

What are metabolic activities?

- making & breaking down molecules
- all reactions necessary to make them
- extracting & utilizing energy to power reactions
- transporting molecules
- dividing to make new cells

Requires Enzymes & Energy

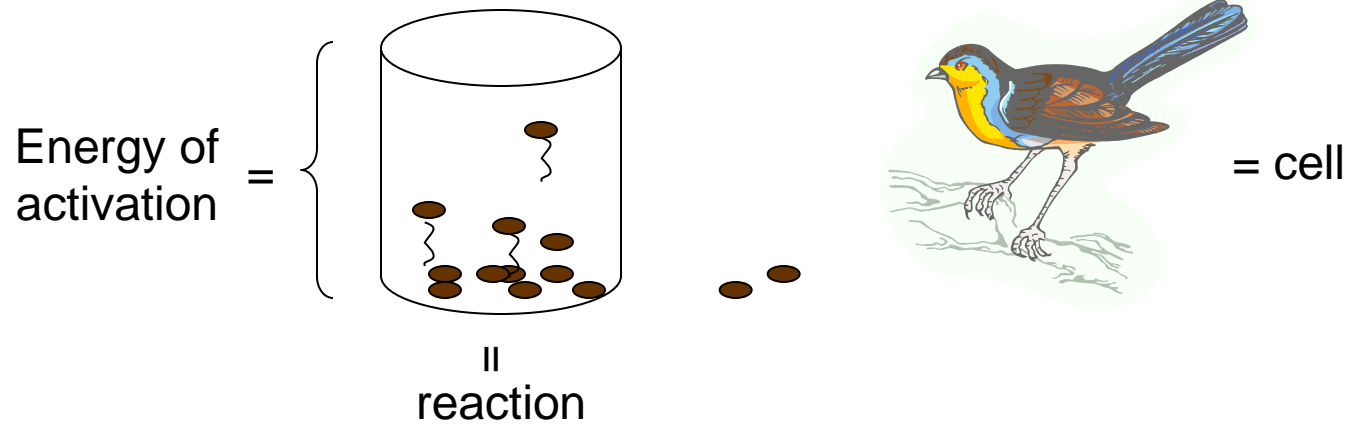
A little background...

- All reactions have an energy barrier that must be overcome before they can begin.
- Energy barrier = Energy of Activation (E_A)
- E_A = the amount of energy required to start a reaction
- Essential reactions need to occur quickly and precisely for a cell to survive.

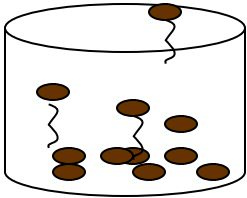
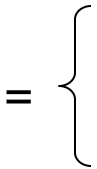
Enzymes

- type of protein
- biological catalyst
- lower the E_A
- **do not add energy**

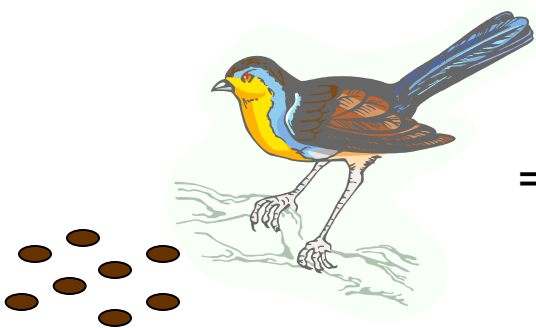
Example: Jumping beans



Energy of activation



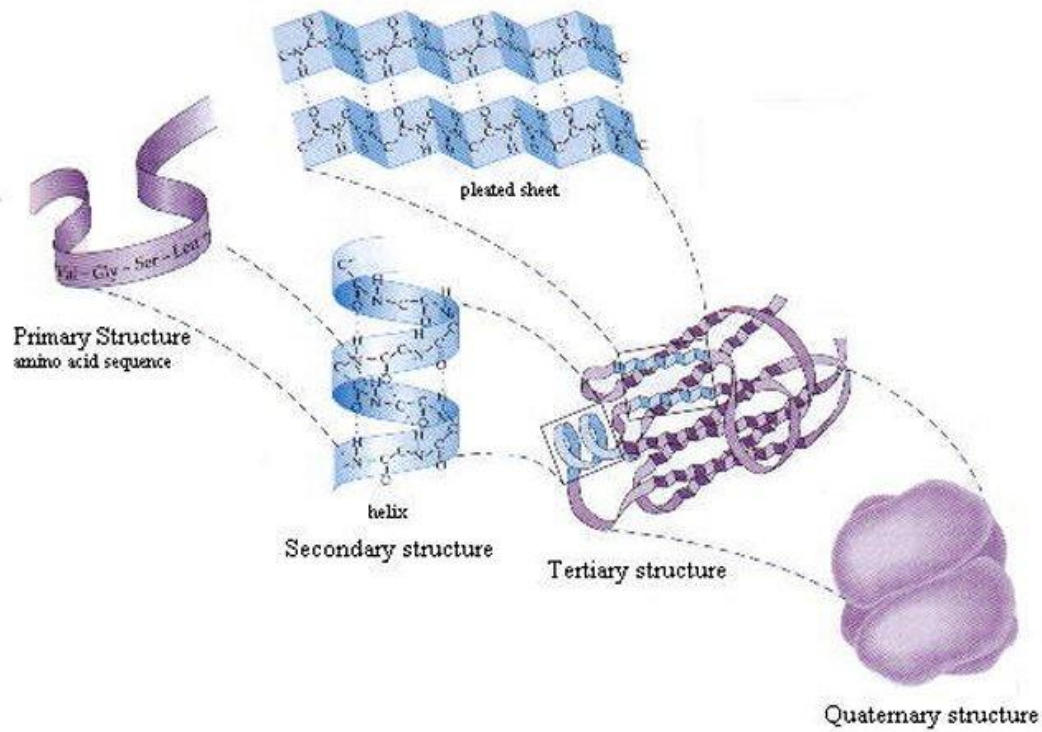
||
reaction



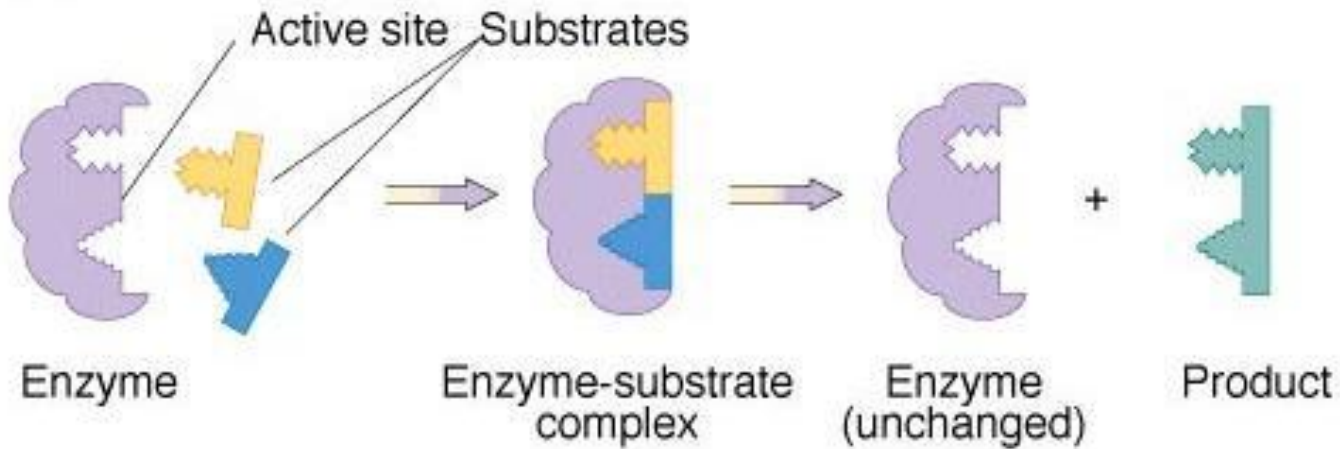
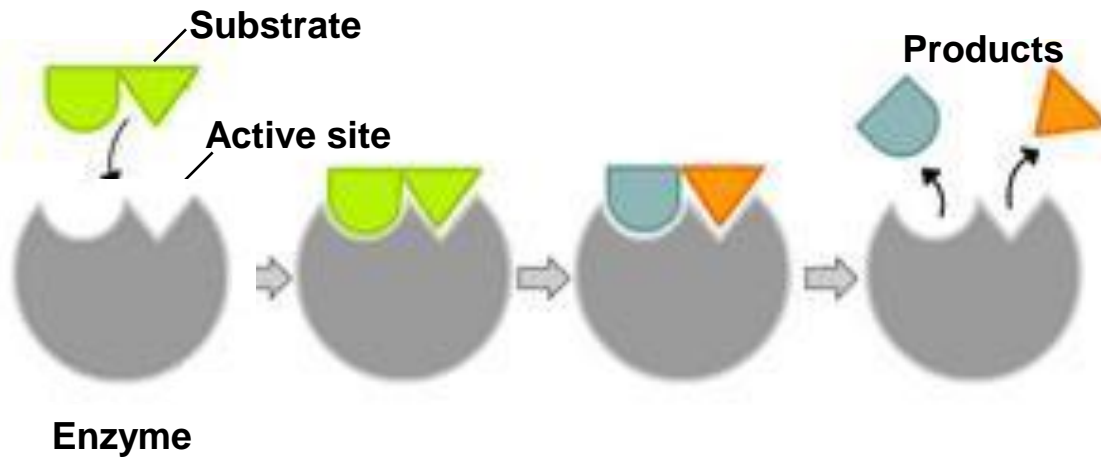
= cell

