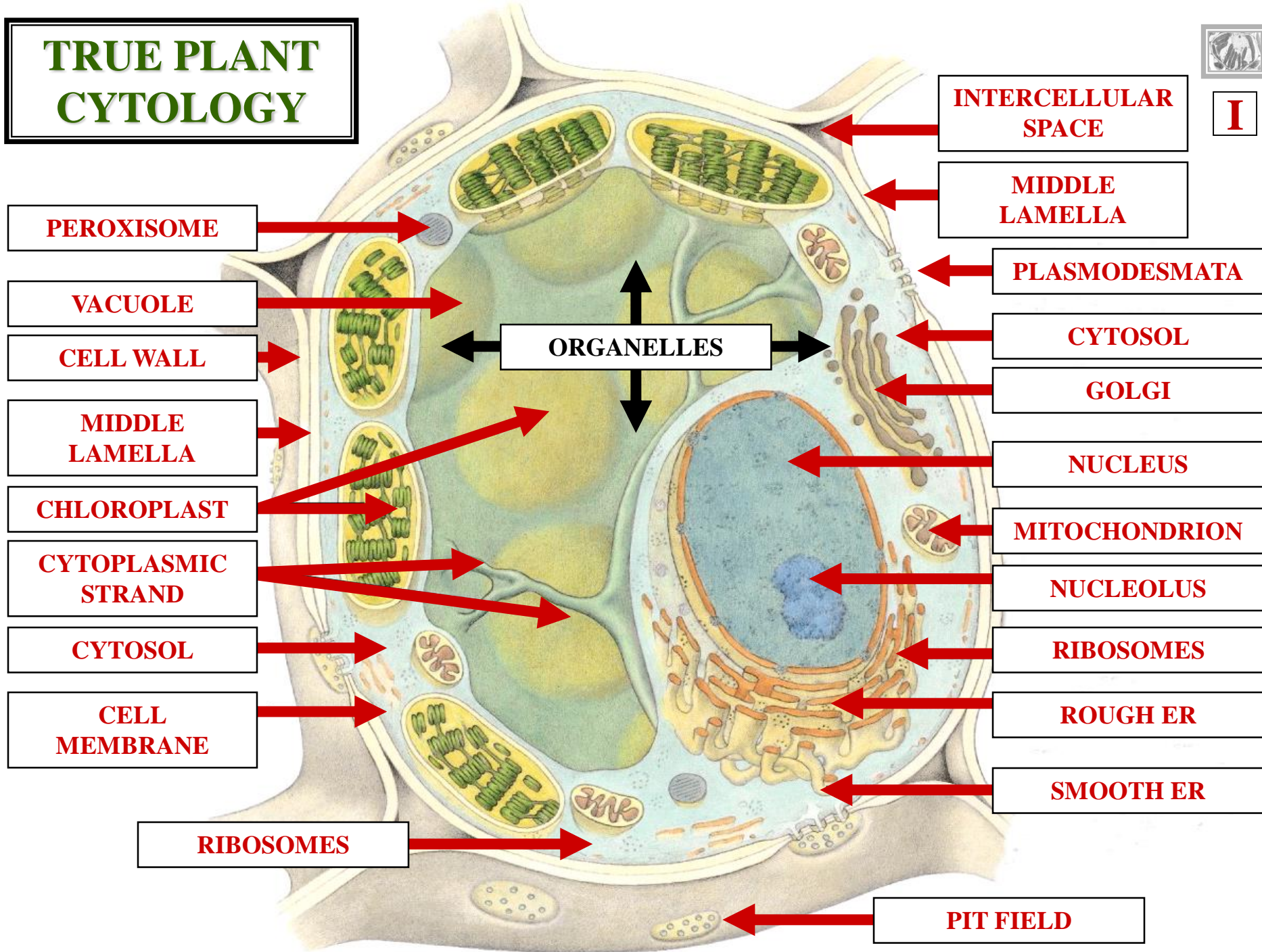
ORGANELLES

**SPECIALIZED ENTITIES
WITHIN CYTOSOL**

**ISOLATE NON-COMPATIBLE
BIO-CHEMICAL REACTIONS**

ORGANELLES

TRUE PLANT CYTOLOGY



ORGANELLES

ISOLATE

NON-COMPATIBLE

BIO-CHEM RXTS

***EFFICIENT
METABOLISM***



HOMEOSTASIS





TRUE PLANT ORGANELLES

TRUE PLANT ORGANELLE TYPES

**TRUE PLANT
ORGANELLE TYPES**

DOUBLE MEMBRANE BOUND

**TRUE PLANT
ORGANELLE TYPES**

**TRUE PLANT
ORGANELLE TYPES**

**DOUBLE MEMBRANE BOUND
SINGLE MEMBRANE BOUND**

**TRUE PLANT
ORGANELLE TYPES**



TRUE PLANT ORGANELLE TYPES

DOUBLE MEMBRANE BOUND
SINGLE MEMBRANE BOUND
NON-MEMBRANE BOUND

TRUE PLANT ORGANELLE TYPES



DOUBLE MEMBRANE BOUND ORGANELLES

**DOUBLE
MEMBRANE
BOUND
ORGANELLE
TYPES**

DMBO
ORGANELLE TYPES

PLASTIDS

DMBO
ORGANELLE TYPES

DMBO
ORGANELLE TYPES

PLASTIDS

MITOCHONDRION

DMBO
ORGANELLE TYPES



DMBO

ORGANELLE TYPES

PLASTIDS

MITOCHONDRION

NUCLEUS

DMBO

ORGANELLE TYPES

PLASTIDS

PLASTIDS



PLASTIDS

PLANT CELLS
ONLY

PLASTIDS



PLANT CELLS ONLY



PLASTID TYPES

PLASTID TYPES

PROPLASTID

PLASTID TYPES

PLASTID TYPES

PROPLASTID
LEUCOPLAST

PLASTID TYPES

PLASTID TYPES

PROPLASTID

LEUCOPLAST

CHROMOPLAST

PLASTID TYPES

PLASTID TYPES

PROPLASTID

LEUCOPLAST

CHROMOPLAST

CHLOROPLAST

PLASTID TYPES

PROPLASTID



PLASTIDS
PROPLASTID

NON-PIGMENTED
IMMATURE PLASTID

PLASTIDS
PROPLASTID



PLASTIDS

PROPLASTID

NON-PIGMENTED
IMMATURE PLASTID

DERIVES OTHER PLASTIDS

PLASTIDS

PROPLASTID

PLASTIDS TYPES



PROPLASTID

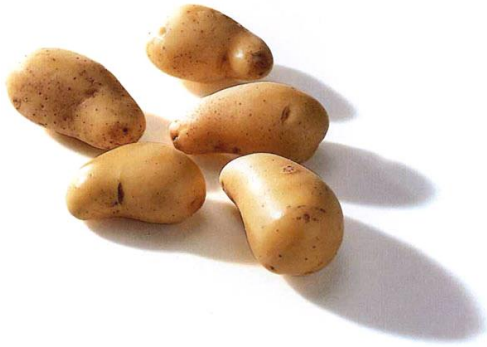


PLASTIDS TYPES

PROPLASTID



L



TUBER



LEAF



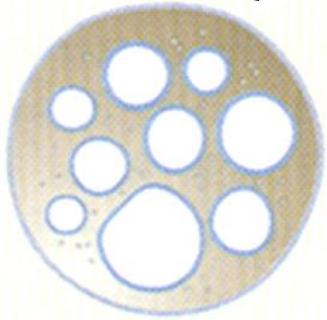
FRUIT

PLASTIDS TYPES

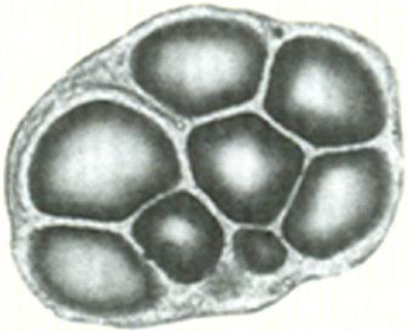
PROPLASTID



C



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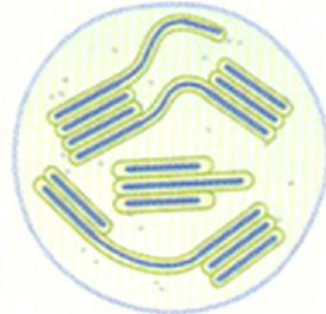
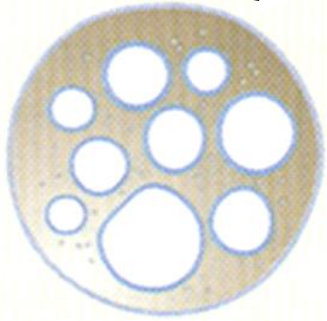
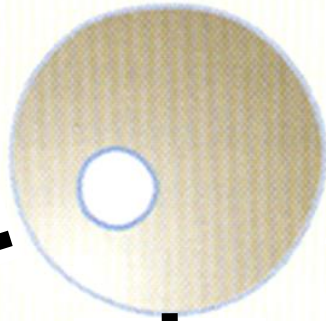


PLASTIDS TYPES

PROPLASTID

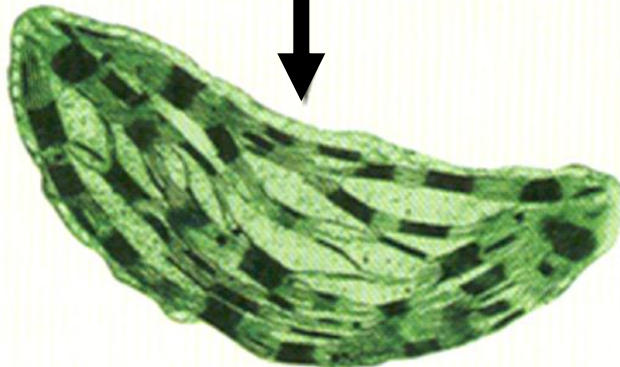
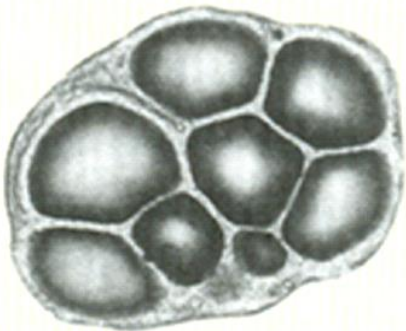


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LEUCOPLAST

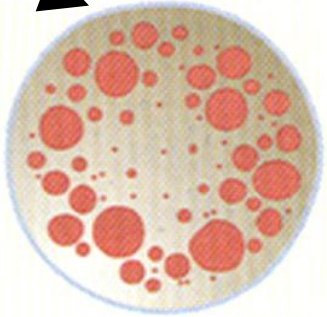
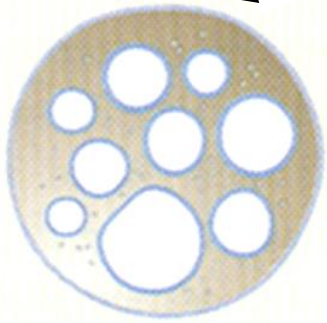
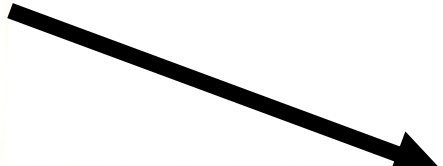
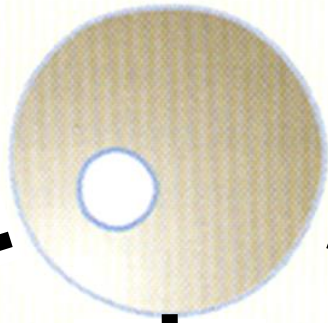
CHLOROPLAST



PLASTIDS TYPES

PROPLASTID

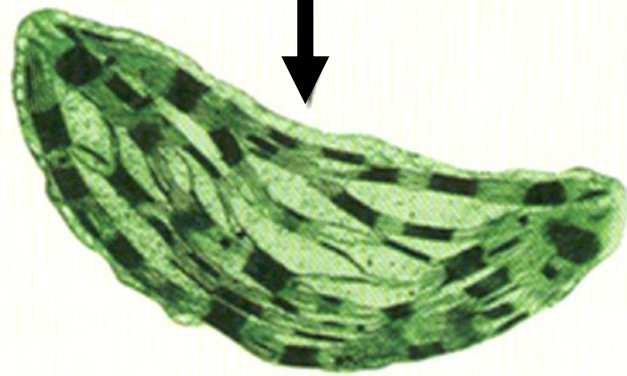
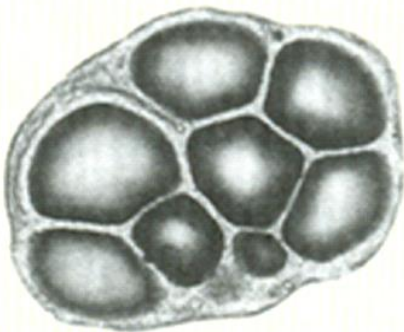
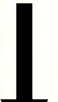
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LEUCOPLAST

