



Unit 3: CTE Alignment Matrix

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Executive Summary

Sponsored by Genentech, Futurelab+ brought together a coalition of partners to develop an innovative, modular, 2-year biotechnology curriculum, along with instructional materials, to expose students and educators to the breadth of education and career pathways across biotechnology. To increase adoption and access to such curricula in California and beyond, the modular curriculum was designed to align with the [California Career Technical Education \(CTE\) Model Curriculum Standards for Biotechnology](#), meet at least 1 year of the [University of California science \(D\) subject requirement](#), and incorporate some of the three-dimensional learning innovations of the [Next Generation Science Standards](#). The 2-year biotechnology curriculum has four core units per year; each core unit has nine lessons and a lab that each take approximately 1 week to complete (9–10 weeks for the full unit). In total, the biotechnology curriculum has 72 lessons and eight labs that span 2 full instructional years. Because the Futurelab+ biotechnology curriculum is modular, teachers can select specific units and materials to design biotechnology courses that are relevant and appropriate for their students and teaching environments.

The purpose of this report is to provide teachers an independent review of which California CTE biotechnology standards are addressed within the curriculum and where they are addressed. The matrices that follow indicate the assignments and/or activities in which students demonstrate their understanding of a particular standard.

This review was completed on materials received March 2, 2022 and has not been updated to reflect any revisions made to materials since then. Only the standards met within Unit 3 are included in the matrices.

Anchor Standards

Standard	Description	Assessed (all student sections)
5.0 Problem Solving and Critical Thinking: <i>Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Health Science and Medical Technology sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)</i>		
5.4	Interpret information and draw conclusions, based on the best analysis, to make informed decisions.	<p>Lesson 2, Day 1 <i>Vote with Your Feet & Turn and Talk</i>—strategy, assessment at teacher discretion <i>Modeling Recombinant DNA</i>—capture sheet <i>Bacterial Plasmid Nitrogen Base Sequences</i>—student sheet <i>Human Nitrogen Base Sequences</i>—student sheet <i>Restriction Enzymes</i>—student sheet and flow chart, assessment at teacher discretion</p> <p>Lesson 2, Day 2 <i>Fix the Answer</i>—capture sheet <i>Pick a Stick</i>—discussion, assessment at teacher discretion <i>CRISPR Paper Simulation</i>—capture sheet</p> <p>Lesson 2, Day 3 <i>CRISPR Editing in the Body for Blindness</i>—questions, assessment at teacher discretion <i>What Is CRISPR? Why are Doctors so Excited About It?</i>—student reading, assessment at teacher discretion <i>Design Journal</i>—writing prompt, assessment at teacher discretion <i>Role of Women in Biotech</i>—student-created video, assessment at teacher discretion</p> <p>Lesson 2, Day 5 <i>3-2-1 Bridge Thinking Routine</i>—strategy, assessment at teacher discretion <i>CRISPR Technology: Benefits and Concerns</i>—infographic and rubric <i>Stand and Share</i>—strategy, assessment at teacher discretion <i>Design Journal Entry</i></p> <p>Lesson 8, Day 1 <i>Round Robin</i>—strategy, assessment at teacher discretion <i>FDA Summary Timeline</i>—rubric</p> <p>Lesson 8, Day 2 <i>Design Journal Entry</i> <i>Ball-Toss</i>—strategy, assessment at teacher discretion <i>Drug Discovery</i>—assignment and rubric</p>

Standard	Description	Assessed (all student sections)
		Lesson 8, Day 3 <i>Phases of Drug Approval and Development</i> —presentation rubric <i>Think-Pair-Share</i> —strategy, assessment at teacher discretion Lesson 8, Day 4 <i>ClinicalTrials.gov</i> —assignment and presentation rubric Lesson 8, Day 5 <i>Gallery Walk</i> —strategy, assessment at teacher discretion
5.6	Read, interpret, and extract information from documents.	Lesson 8, Day 1 <i>Round Robin</i> —strategy, assessment at teacher discretion <i>FDA Summary Timeline</i> —rubric Lesson 8, Day 2 <i>Design Journal Entry</i> <i>Ball-Toss</i> —strategy, assessment at teacher discretion <i>Drug Discovery</i> —assignment and rubric Lesson 8, Day 3 <i>Phases of Drug Approval and Development</i> —reading <i>Think-Pair-Share</i> —strategy, assessment at teacher discretion Lesson 8, Day 4 <i>ClinicalTrials.gov</i> —assignment and presentation rubric Lesson 8, Day 5 <i>Gallery Walk</i> —strategy, assessment at teacher discretion