Enzyme specificity

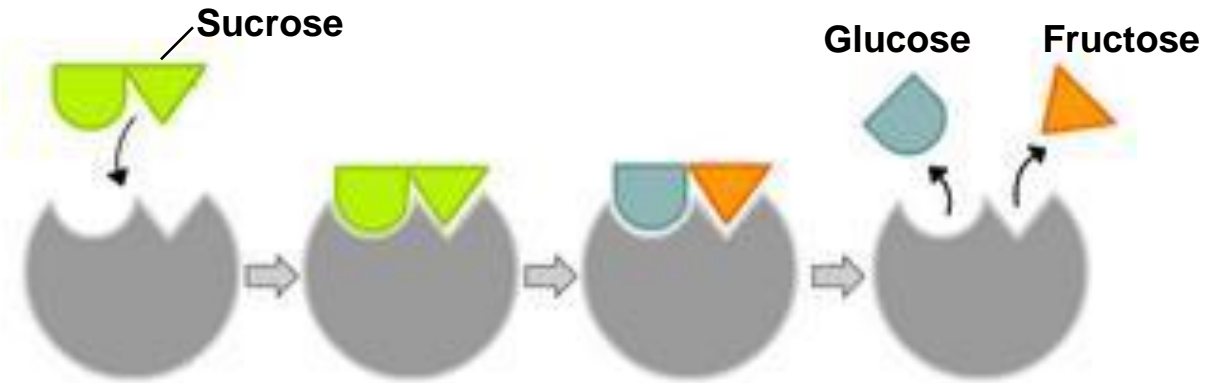
- achieved by shape of molecule



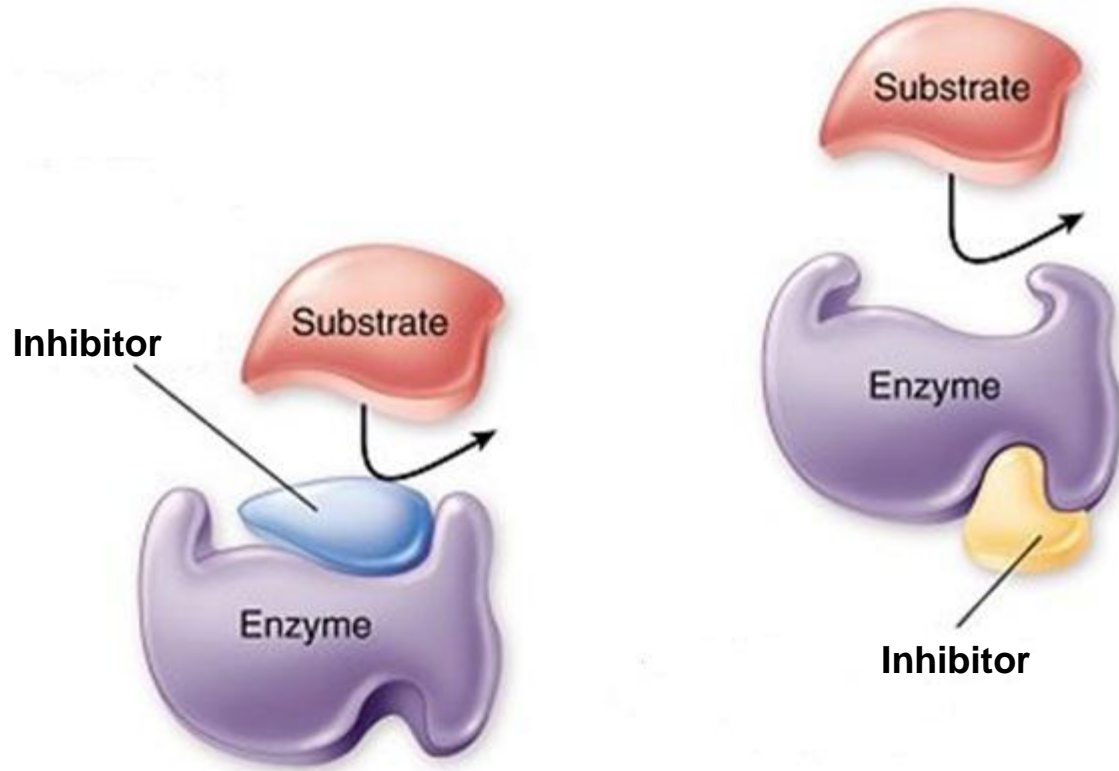
Enzyme with Active Site



What regulates, or controls, when reactions occur?



Enzyme Inhibitor



Energy

- heat from the environment
- chemical energy

ATP = biologically useful form of chemical energy

Sources of energy:

- 1) Food = stored chemical energy
- 2) Sun = solar energy



1) Eat food and extract the stored chemical energy



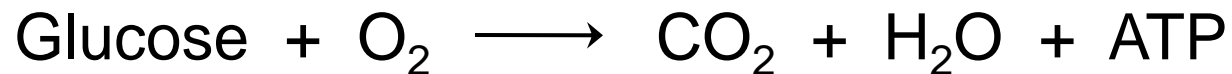
2) Capture solar energy and convert it to chemical energy

1) Extract energy stored in food.

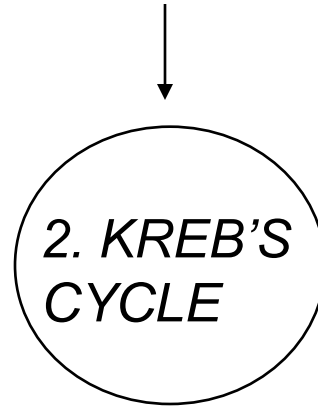
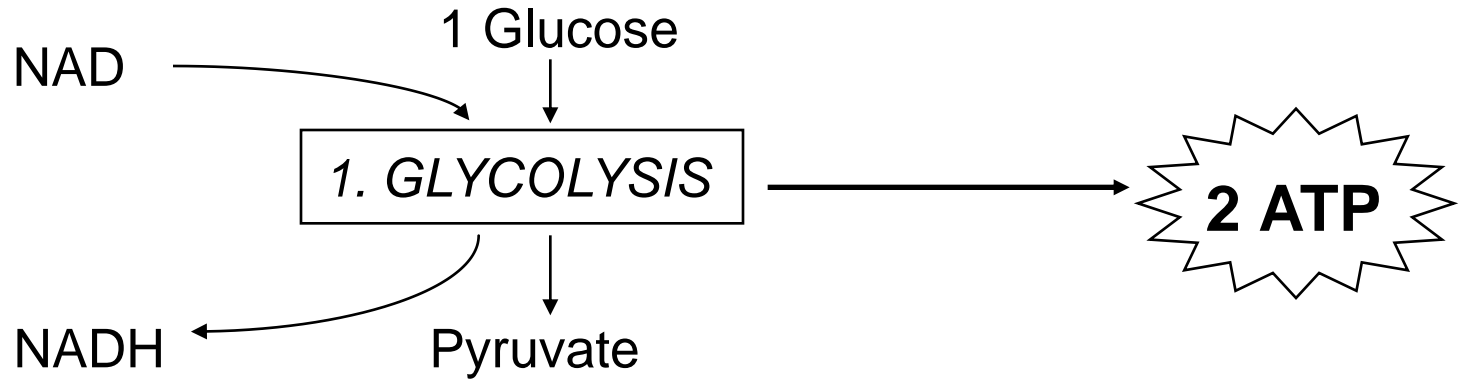


Cellular Respiration

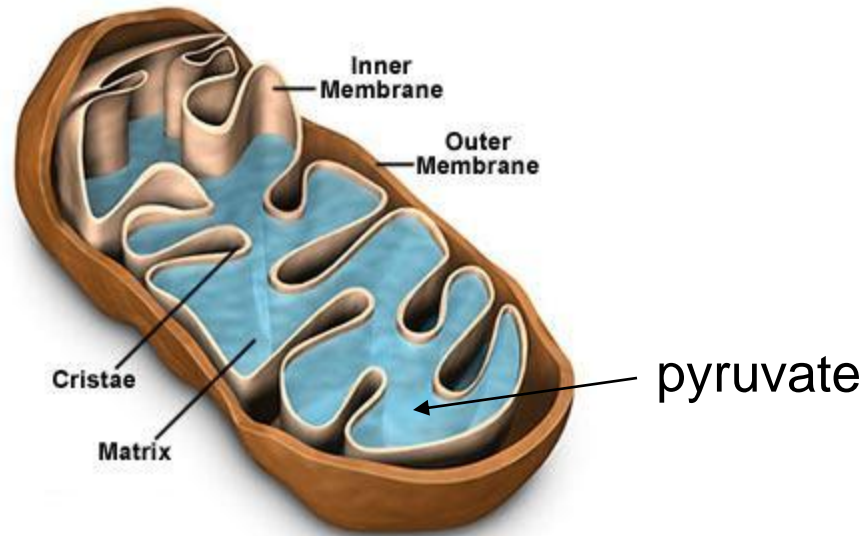
Process that uses oxygen (O_2) to harvest the chemical energy stored in molecules of food to make ATP.