CHLOROPLAST

CHROMOPLAST



LEUCOPLAST



PLASTIDS
LEUCOPLAST

NON-PIGMENTED
PLASTID

PLASTIDS
LEUCOPLAST



PLASTIDS
LEUCOPLAST

NON-PIGMENTED
PLASTID

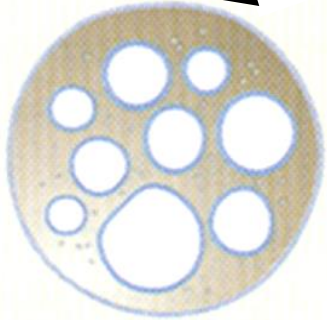
STORES STARCH

PLASTIDS
LEUCOPLAST

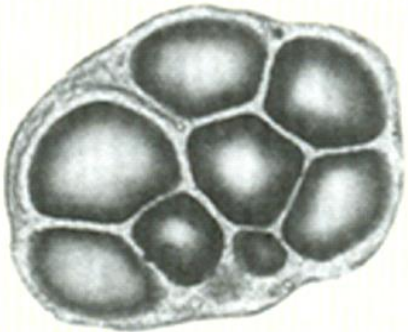
PLASTIDS TYPES



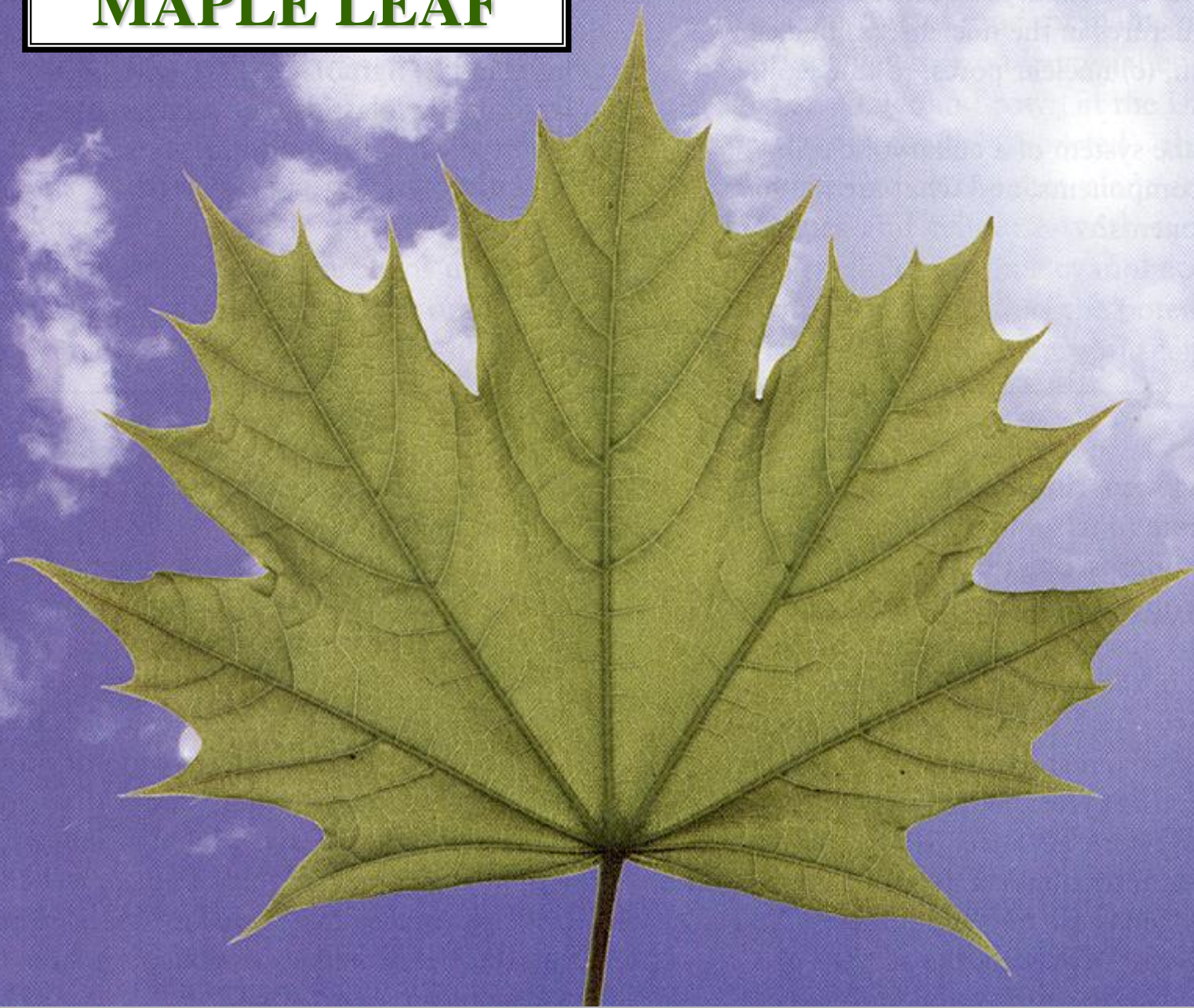
PROPLASTID



LEUCOPLAST



MAPLE LEAF



PHOTOSYNTHESIS



?

S

WATER

CO₂

LIGHT ENERGY

PHOTO

ATMOSPHERE

E-

PHOTOLYSIS



LT RXT

THYLAKOID

CHEMICAL ENERGY

DK RXT

STROMA

CHLOROPLAST

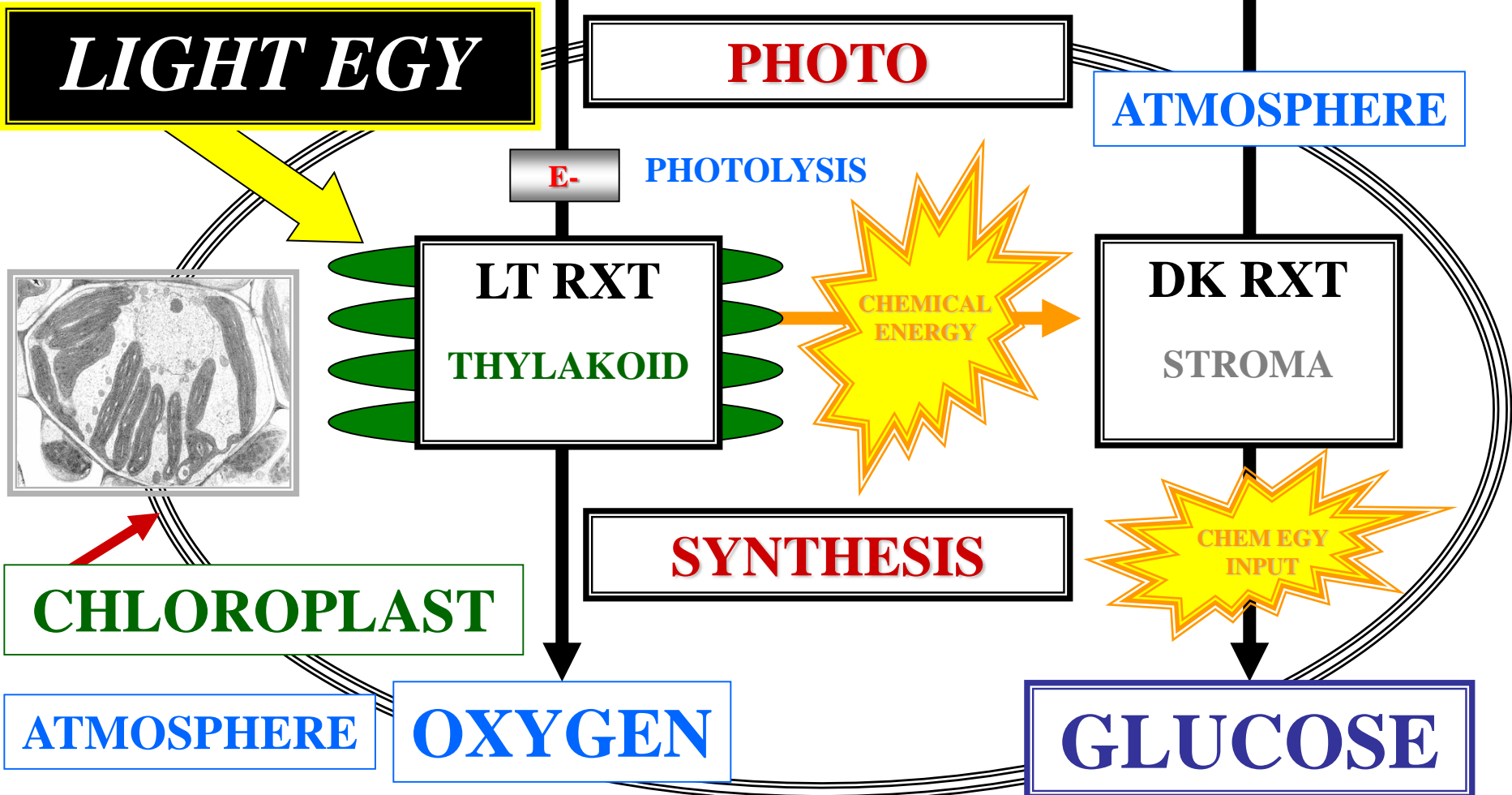
SYNTHESIS

CHEMICAL ENERGY INPUT

ATMOSPHERE

OXYGEN

GLUCOSE



PHOTOSYNTHESIS

S



WATER

CO₂

LIGHT ENERGY

PHOTO

ATMOSPHERE

E-

PHOTOLYSIS

LT RXT

THYLAKOID

CHEMICAL ENERGY

DK RXT

STROMA

SYNTHESIS

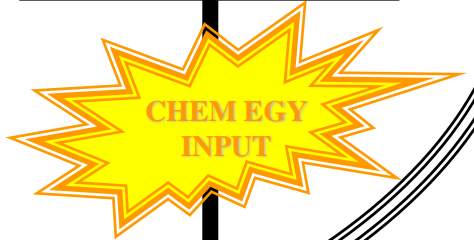
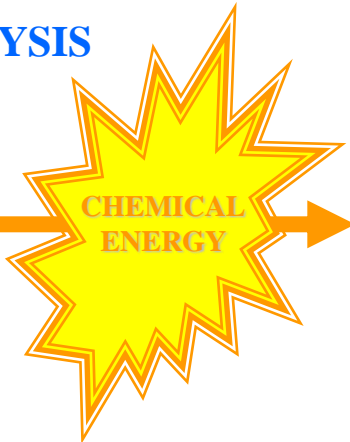
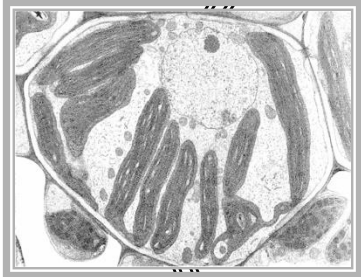
CHEMICAL ENERGY INPUT

CHLOROPLAST

ATMOSPHERE

OXYGEN

?



