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**Unit 3 Review Packet: Cell Energy**

AP Biology

**Topic #1: Cell Respiration**

1. Scientists consider glycolysis to be an ancient process. In other words, scientists claim that glycolysis was found in the common ancestor of all living things. What types of organisms use glycolysis today, and how does this provide support for their claim?

2. What are the reactants (starting molecules) and products (ending molecules) of glycolysis?

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3. Describe the amount and type of ATP production during **glycolysis**. (Note: The type of ATP production refers to substrate-level phosphorylation vs. oxidative phosphorylation.)

4. What are the reactants (starting molecules) and products (ending molecules) of the **intermediate step** between glycolysis and the Krebs / citric acid cycle in which pyruvate is converted to Acetyl CoA?

5. What are the reactants (starting molecules) and products (ending molecules) of the **Krebs / citric acid cycle**?

6. After the Krebs cycle, how is most of the energy from the original glucose molecule stored?

1. How are high-energy electrons from NADH and FADH2 used during the electron transport chain?
2. How is oxygen gas (O2) used during the electron transport chain?
3. Why are there folds (aka cristae) in the inner mitochondrial membrane?
4. Define “proton motive force.” How is this used during the electron transport chain?
5. How is oxidative phosphorylation / chemiosmosis (the type of ATP production that occurs in the electron transport chain) different from substrate-level phosphorylation? Is there more or less ATP made during oxidative phosphorylation than substrate-level phosphorylation?
6. How is aerobic respiration different from anaerobic respiration (aka fermentation)? Which steps of aerobic respiration (i.e. glycolysis, the conversion of pyruvate to acetyl CoA, the Krebs cycle, or the electron transport chain) occur during anaerobic respiration?
7. Why does NAD+ need to be regenerated from NADH for glycolysis to continue? How is this accomplished in **lactic acid fermentation vs. alcoholic fermentation**?
8. In what types of organisms/cells does each type of fermentation occur?
9. *\*\*It is a GREAT idea to look over the chart comparing the steps of cellular respiration that is in your notes questions!\*\**

**Topic #2: Photosynthesis (The Light Reactions and Calvin Cycle)**

1. What pigments are found in the thylakoid membranes? What is their role in the light reactions of photosynthesis?
2. What colors of light are most ABSORBED by chlorophyll a? What color of light is most REFLECTED by chlorophyll a?
3. What happens to water during the light reactions of photosynthesis?
4. What is the goal of cyclic electron flow?
5. What role do the electron transport chains in the thylakoid membrane play in the creation of a proton motive force? How is the proton motive force used?
6. What is the main goal of the Calvin cycle?
7. Describe the relationship between the light reactions and the Calvin cycle.
8. What are the reactants and products of the Calvin cycle?
9. Where in the chloroplast does the Calvin cycle occur?
10. *\*\*Also a great idea to look at your chart for the steps of photosynthesis in your notes questions!\*\**

**Topic #3: Exceptions to Normal Photosynthesis and Comparing Photosynthesis and Cellular Respiration**

1. What occurs during photorespiration? Why is this an issue for plants?
2. How do C4 plants minimize photorespiration?
3. How do CAM plants minimize photorespiration? Why do CAM plants keep their stomata closed during the daytime?
4. Why are photosynthesis and cellular respiration often thought of as a cycle? Write out the full, balanced chemical equation for each process and compare them.
5. What types of organisms have chloroplasts? What types of organisms have mitochondria?
6. Compare / contrast the electron transport chain in the mitochondrion vs. chloroplast in terms of the electron carriers used to “drop off” electrons, the direction of H+ pumping, the creation of an electrochemical gradient, the synthesis of ATP, the final electron acceptor, etc. How are they similar? How are they different? Feel free to use the table or use the space underneath it to structure your own answer.

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| --- | --- | --- |
|  | **Mitochondria (final step)** | **Chloroplast (first step)** |
| Electrons Carriers used |  |  |
| Direction of H+ |  |  |
| Gradient Creation |  |  |
| Synthesis of ATP |  |  |
| Final Electron Acceptor |  |  |