Cellular Energy

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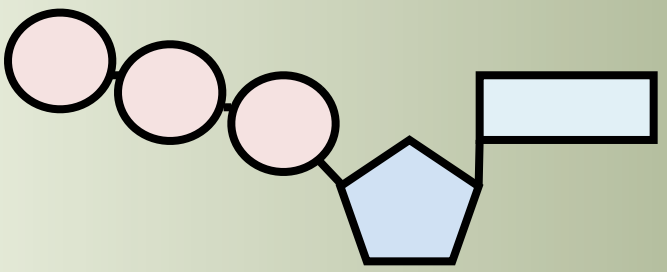
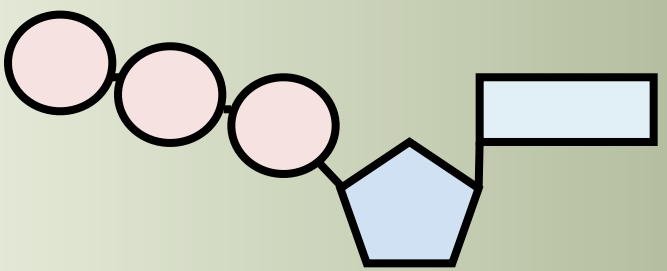


Cellular Energy

ATP – Adenosine TriPhosphate
(the ENERGY molecule)



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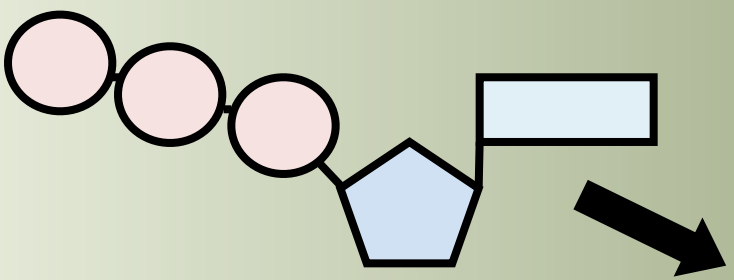

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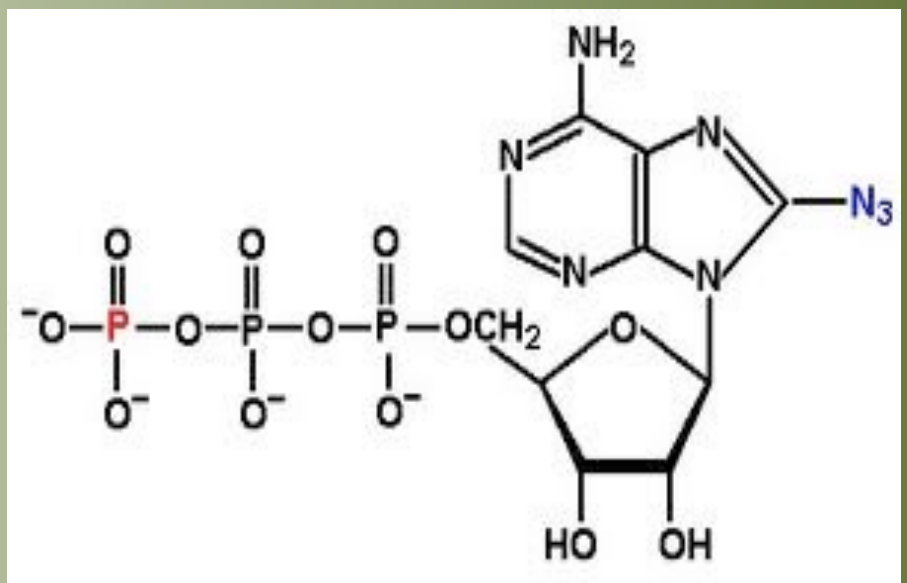

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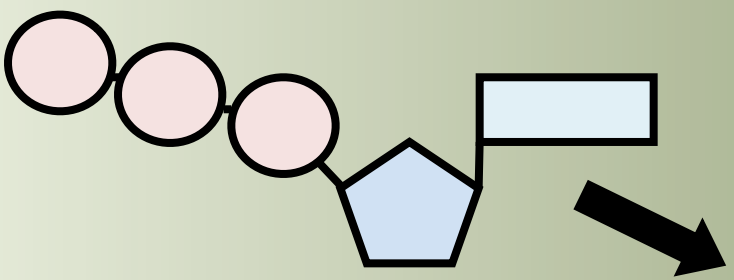

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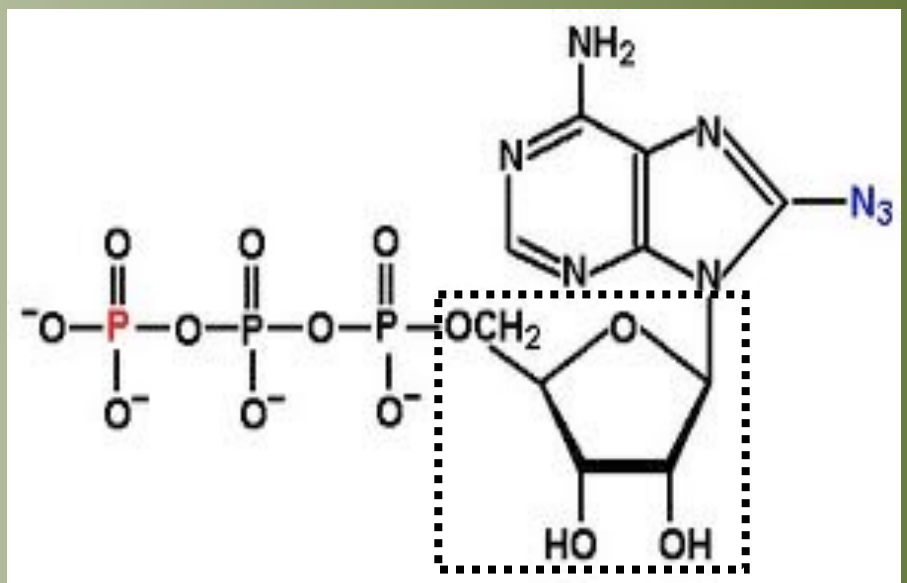

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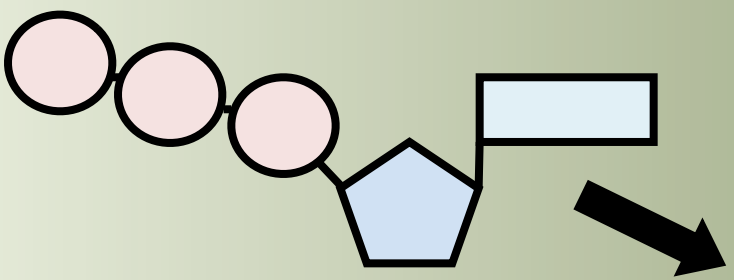

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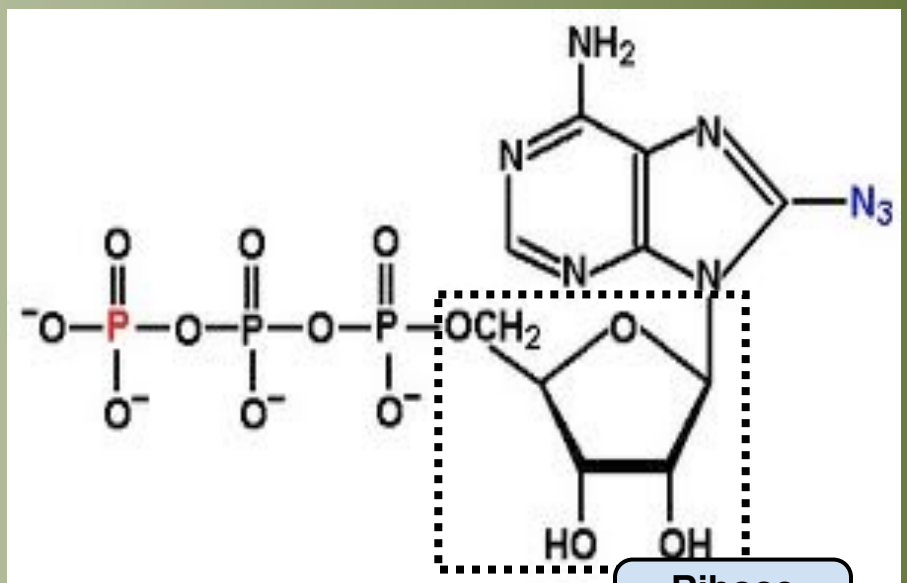

