**Learning Log**

**Learning Log Chapter 5**

1. Compare & contrast the 4 main classes of macromolecules. Include a labeled drawing of their monomers, 3 examples of each polymer & the polymers’ roles in organisms. Be thorough!
2. The basic formula for a carbohydrate is CH2O. Why, then, does glucose (C6H12O6) follow this formula but sucrose (C12H22O11) does not? Explain. *(CUES: water molecule, bond formation, dehydration synthesis)*
3. After a cow is given antibiotics to treat an infection, the vet gives the animal a drink of “gut culture” containing various prokaryotes. Why is this necessary & what would happen if the cow did not drink the “gut culture”? *(CUES: hydrolysis, cellulose, energy)*
4. Compare & contrast saturated, unsaturated & trans fats. Why are unsaturated fats better for your cardiovascular health?
5. Describe the 4 levels of protein structure using Figure 5.20 to explain each level.
6. Draw the two amino acids, glutamic acid and lysine. Which as two carboxyl groups? (circle and label.) Which has two amino groups? (circle and label) Also, draw a dipeptide made up of lysine and glutamic acid bound together by a peptide bond. Identify the peptide bond with an arrow.
7. Suppose you have placed a protein in an aqueous environment. After consulting Figure 5.17, where would you expect to find a region that is rich in the amino acids leucine, isoleucine & valine? Why? A region rich in serine, threonine & glutamine? Why? *(CUES: polar, non-polar, interior, exterior)*
8. Use Figure 5.23 to explain how chaperonins help proteins fold into their proper shape.
9. Why is it beneficial for certain species of hot springs bacteria to have a higher proportion of G-C base pairs and a lower proportion of A-T base pairs within their DNA?

**Learning Log Chapter 6**

1. Distinguish between a light microscope, transmission electron microscope, & a scanning electron microscope & provide 3 different examples of items that you would look at in each.

2. Using Figures 6.6 & 6.9, compare & contrast eukaryotic & prokaryotic cells. *(CUES: nucleus, nucleoid, ribosomes, DNA, plasma membrane, membrane-bound organelles)*  
3. Explain how prokaryotes carry out specific cellular functions without the use of cellular organelles. *(CUES: enzymes, proteins, plasma membrane, embedded)*

4. Using Figure 6.9, compare & contrast animal & plant cells. *(CUES: lysosomes, plasmodesmata, cell wall, centrioles, chloroplasts, mitochondria, central vacuole)*

5. Describe the structure, function & location of the following cell parts:

a. Nucleus (including chromatin & nucleolus)

b. Ribosomes

c. ER (smooth & rough)

d. Golgi apparatus

e. Lysosome

f. Peroxisome

g. Vacuoles

h. Mitochondria

i. Chloroplasts

j. Cytoskeleton (microtubules & microfilaments)

6. Many hormonal signals, for example, insulin, are proteins secreted by cells. Describe the structure and function of all cellular organelles related to the synthesis and secretion of protein signals. *(CUES: plasma membrane, vesicle, Golgi apparatus, ribosome, rough endoplasmic reticulum)*

7. A classmate proposes that mitochondria and chloroplasts should be classified within the endomembrane system. Argue against the proposal.

8. Males afflicted with Kartagener’s syndrome are sterile because of immotile sperm, and they tend to suffer from lung infections. This disorder affects cellular components. Suggest what the underlying defect might be. *(CUES: cilia, flagella, microtubules, cytoskeleton)*

9. Use Figures 6.30 and 6.31 to compare & contrast the 3 different intercellular junctions in animal tissues. Also, explain how plant cells are connected.

10. The polypeptide chain that makes up a tight junction weaves back & forth through the membrane 4 times, with 2 extra-cellular loops, and 1 loop plus short C-terminal and N-terminal tails in the cytoplasm. Looking at Figure 5.17, what would you predict about the amino acid sequence of each region named above in the tight junction protein? *(CUES: R-groups, polar, nonpolar, aqueous, hydrophilic, hydrophobic, alpha helix)*

11. Use online resources to answer the following question: Why is it beneficial for some microorganisms to form biofilms? Also, list 2 places in your body where biofilms can form AND explain how biofilms can be used to the benefit of human society.