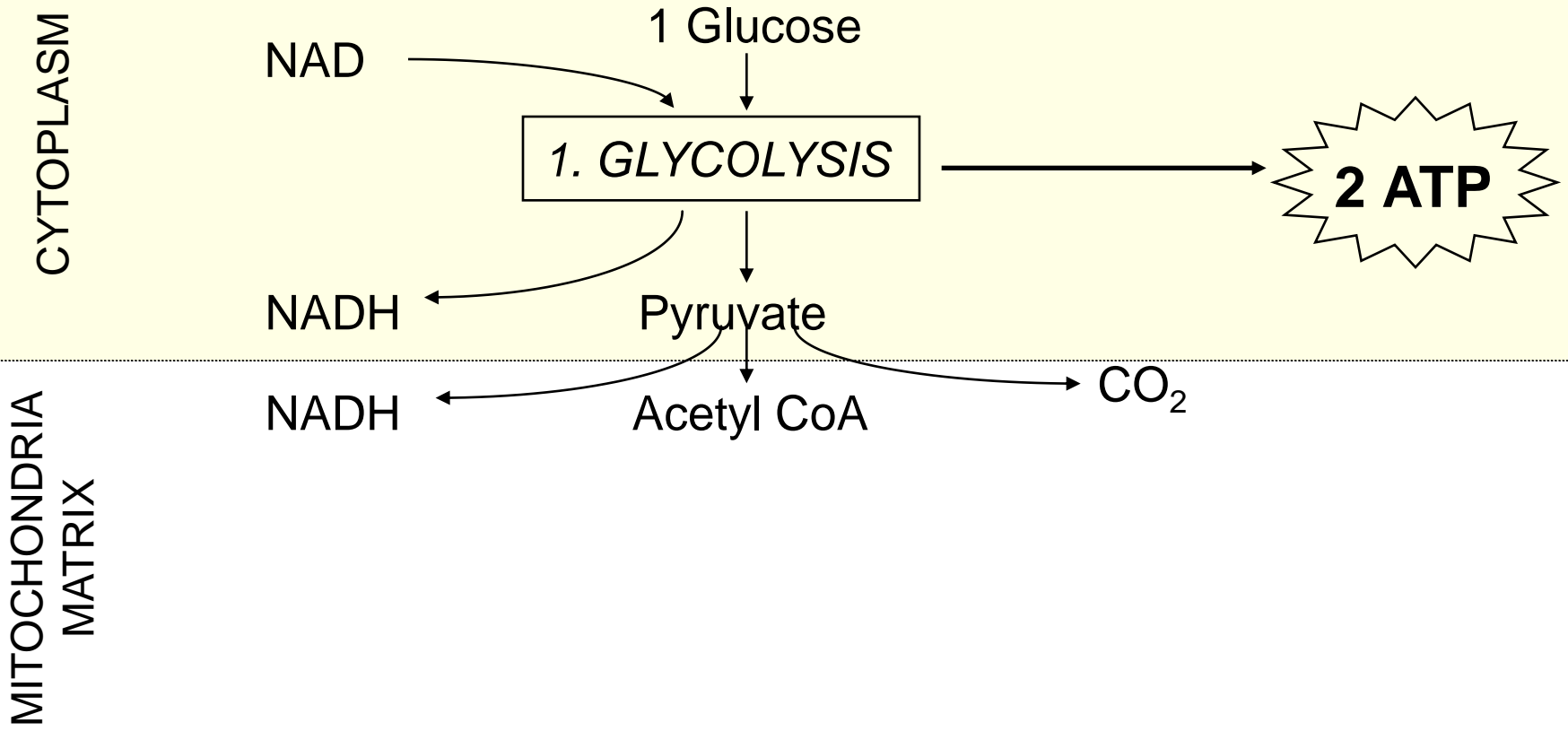
CYTOPLASM

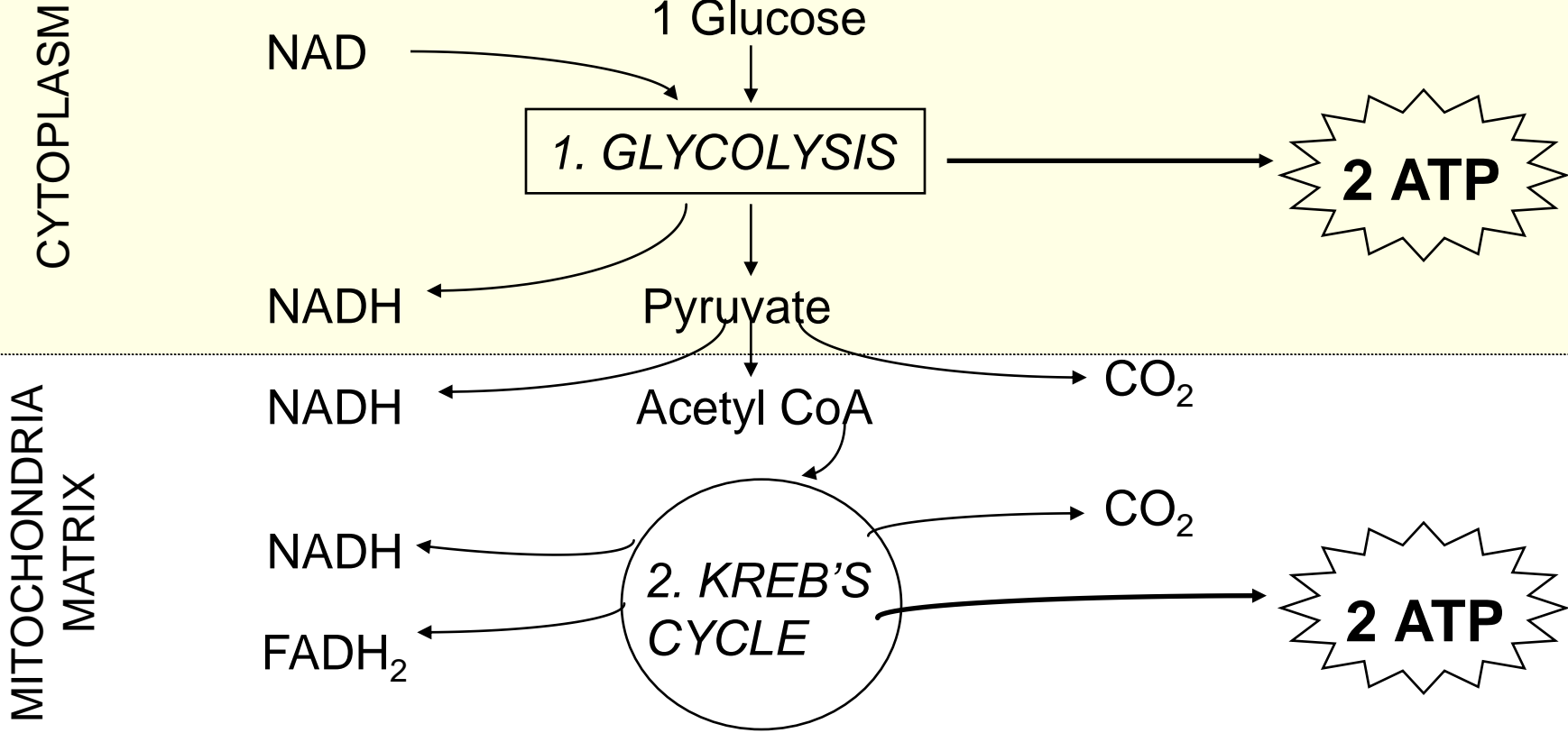


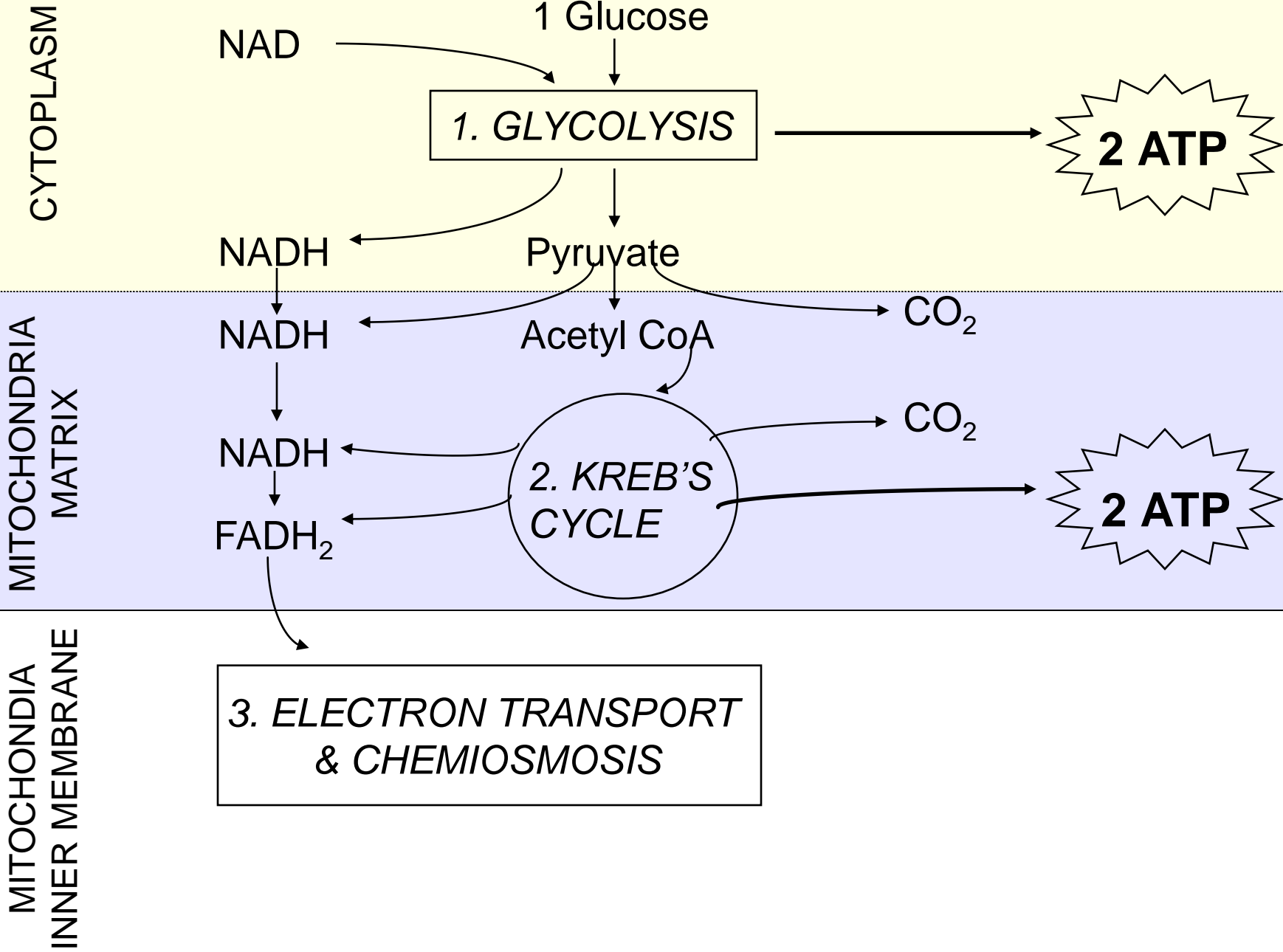
Mitochondria