PHOTOSYNTHESIS



SG

WATER

CO₂

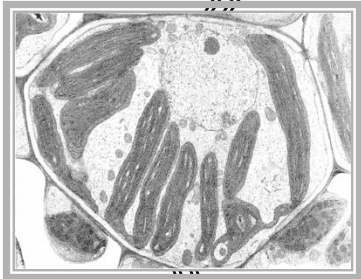
LIGHT ENERGY

PHOTO

ATMOSPHERE

E-

PHOTOLYSIS



LT RXT

THYLAKOID

CHEMICAL ENERGY

DK RXT

STROMA

CHLOROPLAST

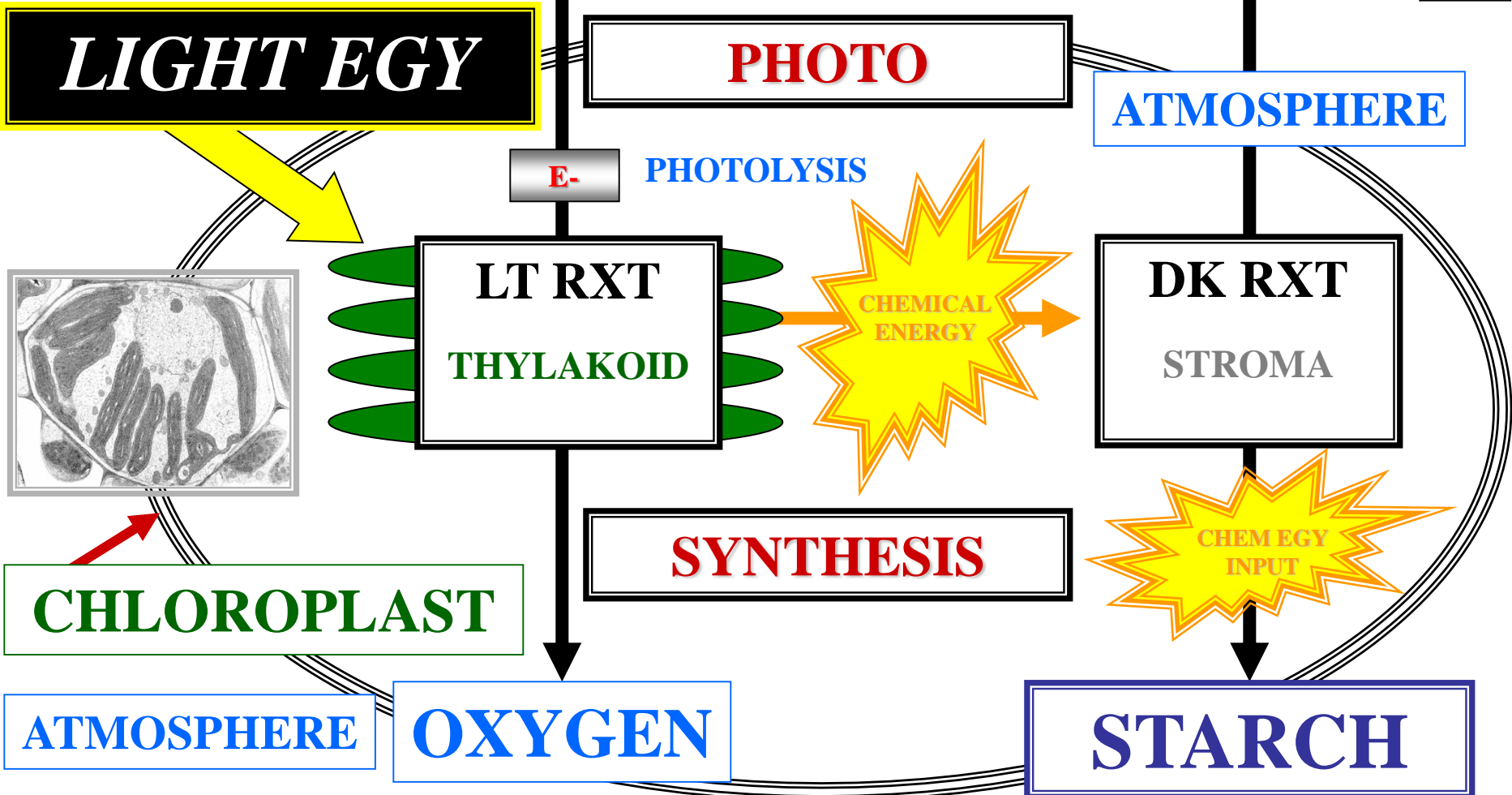
SYNTHESIS

CHEMICAL ENERGY INPUT

ATMOSPHERE

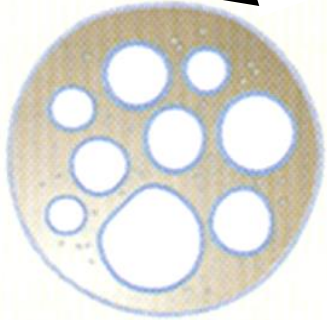
OXYGEN

STARCH



PLASTIDS TYPES

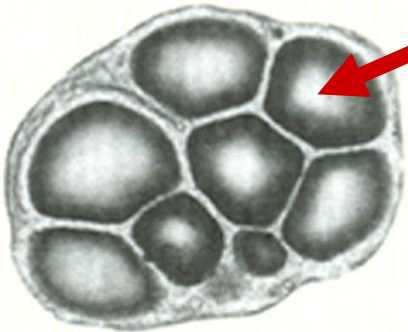
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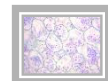


LEUCOPLAST

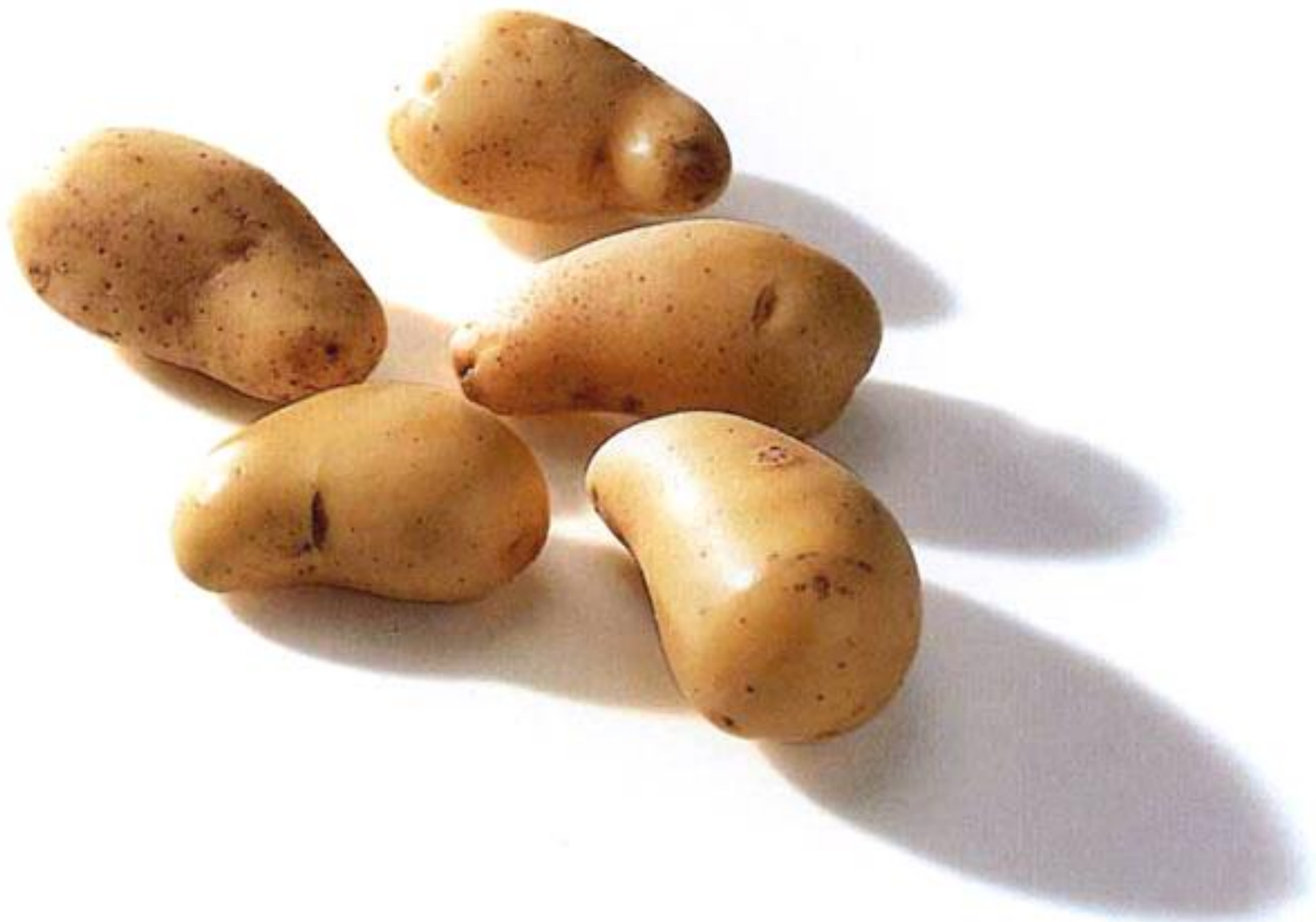


STARCH GRAINS

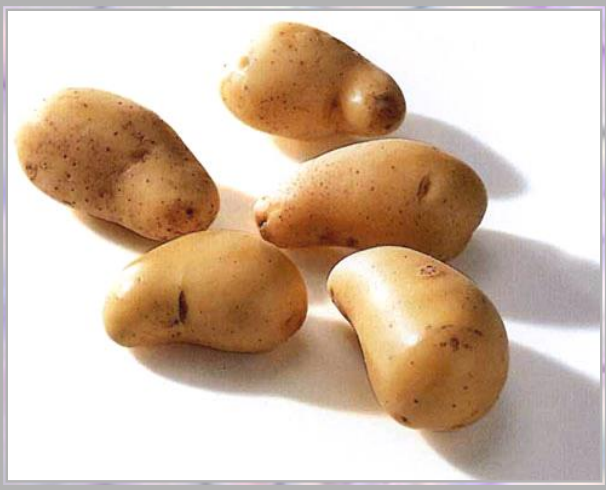
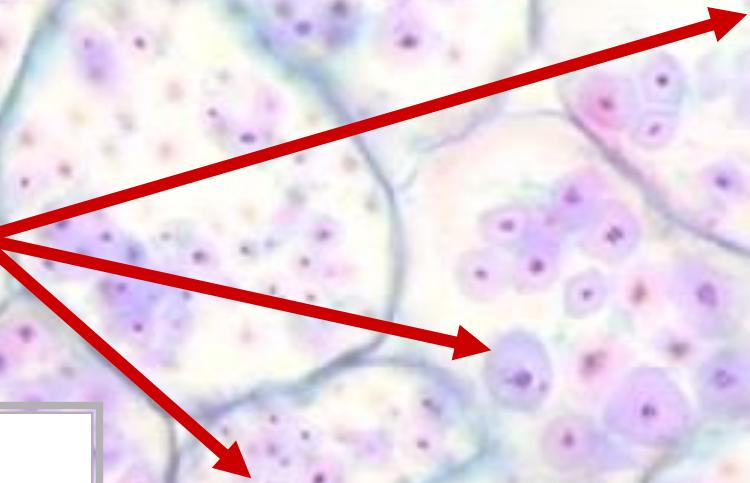




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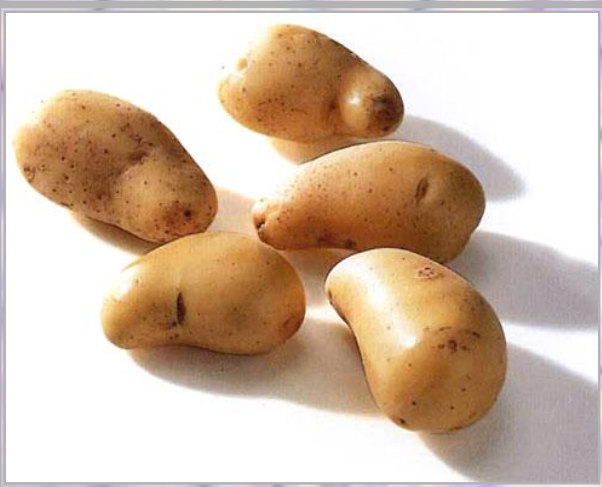
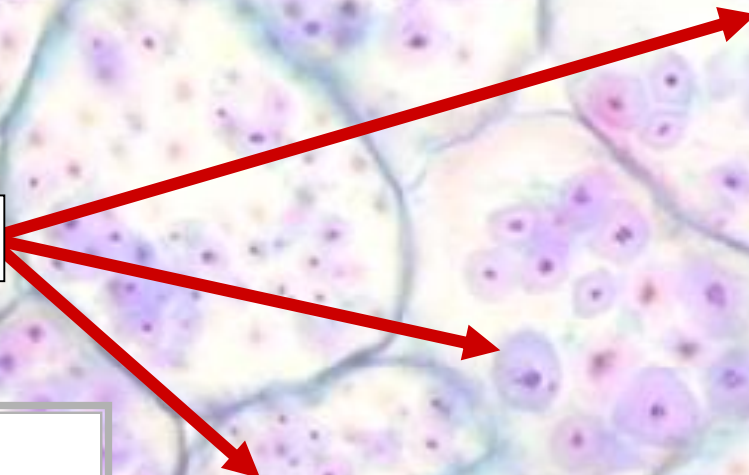


STARCH GRAINS



C.S.