Pathway Standards

Standard	Description	Assessed
A1.0: Define and assess biotechnology and recognize the diverse applications and impact on society.		
A1.2	Describe the use of model organisms in biotechnology research and manufacturing.	Laboratory Investigation, Day 1 <i>Part 1: Pre-Lab</i> —Questions 1 and 2 <i>Bacterial Transformation with Gene Regulation</i> —Questions 1–10 <i>Bacterial Transformation</i> —vocabulary tool Laboratory Investigation, Day 2 <i>Part 1: Pre-Lab</i> —Questions 1 and 3 <i>Part 2: Lab</i> —Question 1 <i>Part 1: Bacterial Transformation</i> —student protocol

Standard	Description	Assessed
		Laboratory Investigation, Day 3 <i>Part 2: Lab—Question 2</i> <i>Part 3: Data Analysis—Questions 1–3</i> <i>Part 4: Making a Model—Question 1</i> Laboratory Investigation, Day 5 <i>Protein Purification—background reading and vocabulary tool, assessment at teacher discretion</i> <i>Part 1: Pre-Lab—Question 1</i> Laboratory Investigation, Day 6 <i>Part 3: Data Analysis—Question 4</i> <i>Part 4: Making a Model—Questions 2–4</i>
A3.0: Demonstrate competencies in the fundamentals of molecular cell biology, including deoxyribonucleic acid (DNA) and proteins and standard techniques for their purification and manipulation.		
A3.1	Define and describe the structure and function of DNA ribonucleic acid (RNA) and proteins, explain the consequences of DNA mutations on proteins.	Lesson 1, Day 1 <i>Round Table (structure/function)—strategy, assessment at teacher discretion</i> <i>Raise a Righteous Hand (structure/function)—strategy, assessment at teacher discretion</i> Lesson 1, Day 2 <i>Protein Synthesis (structure/function)—flow chart and rubric</i> <i>DNA & RNA (structure/function)—Venn diagram</i> <i>DNA Protein (structure/function)—illustration and rubric</i> Lesson 1, Day 3 <i>AEIOU—strategy, assessment at teacher discretion</i> <i>Code for an Animal Instructions—capture sheet</i> <i>Trait Guide—capture sheet</i> <i>Gene Tracker—capture sheet</i> <i>Codon Table—capture sheet</i> <i>Animal DNA Code—capture sheet</i> Lesson 1, Day 4 <i>Macromolecules as Medicine (structure/function)—capture sheet</i> <i>Macromolecule Medicine (structure/function)—guide and rubric</i> <i>Gallery Walk—strategy, assessment at teacher discretion</i> Lesson 1, Day 5 <i>Nucleotide Cut-Outs (structure/function)—capture sheet</i> Lesson 1, Day 5 <i>DNA, RNA, and Protein Foldable rubric</i>

Standard	Description	Assessed
		<p><i>Design Journal Entry</i></p> <p>Lesson 2, Day 1</p> <p><i>Vote With Your Feet & Turn and Talk</i>—class discussion, assessment at teacher discretion</p> <p><i>Modeling Recombinant DNA</i>—capture sheet</p> <p><i>Bacterial Plasmid Nitrogen Base Sequences</i>—student sheet</p> <p><i>Human Nitrogen Base Sequences</i>—student sheet</p> <p><i>Restriction Enzymes</i>—student sheet and flow chart, assessment at teacher discretion</p> <p><i>Tweet-Tweet</i>—strategy, assessment at teacher discretion</p> <p>Lesson 2, Day 2</p> <p><i>Fix the Answer</i>—capture sheet</p> <p><i>Pick a Stick</i>—strategy, assessment at teacher discretion</p> <p><i>CRISPR Paper Simulation</i>—capture sheet</p> <p>Lesson 2, Day 3</p> <p><i>CRISPR Editing in the Body for Blindness</i>—questions</p> <p><i>What Is CRISPR? Why Are Doctors so Excited About It?</i>—student reading, assessment at teacher discretion</p> <p><i>Sequencing CRISPR-Cas9</i>—capture sheet</p> <p><i>Design Journal Entry</i></p> <p>Lesson 2, Day 5</p> <p><i>3-2-1 Bridge Thinking Routine</i>—strategy, assessment at teacher discretion</p> <p><i>CRISPR Technology: Benefits and Concerns</i>—infographic and rubric</p> <p><i>Stand and Share</i>—strategy, assessment at teacher discretion</p> <p><i>Design Journal Entry</i></p> <p>Laboratory Investigation, Day 1</p> <p><i>Part 1: Pre-Lab</i>—Questions 1 and 2</p> <p><i>Bacterial Transformation with Gene Regulation</i>—Questions 1–10</p> <p><i>Bacterial Transformation</i>—vocabulary tool</p> <p>Laboratory Investigation, Day 3</p> <p><i>Part 4: Making a Model</i>—Question 1</p> <p>Laboratory Investigation, Day 5</p> <p><i>Protein Purification</i>—background reading and vocabulary tool, assessment at teacher discretion</p> <p><i>Part 1: Pre-Lab</i>—Question 1</p>
A3.2	Describe enzyme structure and function,	Lesson 4, Day 1