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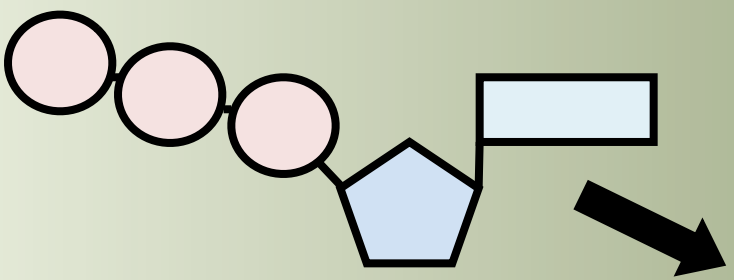

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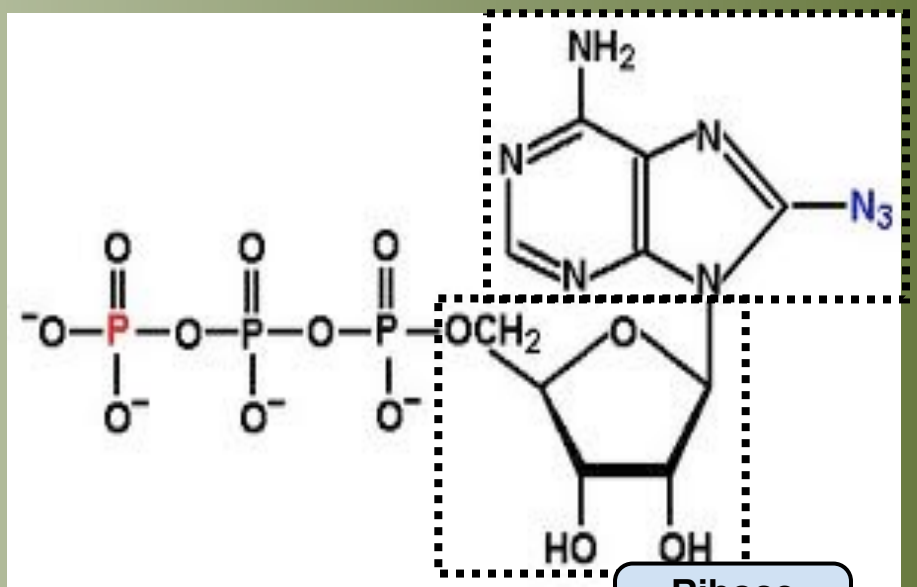

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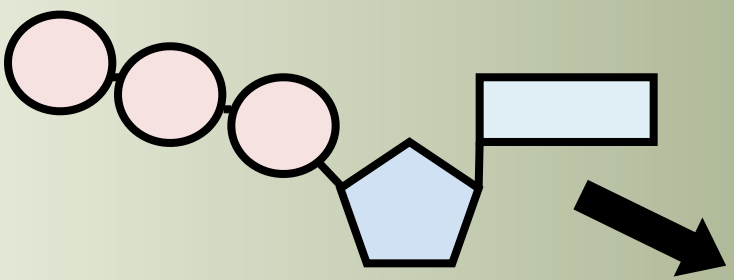

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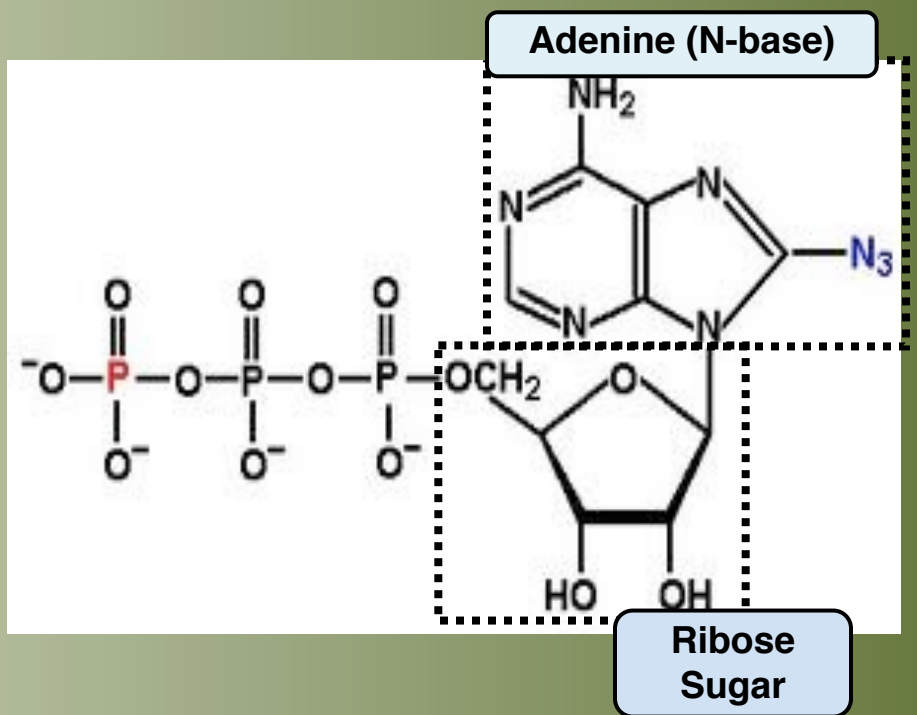

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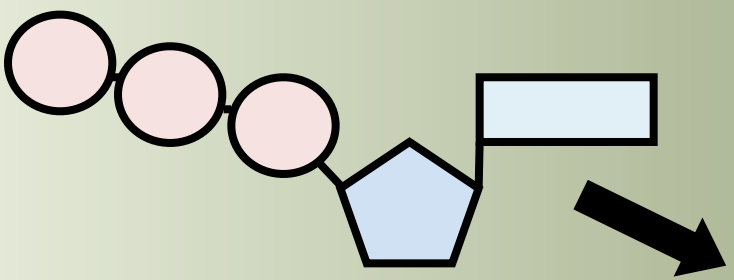

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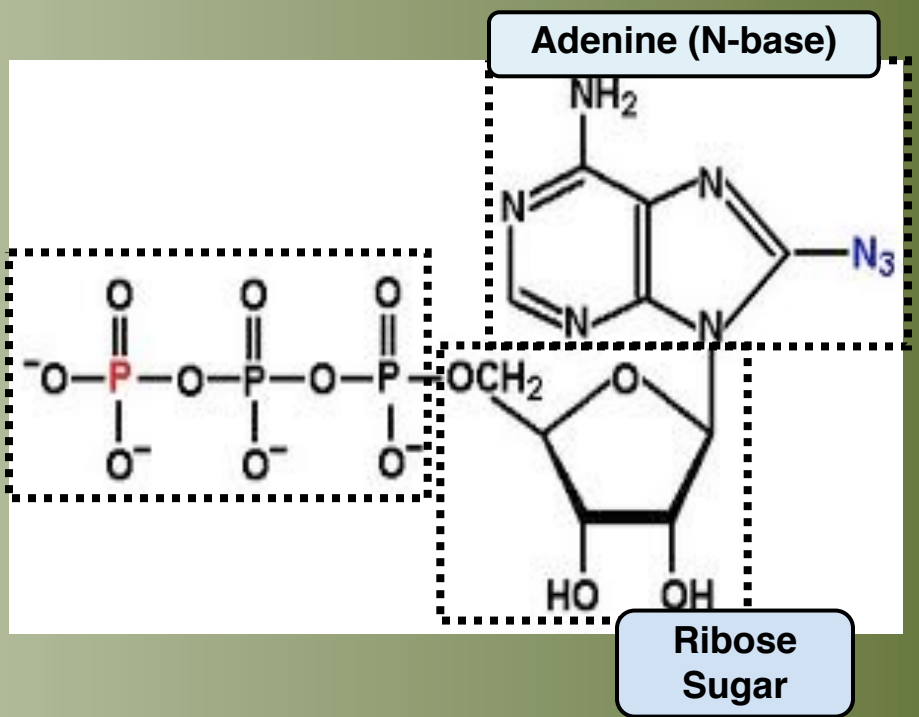

