

Biotechnology - Unit 1 - Introduction to Biotechnology

Unit Focus

This unit will provide historical context to the field of biotechnology including a survey of the industry, applications of biotechnology, steps in the production and delivery of recombinant DNA products, and the bioethical implications of these techniques. As this is a career-based experience, students will be using highly specialized equipment and laboratory procedures that are identical to a professional laboratory. As such, biotechnology lab safety and aseptic technique will be emphasized in this introductory unit in preparation for various laboratory investigations that will be conducted throughout the course.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p>Next Generation Science Standards (DCI) <i>Science: 10</i></p> <ul style="list-style-type: none"> All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. <i>LS1.9.A2</i> Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. <i>LS3.9.A1</i> <p><i>Science: 11</i></p> <ul style="list-style-type: none"> When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. <i>ETS1.9.B1</i> 	<p>T1 Communicate effectively based on purpose, task, and audience to promote collective understanding and/or recommend actions.</p>	
	Meaning	
	Understanding(s)	Essential Question(s)
	<p>U1 Scientists examine evidence to formulate interesting questions and solve problems. U2 Established knowledge provides the foundation for future scientific and engineering advances. U3 Good experimental design leads to precise and accurate data.</p>	<p>Q1 How has technology been used to improve our lives? Q2 How do lab techniques affect the quality of the results of an experiment? Q3 How do scientists record their procedures and results in a way that accurately describes their experiments and does so with honesty and integrity?</p>
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
<p>K1 Current knowledge about DNA, genes, and proteins has not been around forever. It is the result of decades of research by multiple scientists and organizations. K2 The Human Genome Project sequenced the 3.2 billion base-pairs in the human genome, advancing the study of genetics and leading to improvements in medicine and identification of genes and their functions. K3 Carefully following lab protocols will prevent the contamination of DNA samples, which can considerably</p>	<p>S1 Safely, accurately and precisely performing experiments in a laboratory setting using specific biotechnology equipment. S2 Maintaining a well-organized scientific laboratory notebook.</p>	

Stage 1: Desired Results - Key Understandings

<p>NGSS/NSTA Science & Engineering Practices <i>NGSS Science & Engineering Practices: 9-12</i></p> <ul style="list-style-type: none"> Select appropriate tools to collect, record, analyze, and evaluate data. <i>SE.9-12.3.4</i> <p>Student Growth and Development 21st Century Capacities Matrix <i>Self-Direction</i></p> <ul style="list-style-type: none"> Perseverance: Students will be able to identify problem(s) and use appropriate strategies to continue toward a desired goal. <i>MM.4.2</i> 	<p>skew the results of a lab experiment.</p> <p>K4 Vocabulary: biotechnology, micropipette, centrifuge, electrophoresis, thermocycler, aseptic technique, recombinant DNA, bioethics</p> <p>K5 Maintaining the aseptic technique is accomplished by using sterile tips, lab counters, keeping lids closed, etc.</p>	
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