Standard	Description	Assessed
	diagram the impact of enzymes and catalysis on reaction rates, and recognize the emerging role of enzymes in replacing industrial chemicals.	<p><i>Nucleic Acid (DNA), Nucleic Acid (RNA), and Amino Acid</i> (enzyme structure and function)—foldable</p> <p><i>Protein Assignment</i> (enzyme structure and function)</p> <p><i>Thumbs Up!</i> (enzyme structure)—capture sheet</p> <p>Lesson 4, Day 2</p> <p><i>Am I an Enzyme or Not?</i> (enzyme structure and function)—capture sheet</p> <p>Lesson 4, Day 3</p> <p><i>Table Top Texting</i> (enzymes on reaction rates)—graphic organizer</p> <p><i>Enzyme Replacement Therapy</i> (enzymes on reaction rates)—poster and rubric</p> <p>Lesson 4, Day 4</p> <p><i>Snowball Fight</i> (function, emerging role of enzymes)—strategy, assessment at teacher discretion</p> <p><i>Design Journal Entry</i></p> <p>Lesson 4, Day 5</p> <p><i>The Most Interesting Enzyme</i>—presentation and rubric</p>
A3.3	Employ standard techniques of DNA extraction, purification, restriction digests, bacterial cell culture, and agarose gel electrophoresis and document and evaluate results.	<p>Lesson 3, Day 1</p> <p><i>DNA Extraction</i> (DNA extraction, purification)—virtual lab and capture sheet</p> <p><i>3-2-1 Bridge</i> (DNA extraction, purification)—strategy, assessment at teacher discretion</p> <p>Lesson 3, Day 2</p> <p><i>Restriction Enzyme Practice</i> (restriction digests)—capture sheet</p> <p><i>Pick a Stick</i> (gel electrophoresis)—strategy, assessment at teacher discretion</p> <p>Lesson 3, Day 3</p> <p><i>Gel Electrophoresis</i> (gel electrophoresis)—virtual lab and capture sheet</p> <p><i>Analyzing the Results of Gel Electrophoresis</i> (gel electrophoresis)—capture sheet</p> <p><i>Design Journal Entry</i></p> <p>Lesson 3, Day 5</p> <p><i>Biotechnology Applications</i> (DNA extraction)—infographic and rubric</p> <p><i>Design Journal Entry</i></p> <p>Lesson 6, Day 1</p> <p><i>Laboratory Technique: Gel Electrophoresis</i>—simulation and capture sheet</p>

