Final Examination Review

- Look over previous study guides, quizzes, and examinations:

- Localize the following at the cellular, organellar and sub-organellar level where appropriate; otherwise, be familiar with the process and how it functions
  
  - Rubisco in C₄ plant (just cell type)
  - Evolution of CO₂ in photorespiration (organelle)
  - Starch synthesis
  - Glycolysis
  - Respiratory electron transport system
  - Oxidative phosphorylation
  - Proton accumulation in mitochondria
  - PEP carboxylase in C₄ plant (cell type)
  - P₅-translocator
  - Sucrose synthesis
  - Photophosphorylation
  - TCA Cycle
  - Fermentation (ethanol and lactic acid production)
  - H⁺ accumulation in mitochondria
  - Oxidative pentose phosphate pathway
  - Glyoxylate pathway
  - Gluconeogenesis

- Define the following
  
  - Phosphorylation
  - Invertase
  - NADH and FADH
- Pyruvate
- Citric acid cycle (TCA or Krebs)

- How do electrons and protons cooperate to make ATP in mitochondria?
- Give an example of an instance where a plant may carry out anaerobic respiration

- Who discovered:
  - C3 pathway of photosynthesis?
  - C4 pathway?
  - TCA cycle?
  - Chemiosmotic theory explaining the mechanism of ATP synthesis?

- What is the major biochemical origin of the CO2 in our atmosphere and where in the cell does it occur? That is the biochemical role of O2 in respiration?

- The equation for oxidative respiration is shown below. What compound gets oxidized (to what?) and which compound gets reduced (to what?)?

  \[
  C_6H_{12}O_6 + 6O_2 + 6H_2O \rightarrow 6CO_2 + 12H_2O (36 \text{ ATP})
  \]

- Unlike animals, plants are not immediately killed by exposure to cyanide (CN), carbon monoxide (CO) or azide. Why?

- Compare substrate-level phosphorylation, photophosphorylation, and oxidative phosphorylation.

- What are the main products of cellular respiration?

- What is the difference between oxidative and reductive pentose phosphate pathways?

- What are the main functions of the oxidative pentose phosphate pathway?

- What is the initial substrate for glycolysis?

- How many ATP are consumed to produce fructose bisphosphate sucrose?

- Summarize the three steps of aerobic cellular respiration. Describe where each of these steps occurs, the main substrates used, and products formed each one of the steps.
• From an energetic point of view (i.e. net production of ATP) which one of the three steps is most important? Are these three steps dependent on each other? Why? How much net ATP is approximately produced during each one of the steps in aerobic respiration?

• What pathway do roots in flooded soils use to meet their energy demands?

• Provide an accurate conceptual description of what happens during the electron transport chain. What are energy conservation sites?

• What is the cyanide resistant pathway? Does it affect ATP production?

• Why do plants need to respire?