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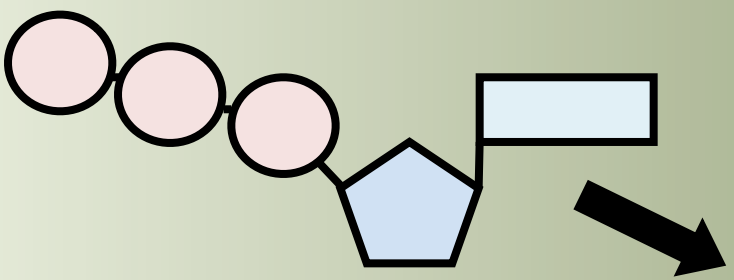

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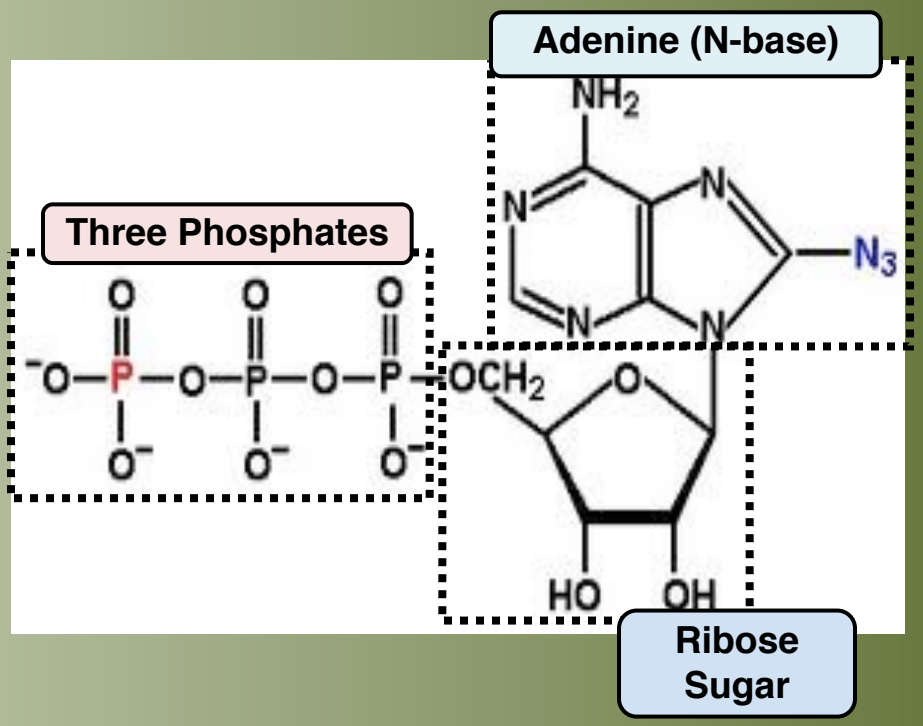

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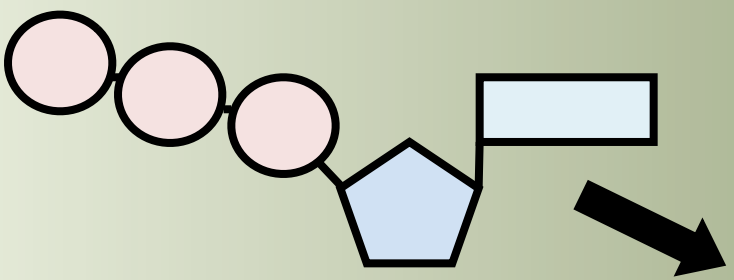

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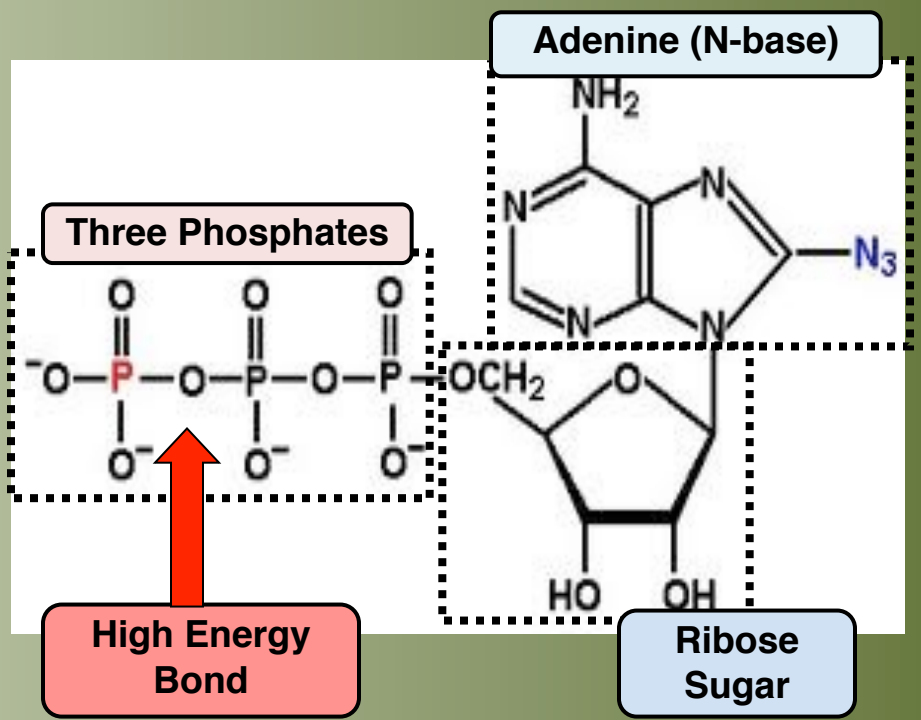

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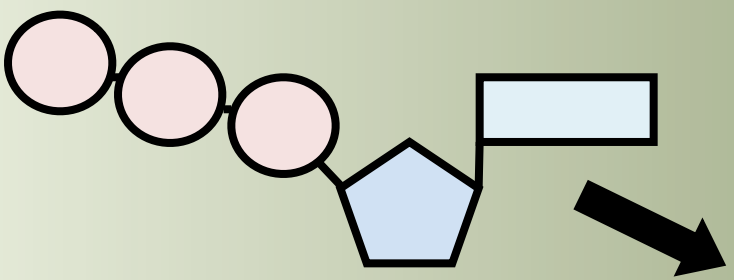