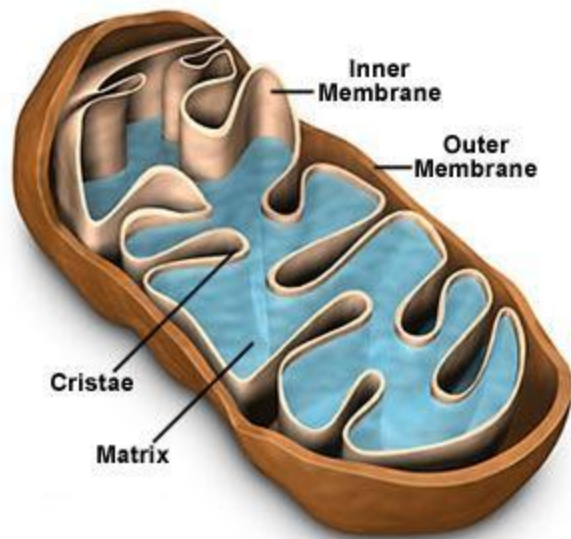


Cytoplasm of cell

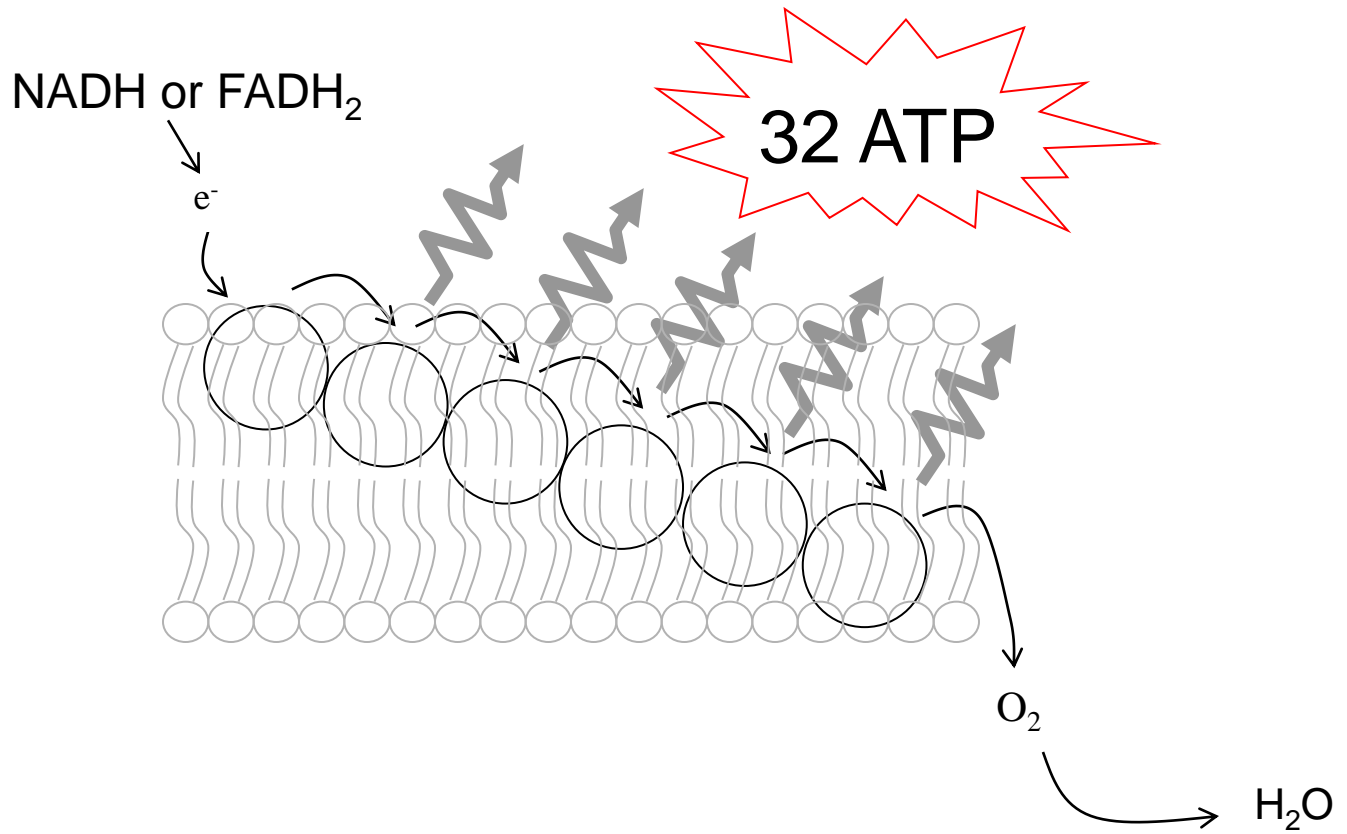




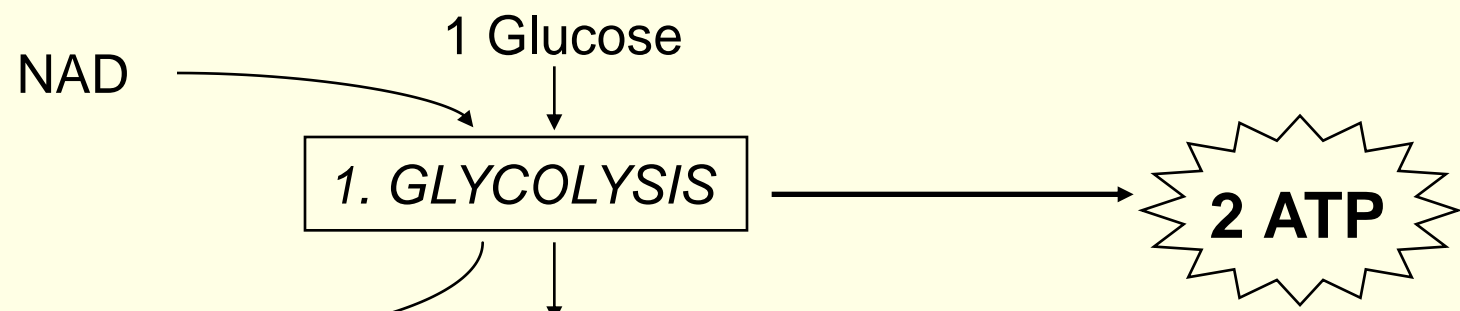




