**Unit 1: Biochemistry, Water and Enzymes**

**Read:** Chapter 3, Chapter 4 (sections 1 and 3), Chapter 5, Chapter 8 (section 4 and 5)

**Videos:** Bozeman – Water: A Polar Molecule, #42 – Biological molecules, #48 – Enzymes

Bozeman Labs - #2 Enzyme Catalysis

**Objectives:**

1. Why is matter necessary for biological systems?
2. Explain the uses of carbon, hydrogen, oxygen, nitrogen, phosphorous and sulfur in biological systems.
3. Diagram the exchange of matter between organisms and the environment.
4. What function does nitrogen serve in proteins? In nucleic acids?
5. What function does phosphorus serve in nucleic acids? In phospholipids?
6. Why do biological systems need water?
7. How does the structure of a water molecule relate to its function(s)?
8. How does the polarity of water lead to the emergence of unique properties in liquid water?
9. Compare the synthesis and decomposition of biological macromolecules.
10. Where does the energy needed to drive the synthesis of biological macromolecules come from?
11. How does the structure of <polysaccharides, proteins, nucleic acids> influence the function of those molecules?
12. How does the structure of DNA contribute to its roles in protein synthesis and heritability?
13. Why is DNA a good molecule for information storage?
14. How do the differences in the structure of DNA and RNA contribute to the difference in the functions of those molecules?
15. Explain how the sequence of amino acids in a protein determines each level of that protein’s structure.
16. Explain how the conditions of the environment that a protein is in affect the structure and function of that protein.
17. Explain how the structure of lipids determines the polarity of the molecule.
18. If the chemistry of water occurs in aqueous solution, why are lipids useful in biological systems?
19. Why is starch easily digested by animals, while cellulose isn’t?
20. Explain how directionality influences structure and function of the following polymer:
    1. Nucleic acids
    2. Proteins
    3. Carbohydrates
21. Describe the relationship between the structure and function of enzymes.
22. Explain how environmental conditions can affect enzyme function. Provide examples.
23. Explain how enzymes accomplish biological catalysis. Provide examples.
24. Describe how enzyme-mediated reactions can be controlled through competitive and non-competitive interactions.
25. Propose experimental designs by which the rate of enzyme function can be measured and studied.