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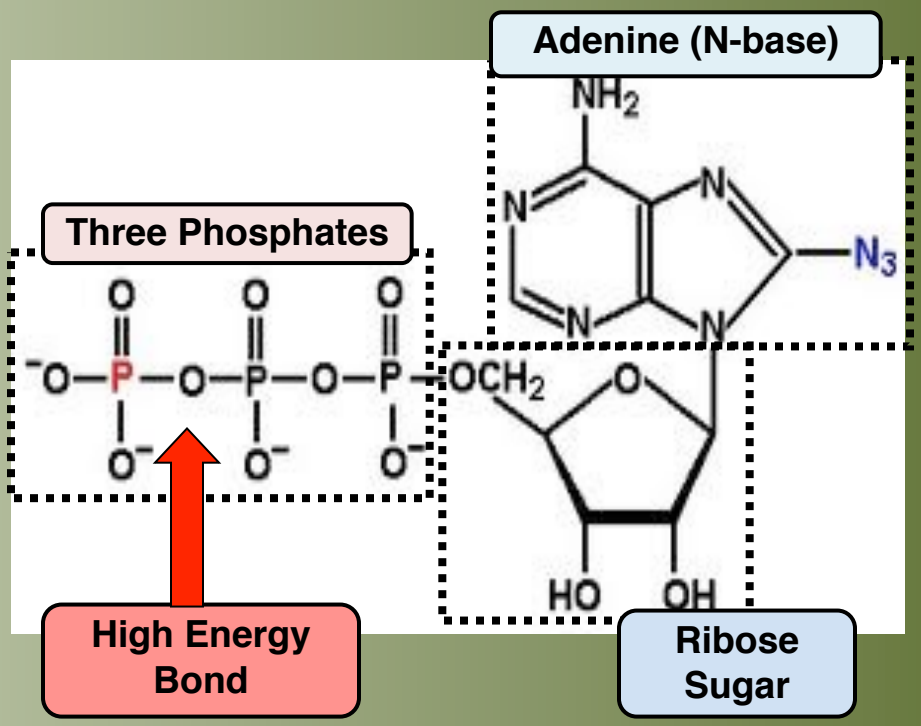

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Cellular Energy

How is the energy released from ATP??

Every cell requires energy to function

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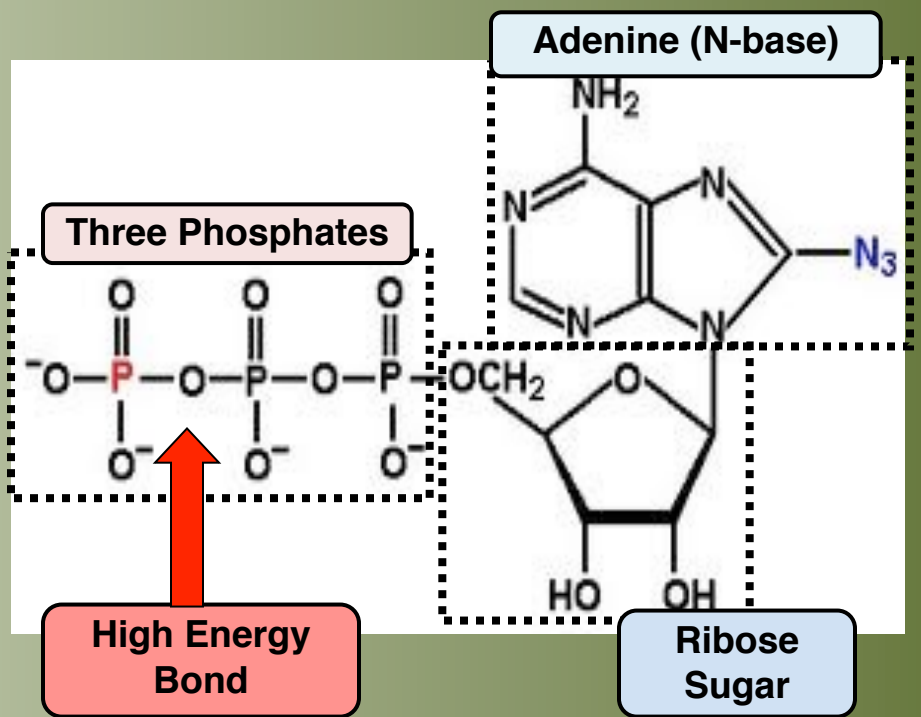

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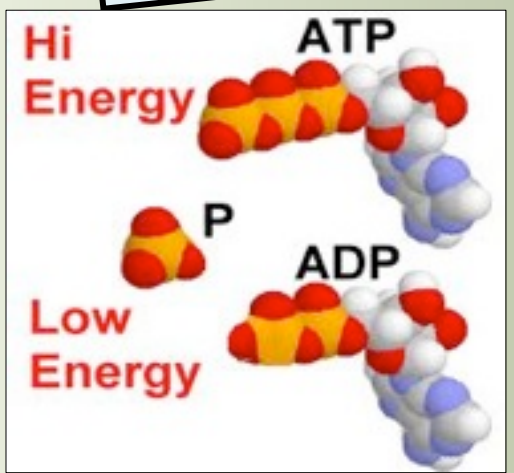

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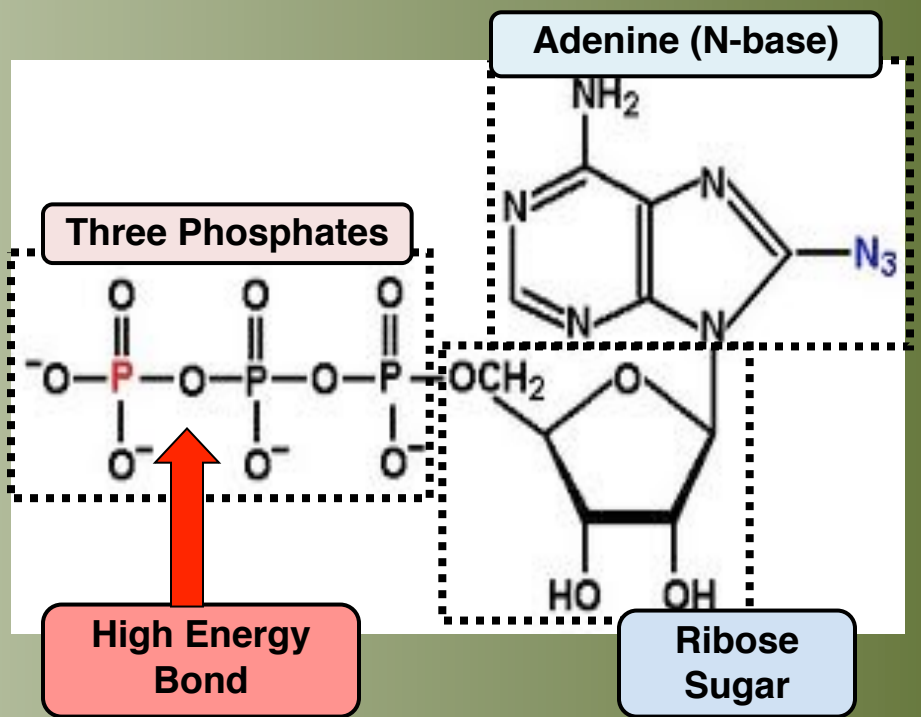

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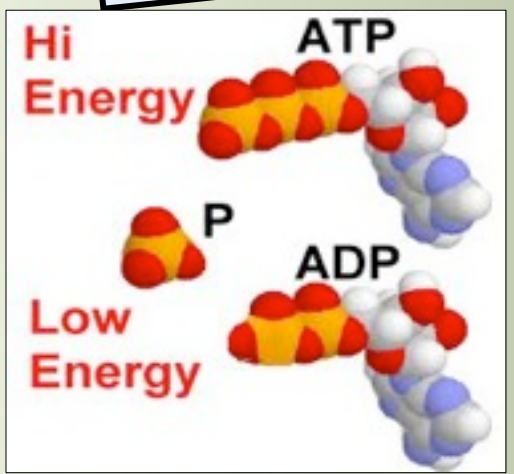

When the 3rd phosphate group breaks off – energy is released!

