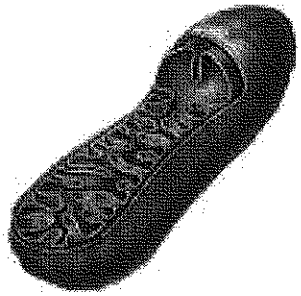
AP BIOLOGY
UNIT 3, CELLULAR RESPIRATION AND PHOTOSYNTHESIS
MS. VITALE



ESSENTAIL QUESTIONS

1. What is the difference between respiration and cellular respiration?
2. How is energy banked and used in ATP molecules?
3. How do cells tap energy for electrons transferred from organic fuels to oxygen?
4. How do hydrogen carriers shuttle electrons in redox reactions?
5. What are the two mechanisms that generate ATP?
6. What are the three main stages of cellular respiration and what occurs in each stage?
7. How many ATPs does one molecule of glucose yield?
8. What is anaerobic respiration and how does it differ from aerobic respiration?
9. What are some interconnections between molecular breakdown and the synthesis of energy?

Slow twitch muscle fibers- can sustain repeated, long, contractions

- Don't generate a lot of power
- Perform better in endurance
- Aerobic respiration
- More myoglobin

Fast twitch muscle fibers- contract quickly and powerfully

- Tire easily
- Perform best for short, intense activity
- Anaerobic respiration
- Less myoglobin

% of each type of fibers is genetic

Respiration-

Cellular respiration-

$C_6H_{12}O_6 + 6CO_2 \rightarrow 6CO_2 + 6H_2O + ATPs$

1 tablespoon of glucose (10g)=_____.

1 ATP contains ____% of the energy from 1 glucose molecule.

A cell banks about _____% of the energy from 1 glucose.

The rest is released as _____.

The energy available to a cell is in the _____ of organic molecules.

Simply stated, cellular respiration takes glucose apart in a series of steps.

It uses the energy carried by _____ that are rearranged when old bonds break and new ones form.

Cellular respiration works by shuttling _____ through a series of energy-releasing reactions.

In each step, electrons start out in molecules where they have more energy and wind up in molecules with less energy.

The reactions release energy in small amounts and the cell stores some of it as _____.

A cell transfers energy from glucose to ATP by coupling _____ reactions with _____ reactions.

loss of H atoms

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + E$ (ATP)

gain of H atoms

You don't see any electron transfers, you only see changes in H atom distribution.

Glucose loses H atoms as it is converted to CO_2.

O_2 is the ultimate recipient of electrons in cellular respiration.

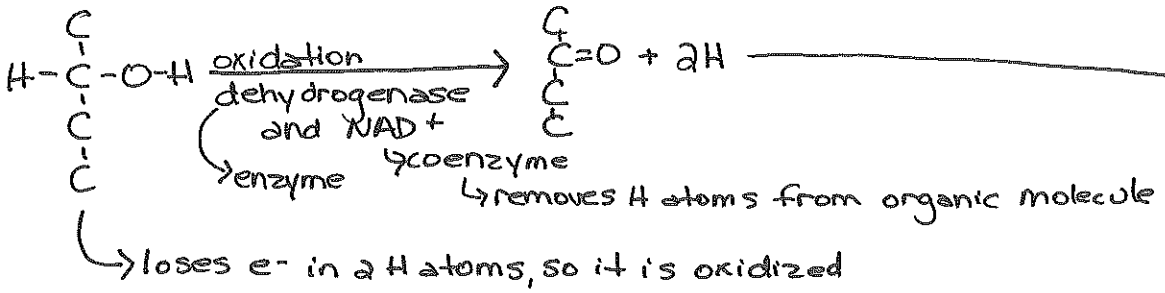
As a result, the electrons stripped from glucose end up in H_2O.

Redox reactions-

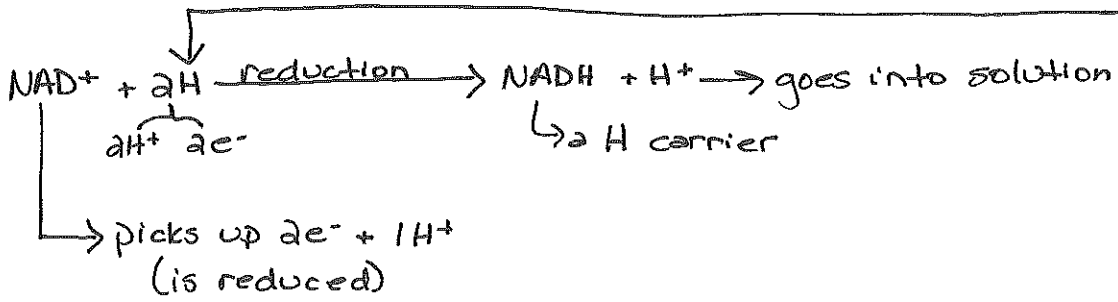
Oxidized molecule-

Reduced molecule-

EXAMPLE:

