~Unit 5 Photosynthesis and Cellular Respiration Test Study Guide~

Part 1 (Aerobic cellular respiration)

Stage	General name	Where it occurs	Importance	Products
1	Glycolysis	Cytoplasm	Creation of pyruvate	Pyruvate, ATP, NADH
2	Kreb Cycle	Mitochondria	Creation of NAHD + FADH2 for ETC	Co2, NADH/ FADH2
3	Electron Transport Chain	Mitochondria	Creation of most of ATP	ATP

Questions and Answers

1. What is the overall purpose of cellular respiration? Also write the overall general equation for respiration?
    a. Purpose is to break down glucose to create ATP, energy in chemical form that powers the body.
    b. Glucose($C_6H_{12}O_6$) + $6O_2$ ---------- $6H_2O$ + $6CO_2$ +36 ATP
2. Explain how energy is stored in the cell on a chemical level
    a. Energy is stored by creating bonds, which usually make long molecules. Most energy is converted into ATP, the major energy molecule of the body.
3. Pyruvate in stage 2 is used as a reactant, where did this molecule come from?
    a. Pyruvate in stage 2 comes from pyruvate in stage 1.

Part II (Anaerobic respiration)

1. What is the major difference between anaerobic and aerobic respiration?
    a. The major difference between aerobic and anaerobic respiration is that aerobic uses oxygen and anaerobic doesn't. Due to this Aerobic makes more ATP and

creates CO2 and H2O. Anaerobic makes less ATP and creates Lactic Acid or ethanol and CO2 depending if it is in humans or is yeast fermentation.

2. Explain the difference between lactic respiration and ethanol respiration.
    a. For anaerobic respiration there's two types: lactic acid respiration which occurs in humans and ethanol respiration which occurs in yeast. In both these processes your body makes ATP in Glycolysis. The **difference** is when the glucose is turned into pyruvate for lactic acid respiration the pyruvate turns into lactic acid while in ethanol respiration it turns into ethanol and CO2 and another **difference** is one occurs in yeast and the other in humans.
3. Explain two ways your body might go into lactic acid respiration?
    a. **High altitudes**- this is why runners train there so when they do races they are able to surpass their competitors. Because, their body learns how to create more energy faster in anaerobic respiration.
    b. **Exercise**- when you're exercising your body uses more energy. But, your body isn't able to take in enough O2 to keep up with the amount of ATP your body needs which is why some of your cells go into anaerobic respiration.
4. When would you use ethanol respiration (yeast anaerobic respiration)
    a. When making bread, alcohol, nail polish remover, cheese and so forth.

Part III (Photosynthesis)

1. What are the main reactants of photosynthesis?
    a. Light, water, carbon dioxide
2. What are the main products of photosynthesis?
    a. Glucose and oxygen

	General Name	**Specific Name(s)**	**Where it occurs**	**Major product(s)**
Stage 1	Light dependent reactions	Photosystems I and II	Thylakoids of the chloroplast	NADPH, ATP, O2
Stage 2	Light Independent reactions	Calvin Cycle	Stroma of chloroplasts	Glucose

3. Why is chlorophyll important to the plant?
    a. Chlorophyll absorbs the sunlight that gets the entire 1st stage started. Also the light that it absorbs provides the energy necessary to make ATP and NADPH.
4. Why is photosynthesis important for you or I to understand?
    a. Without photosynthesis the entire ecosystem would die out. The products (glucose/O2) created from photosynthesis are needed to start the process to create energy. Without energy nothing lives and you can't get energy without photosynthesis.

Similarities and Differences of Photosynthesis and Aerobic Cellular Respiration	
Similarities	**Differences**
Both process contain CO2, H2O, Glucose and O2	Photosynthesis contains light while ACP contains ATP
Both occur in plants	Photosynthesis occurs in the chloroplast while ACP occurs in the mitochondria except the glycolysis stage
Both include cycles that recycle molecules	
Products of each stage are used as reactants of another	

5. Why do plants both use and produce CO_2 (do both photosynthesis and cellular respiration)?
    a. Plants produce CO2 in cellular respiration so it can use it in photosynthesis to create glucose and oxygen. The body uses CO2 to make glucose, because of their autotrophs and make their own food.
6. Do some research: Where and when specifically does your body enter anaerobic vs. aerobic respiration?
    a. Your body enters anaerobic when your body needs more energy, but isn't able to take in enough oxygen to keep up with the amount of energy your body needs. So, some of your cells go into anaerobic respiration. Your body is aerobic when you're sitting, sleeping, or walking to class. Anything not strenuous. The reason your body is aerobic during this time is that your body doesn't need as much

energy, so your body is able to take in enough oxygen to keep up with the amount of energy your body needs.