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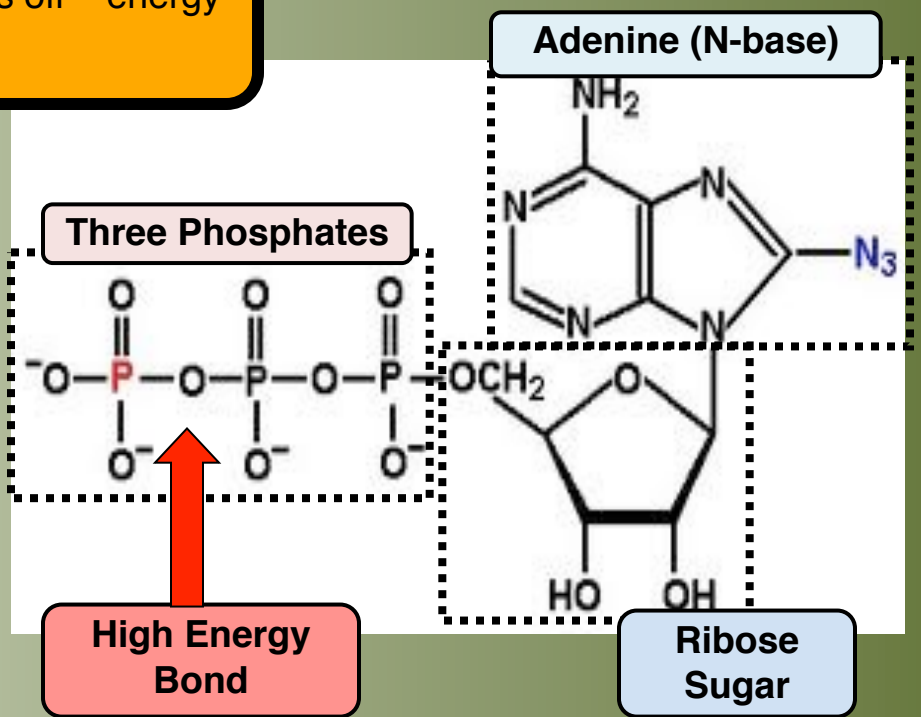

Cellular Energy

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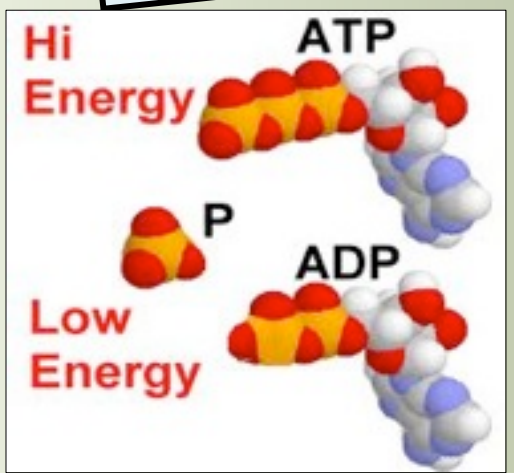
ATP – adenosine triphosphate
ADP – adenosine diphosphate



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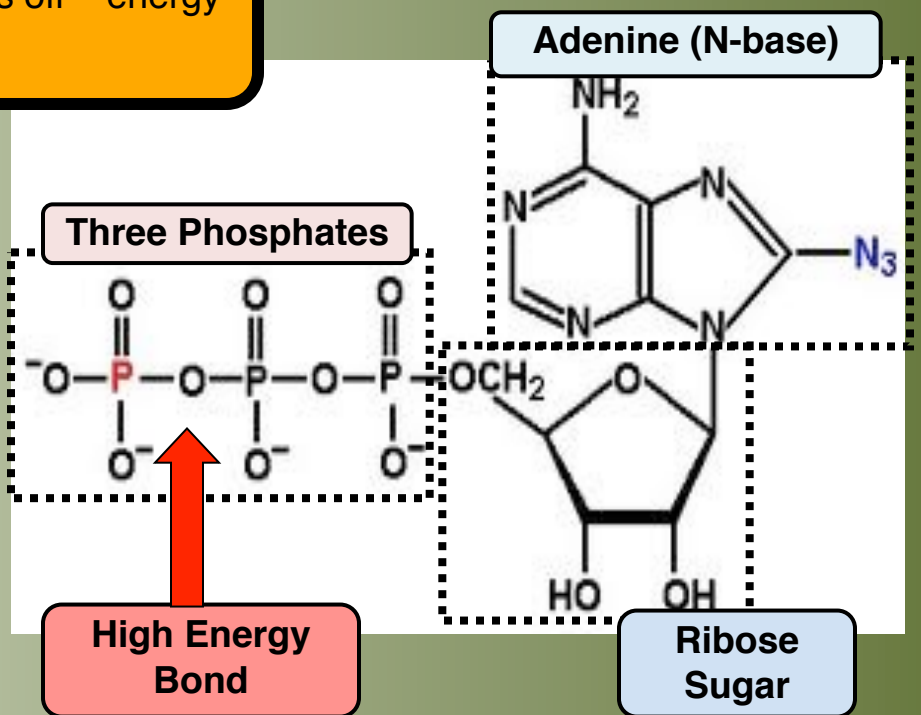

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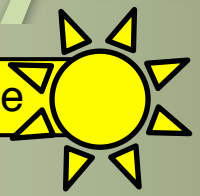
The ULTIMATE source of our energy is the 

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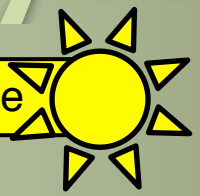

The energy is captured by PHOTOSYNTHETIC PLANTS

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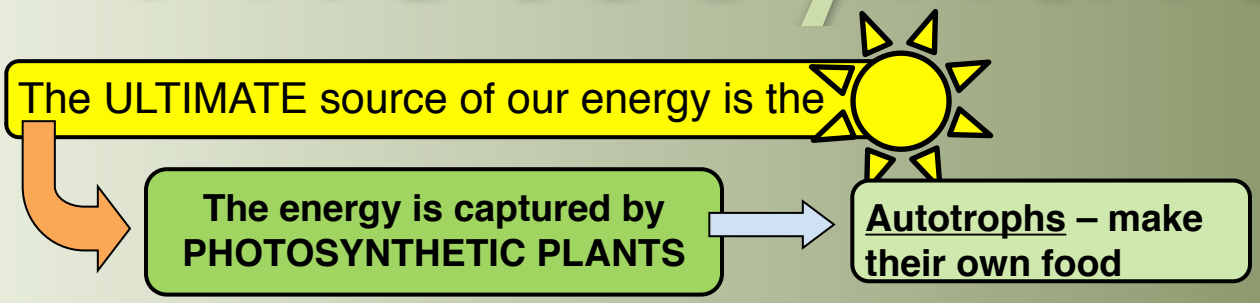

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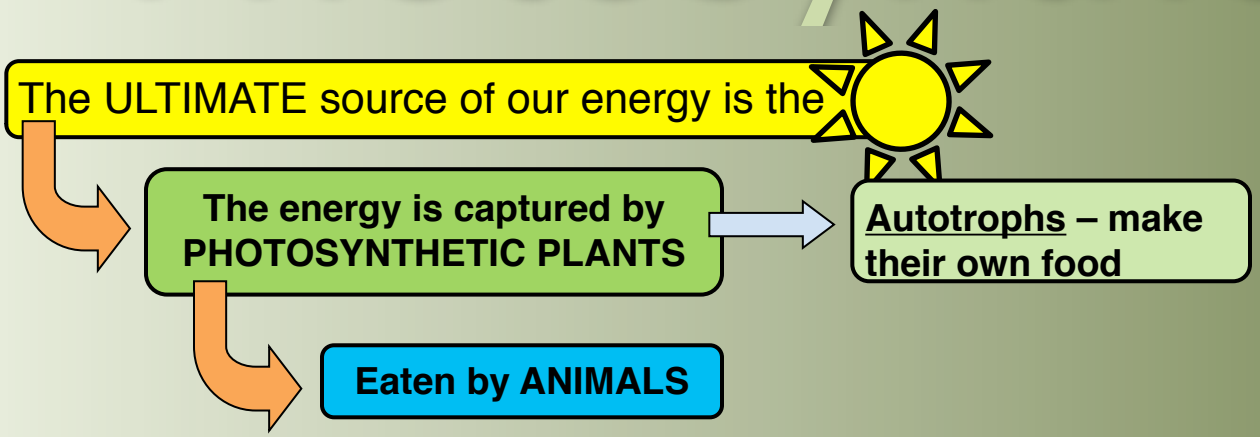

