**Biotechnology Unit 1**

**Essential Questions:**

1. Why is biotechnology considered an integrated science?
2. How does society exercise its ethical responsibility in the applications of biotechnology?
3. How do microorganisms provide essential models that give us a fundamental knowledge about life processes?
4. How do humans utilize and harness microorganisms and their products?

**Enduring Understandings:**

Overarching “big ideas”

1. Biotechnology is a science that integrates biology, chemistry, computer science and bioengineering.
2. Ethical decision making requires:
3. Recognition of ethical issue
4. Understanding of scientific concepts
5. Evaluation of ethical alternative actions
6. Decision making
7. Reflection on outcome.
8. Microbial phylogeny, structure and function, and horizontal gene transfer inform us about life processes.
9. Biotechnology uses microorganisms to produce a variety of products for medicine, agriculture, and the environment.

**Learning Objectives:**

By the conclusion of this unit you will be able to:

1. Define biotechnology and describe the many scientific disciplines that contribute to biotechnology.
2. Create a timeline of major events in the history of biotechnology.
3. Compare classical biotechnology to modern biotechnology.
4. Describe different types of biotechnology and their applications.
5. Demonstrate the process of ethical decision-making.
6. Explain how phylogenetic techniques and our understanding of evolution contribute to microbial classification.
7. Identify from pictures and descriptions the 4 major types of bacteria.
8. Based on visual characteristics demonstrate the ability to classify bacteria.
9. Describe the three ways in which genes are transferred among bacteria.
10. Describe the processes of genetic recombination.
11. Summarize the types of biotechnology microbial products.
12. List ways in which biotechnology has changed the following fields: agriculture, animal farming, aquaculture, manufacturing, pharmaceutics, medicine and the environment.
13. Explain the relationship between bacterial structures and their functions.
14. Conduct and report on a lab demonstrating the effectiveness of antibacterial soaps.
15. Explain how some strains of E. coli can be pathogenic while other strains are not.
16. Relate the bacterial population growth curve to the spread of bacteria.
17. Present arguments concerning the genetically modified food controversy.
18. Describe the characteristics of fungi that make them important in microbiology and biotechnology.
19. Describe viral replication processes and the use of viruses as vectors.