Cellular Respiration – Catabolic

$C_6H_{12}O_6 + 6\ O_2 \longrightarrow 6\ CO_2 + 6\ H_2O + Energy$

glucose, oxygen, carbon dioxide, water

aerobic respiration → a metabolic process that requires oxygen

anaerobic respiration → a metabolic process that does not require oxygen

Cellular respiration is a 3-step process

1. Glycolysis
2. Kreb's cycle or citric acid cycle
3. Electron Transport

Glycolysis

- Anaerobic process → does not require oxygen
- takes place in cytoplasm
- glucose is broken down into 2 ATP and 2 NADH and 2 PYRUVATE

Kreb's Cycle – Aerobic process – needs O_2

- Pyruvate is transformed into CO_2 inside the mitochondria
  - ↳ waste
- Results

* 6 CO_2 2 ATP 8 NADH 2 $FADH_2$ *

Electron Transport – Aerobic – needs O_2

- Takes place on the mitochondria membrane
- NADH and $FADH_2$ donate electrons into the electron transport chain
  - ↳ carry e⁻
- H^+ ions diffuse through ATP synthase and ATP is produced
  - ↳ enzymes

* 32 ATP produced TOTAL

36 ATP Total

- ↳ 2 ATP = Glycolysis
- 2 ATP = Kreb's cycle
- 32 ATP = Elec. Transport

Anaerobic Respiration

- occur when oxygen levels are low
  - ↳ cannot use Kreb's or Electron transport
- cells will use glycolysis until NAD^+ is used up

Fermentation

- replenishes the NAD^+ in cell
- 2 types

1. Lactic acid fermentation
   - pyruvate from glycolysis converted to lactic acid
   - muscle fatigue during exercise → sore muscles
   - 2 ATP
2. Alcohol fermentation
   - occurs in yeast
   - pyruvate from glycolysis converted to alcohol

Photosynthesis vs. Cell Respiration

Photosynthesis	Cell Respiration
- need light	- do not need light
- chloroplasts / chlorophyll	- mitochondria
- Products = O_2 and glucose	- Reactants = O_2 and glucose
- Reactants = CO_2 and H_2O	- Products = CO_2 and H_2O
- Plants	- Animals
	- 36 total ATP

***Photosynthesis and Cell respiration form a cycle where the products from one process are the reactants for the other process and vice versa