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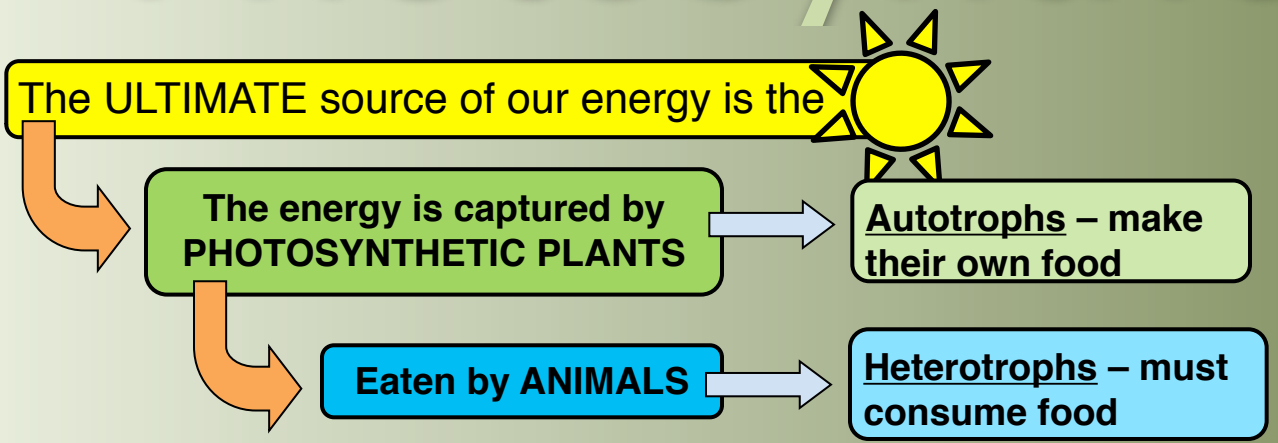

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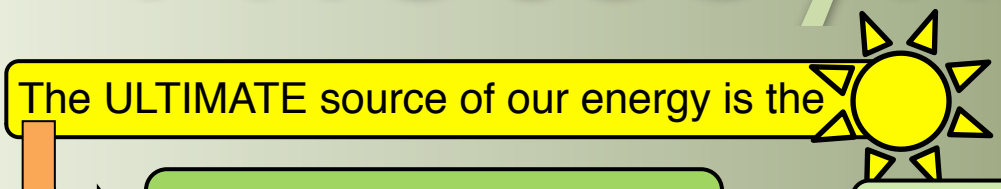
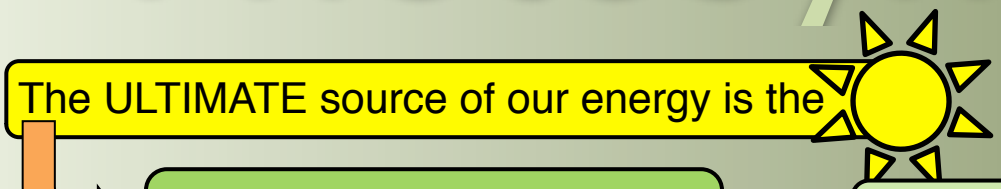


The energy is captured by PHOTOSYNTHETIC PLANTS → **Autotrophs** – make their own food

Eaten by ANIMALS → **Heterotrophs** – must consume food

What do plants need to survive??

Photosynthesis



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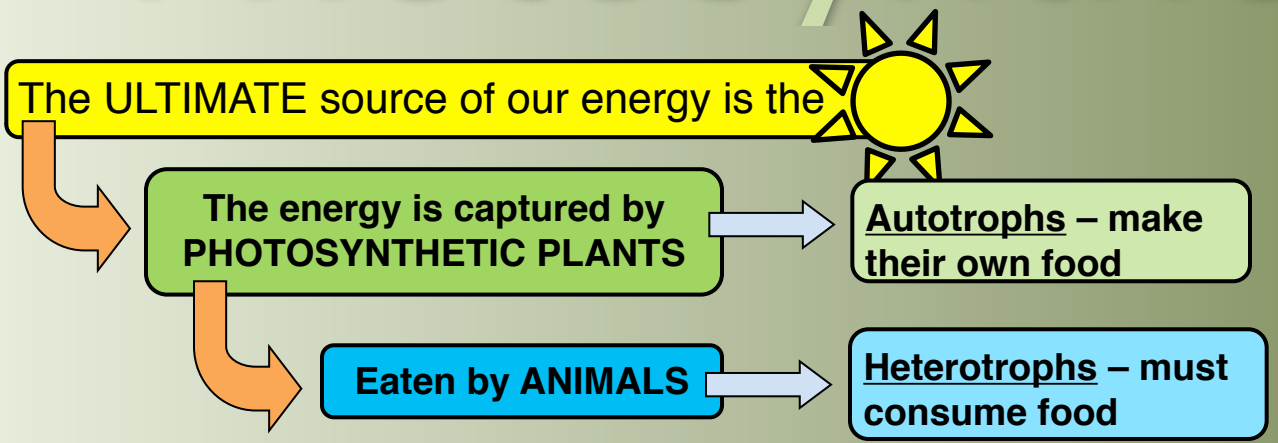

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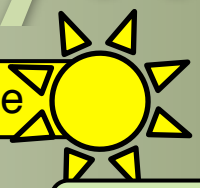

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Converting SUN ENERGY into CHEMICAL ENERGY

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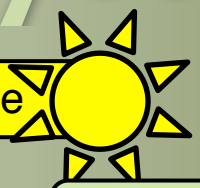

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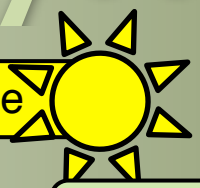

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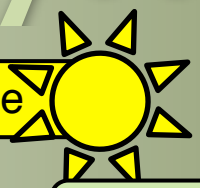

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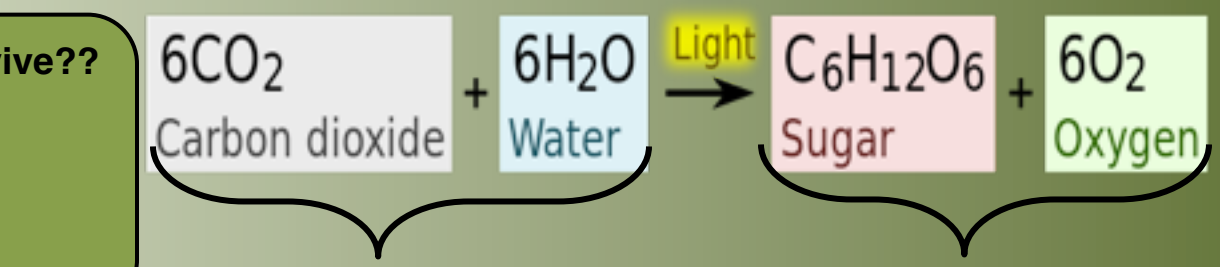

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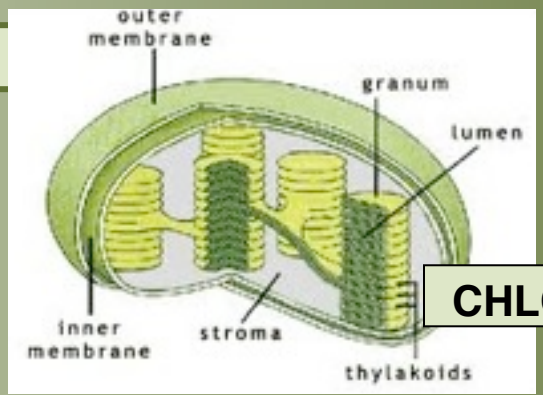

