Learning Objectives
Chapter 23 – Biochemical Energy Production

- What is metabolism? What is the difference between catabolism and anabolism?
- You should be able to recognize (in a picture), the nucleus, the cytoplasm, and the mitochondria in a eukaryotic cell. You should also know the main functions of these organelles.
- Why is ATP called the energy currency of the cell? Why does hydrolyzing ATP release so much energy?
- What are the three major coenzymes used in metabolic reactions? You should know which types of reactions they participate in and the abbreviations for their oxidized and reduced forms.
- What are “high-energy” phosphate compounds?
- What occurs during the four major stages of metabolism?
- When carbohydrates are digested, what is produced? Proteins? Lipids?
- Under what conditions does the citric acid cycle function?
- You should know the overall types of reactions for the citric acid cycle.
- If I were to give you a figure of the citric acid cycle showing only the carbon compounds involved. You should be able to identify the following on the chart:
  - Where NADH is produced.
  - Where FADH2 is produced.
  - Where CO₂ is produced.
  - Where GTP is produced.
  - What type of reaction is happening in each step (hydration, decarboxylation, etc).
  - Which steps involve oxidations and reductions.
- What are 4 of the different ways in which the citric acid cycle is regulated?
- What is the electron transport chain? Where does it occur? What happens (overall) in the electron transport chain?
- How is the structure of the mitochondrion important to the electron transport chain?
- What are electron carriers? What are the different electron carriers involved in the electron transport chain? Which enzyme complexes are these carriers associated with?
- In which order are electrons transferred in the electron transport chain?
- What is the final electron acceptor in the electron transport chain?
- You should be able to look at a reaction and determine if an electron carrier is oxidized or reduced during the reaction. (see slide 41)
- You should know the products of the electron transport chain.
- What is the chemiosmotic model? Where are protons pumped? Through which complexes are protons pumped? What is the relationship between the number of electrons passed through the electron transport chain and the number of hydrogen ions pumped?
- What is a proton gradient? How is the proton gradient used to produce ATP?
- What are the two portions of ATP Synthase, and what are their functions?
- How many ATP’s can be produced from the oxidation of 1 mole of NADH? From 1 mole of FADH2? Why are these two values different?
- How many ATP equivalents are produced during one turn of the citric acid cycle and the subsequent oxidation of the reduced coenzymes formed in the citric acid cycle?