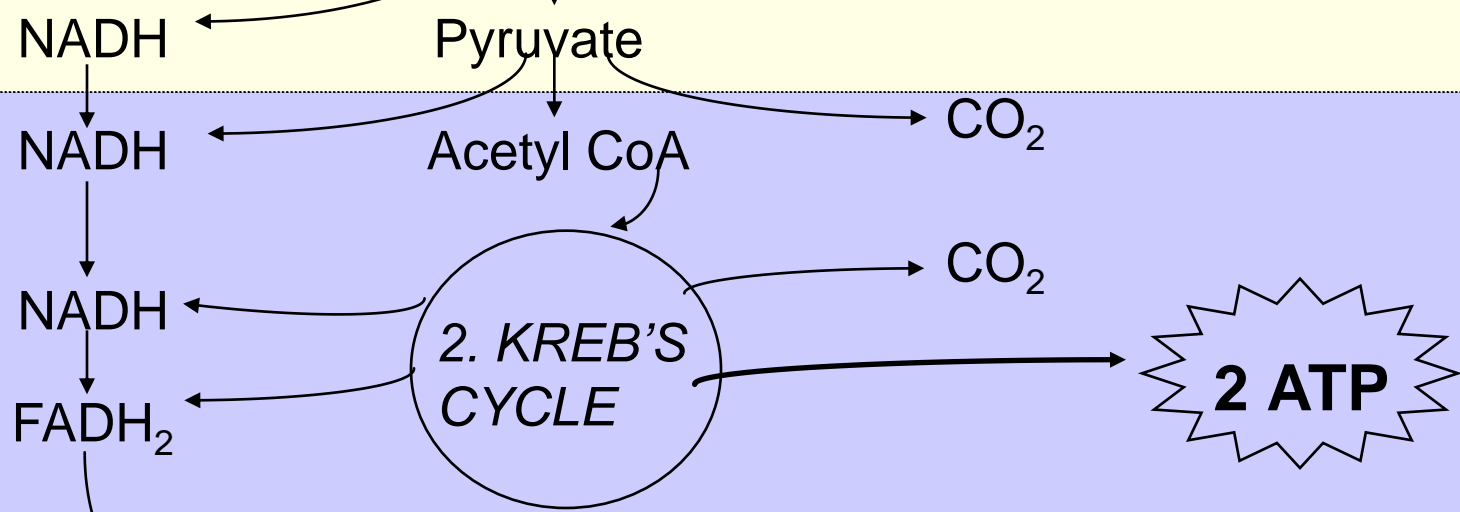
Electron Transport Chain



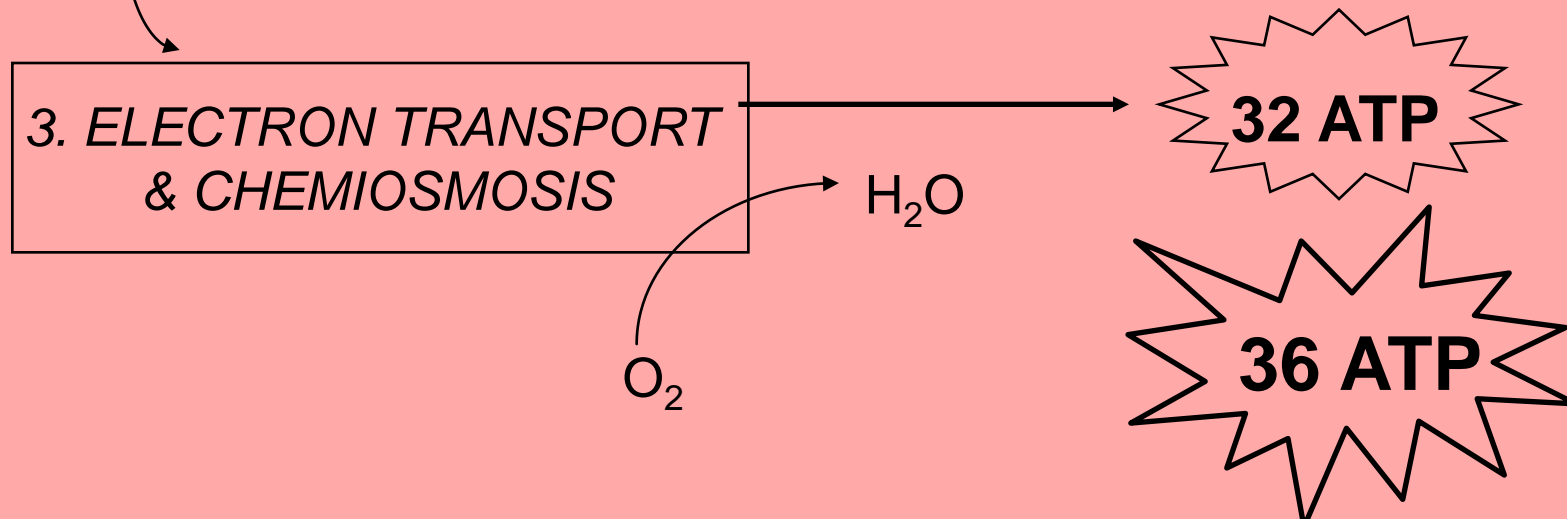
CYTOPLASM



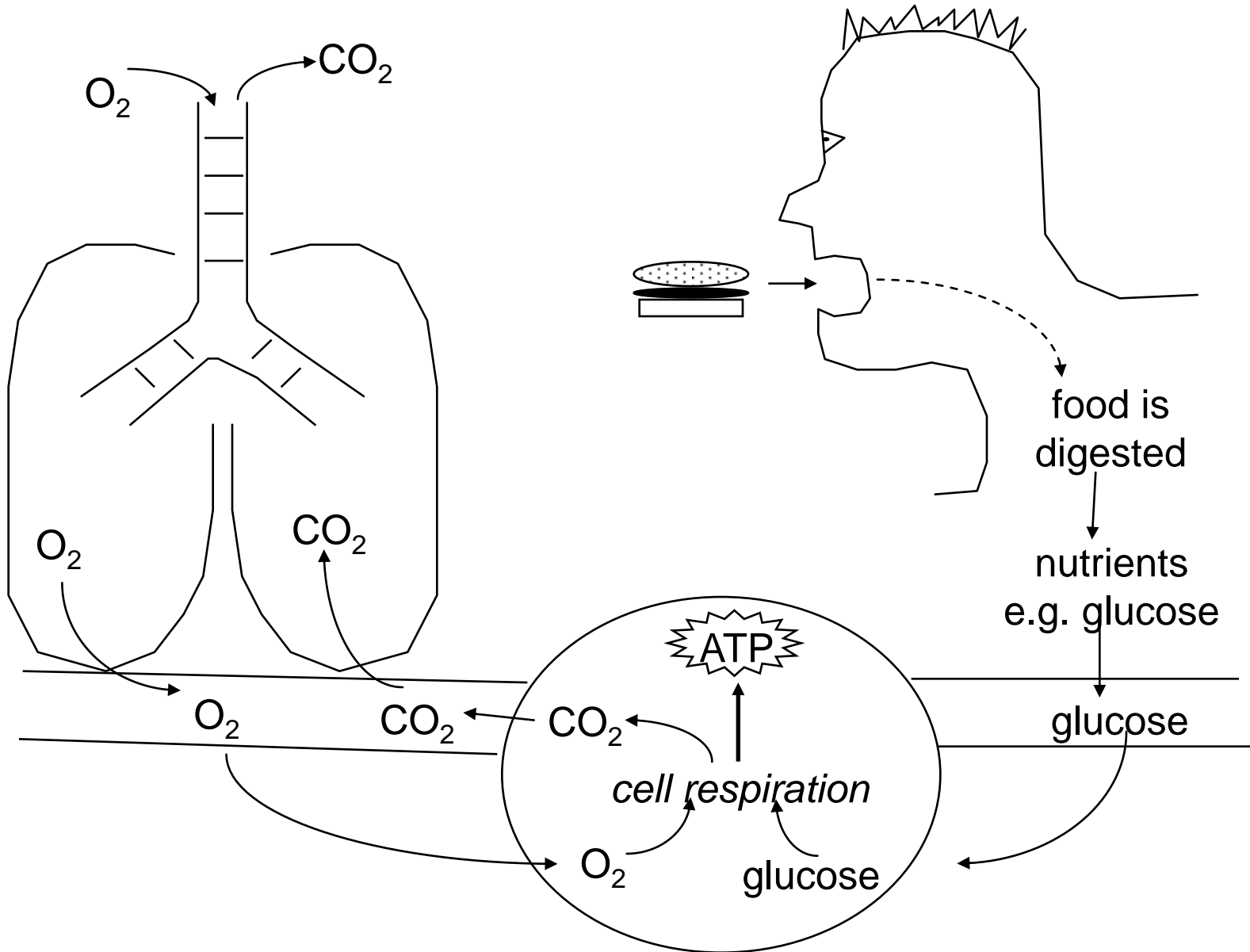