CHLOROPLAST

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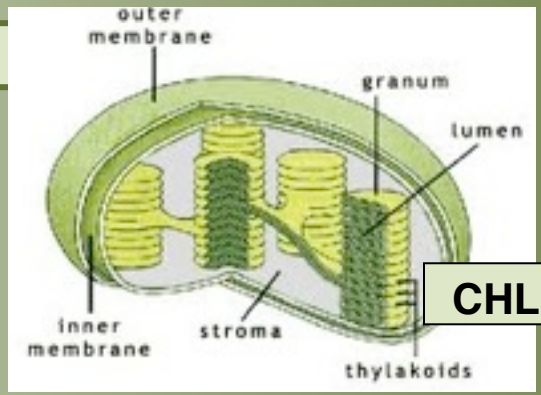

CHLOROPLAST

2 Groups of Reactions

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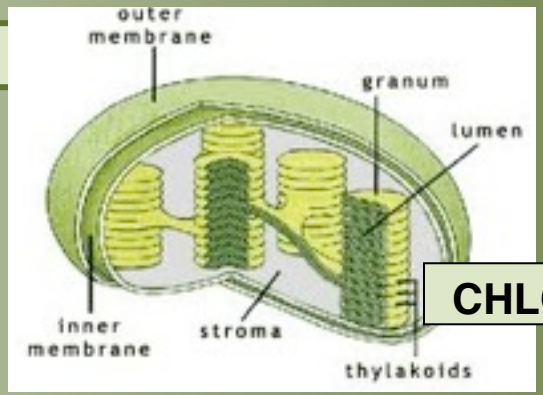

CHLOROPLAST

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Light Reactions:
In – H_2O, sunlight
Out – **ATP, O_2**

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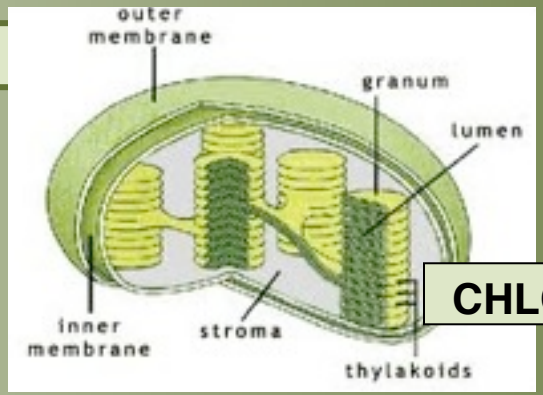

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~ "Photo" part of photosynthesis
~ Sun energy is captured by chlorophyll (pigment in chloroplast)

Photosynthesis

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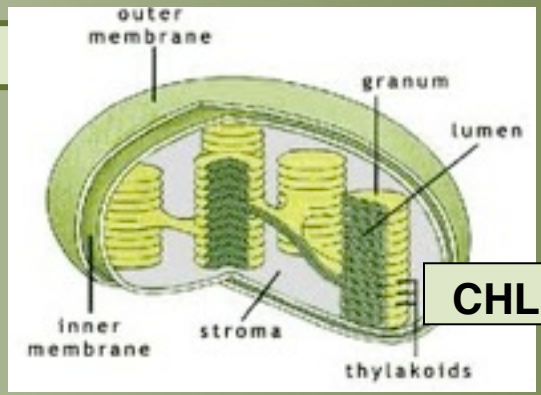

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2 Groups of Reactions

Light Reactions:
In – H_2O, sunlight
Out – **ATP, O_2**

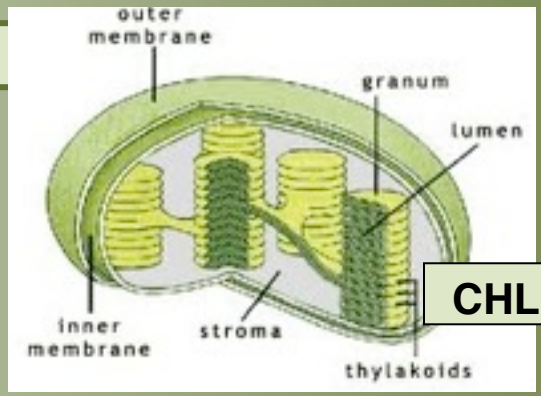
Calvin Cycle:
In – CO_2, H, ATP
Out – **Sugars**

~ "Photo" part of photosynthesis
~ Sun energy is captured by chlorophyll (pigment in chloroplast)

Photosynthesis

Where does photosynthesis happen??

Plant Cell



CHLOROPLAST

What do plants need to survive??

Water

Sunlight

Carbon dioxide

How are these used by the pla

2 Groups of Reactions

Light Reactions:
In – H_2O, sunlight
Out – **ATP, O_2**

~ "Photo" part of photosynthesis
~ Sun energy is captured by chlorophyll (pigment in chloroplast)

Calvin Cycle:
In – CO_2, H, ATP
Out – **Sugars**

~ "synthesis" part of photosynthesis
~ ATP from light reactions used to make simple sugars (later stored)

Cellular Respiration

Cellular Respiration

How do we get the stored chemical energy OUT?!

Cellular Respiration

How do we get the stored chemical energy OUT?!

Food molecules are broken

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Food molecules are broken

Mitochondria

Cellular Respiration

How do we get the stored chemical energy OUT?!

Food molecules are broken

FOUND IN <u>ALL</u> EUKARYOTIC CELLS

Mitochondria

Cellular Respiration

How do we get the stored chemical energy OUT?!

Food molecules are broken

Can then be used for all cell processes requiring energy.

Mitochondria

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Mitochondria

FOUND IN ALL EUKARYOTIC CELLS

$C_6H_{12}O_6$ Sugar + $6O_2$ Oxygen → $6CO_2$ Carbon dioxide + $6H_2O$ Water + ATP

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Glycolysis

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3

Glycolysis **2 ATPs**

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Glycolysis — **2 ATPs**

Glucose splitting
Happens in all cells

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Glycolysis

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2 Pyruvic Acids

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Kreb's Cycle

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Kreb's Cycle — 2 ATPs

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- Glycolysis — 2 ATPs
- Kreb's Cycle — 2 ATPs
- Electron Transport Chain (ETC)

Glucose splitting Happens in all cells

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- Glycolysis — 2 ATPs
- Kreb's Cycle — 2 ATPs
- Electron Transport Chain (ETC) — 34 ATPs

Glucose splitting Happens in all cells

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- **Kreb's Cycle** — 2 ATPs
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2nd and 3rd parts only happen in eukaryotes (mitochondria) (oxygen)

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Cellular Respiration

Organisms that use OXYGEN can do *aerobic* respiration

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Organisms that use OXYGEN can do *aerobic* respiration

Anaerobic organisms do anaerobic respiration (no oxygen)

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Glucose splitting
Happens in all cells

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Kreb's Cycle — **2 ATPs**

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Organisms that use OXYGEN can do *aerobic* respiration

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Alcoholic Fermentation
Lactic Acid Fermentation

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$C_6H_{12}O_6$ Sugar + $6O_2$ Oxygen → $6CO_2$ Carbon dioxide + $6H_2O$ Water +