		<p>Lesson 6, Day 2 <i>Nucleic Acid Assays</i> (gel electrophoresis)—presentation and rubric</p> <p>Lesson 6, Day 3 <i>Nucleic Acid-Based Assay</i> (gel electrophoresis)—review <i>Nucleic Acid-Based Tests Used in Medicine</i> (gel electrophoresis)—assignment and rubric</p> <p>Lesson 6, Day 4 <i>Nucleic Acid-Based Drugs</i> (gel electrophoresis)—model and rubric <i>Design Journal Entry</i></p> <p>Lesson 6, Day 5 <i>Nucleic Acid Assay Scramble</i> (gel electrophoresis)—capture sheet</p> <p>Laboratory Investigation, Day 1 <i>Part 1: Pre-Lab</i>—Questions 1 and 2 <i>Bacterial Transformation with Gene Regulation</i>—Questions 1–10 <i>Bacterial Transformation</i>—vocabulary tool, assessment at teacher discretion</p> <p>Laboratory Investigation, Day 2 <i>Part 1: Pre-Lab</i>—Questions 1 and 3 <i>Part 2: Lab</i>—Question 1 <i>Part 1: Bacterial Transformation</i>—student protocol</p> <p>Laboratory Investigation, Day 3 <i>Part 2: Lab</i> (bacterial cell culture)—Question 2 <i>Part 3: Data Analysis</i> (bacterial cell culture)—Questions 1–3</p> <p>Laboratory Investigation, Day 4 <i>Part 4: Making a Model</i> (purification, bacterial cell culture)—Question 2 <i>Part 2: Protein Purification</i> (purification, bacterial cell culture)—student protocol</p> <p>Laboratory Investigation, Day 5 <i>Part 2: Protein Purification</i>—student protocol <i>Protein Purification</i>—background reading and vocabulary tool, assessment at teacher discretion <i>Part 1: Pre-Lab</i>—Question 1</p> <p>Laboratory Investigation, Day 6 <i>Part 2: Protein Purification</i>—student protocol <i>Part 3: Data Analysis</i>—Question 4 <i>Part 4: Making a Model</i>—Questions 2–4</p>
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Standard	Description	Assessed
A3.4	Employ standard protein techniques, including antibody production, enzyme assays, spectrophotometry, gel electrophoresis, and chromatography and document and evaluate results.	<p>Lesson 5, Day 1 <i>Methods of Protein Production</i>—capture sheet</p> <p>Lesson 5, Day 2 <i>Techniques in Protein Production</i>—review and capture sheet <i>Stand and Share</i>—strategy, assessment at teacher discretion <i>Small Group Alternative: Sorting Cards</i>—activity, assessment at teacher discretion <i>Protein Purification Techniques Video</i>—capture sheet</p> <p>Lesson 5, Day 3 <i>Protein Purification Lab Tools and Protein Tags</i>—capture sheet</p> <p>Lesson 5, Day 4 <i>Protein Purification</i>—flow chart and rubric <i>Protein Purification Lab Manual</i>—assignment and rubric</p> <p>Lesson 5, Day 5 <i>Protein Purification</i>—review and capture sheet <i>Nonhuman Proteins Used in Humans</i>—assignment and rubric <i>Design Journal Entry</i></p> <p>Lesson 7, Day 1 <i>Design Journal Entry</i> (assays) <i>3-2-1 Bridge</i>—strategy, assessment at teacher discretion</p> <p>Lesson 7, Day 2 <i>Kidney Disease PSA</i>—assignment and rubric</p> <p>Lesson 7, Day 3 <i>Biuret Protein Assay Serial Dilution and Standard Curve</i> (standard protein techniques, assays, chromatography)—assignment and capture sheet <i>Silent Appointment</i>—strategy, assessment at teacher discretion <i>Pick a Stick</i>—strategy, assessment at teacher discretion</p> <p>Lesson 7, Day 4 <i>Design Journal Entry</i></p> <p>Lesson 7, Day 5 <i>Interactive ELISA Assay Virtual Lab</i> (standard techniques, enzyme assays)—assignment</p> <p>Lesson 7, Day 5 <i>Exit Ticket</i>—strategy, assessment at teacher discretion</p>
A3.5	Predict outcomes of DNA and protein separation protocols.	<p>Lesson 3, Day 2 <i>Restriction Enzyme Practice</i>—capture sheet</p> <p>Lesson 3, Day 3</p>