**Learning Log Chapter 7**

1. Why are membranes considered selectively permeable? In your answer, please include the items that are selected for, selected against & state why.
2. The soil immediately surrounding around hot springs is much warmer than that of neighboring regions. Two closely related species of native grasses are found, one in the warmer region and one in the cooler region. If you analyzed their membrane lipid compositions, what would you expect to find? Explain!! *(CUES: phospholipid bilayer, saturated fatty acids, unsaturated fatty acids)*
3. The current model of the plasma membrane is referred to as the fluid mosaic model. Provide evidence that the membrane is “fluid” and describe the “mosaic” of this model. *(CUES: unsaturated, saturated, ECM, glycoprotein, carbohydrate, cholesterol, integral protein, phospholipid)*
4. Use Figure 7.13 to describe the flow of water in hypertonic, hypotonic & isotonic solutions. How is this different in an animal & plant cell? *(CUES: turgid, flaccid, plasmolyzed, lysis)*
5. In the supermarket, produce is often sprayed with water. Explain why this makes vegetables look crisp. *(CUES: osmosis, turgid)*
6. Briefly explain how each of the three factors below can impact the diffusion of solutes across cell membranes:  
    a. size of the diffusion molecule *(CUES: integral protein, facilitated diffusion)*  
    b. temperature  *(CUES: molecular energy)*

c. concentration gradient *(CUES: low solute concentration, high solute concentration, passive transport, active transport, energy)*

1. Aquaporins exclude passage of hydronium ions (H3O+). Recent research on fat metabolism has shown that some aquaporins allow passage of glycerol, a three-carbon alcohol, as well as H2O. Since H3O+ is much closer in size to water than is glycerol, what do you suppose is the basis of this selectivity?  *(CUES: amino acids, R-groups, polar, ionic, charged)*
2. Many plants’ roots possess tiny hair-like projections called root hairs. Some fungal infections, which can prove to be fatal to the plant, infect and destroy root hairs, while leaving the rest of the plant’s root intact. Why would this be detrimental to the plant? Include in your answer the function of root hairs and their importance to proper plant function. *(CUES: surface area)*
3. Use Figure 7.17 to describe the movement of molecules in active & passive transport across a selectively permeable membrane. USE EACH CUE IN YOUR DESCRIPTION OF BOTH ACTIVE & PASSIVE TRANSPORT.  *(CUES: ATP, concentration gradient, integral protein, hydrophilic, hydrophobic, polar, non-polar)*
4. Describe the two major structural components of glycoproteins and briefly describe the importance of glycoproteins to cell-to-cell communication and to the immune system.

**Learning Log Chapter 8**

1. Discuss the forms of energy found in an apple as it grows on a tree, then falls, then is digested by someone who eats it. *(CUES: chemical, potential, kinetic)*

2. How does ATP usually transfer energy from exergonic to endergonic reactions? *(CUES: dehydration synthesis, hydrolysis, coupled)*

3. Use Figure 8.15 to explain the function of enzymes. *(CUES: free energy, activation energy, reactants, products)*

4. Use Figure 8.17 to illustrate why enzymes are substrate-specific & how an enzyme’s microenvironment in its active site plays an active role in the enzyme’s function. *(CUES: hydrogen bonds, ionic bonds, induced fit, stress, R-groups)*

5. Use Figure 8.19 & 8.20 to explain how the following factors influence enzyme activity. Please consider both an increase & decrease in activity with your discussion.

a. Temperature b. pH

c. co-factors d. competitive inhibitors

e. allosteric inhibitors f. allosteric activators

6. Imagine you are a pharmacological researcher who wants to design a drug that inhibits a particular enzyme. Upon reading the scientific literature, you find that the enzyme’s active site is similar to that of several other enzymes whose activity must remain unchanged. What might be a good approach to developing your inhibitor drug so that it only inhibits the specific enzyme of interest? *(CUES: competitive inhibitor, noncompetitive inhibitor, active site, allosteric site)*

7. Succinate dehydrogenase is an enzyme that oxidizes a substrate, succinate. Malonate is an inhibitor of the succinate dehydrogenase enzyme. How would you determine whether malonate is a competitive or a noncompetitive inhibitor?

**Can Credit Question**

One of your fellow classmates tells you that: “The mitochondrion is the site where ingested food molecules are made into ATP molecules.” Point out the error of your classmate’s statement by offering a statement that is more scientifically accurate. *(CUES: chemical reaction, products, glucose, reactants, oxygen, carbon dioxide, water)*