LEUCOPLASTS

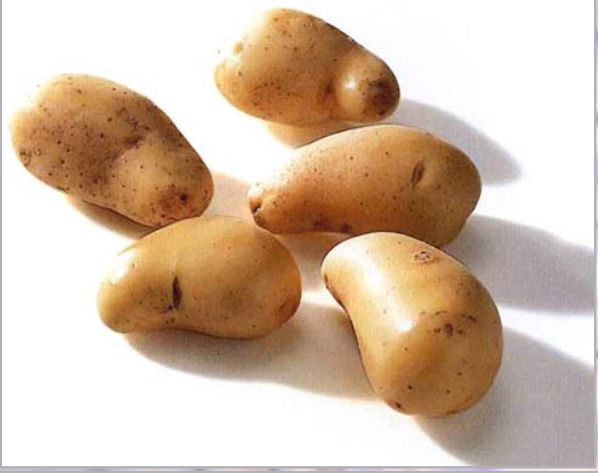


C.S.

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C

**LEUCOPLASTS
STORE STARCH**



C.S.

CHROMOPLAST



PLASTIDS
CHROMOPLAST

PIGMENTED PLASTID

CAROTENOID PIGMENTS
DOMINATE

PLASTIDS
CHROMOPLAST



PLASTIDS

CHROMOPLAST

PIGMENTED PLASTID

CAROTENOID PIGMENTS

DOMINATE

ATTRACT ANIMALS

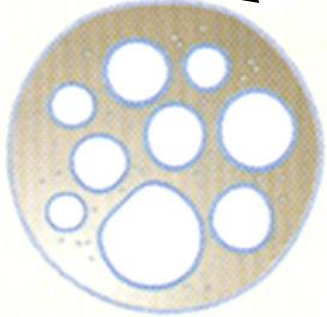
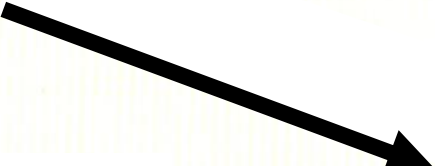
PLASTIDS

CHROMOPLAST

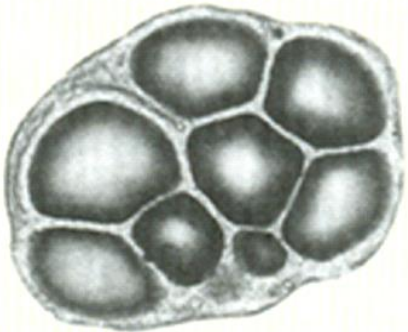
PLASTIDS TYPES



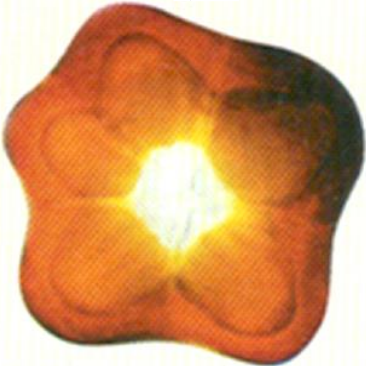
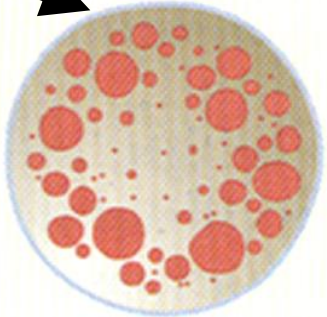
PROPLASTID



LEUCOPLAST



CHROMOPLAST



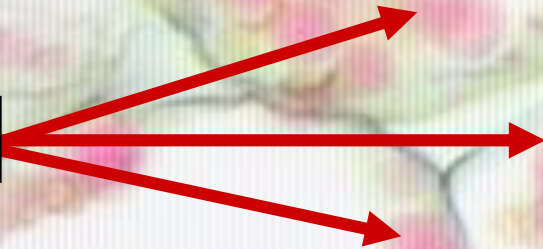


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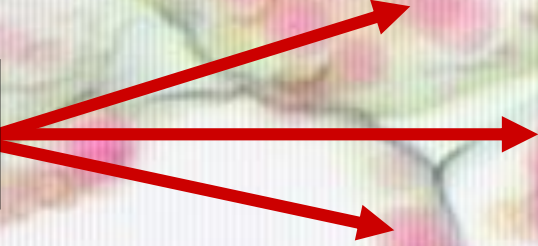
CHROMOPLASTS



C.S.

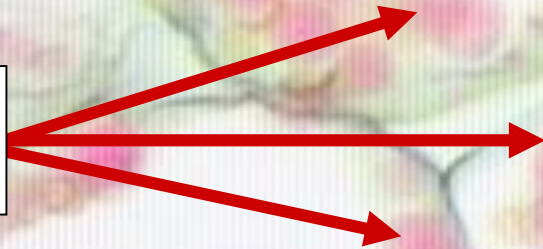


**CHROMOPLASTS
CAROTENOIDS**



C.S.

**CHROMOPLASTS
CAROTENOIDS**



**CHROMOPLASTS
ATTRACT
ANIMALS**

C.S.

CHLOROPLAST



PLASTIDS

CHLOROPLAST

PIGMENTED PLASTID

CHLOROPHYLL PIGMENTS

DOMINATE

PLASTIDS

CHLOROPLAST



PLASTIDS

CHLOROPLAST

CHLOROPHYLL PIGMENTS

DOMINATE

CONDUCTS

PHOTOSYNTHESIS

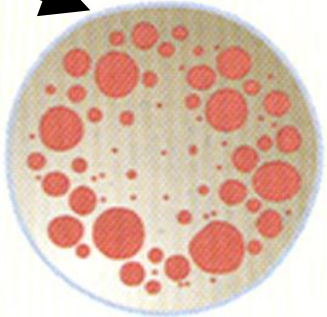
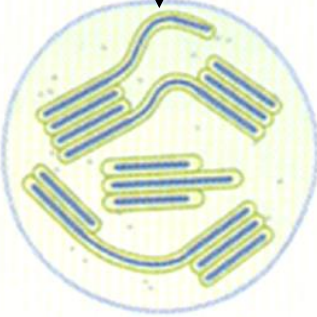
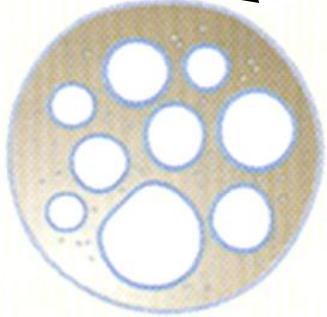
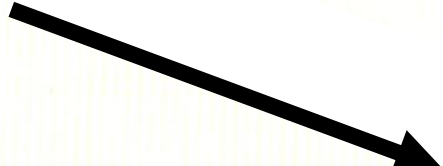
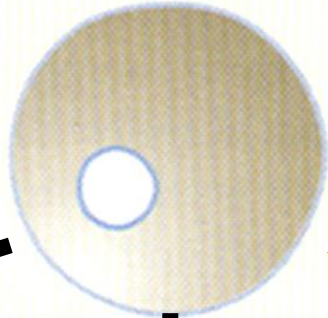
PLASTIDS

CHLOROPLAST

PLASTIDS TYPES



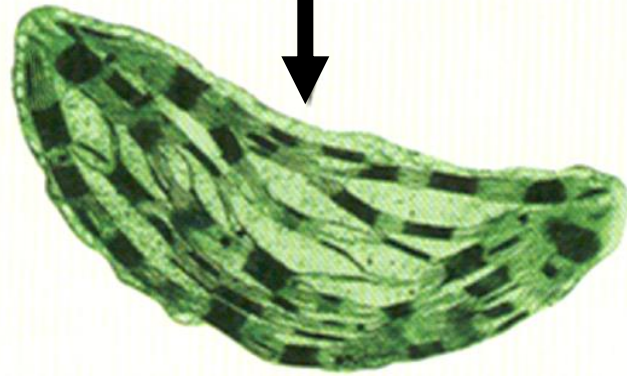
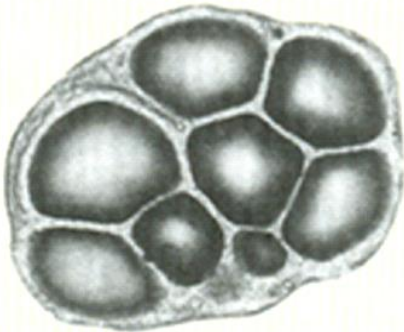
PROPLASTID



LEUCOPLAST

CHLOROPLAST

CHROMOPLAST



MAPLE LEAF



C



C

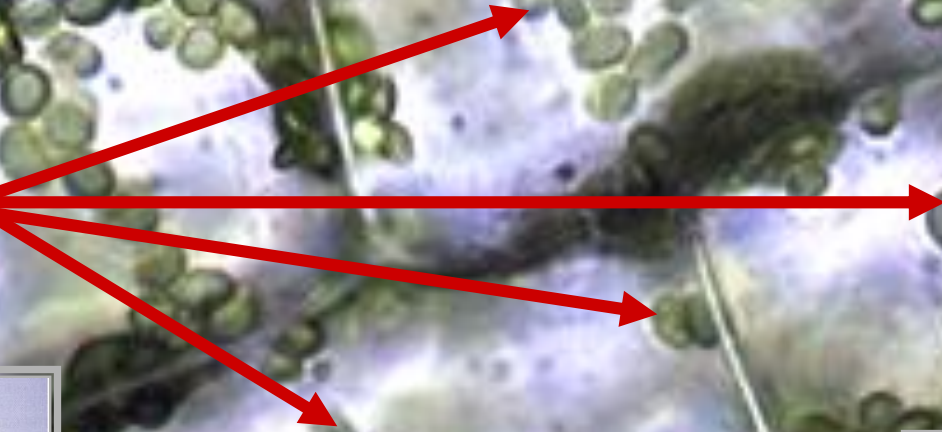
CHLOROPLASTS



C.S.



CHLOROPLASTS
CHLOROPHYLL



C.S.