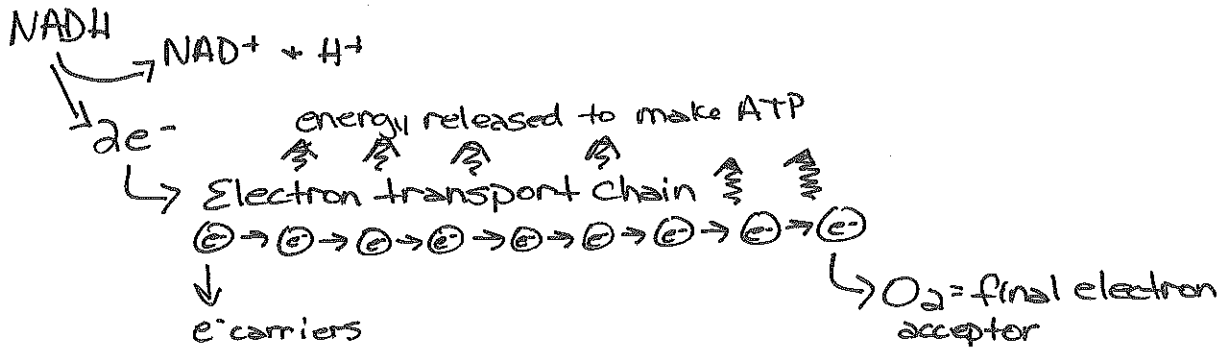


NAD+ = nicotin amide adenine dinucleotide
*an organic molecule that cells make from the vitamin niacin
*used to shuttle electrons in redox reactions



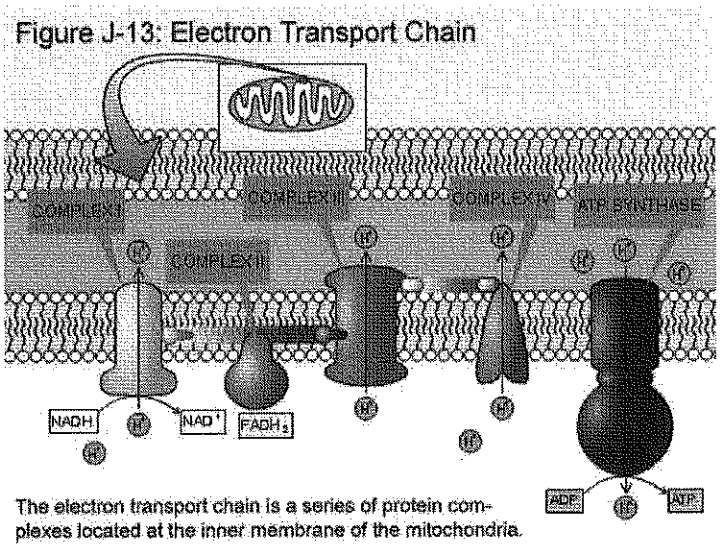
NADH takes electrons from glucose to other molecules in the cell.

The electrons carried by NADH go to an electron carrier molecule which gains electrons from NADH which then becomes NAD+