MITOCHONDRIA MATRIX

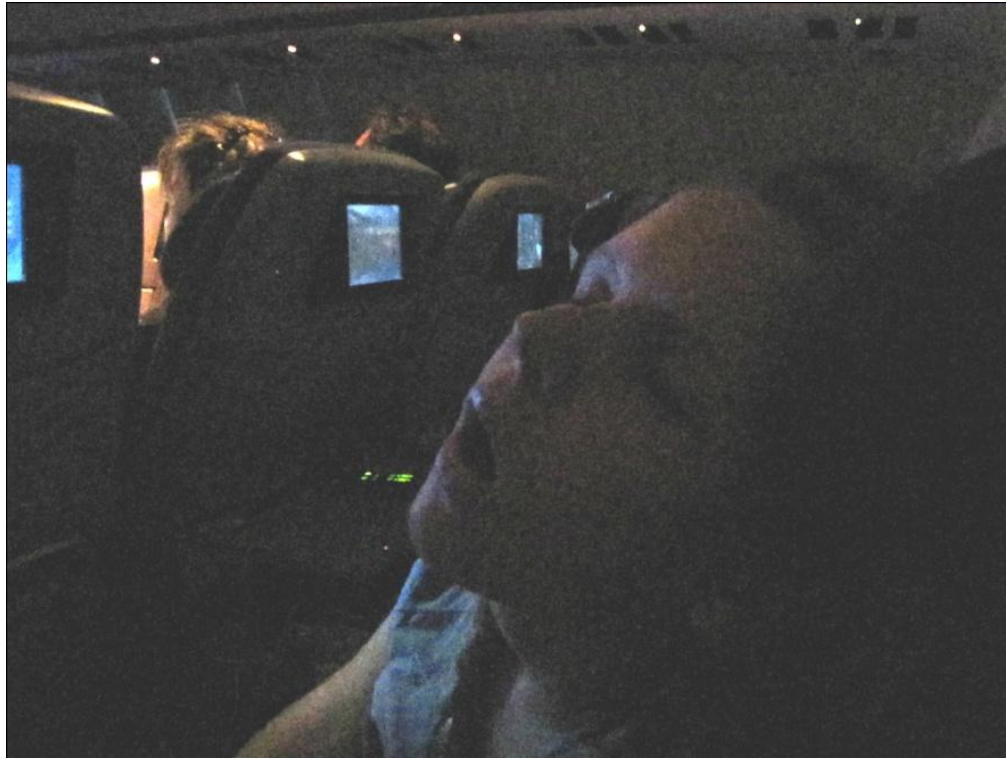


MITOCHONDRIA INNER MEMBRANE



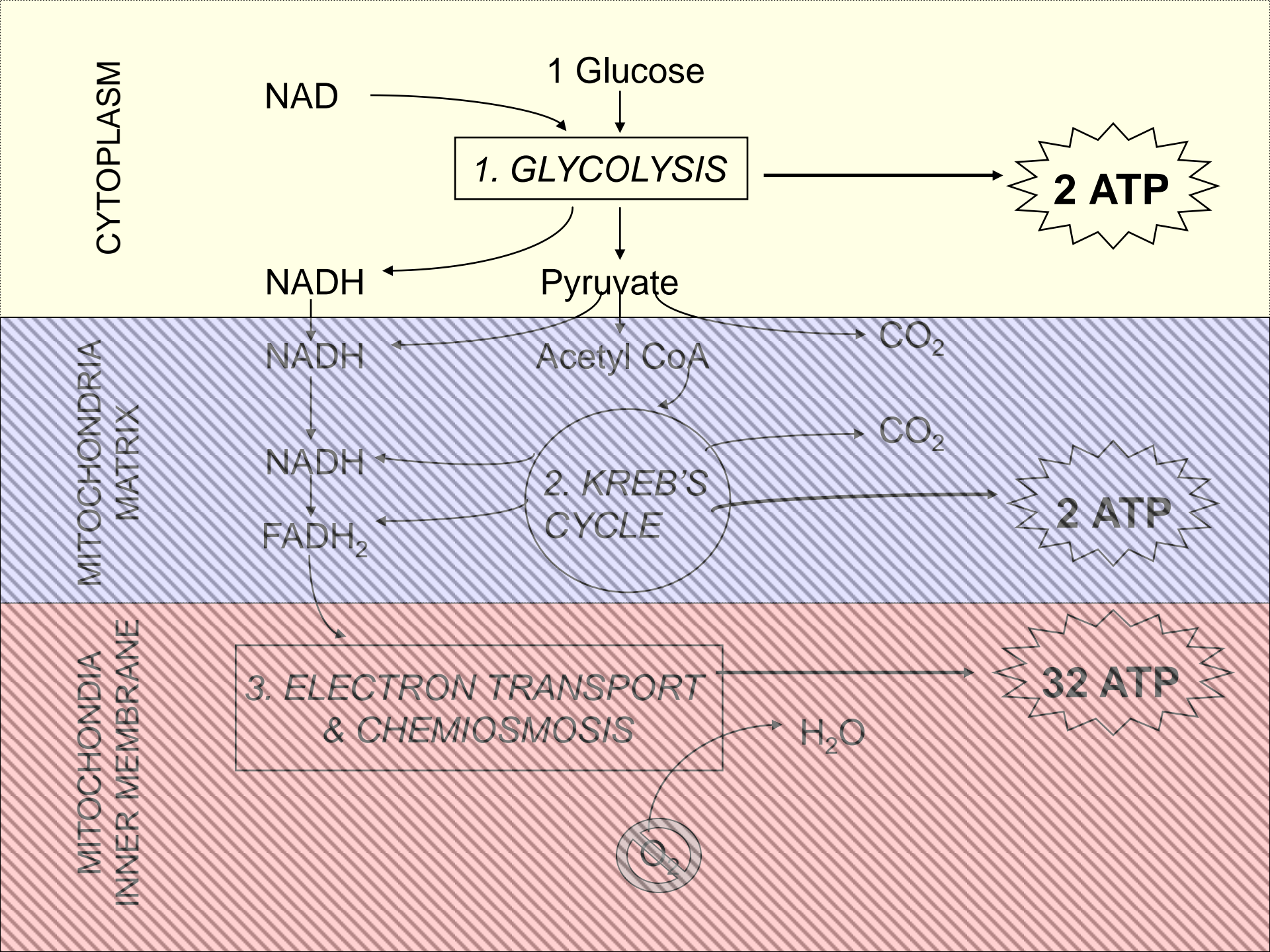
Why do we eat and breathe?