Standard	Description	Assessed
		<p><i>Gel Electrophoresis Virtual Lab</i>—capture sheet</p> <p><i>Analyzing the Results of Gel Electrophoresis</i>—capture sheet</p> <p>Lesson 3, Day 4</p> <p><i>Pharmacogenomics Video</i>—capture sheet</p> <p>Lesson 3, Day 5</p> <p><i>Biotechnology Applications Infographic</i>—assignment and rubric</p> <p><i>Design Journal Entry</i></p> <p>Laboratory Investigation, Day 2</p> <p><i>Part 1: Pre-Lab</i>—Questions 1 and 3</p> <p><i>Part 2: Lab</i>—Question 1</p> <p><i>Part 1: Bacterial Transformation</i>—student protocol</p> <p>Laboratory Investigation, Day 3</p> <p><i>Part 2: Lab</i>—Question 2</p> <p><i>Part 3: Data Analysis</i>—Questions 1–3</p> <p><i>Part 4: Making a Model</i>—Question 1</p> <p>Laboratory Investigation, Day 4</p> <p><i>Part 4: Making a Model</i>—Question 2</p> <p>Laboratory Investigation, Day 5</p> <p><i>Protein Purification</i>—background reading and vocabulary tool, assessment at teacher discretion</p> <p><i>Part 1: Pre-Lab</i>—Question 1</p>
A4.0: <i>Integrate computer skills into program components.</i>		
A4.2	Describe conditions that promote cell growth under aseptic conditions in the laboratory and workplace.	<p>Lesson 1, Day 4</p> <p><i>Macromolecules as Medicine</i>—capture sheet</p> <p>Laboratory Investigation, Day 2</p> <p><i>Part 2: Lab</i>—Question 1</p> <p><i>Part 1: Bacterial Transformation</i>—student protocol</p> <p>Laboratory Investigation, Day 3</p> <p><i>Part 2: Lab</i>—Question 2</p> <p><i>Part 3: Data Analysis</i>—Questions 1–3</p>
A4.3	Use various methods to monitor the growth of cell cultures.	<p>Lesson 1, Day 2</p> <p><i>Protein Synthesis</i>—flow chart and rubric</p> <p><i>DNA Protein</i>—illustration and rubric</p> <p>Lesson 1, Day 4</p> <p><i>Macromolecule Medicine Guide</i>—activity and rubric</p> <p><i>Gallery Walk</i>—strategy, assessment at teacher discretion</p> <p>Lesson 1, Day 5</p> <p><i>Nucleotide Cut-Outs</i> (structure and function)—capture sheet</p>

Standard	Description	Assessed
A5.0: <i>Integrate computer skills into program components.</i>		
A5.1	Use the Internet and World Wide Web to collect and share scientific information.	<p>Lesson 8, Day 1 <i>FDA Summary Timeline</i>—activity and rubric <i>Exit Ticket</i>—strategy, assessment at teacher discretion</p> <p>Lesson 8, Day 2 <i>Design Journal Entry</i> <i>Ball-Toss</i>—strategy, assessment at teacher discretion <i>Drug Discovery</i>—assignment and rubric</p> <p>Lesson 8, Day 3 <i>Phases of Drug Approval and Development</i>—presentation and rubric <i>Think-Pair-Share</i>—strategy, assessment at teacher discretion</p> <p>Lesson 8, Day 4 <i>ClinicalTrials.gov</i>—assignment and rubric <i>Design Journal Entry</i></p> <p>Lesson 8, Day 5 <i>Ethics Role-Play</i>—rubric</p> <p>Lesson 9, Day 1 <i>Drug Administration Sort Paper</i>—activity, assessment at teacher discretion <i>Round Table</i>—strategy, assessment at teacher discretion <i>Raise a Righteous Hand</i>—strategy, assessment at teacher discretion <i>Drug Administration Anticipation Guide</i> <i>Drug Delivery Systems</i>—capture sheet <i>Biologics Exit Ticket</i>—strategy, assessment at teacher discretion <i>Placemat Strategy</i>—strategy, assessment at teacher discretion</p> <p>Lesson 9, Day 2 <i>Drug Delivery WebQuest</i>—capture sheet</p> <p>Lesson 9, Day 3 <i>Which Therapy?</i>—capture sheet <i>Stand and Share</i>—strategy, assessment at teacher discretion <i>Design Journal Entry</i></p> <p>Lesson 9, Day 4 <i>Gene Patenting Argument</i>—capture sheet and rubric</p> <p>Lesson 9, Day 5 <i>Mystery Drug Presentation</i>—also referred to as <i>Mystery Disease Conference</i></p>

