Bio 210A
Respiration Study Guide

Respiration
- Review cellular respiration and the central metabolic pathways that break down carbon skeletons of organic fuel and transform the potential energy of their chemical bonds into ATP.
- Follow the breakdown or complete oxidation of glucose under aerobic conditions.
- For each pathway, specify:
  a. the sub-cellular location and specific location within the mitochondrion (where applicable)
  b. substrates and products: organic molecule, inorganic molecules, reducing power, and ATP.
  c. The mechanism of ATP generation when applicable (substrate level phosphorylation or oxidative phosphorylation).
- Identify the pathway(s) that produce CO₂, reducing power, and ATP.
- Identify the soluble electron carriers within the cells, the pathways where their reduced forms are generated, their chemical composition, and their role as coenzymes.
- What role does oxygen play in cellular respiration and in which pathway does it participate?
- Distinguish between the electron transport chain and chemiosmosis. Which of the two generates the proton motive force (PMF) and which is driven by the PMF? Where is ATP synthase located and how is it activated?
- How many ATPs can be produced from NADH and from FADH₂?
- Review the mechanisms by which deadly poisons cause death by targeting the ETC and oxidative phosphorylation.
- Follow the flow of electrons during cellular respiration starting from glucose to oxygen.
- Based on your understanding of the conditions on early earth at the time of appearance of the first cell, which is the most ancient metabolic pathway that takes place in the absence of oxygen?
- What is the metabolic role of fermentation for the cell? Where does it take place? What are the two main types of fermentation? What role does fermentation play for the cell in the absence of oxygen?
- Where is NAD⁺ regenerated during aerobic organisms and during fermentation?
- Name the pathway(s) involved with the cell’s use of carbohydrate other than glucose and amino acids as sources of cellular energy? What is Beta oxidation and how are triglycerides used as a source of energy?
- How is the rate of the central metabolic pathways controlled? Review the role of Phosphofructokinase of glycolysis and its allosteric activators and inhibitors.