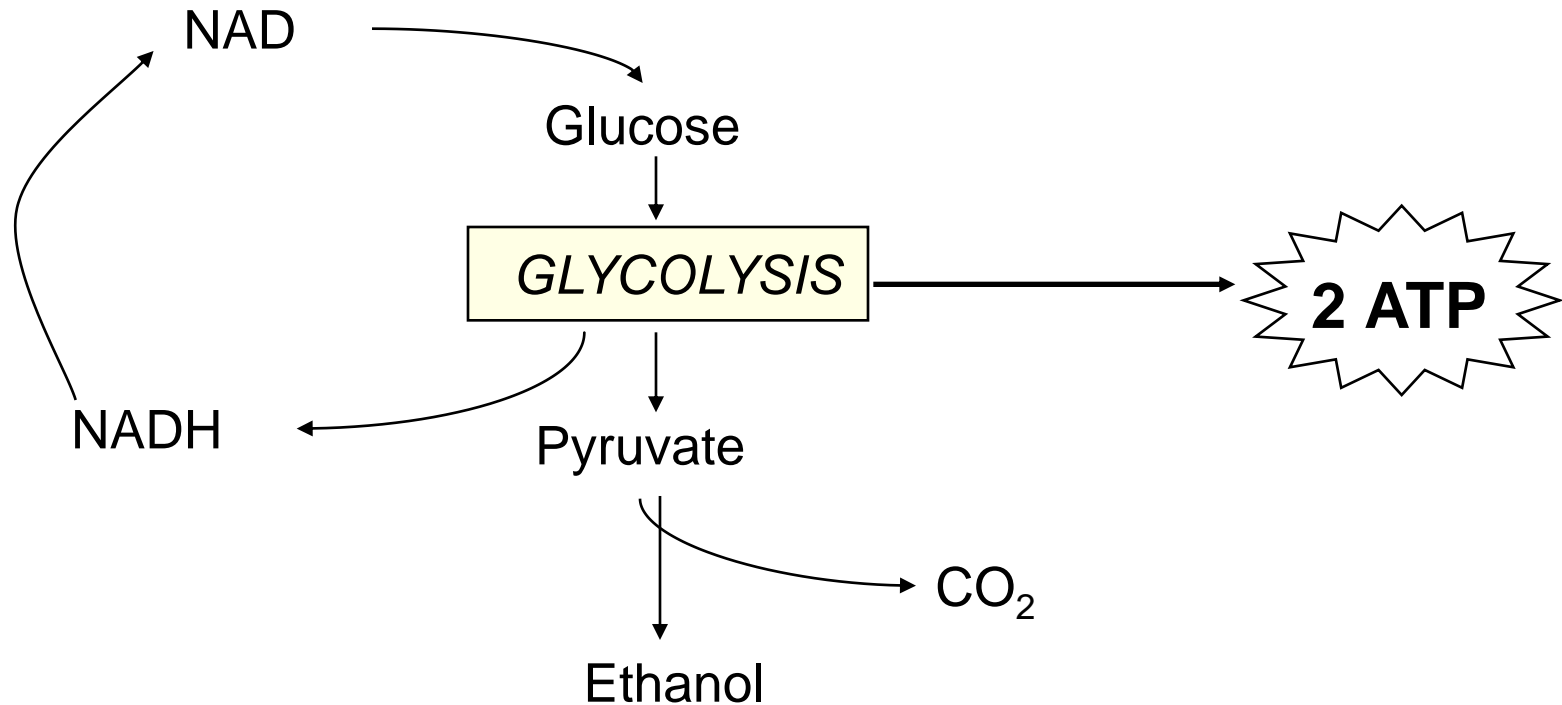
45 kg = 90 lbs of ATP/day

ATP present at any moment < 1 gram



Fermentation

Anaerobic alternative to Cellular Respiration



Cellular Respiration



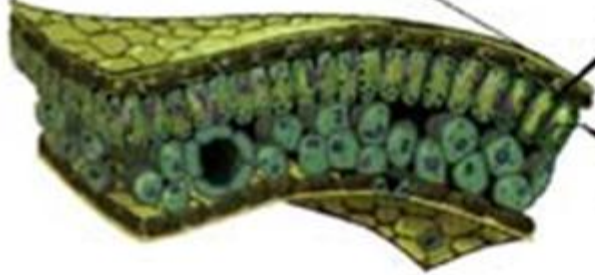
Photosynthesis

2) Capture solar energy and store it as chemical energy

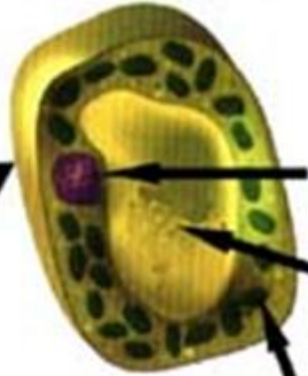


Process that captures and converts solar energy and stores it as chemical energy (makes high energy molecules of food).

Leaf Cross Section



Mesophyll cell

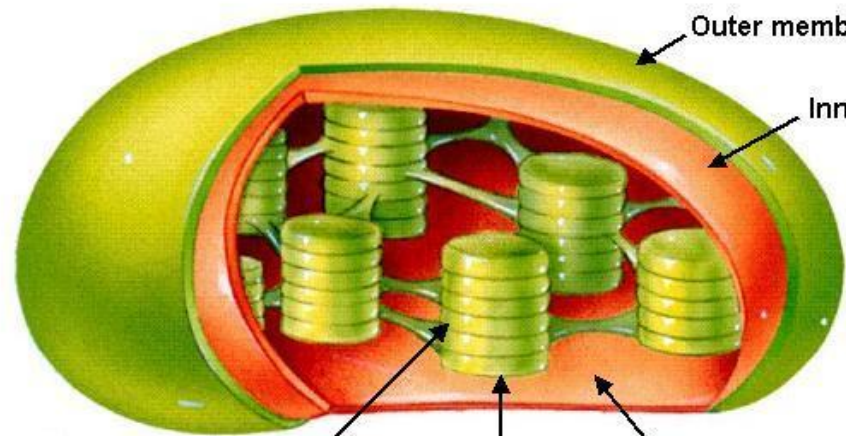


Nucleus

Vacuole

Mesophyll cell

Chloroplast



Outer membrane

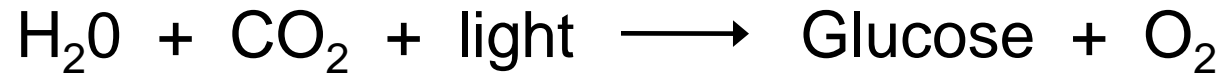
Inner membrane

Granum
(stack of
thylakoids)