PHOTOSYNTHESIS



WATER

CO₂

LIGHT ENERGY

PHOTO

ATMOSPHERE

E-

PHOTOLYSIS

LT RXT

THYLAKOID

CHEMICAL ENERGY

DK RXT

STROMA

SYNTHESIS

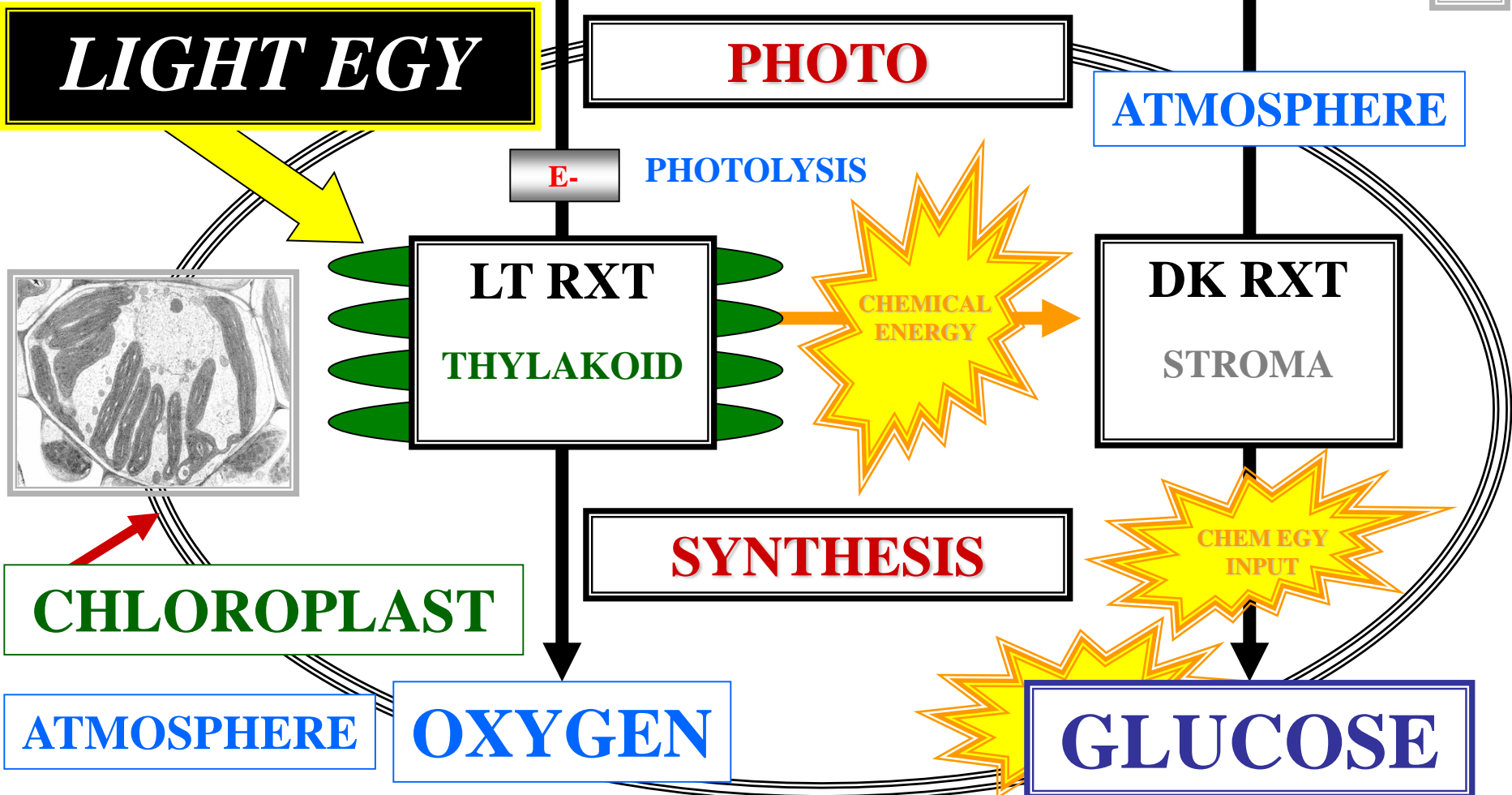
CHEMICAL ENERGY INPUT

CHLOROPLAST

ATMOSPHERE

OXYGEN

GLUCOSE





PLASTID TYPE SUMMARY

PLASTIDS TYPES



PROPLASTID

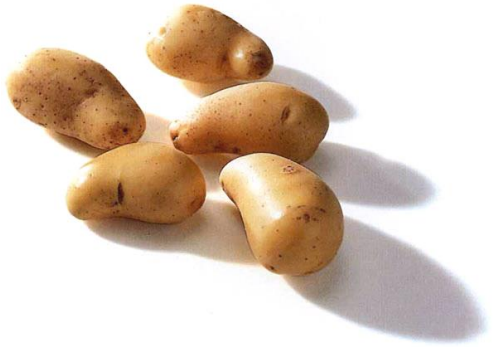
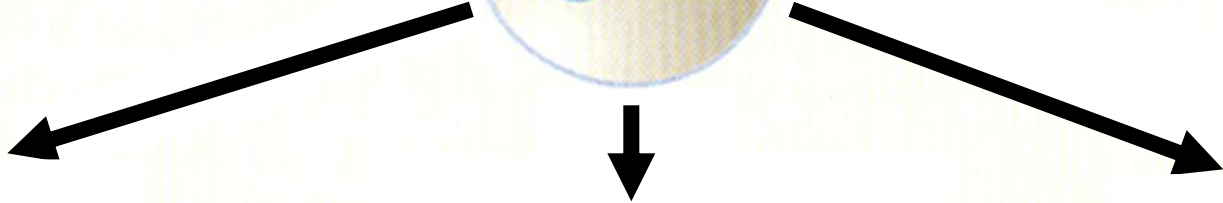


PLASTIDS TYPES

PROPLASTID



L



TUBER



LEAF



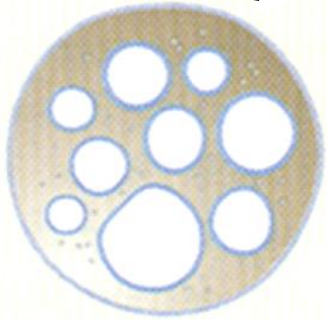
FRUIT

PLASTIDS TYPES

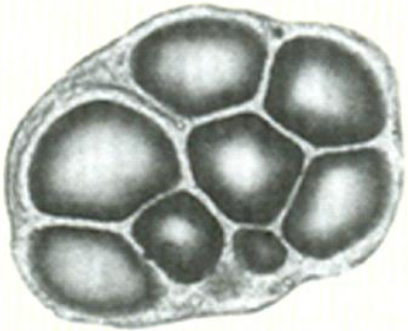
PROPLASTID



C



LEUCOPLAST

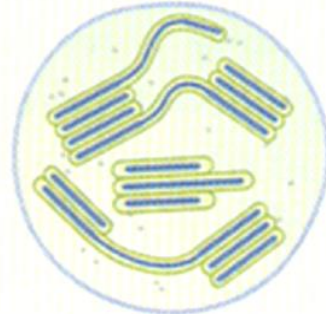
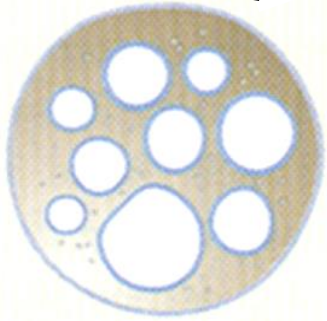
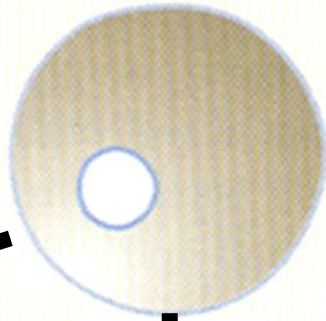


PLASTIDS TYPES

PROPLASTID

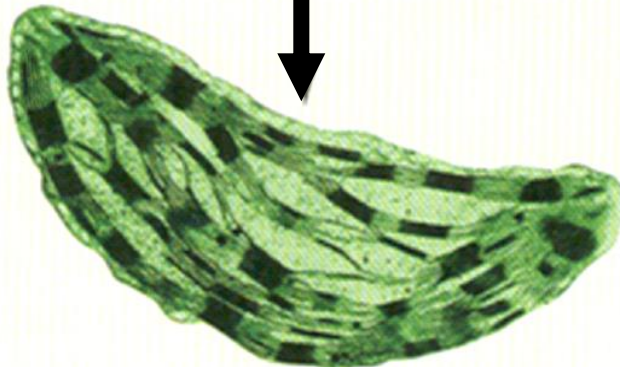
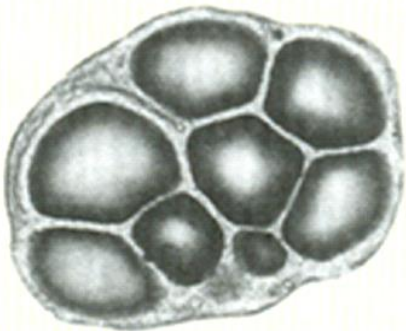


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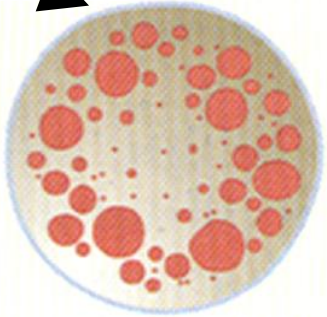
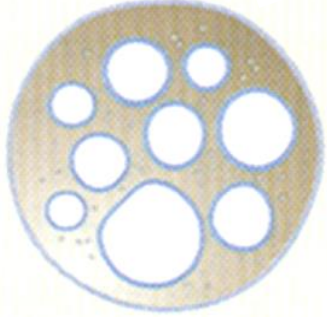
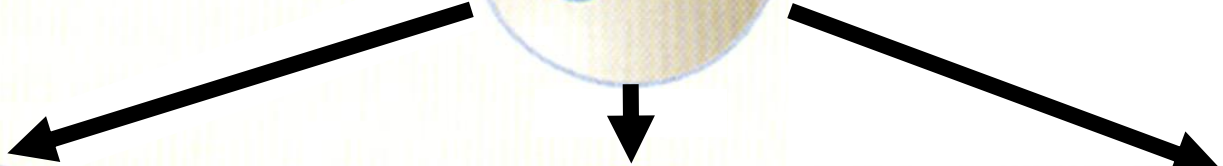
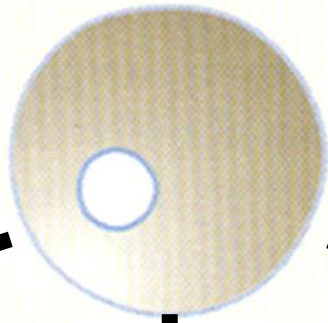
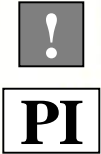
LEUCOPLAST

CHLOROPLAST



PLASTIDS TYPES

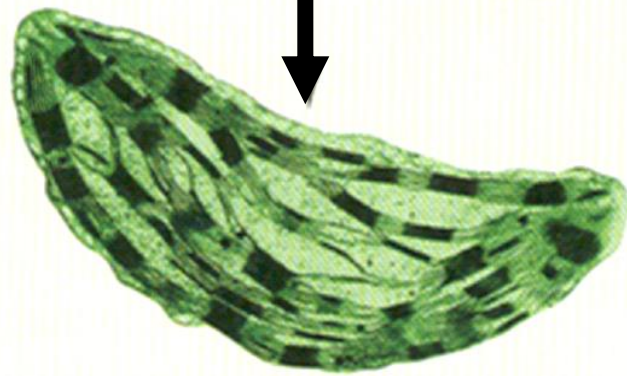
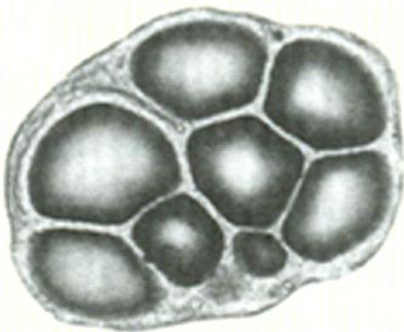
PROPLASTID



LEUCOPLAST

CHLOROPLAST

CHROMOPLAST





PLASTIDS INTERCONVERT



**PLASTIDS
INTERCONVERT**

**PLASTIDS
INTERCONVERT**

**PLASTIDS
INTERCONVERT**



PLASTIDS

INTERCONVERT

PLASTIDS

INTERCONVERT

GIVEN DIFFERENT

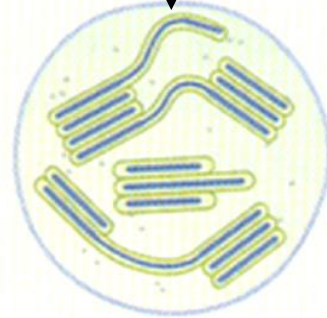
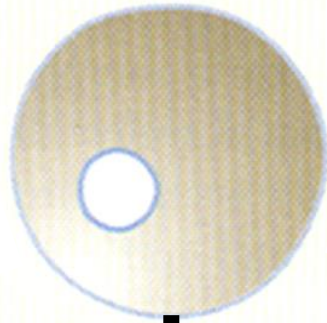
ENVIRONMENT

