**The Cell and Cell Membrane**

**Study Guide**

1. What is the cell theory?
2. What is the difference between prokaryotic and eukaryotic cells?
3. What features do bacteria and archaea share? How are they different?
4. Describe the function of the nucleus, nucleolus, ribosomes, smooth and rough ER, golgi body, lysosomes, peroxisomes, vacuoles, mitochondria, chloroplast, flagella, cilia, cell wall, and cell membrane
5. What is endosymbiosis? What is the evidence for mitochondria and chloroplasts arising from endosymbiosis?
6. Distinguish between organelles and inclusions. Give two examples of each
7. What three organelles are involved in protein synthesis?
8. In what ways do the smooth and rough ER differ?
9. List the three types of cell-cell junctions and describe the function of each
10. List the three cytoskeletal components in order of smallest 🡪 largest
11. How does the structure of the plasma membrane depend on the amphiphilic (means both hydrophobic and hydrophilic) nature of phospholipids
12. What is the fluid mosaic model?
13. What are the major components of the cell membrane
14. Explain the difference between a receptor, pump, and cell-adhesion molecule
15. How does a gate differ from other channel proteins?
16. How do microvilli and cilia differ in structure and function
17. What does it mean to say a solute moves down its concentration gradient?
18. How does osmosis work to maintain cell volume?
19. Define hypotonic, isotonic, and hypertonic
20. What do facilitated diffusion and active transport have in common? How are they different?
21. How does the sodium-potassium pump exchange sodium ions for potassium ions across the membrane? What are some purposes served by this pump?
22. How does phagocytosis differ from pinocytosis?

**Cellular Respiration**

**Study Guide**

1. Define heterotrophs and autotrophs
2. Why don’t cells just link the oxidation of glucose directly to cellular functions? Why do you have this complicated transfer of electrons and generation of ATP?
3. What is a redox reaction?
4. What is the primary electron carrier in energy metabolism? How does it work?
5. What is the function of ATP? What are the two main mechanisms for ATP generation?
6. In glycolysis what are you starting with? What do you end with?
7. What is your total ATP generation in glycolysis and your net ATP generation?
8. After glycolysis, what happens to your end product if it is part of a fermentation pathway? What about if it continues on to aerobic respiration?
9. What do you start with for the Krebs cycle? What do you end up with?
10. During the one turn of the Krebs cycle, how many NAD+ are reduced? How many FAD+ are reduced? How many ATP are generated by substrate level phosphorylation?
11. How many turns of the Krebs cycle per glucose?
12. How does the cell harvest the energy from the electrons shuttled in NADH?
13. What is chemiosmosis and how does it work to generate ATP?
14. What is the highest yield of ATP possible for one molecule of glucose undergoing aerobic respiration? How do you get that number?
15. Why is the actual yield more like 30 ATP? How efficient is the cell at harnessing energy? Is it more or less efficient than a car engine?
16. How can cells extract energy from lipids and proteins?

**Photosynthesis**

**Study Guide**

1. What is the difference between autotrophs and heterotrophs? Photosynthetic organisms are which?
2. What is the photosynthetic equation
3. Where does photosynthesis occur
4. Diagram out a chloroplast and label the thylkaloid, stroma, grana, thylkaloid space
5. How did the use of an oxygen isotope help elucidate the chemistry of photosynthesis
6. What is meant when we talk about the dual nature of light? What is the difference between the two properties of light?
7. What color of light is least effective in driving photosynthesis
8. In the light reaction, what is the initial electron donor? At the end of the light reaction, where are the electrons?
9. What is a photosystem?
10. Diagram the linear electron flow during the light reaction and show how it generates ATP and NADPH
11. What is the role of NADPH? What is it similar to in cellular respiration?
12. What occurs during the Calvin cycle and why is it called the dark reaction?
13. How are the large numbers of ATP and NADPH molecules used during the Calvin cycle consistent with the high value of glucose as an energy source?
14. Why do plants have mitochondria?
15. In synthesizing one glucose molecule, the Calvin cycle uses how many molecules of carbon dioxide? Molecules of ATP? Molecules of NADPH?