

Unit Flow Chart CTE Biotechnology Pathway

YEARS		YEAR 1				YEAR 2					
		Crowdsourcing Innovations in Biotechnology	Taking Action in Your Community: Health Equity	Nucleic Acids and Proteins: Disease Treatment Innovations	Behind the Scenes of Scientific Breakthroughs		Solution Seeking Microbes	Alternative Proteins	Plants to Pharmaceuticals	Community Science	
LESSON PLANS											
Problem Overview	The Central Dogma of Biology	DNA Modification	DNA Isolation and Purification	Protein Modification	Protein Isolation and Purification	LAB: Genetic Engineering for Protein Production	Nucleic Acid Assays	Protein Assays	How Are Drugs Tested?	Mechanisms of Drug Delivery	
<i>Explore the concept of diagnosing and treating diseases, then innovate a solution using mechanisms of nucleic acids and proteins.</i>	<i>Understand how genetic information is used to make protein and investigate medical treatments that rely on protein synthesis manipulation.</i>	<i>Learn how CRISPR technology works to manipulate DNA and explore the applications and ethical implications of the technology.</i>	<i>Examine the methods used to isolate and purify DNA, and discover how this helps customize medication and increase drug efficacy.</i>	<i>Explore how a change in DNA can cause changes in protein shape and function that can be used to treat and possibly cure disease.</i>	<i>Play the role of a biochemist to learn about and practice the processes and technology used to purify proteins.</i>	<i>Learn how we modify the DNA of organisms to create and isolate useful protein products.</i>	<i>Research nucleic-acid based tests and therapies to understand how they are used in disease treatment.</i>	<i>Discover how protein assays are used in research and clinical diagnoses through exploration of lab techniques.</i>	<i>Examine the drug development process and how ethics play a role in biomedical research in the drug approval process.</i>	<i>Explore common drug delivery mechanisms and emerging techniques by reviewing technologies.</i>	
51 TOTAL DAYS	5 DAYS	5 DAYS	5 DAYS	5 DAYS	5 DAYS	6 DAYS	5 DAYS	5 DAYS	5 DAYS	5 DAYS	
INSTRUCTIONAL ACTIVITIES	Drug Flyer or Brochure <i>Students work together to create a brochure or flyer that will inform others about a medicine that has been created from DNA, RNA, or proteins.</i>	CRISPR Paper <i>Students build a paper 2-D model of CRISPR-Cas9 to explore how it is used to edit genes.</i>	DNA Extraction Virtual Lab <i>Student pairs virtually work to isolate and extract DNA.</i>	Enzyme Therapy Poster <i>Students work in small groups to create a poster including information about a specific enzyme used as treatment for a disease.</i>	Diabetes and Insulin Tabletop Jigsaw <i>Students read articles about diabetes and learn how insulin is linked to the treatment of the disease.</i>	<i>Student lab groups genetically engineer E. coli bacteria to produce a glowing fluorescent green protein (GFP) and will then isolate the GFP from the transformed bacteria through a technique called nickel affinity chromatography.</i>	Nucleic Acid Assays Presentation <i>Students create a PowerPoint or Google Slides presentation that informs the audience about a specific type of nucleic acid assay.</i>	Kidney Disease PSA <i>Students work individually or in teams to create a PSA that will educate the public on a disease or condition that can lead to kidney disease.</i>	Drug Approval Process Timeline and Presentation <i>Students create a digital timeline and presentation of the steps involved in the approval of new drug innovations.</i>	Drug Delivery Webquest <i>Students use provided links to read articles and watch videos that will introduce them to various drug delivery systems.</i>	
	DNA Model and Foldable <i>Student pairs or small groups use nucleotide cut-outs to create a model of DNA and then create a foldable detailing the differences between DNA, RNA, and proteins.</i>	Women in Biotech Video <i>Students create a video response about the significance of female scientists, such as Rosalind Franklin and Jennifer Doudna.</i>	Gel Electrophoresis Virtual Lab <i>Students create a DNA fingerprint through the completion of a virtual lab and analyze the results of various applications.</i>	Enzyme Therapy Presentation <i>Student groups present their enzyme posters to the class, following the provided presentation rubric, and gain feedback from peers.</i>	Protein Purification Flowchart <i>Students create a flowchart that models a chosen protein purification technique that will be shared with others in the class.</i>		Nucleic Acid Drug Model <i>Student work in small groups to create a 3-D model of a nucleic acid-based drug to show the components of the drug and how it works to treat disease.</i>	Purifying Proteins Virtual Lab <i>Students work in small groups to use chromatography to purify virtual proteins.</i>	Ethical Issues in Biomedical Research Video <i>Students read case studies and research ethical issues involved in pre-clinical and clinical biomedical research and create a role-play informative video based on the information they have learned.</i>	Gene Patenting Argument Graphic Organizer <i>Students work in groups to review an article about gene patenting and create a graphic organizer arguing for or against gene patenting.</i>	
		CRISPR Infographic <i>Students apply their knowledge of CRISPR to create an infographic summarizing its benefits and the potential concerns of its use and application.</i>								Mystery Disease Conference <i>Students work in groups to create a drug delivery innovation.</i>	