Biotechnology Unit 1: DNA and the tools of biotechnology

Unit overview: This unit will serve as the foundation for our semester in biotechnology. We will begin by defining biotechnology and discussing biotechnology past and present. We will learn how two types of cellular respiration have been used as tools to improve life. We will refresh our memories about DNA structure and add in additional details which will prove important in analyzing DNA in later units. We will also have a bit of a history lesson as we learn how the structure of DNA was discovered. The unit will continue with a question: how do scientists extract DNA from cells? We will conclude with a review of protein structure and function.

Objectives:
1. Define biotechnology and be able to give some examples (in addition to those below).
2. Define “enzymes” and explain how enzymes involved in cheese production are an example of both “old” and “new” biotechnology.
3. Describe the difference between anaerobic and aerobic cellular respiration (reactants, products, organisms, applications).
4. Explain what biofuels are, how they are produced, and how they are an example of Biotech.
5. On a diagram of DNA, be able to identify the following:
   a. Deoxyribose, nitrogen base, phosphate group, and how these form nucleotides
   b. Pyrimidine vs purine bases
   c. Phosphodiester and hydrogen bonds
   d. Base-pair rules including number of hydrogen bonds
   e. Anti-parallel using 5’ and 3’ carbon
   f. Direction and amount of twist in the double helix shape
6. Explain how Chargaff’s data led to the base pair rules.
7. Explain in importance of Franklin’s X-ray crystallography data in solving DNA structure.
8. Describe the experiments that Watson and Crick did to solve DNA structure.
9. Explain how to isolate DNA from cells using soap, salt, proteases, and ethanol.

Science and technology multiply around us. To an increasing extent they dictate the languages in which we speak and think. Either we use those languages or we become mute.

~J.G. Ballard