7. Research: What specific issues/ problems are connected to anaerobic respiration? And how does Lactic Acid play a role in that?
    a. In anaerobic respiration the 2 pyruvate turns into 2 lactic acid.The problems with this is lactic acid can cause muscle deficiency, lower PH levels and cause burning sensations in your muscles.
8. Why do plants appear green to the human eye?
    a. Light is made up of different colors. Chlorophyll absorbs only the high and low end of the colors(red/ orange and blue/violet). Therefore, green/ yellow is reflected back on our eyes because that's the color light plants absorb the least. This is why plants generally appear green.
9. Why is light important?
    a. Light is used to start photosynthesis.
    b. Light splits H2O into oxygen
    c. Light dependent reactions(turning NADP to NADPH)

Aerobic Cellular Respiration

- Formula: Glucose($C_6H_{12}O_6$) + $6O_2$ ---------- $6H_2O$ + $6CO_2$ +36 ATP
- Glycolysis
    - Occurs in the cytoplasm
    - Breaks glucose in half to form 2 pyruvate
    - When glucose is broken down it releases energy. This is used to turn 2 ADP into 2 ATP.
    - Glycolysis also takes in 2 NAD and turns it into 2 NADH for further stages
    - **Glycolysis makes 2 ATP**
- Kreb Cycle
    - Occurs in the mitochondria
    - pyruvate turn into CO_2
    - The process of pyruvate turning into CO_2 releases energy which turns 2NAD+ into 2 NADH and 2 FADH + into 2 $FADH_2$
    - Creates electrons for third stage (electron transport chain)
    - **Kreb Cycle creates 2 ATP**
- Electron Transport Chain
    - Occurs in the mitochondria(inner mitochondrial membrane)
    - NADH and $FADH_2$ give off high energy electrons which are used to pump protons from low to high concentration.

    - When the protons come back into the membrane they add a phosphate to all the ADP(passive transport).
    - **Electron Transport Chain creates 32 ATP**

Anaerobic Respiration

- Lactic Acid Fermentation
    - **Formula**: C6H12O6 ---------- 2 Lactic Acid + 2 ATP
- Glycolysis
    - Occurs in the cytoplasm
    - Breaks glucose in half to form 2 pyruvate
    - When glucose is broken down it releases energy. This is used to turn 2 ADP into 2 ATP.
    - **Glycolysis creates 2 ATP**
- Fermentation
    - Occurs in cytoplasm
    - 2 pyruvate turn into 2 lactic acids
- Yeast Fermentation
    - Formula: C6H12O6------- 2CO2 + 2 Ethanol +2ATP

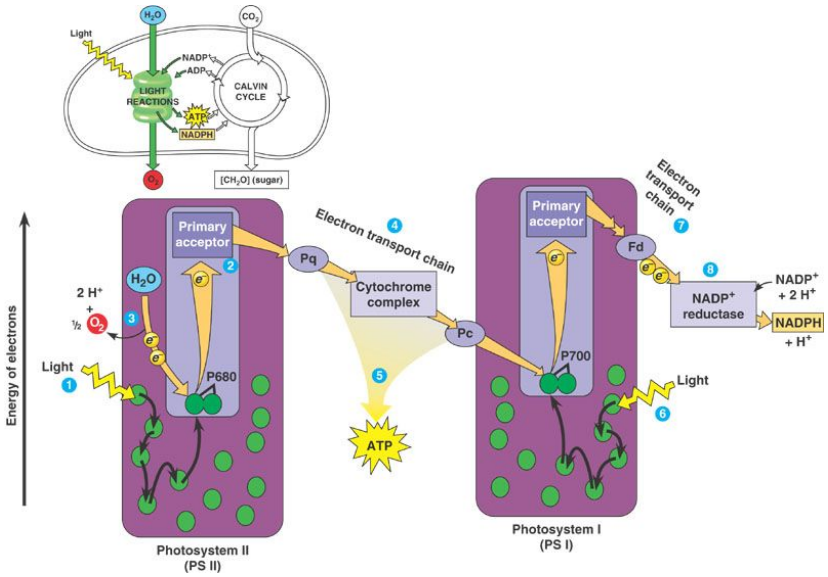
Photosynthesis

- **Formula**: 6CO2 + 6H2O +Light -------- C6H12O6 + 6O2
- Photosystems 1 & 2: Sun absorption (Light dependent reactions)
    - The chlorophyll (inside chloroplasts) absorbs the sun's energy
    - Occur in thylakoid of chloroplast
    - Lights helps turn NADP+ and ADP into NADPH and ATP
    - Lights splits H2O to create oxygen
    - Reactants- NADP+, ADP, light, H2O
    - Products- NADPH, ATP, O2
- Calvin Cycle: Light Independent Reactions
    - Occur in the stroma of chloroplast
    - ATP and NADPH along with CO2 are used to create glucose
    - These high energy molecules are used to form the chemical bonds between the sugar molecules required for the cell.
    - ATP and NADPH are used up so ADP and NADP+ are left over

Picture

- These aren't named based on when they occur, but when they were discovered by scientists.

- In photosystem 2- light splits H2O into oxygen and protons for the production of ATP in ETP.
- Photosystem 1- light converts NADP+ to NADPH which will be used in the next stage.



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