PLASTIDS

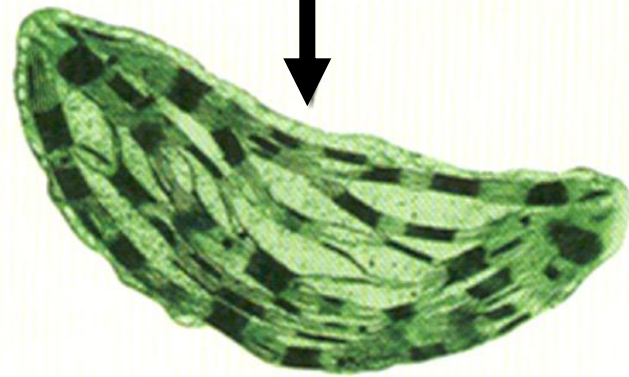
INTERCONVERT

PLASTIDS INTERCONVERT

PROPLASTID



CHLOROPLAST

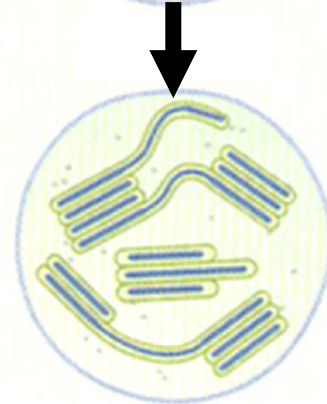


PLASTIDS INTERCONVERT

PROPLASTID

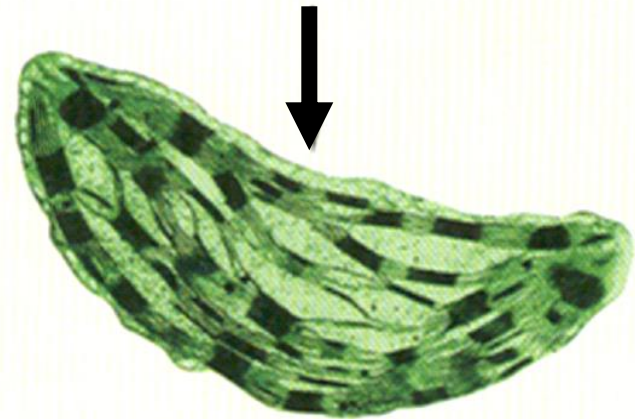


**DIFFERENT
ENVIRONMENT**



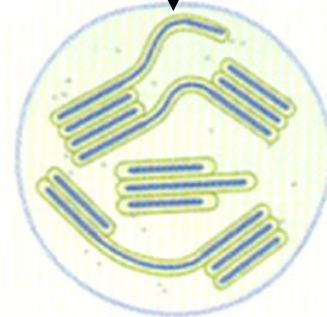
**DIFFERENT
ENVIRONMENT**

CHLOROPLAST



PLASTIDS INTERCONVERT

PROPLASTID

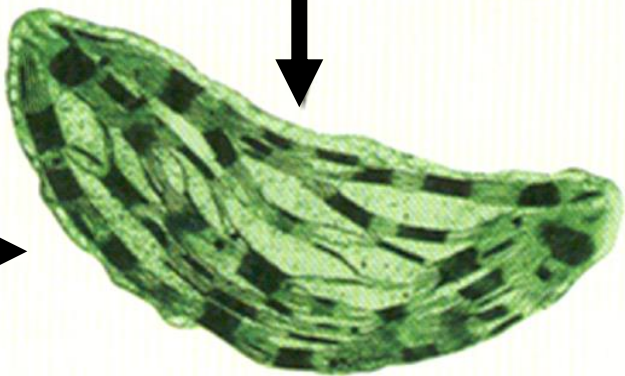
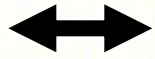
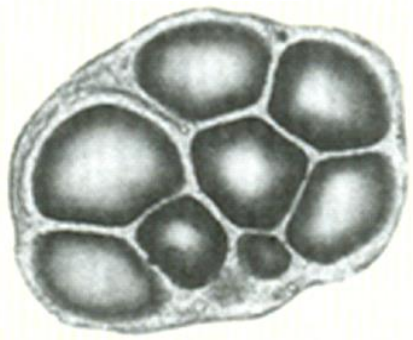


**DIFFERENT
ENVIRONMENT**

**DIFFERENT
ENVIRONMENT**

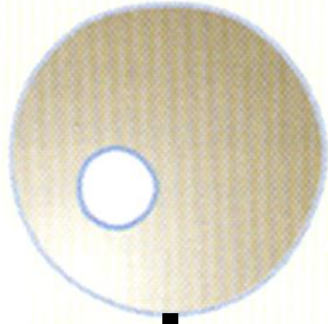
LEUCOPLAST

CHLOROPLAST

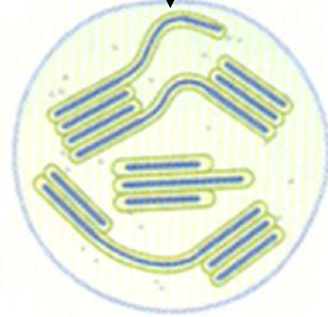


PLASTIDS INTERCONVERT

PROPLASTID



DIFFERENT ENVIRONMENT

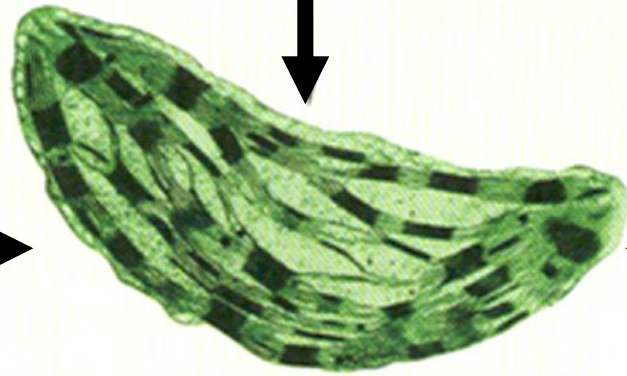
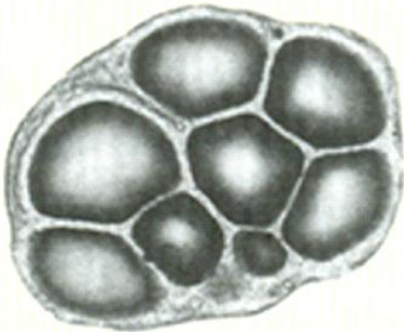


DIFFERENT ENVIRONMENT

LEUCOPLAST

CHLOROPLAST

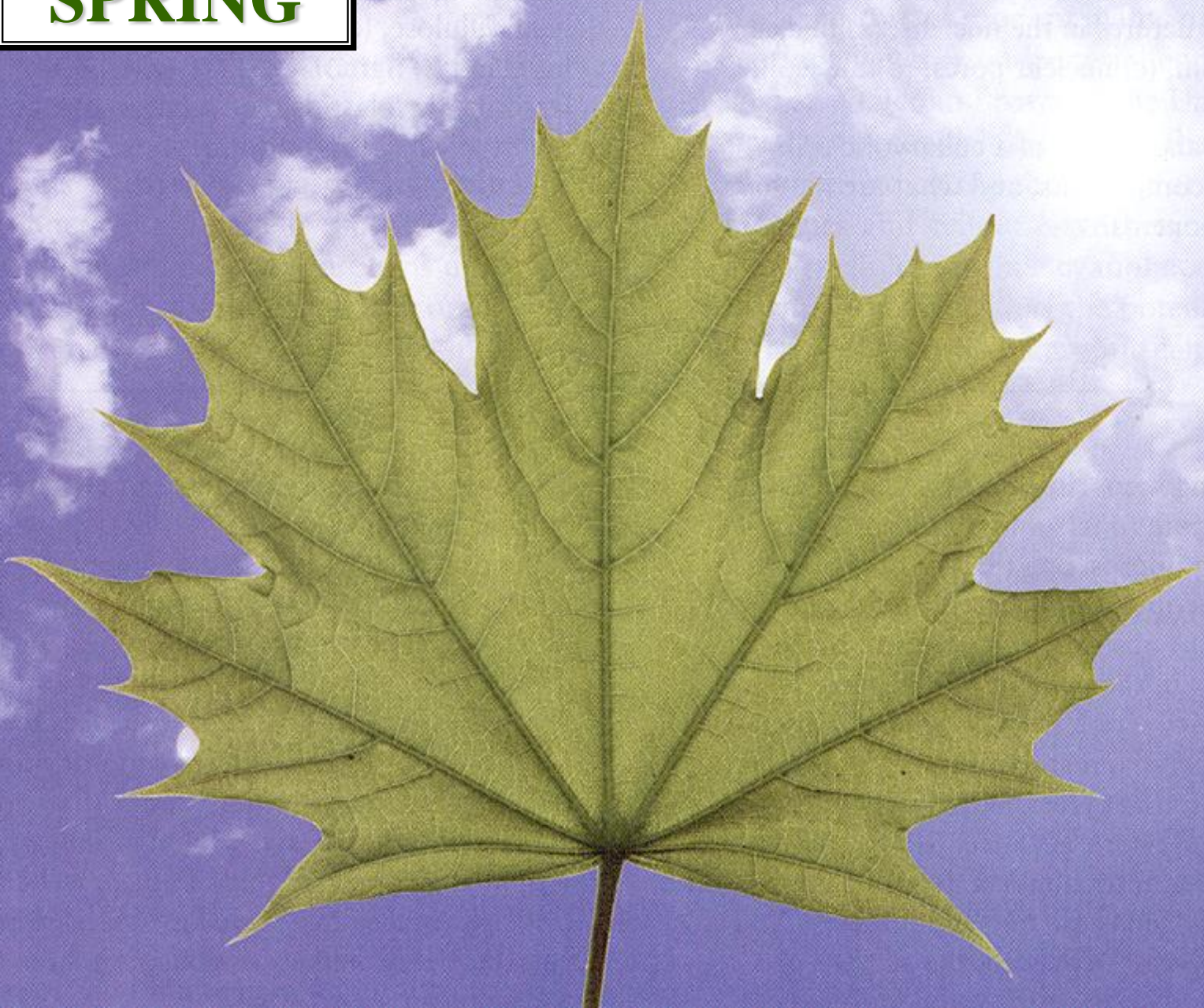
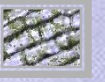
CHROMOPLAST





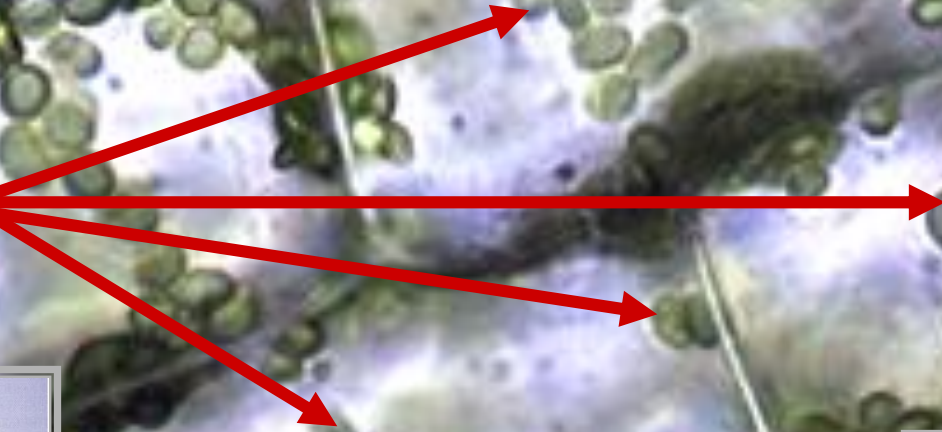
**PLASTIDS
INTERCONVERT
FALL COLORS**

SPRING



F

CHLOROPLASTS
CHLOROPHYLL



C.S.

FALL

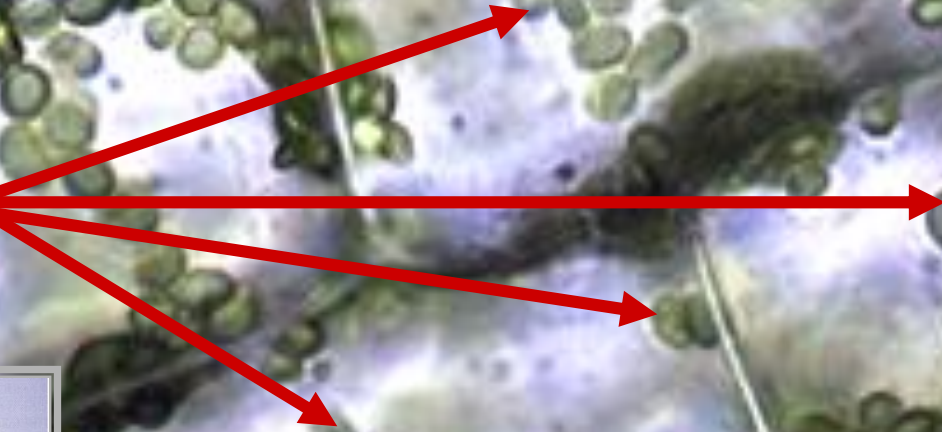
C

TEMPERATURE
DECREASES

DAY LENGTH
DECREASES

D

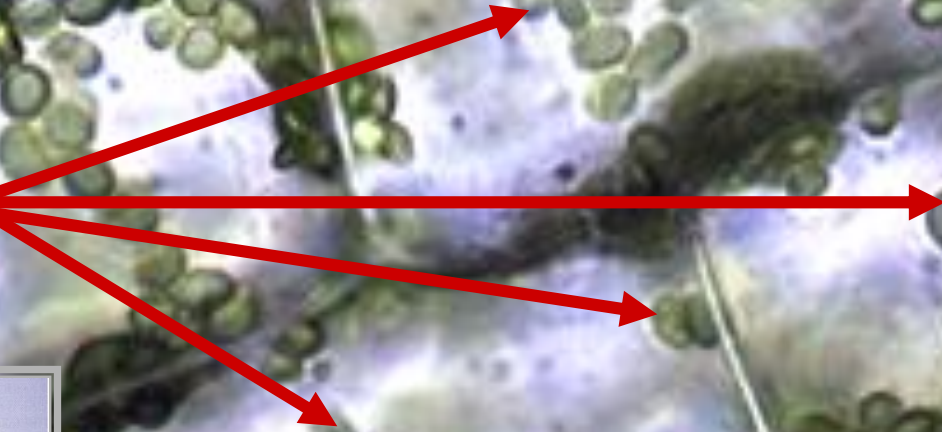
CHLOROPLASTS
CHLOROPHYLL



C.S.