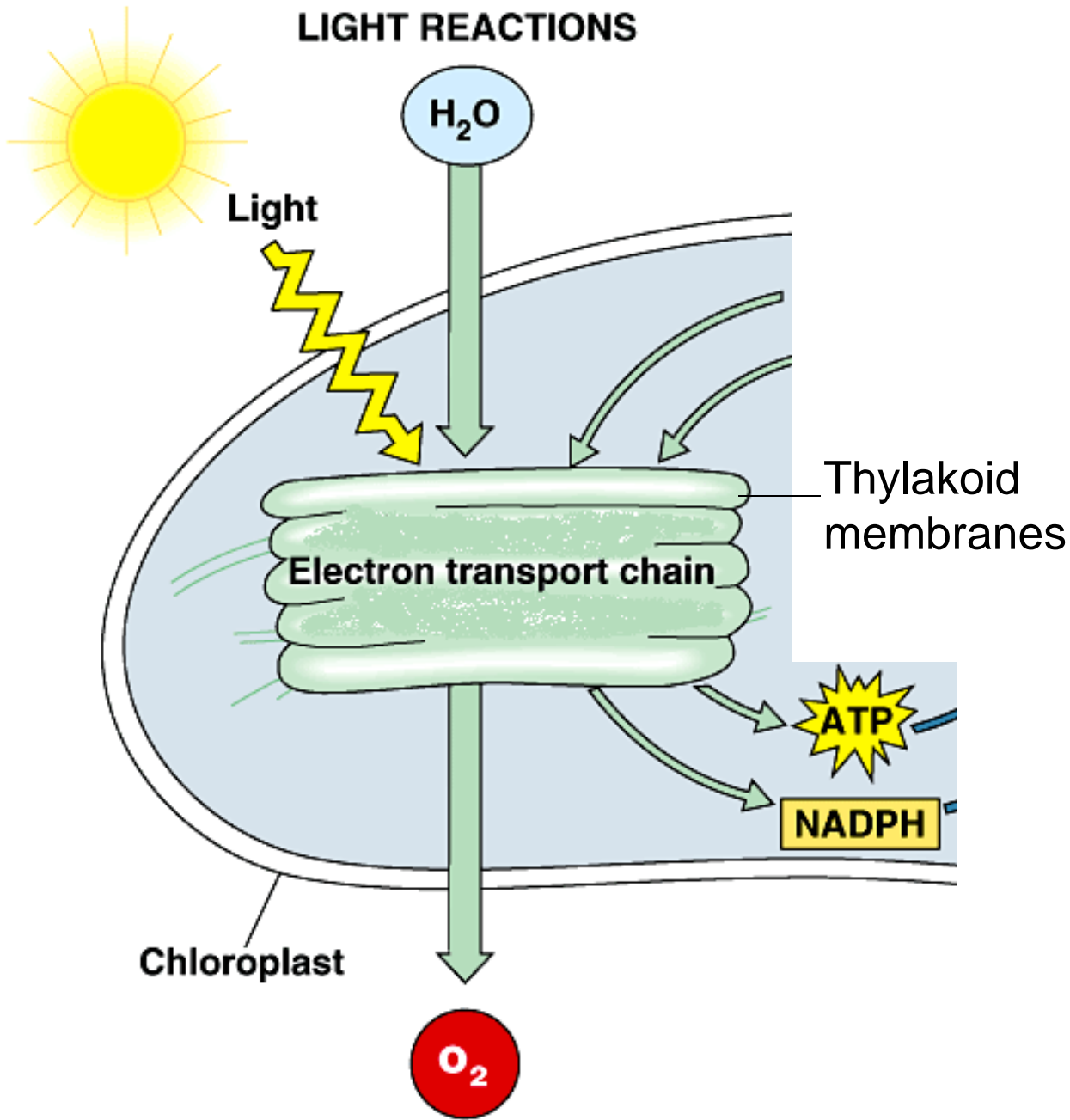
Thylakoid

Stroma

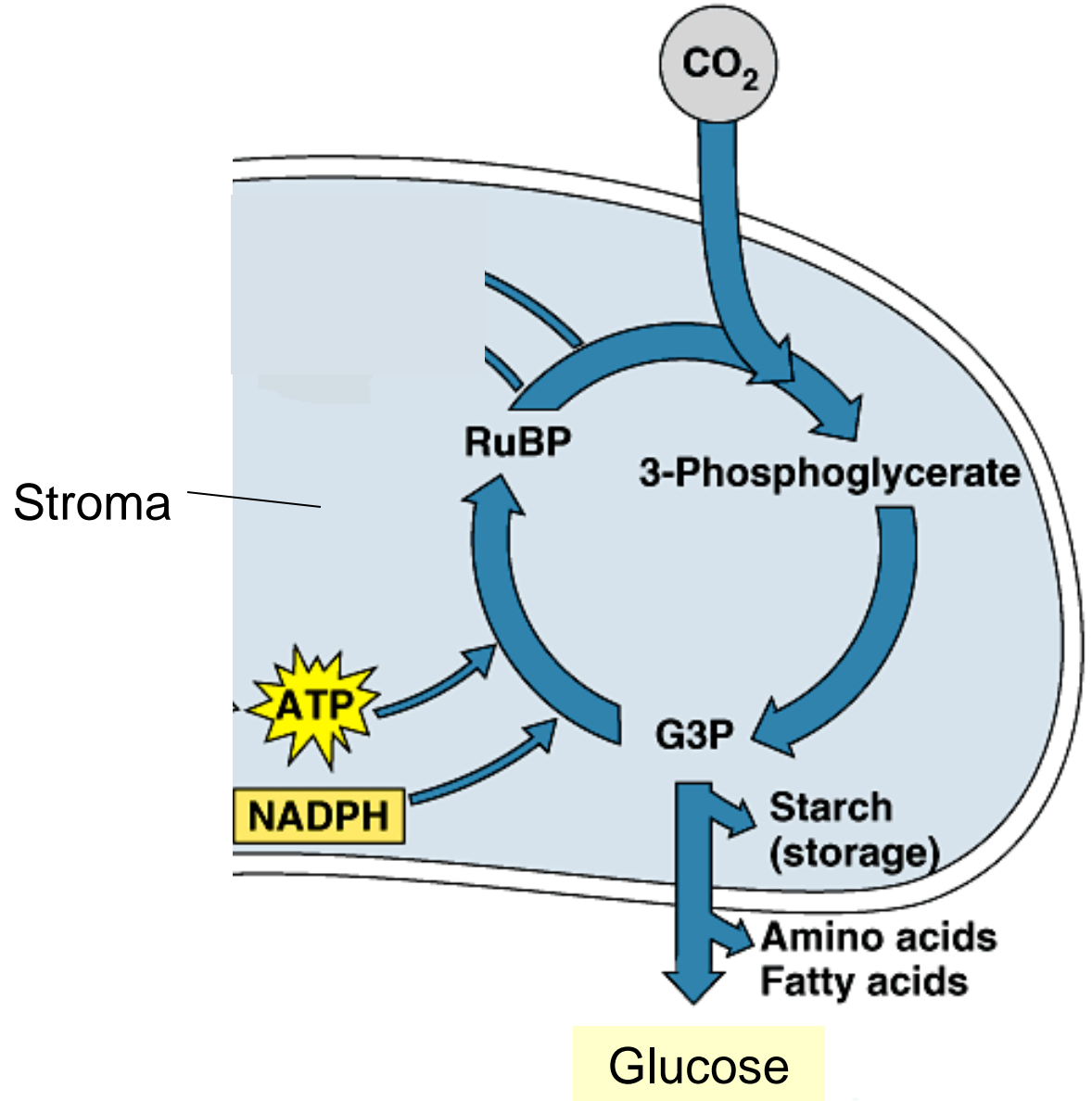
Photosynthesis

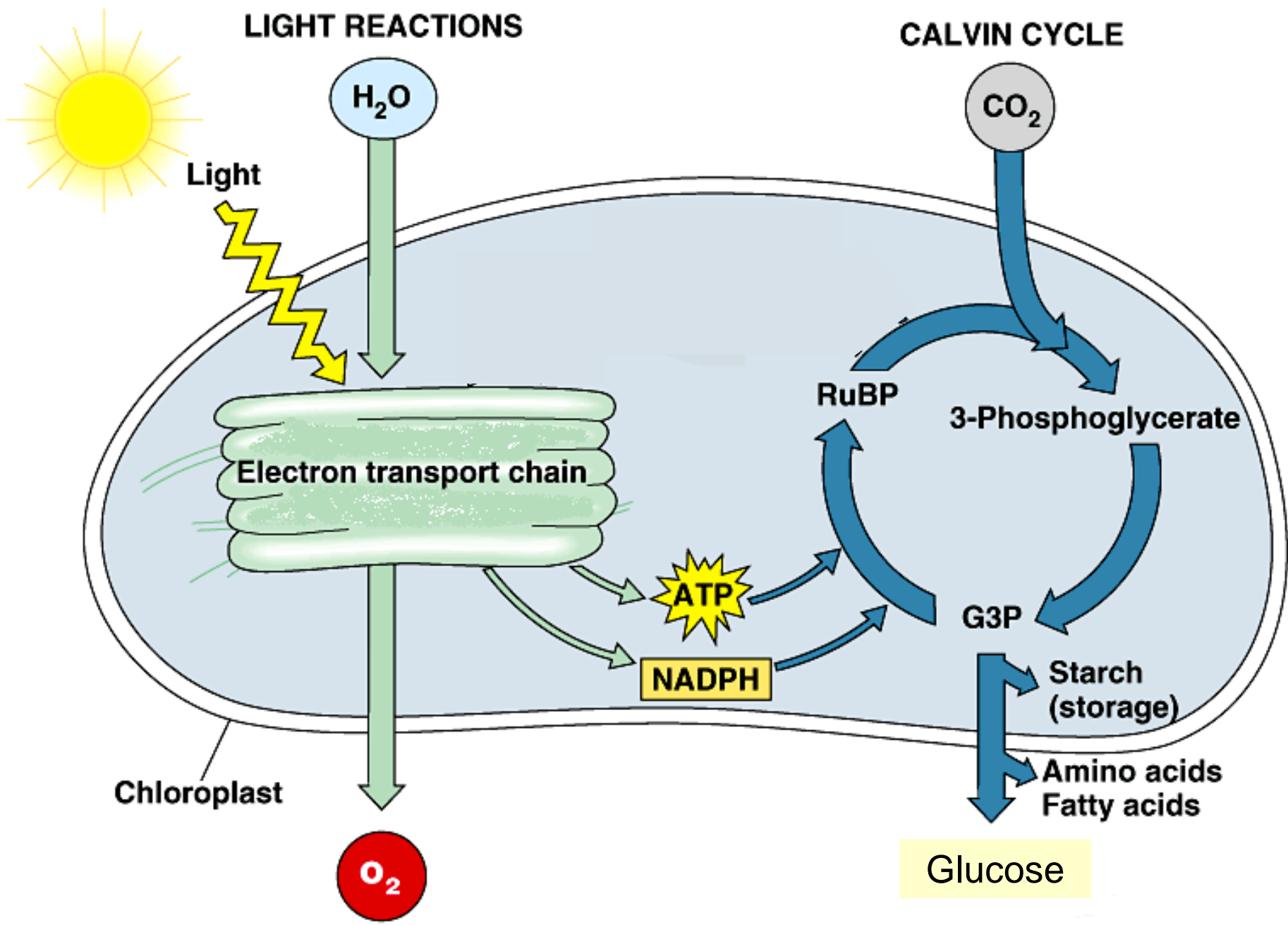


LIGHT REACTIONS

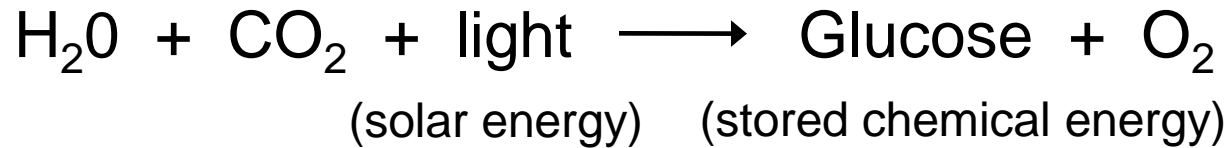


Dark Reactions = CALVIN CYCLE





Photosynthesis



Cellular Respiration