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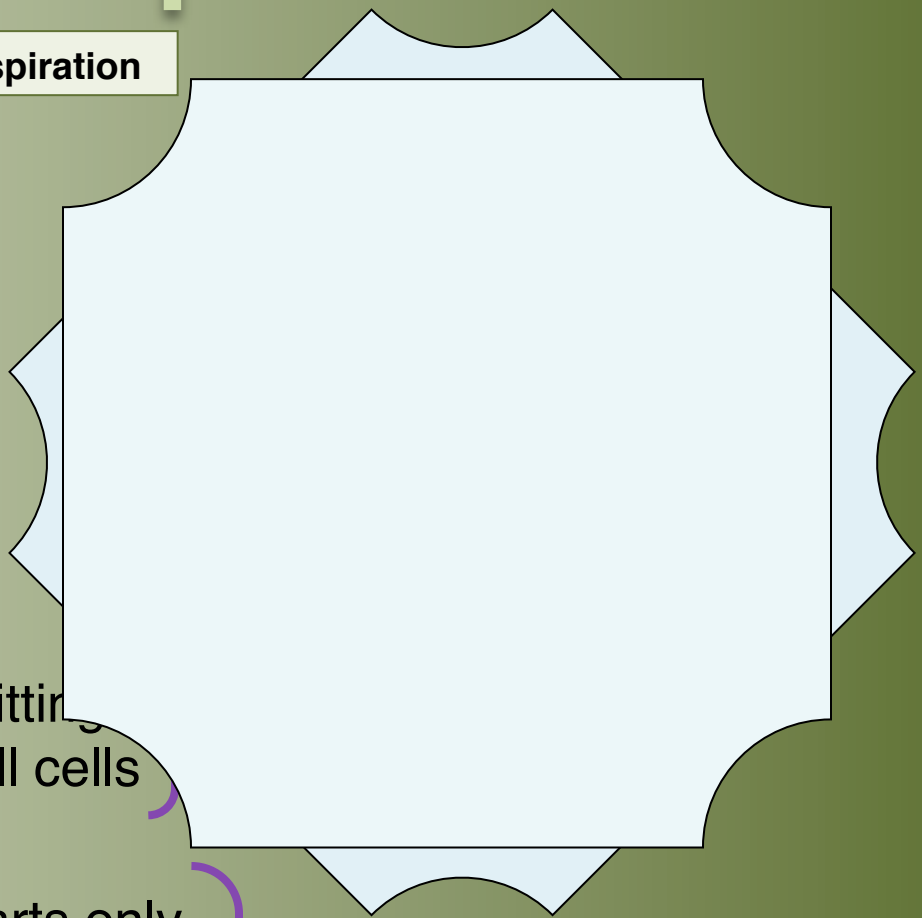

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Glucose splitting
Happens in all cells

Kreb's Cycle — **2 ATPs**

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Cellular Respiration

Organisms that use OXYGEN can do *aerobic* respiration

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Alcoholic Fermentation
Lactic Acid Fermentation

Alcoholic

Yeast cells (and other organisms) produce CO_2

Glycolysis — **2 ATPs**

Glucose splitting
Happens in all cells

Kreb's Cycle — **2 ATPs**

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Alcoholic Fermentation
Lactic Acid Fermentation

Alcoholic

Yeast cells (and other organisms) produce CO

BUBBLES

Glycolysis — **2 ATPs**

Kreb's Cycle — **2 ATPs**

Electron Transport Chain (ETC) — **34 ATPs**

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Happens in all cells

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Alcoholic Fermentation
Lactic Acid Fermentation

Alcoholic

Yeast cells (and other organisms) produce CO_2

BUBBLES

Glucose broken into CO_2, alcohol, ATP (only 2)

Glycolysis — **2 ATPs**

Kreb's Cycle — **2 ATPs**

Electron Transport Chain (ETC) — **34 ATPs**

Glucose splitting
Happens in all cells

2nd and 3rd parts only happen in eukaryotes (mitochondria) (oxygen)

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Organisms that use OXYGEN can do *aerobic* respiration

Anaerobic organisms do anaerobic respiration (no oxygen)

Alcoholic Fermentation
Lactic Acid Fermentation

Lactic Acid

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Happens in all cells

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Alcoholic Fermentation
Lactic Acid Fermentation

Lactic Acid

When there's little oxygen; lactic acid buildup in muscles after workout

Glycolysis — **2 ATPs**

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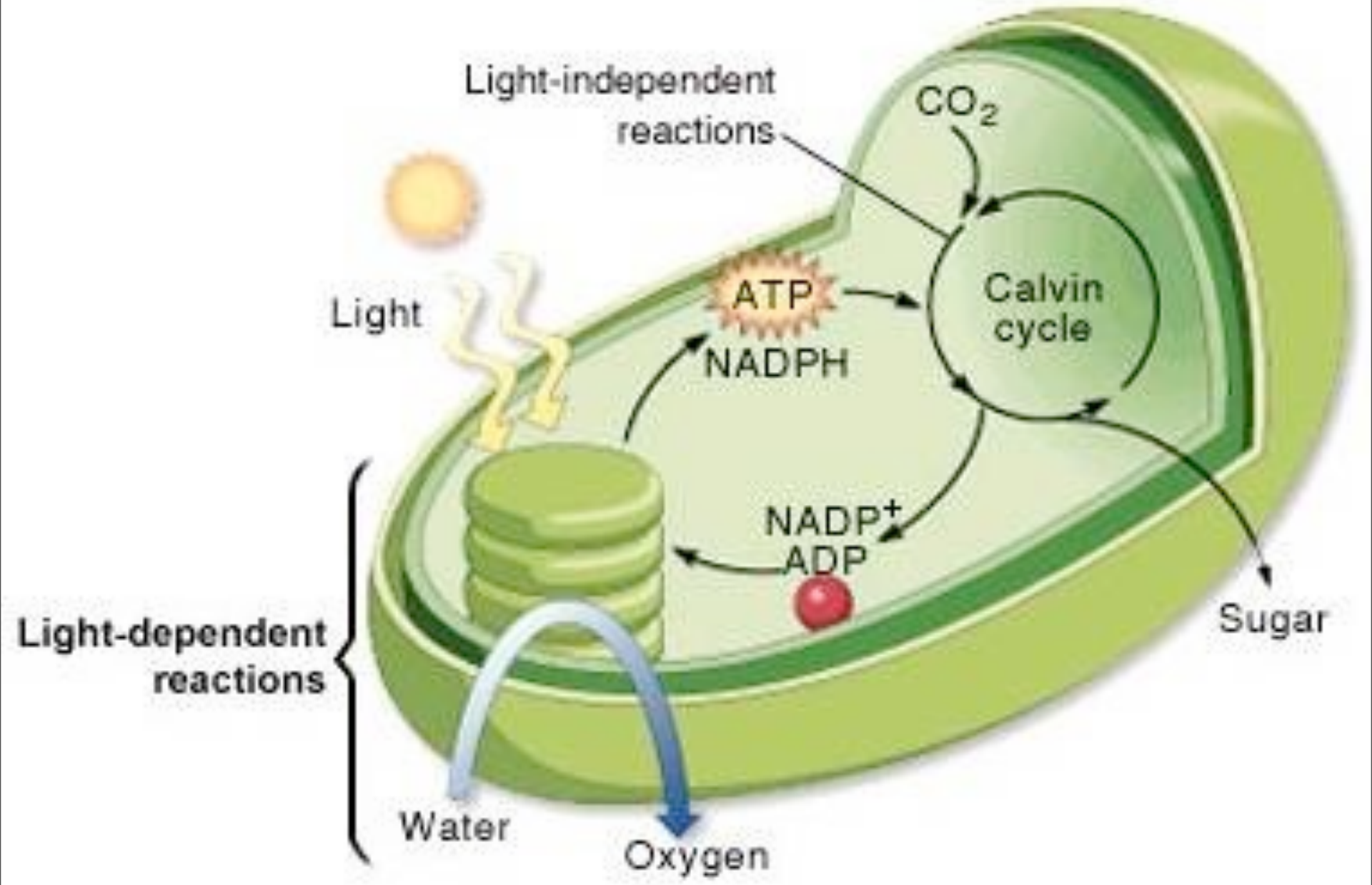
Reactions

Reactions

Balancing Equations


Light-independent reactions
CO_2
Light
ATP
NADPH
Calvin cycle
$NADP^+$
ADP
Light-dependent reactions
Sugar
Water
Oxygen

http://www.youtube.com/watch?v=mYbMPwmwx88&feature=related

http://www.youtube.com/watch?v=pE82qtKSSH4&feature=related

http://www.youtube.com/watch?v=C1_uez5WX1o

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PLANTS