CELLULAR RESPIRATION

\[ \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{H}_2\text{O} + 6\text{CO}_2 \text{ (+ ATP!)} \]

* Cellular respiration is the process used by ALL organisms to release energy.

* There are 2 main types of respiration: FERMENTATION (NO O₂ needed)
  &
  AEROBIC RESPIRATION (O₂ necessary)

* Here is an overview of what happens during respiration:

  1. **Glycolysis**
     - ALL organisms must do
     - Takes place in the cytoplasm
     - Converts glucose to 2 pyruvic acid

  2. **Anaerobic Respiration**
     - AKA Lactic Acid Fermentation
     - (Animals)
     - Converts to Lactic Acid

  3. **Aerobic Respiration**
     - Convert to Electron Transport Chain
     - Converts to CO₂
     - Converts to H₂O
     - Converts to ATP
A. Glycolysis

1. Occurs in the ____________________

2. Whether an organism will undergo fermentation OR aerobic respiration, glycolysis WILL occur.

3. What happens:
   a. one molecule of __________________ breaks down into
      2 molecules of __________________ _________.
   
   b. 2 molecules of _______ are formed.

B. Fermentation → breakdown of pyruvic acid WITHOUT O₂

1. Lactic Acid Fermentation
   a. occurs in ________________ cells when O₂ is in short supply
   
   b. accumulation of lactid acid HURTS!
      → makes muscles BURN/cramp
      → makes them feel tired and sore

2. Alcoholic Fermentation
   a. occurs in ________________ cells and some microorganisms
   
   b. accumulation of ethyl alcohol results
      → microorganisms that use alcoholic fermentation are used to
      make wine and beer!

*NO ADDITIONAL ATP MOLECULES ARE MADE IN FERMENTATION*
C. Aerobic Respiration

* MOST organisms carry out aerobic respiration

Aerobic respiration occurs in the mitochondria

- mitochondria have a double membrane—the inner membrane is folded and convoluted; the dense solution contained by the inner membrane is the matrix

* Two series of reactions are used to carry out aerobic respiration:

1. KREBS CYCLE \( \rightarrow \) on the inner membrane and matrix

\( \Rightarrow \) ELECTRON TRANSPORT CHAIN \( \rightarrow \) on the inner membrane

1. First Step \( \rightarrow \) HAPPENS after GLYCOLYSIS, but BEFORE the KREBS CYCLE

a. the \_______ \_______ made in \_______

is converted to acetyl-CoA

* b. \_______ is released

You can't start the Krebs Cycle using the PYRUVIC ACID you made in glycolysis; you have to switch it into ACETYL-C.

2. Krebs Cycle/Citric Acid Cycle

a. \_______\_______ enters the Krebs cycle and undergoes a series of reactions

* b. in the process, MORE \_______ is released out of the cell

c. 2 more molecules of \_______ are formed

NET ATP gain after glycolysis and the Krebs cycle = \_______ ATP
3. Electron Transport Chain

a. carrier molecules that are produced earlier in respiration (NADH + FADH₂) carry electrons down an electron transport chain

b. a HUGE amount of ATP is generated ~ ______ molecules of ______

* NET ATP gain for aerobic respiration: ______ from glycolysis

______ from the Krebs cycle

______ from the electron transport chain

EQUALS

_______ TOTAL ATP!!

c. at the end of the electron transport chain, O₂ is the FINAL ELECTRON ACCEPTOR

\[ \frac{1}{2} \text{O}_2 + 2\text{H}^+ + 2e^- \rightarrow \text{H}_2\text{O} \]

(WATER is formed)

* THIS IS WHY WE MUST HAVE O₂—WITHOUT THE FINAL ELECTRON ACCEPTOR, RESPIRATION WOULD SHUT DOWN AND OUR CELLS WOULD DIE IMMEDIATELY!!!