**CHLOROPHYLL
DEGRADES**

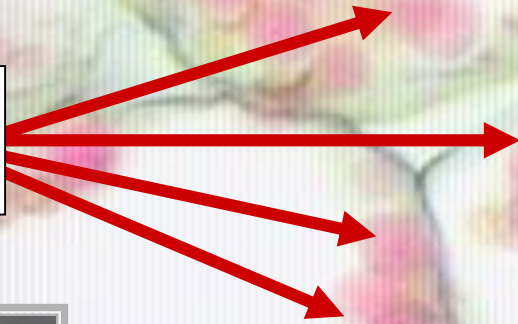


C.S.

i

C

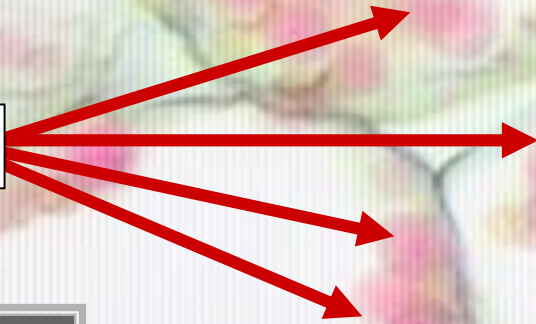
CHLOROPLASTS
CAROTENOIDS



C.S.



CHROMOPLASTS



C.S.

FALL

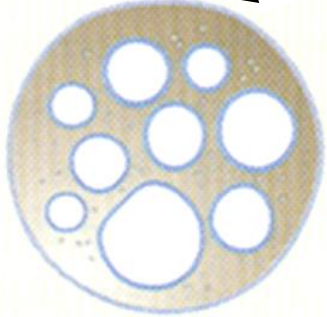
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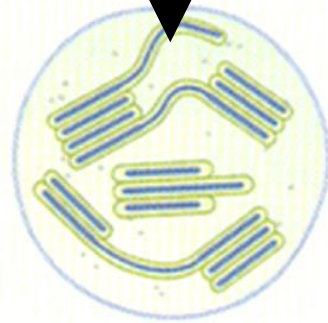
FALL COLORS ALABAMA FOREST

PLASTIDS TYPES

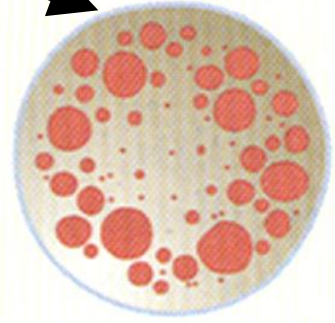
PROPLASTID



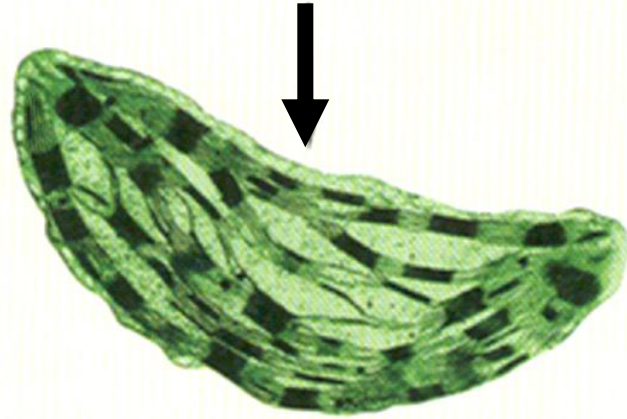
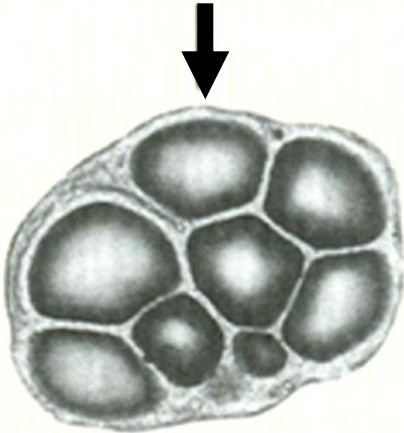
LEUCOPLAST