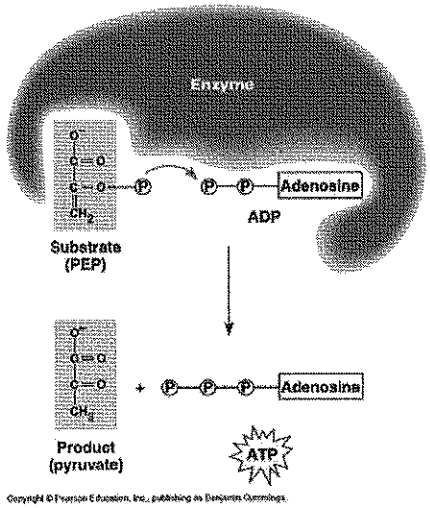


2 mechanisms generate ATP-

1. Chemiosmotic phosphorylation (chemiosmosis)
2. Substrate-level phosphorylation

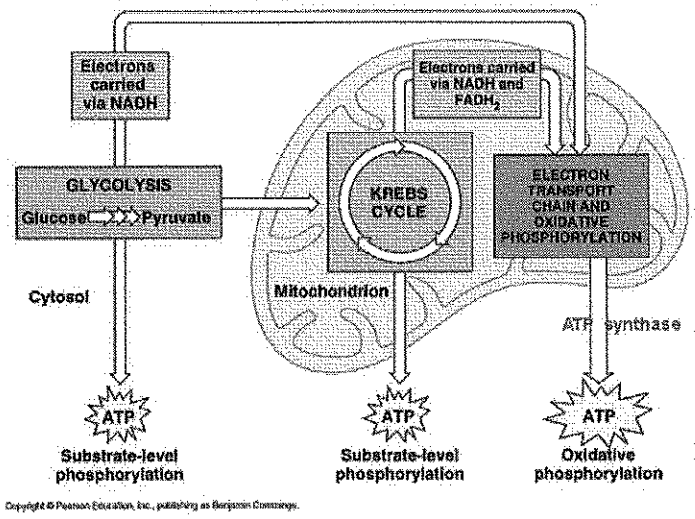


Substrate level phosphorylation-

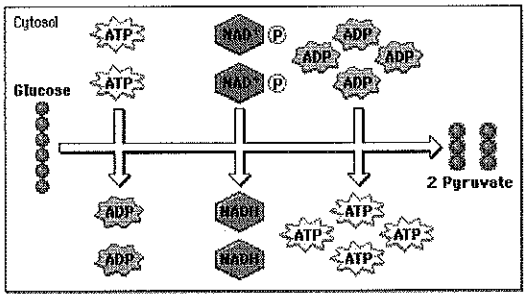


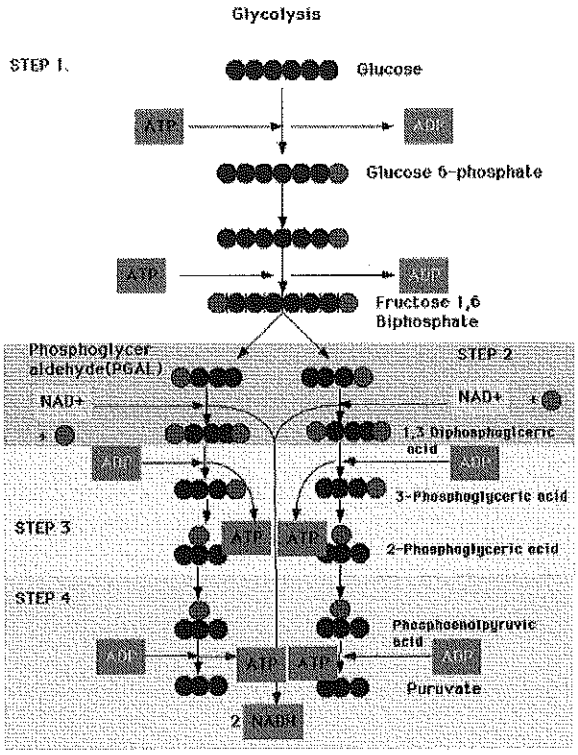
Cellular respiration occurs in 3 main stages:

1. Glycolysis
2. Krebs cycle
3. Electron transport chain



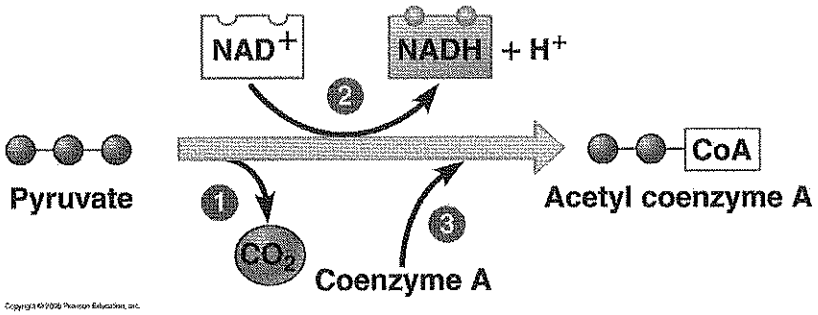
Glycolysis-



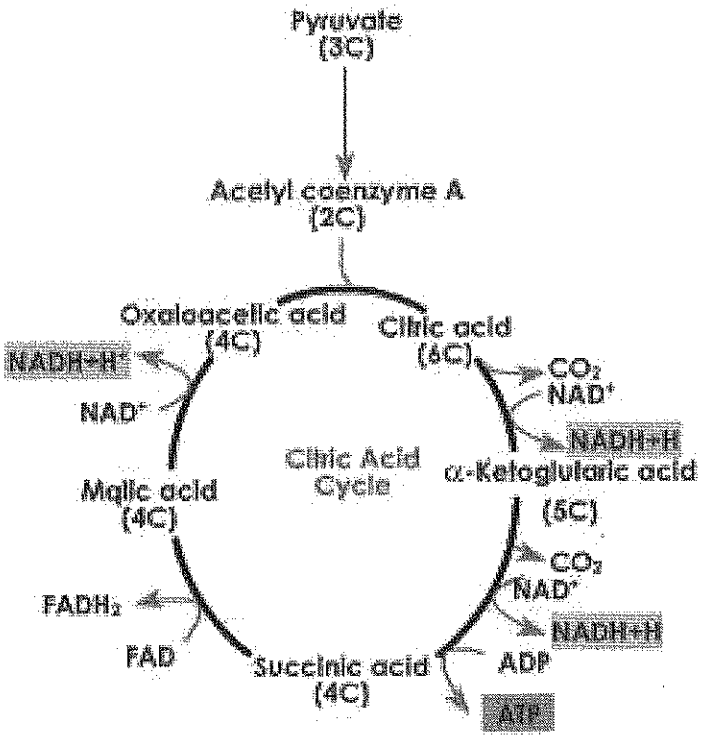

Glycolysis
STEP 1
Glucose
ATP
ADP
Glucose 6-phosphate
ATP
ADP
Fructose 1,6
Biphosphate
Phosphoglycer
aldehyde(PGAL)
STEP 2
NAD+
NAD+
1,3 Diphosphoglceric
acid
ADP
ADP
3-Phosphoglyceric acid
STEP 3
ATP
ATP
2-Phosphoglyceric acid
STEP 4
Phosphoenolpyruvic
acid
ADP
ATP
ATP
ADP
Puruvate
2 NADH

Pyruvic acid is:

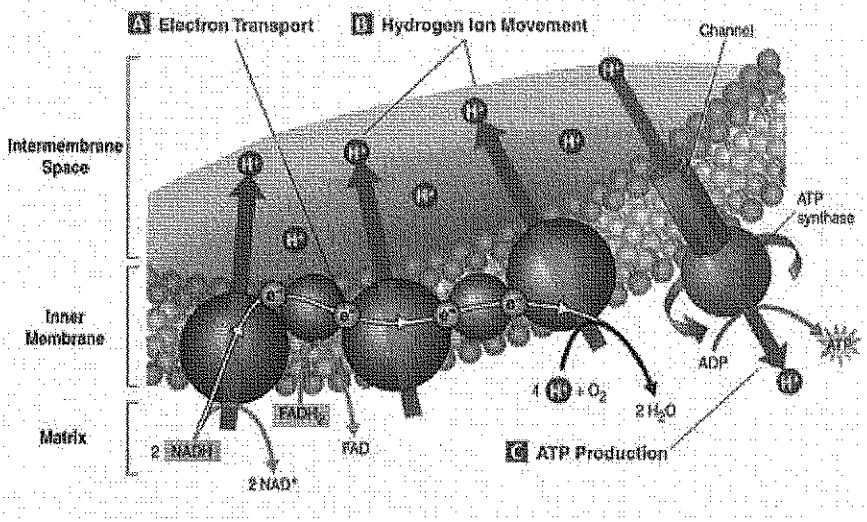
1. Oxidized while a molecule of NAD+ is reduced to NADH
2. A Carbon atom is removed and released in CO_2
3. A compound called coenzyme A (derived from a B vitamin) joins with the 2-Carbon fragment remaining from pyruvic acid to form a molecule of acetyl coenzyme A (acetyl CoA)



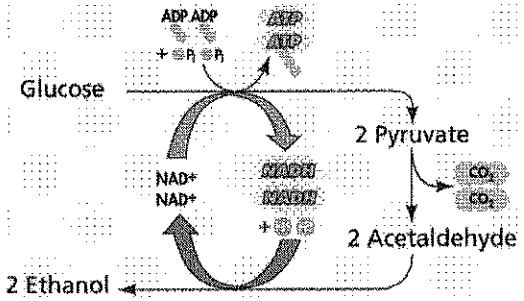
The Krebs Cycle

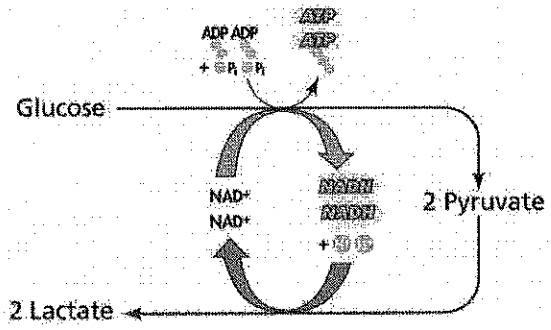


Electron Transport Chain



Fermentation





Strict anaerobes-

Facultative anaerobes-