CHLOROPLAST



CHROMOPLAST



CHLOROPLAST

CHLOROPLAST

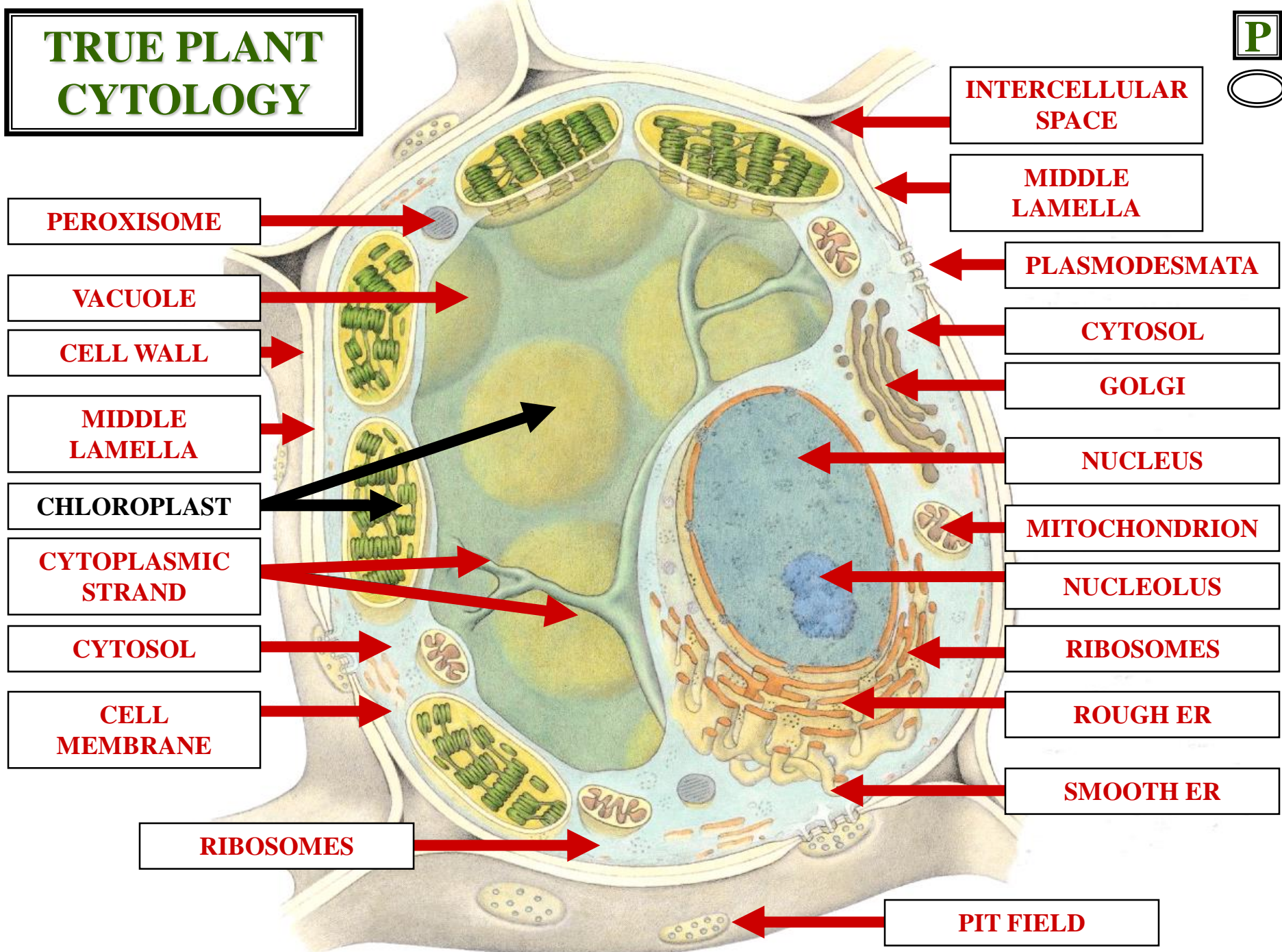


CHLOROPLAST

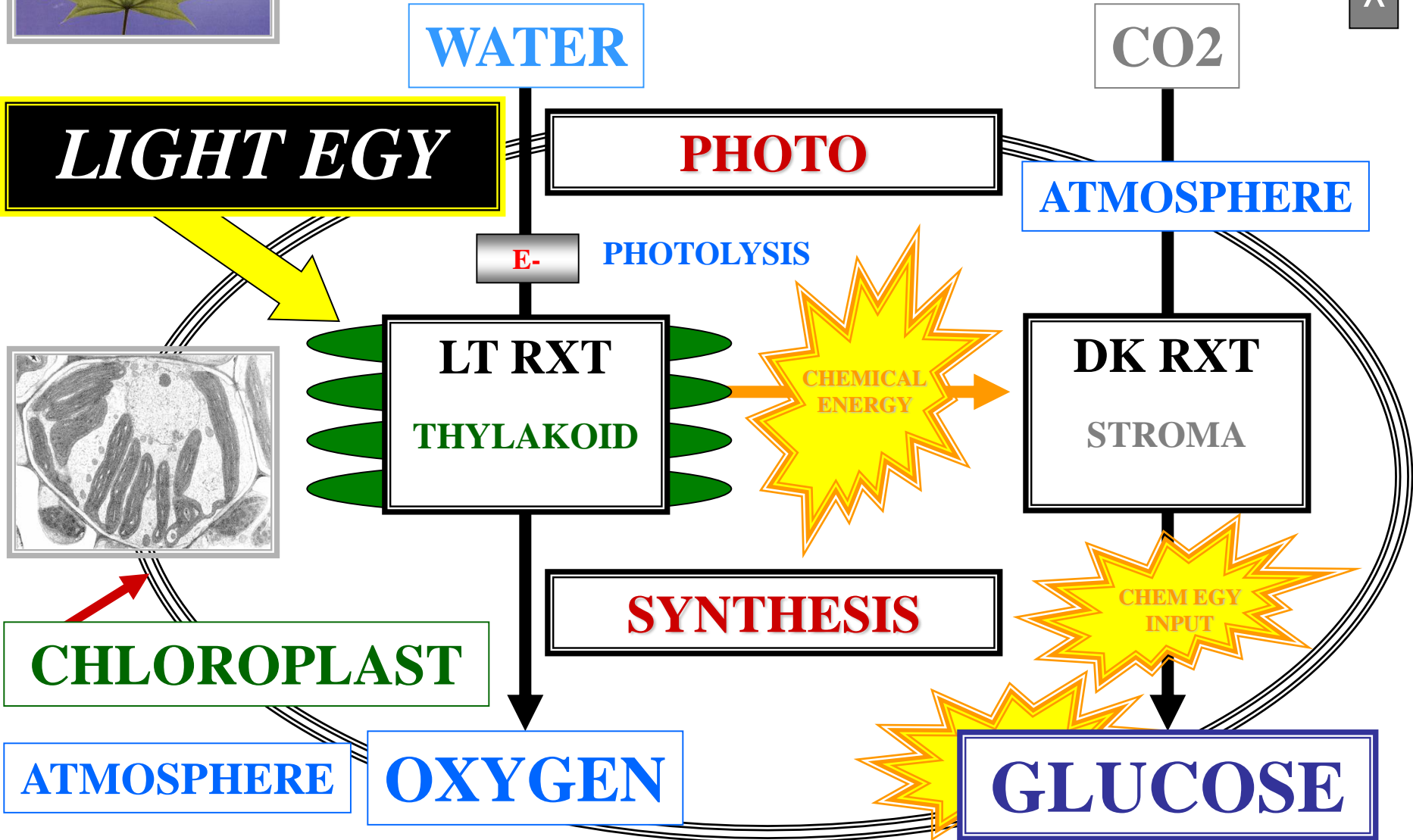
SITE: PHOTOSYNTHESIS

CHLOROPLAST

TRUE PLANT CYTOLOGY



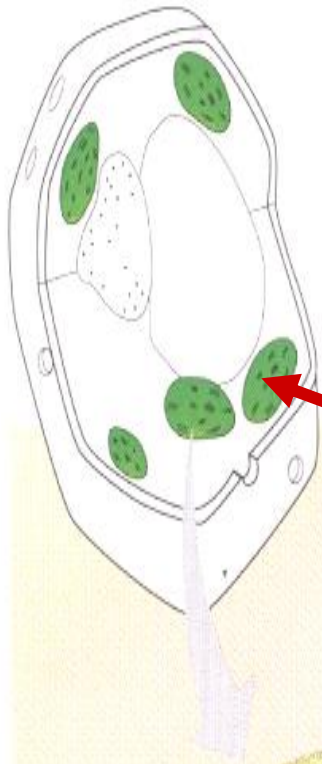
PHOTOSYNTHESIS



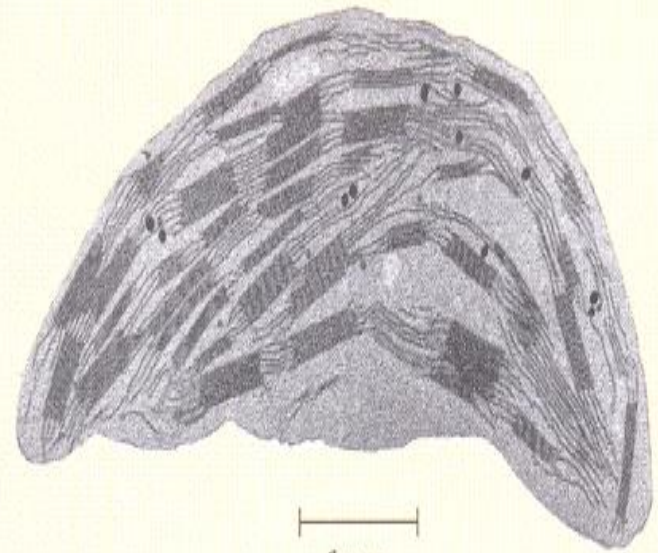


CHLOROPLAST ULTRASTRUCTURE

CHLOROPLAST ULTRASTRUCTURE

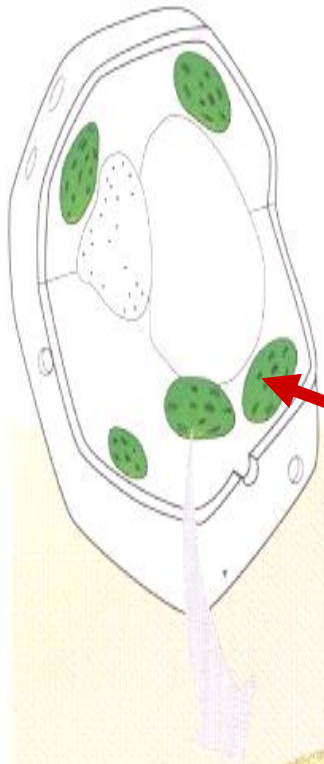


CHLOROPLAST

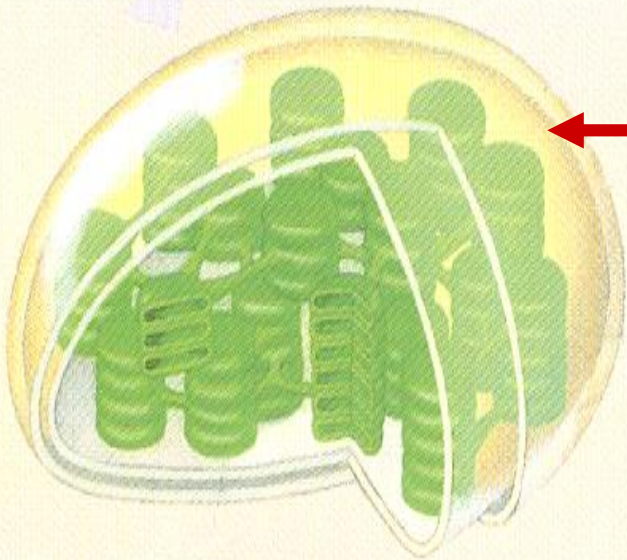


1 μ m

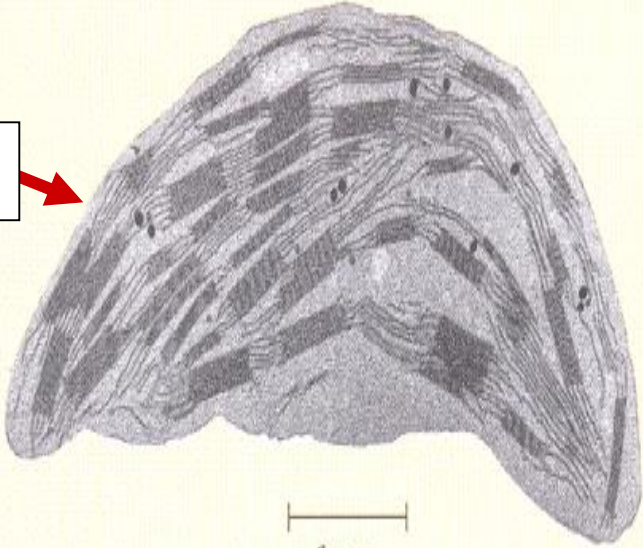
CHLOROPLAST ULTRASTRUCTURE



CHLOROPLAST

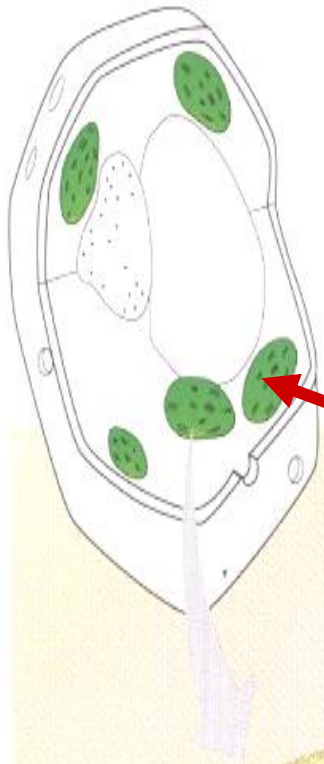


OUTER
MEMBRANE

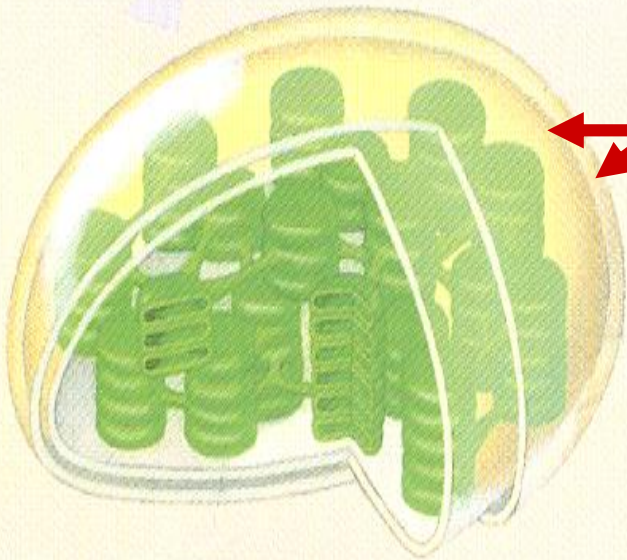


1 μ m

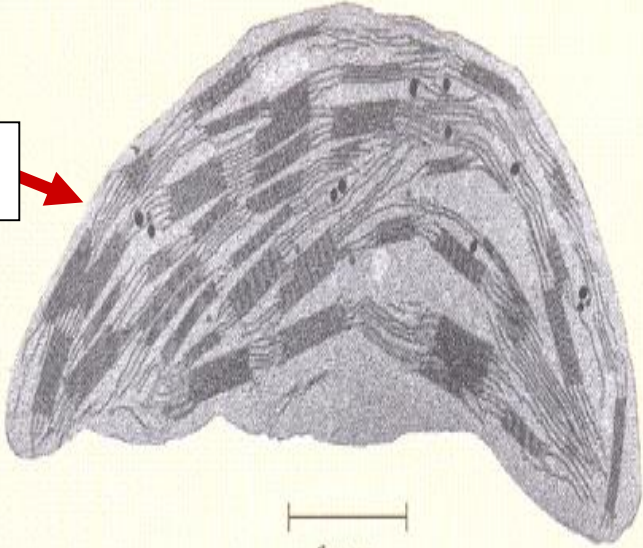
CHLOROPLAST ULTRASTRUCTURE



CHLOROPLAST



OUTER & INNER
MEMBRANE



1 μ m

THYLAKOID MEMBRANE



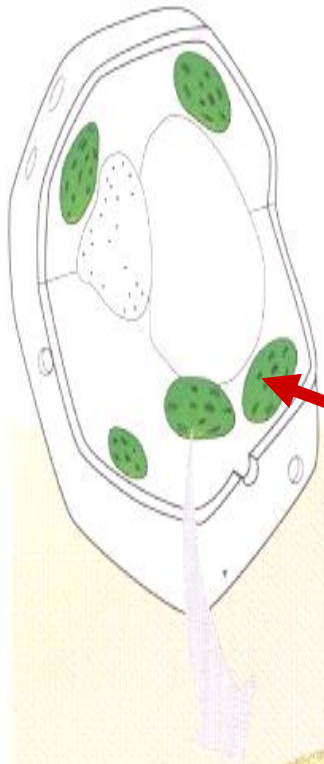
THYLAKOID MEMBRANE

CHLOROPLAST

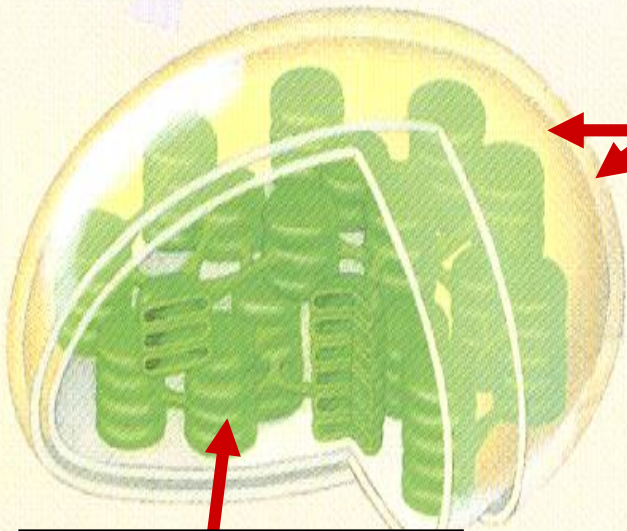
**PIGMENTED INNERMOST
MEMBRANE**

THYLAKOID MEMBRANE

CHLOROPLAST ULTRASTRUCTURE

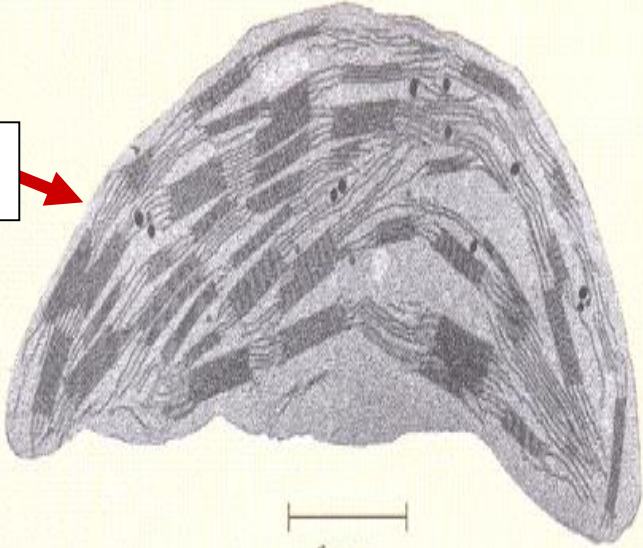


CHLOROPLAST



THYLAKOID MEMBRANE

OUTER & INNER
MEMBRANE



1 μ m