Standard	Description	Assessed
		<i>Social Awareness Campaign Guidelines and Planning, Project Components: Research, 2-D Model or Animation, Clinical Trial Flowchart or Timeline, and Pecha Kucha Slideshow</i> <i>Patient Profiles</i> <i>Design Journal Entry</i>
A5.2	Use a variety of methods, including literature searches in libraries, computer databases, and online for gathering background information, making observations, and collecting and organizing data.	Lesson 5, Day 1 <i>Diabetes and Insulin Tabletop Jigsaw</i> (online background information)—activity and capture sheet <i>Methods of Protein Production</i> (online resources)—capture sheet Lesson 5, Day 5 <i>Nonhuman Proteins Used in Humans</i> —assignment and rubric
A7.0: Understand the function of regulatory agencies for the biotechnology industry and the lasting impact of routine laboratory and communication practices on product development and manufacturing.		
A7.1	Identify agencies at the local, state, and federal levels.	Lesson 8, Day 1 <i>FDA Summary Timeline</i> —rubric <i>Exit Ticket</i> —strategy, assessment at teacher discretion Lesson 8, Day 3 <i>Phases of Drug Approval and Development</i> —presentation and rubric <i>Think-Pair-Share</i> —strategy, assessment at teacher discretion Lesson 8, Day 4 <i>ClinicalTrials.gov</i> —assignment and presentation rubric <i>Design Journal Entry</i>
A7.2	Be aware of the role of agencies in promoting patient safety, quality control, and entrepreneurship.	Lesson 8, Day 1 <i>FDA Summary Timeline</i> —assignment and rubric <i>Exit Ticket</i> —strategy, assessment at teacher discretion Lesson 8, Day 3 <i>Phases of Drug Approval and Development</i> —assignment and presentation rubric <i>Think-Pair-Share</i> —strategy, assessment at teacher discretion Lesson 8, Day 4 <i>ClinicalTrials.gov</i> (safety and quality control)—assignment and presentation rubric <i>Design Journal Entry</i>
A8.0: Follow sustainable and safe practices with high regard for quality control.		
A8.1	Follow written protocols and oral	Lesson 5, Day 2 <i>Protein Purification Techniques Video</i> —capture sheet

Standard	Description	Assessed
	directions to perform a variety of laboratory and technical tasks.	<p>Lesson 5, Day 3 <i>Protein Purification Lab Tools and Protein Tags</i>—capture sheet</p> <p>Lesson 5, Day 4 <i>Protein Purification</i>—flow chart and rubric <i>Protein Purification Lab Manual</i>—assignment and rubric</p> <p>Lesson 5, Day 5 <i>Protein Purification</i>—review and capture sheet <i>Nonhuman Proteins Used in Humans</i>—assignment and rubric <i>Design Journal Entry</i></p> <p>Laboratory Investigation, Day 1 <i>Bacterial Transformation with Gene Regulation</i>—Questions 1–10</p> <p>Laboratory Investigation, Day 2 <i>Part 2: Lab</i>—Question 1 <i>Part 1: Bacterial Transformation</i>—student protocol</p> <p>Laboratory Investigation, Day 3 <i>Part 2: Lab</i>—Question 2 <i>Part 3: Data Analysis</i>—Questions 1–3</p> <p>Laboratory Investigation, Day 4 <i>Part 2: Protein Purification</i>—student protocol</p> <p>Laboratory Investigation, Day 5 <i>Part 2: Protein Purification</i>—student protocol</p>

Standard	Description	Assessed
		Laboratory Investigation, Day 5 <i>Part 2: Protein Purification—student protocol</i> Laboratory Investigation, Day 6 <i>Part 2: Protein Purification—student protocol</i>
A8.7	Determine which equipment is appropriate to use for a given task and the units of measurement used.	Laboratory Investigation, Day 1 <i>Bacterial Transformation with Gene Regulation—Questions 1–10</i> Laboratory Investigation, Day 2 <i>Part 2: Lab—Question 1</i> <i>Part 1: Bacterial Transformation—student protocol</i> Laboratory Investigation, Day 4 <i>Part 2: Protein Purification—student protocol</i> Laboratory Investigation, Day 5 <i>Part 2: Protein Purification—student protocol</i> Laboratory Investigation, Day 6 <i>Part 2: Protein Purification—student protocol</i>
A9.0: Understand that manufacturing represents inter-connectedness between science and production.		
A9.1	Describe the major steps of a product's move through a company's product pipeline.	Lesson 5, Day 1 <i>Methods of Protein Production—capture sheet</i> Lesson 5, Day 2 <i>Small Group Alternative: Sorting Cards—activity, assessment at teacher discretion</i> <i>Protein Purification Techniques Video—capture sheet</i> Lesson 5, Day 5 <i>Nonhuman Proteins Used in Humans—assignment and rubric</i> <i>Design Journal Entry</i> Lesson 8, Day 1 <i>FDA Summary Timeline—assignment and rubric</i> Lesson 8, Day 2 <i>Ball-Toss Discussion—strategy, assessment at teacher discretion</i> <i>Drug Discovery—assignment and rubric</i> <i>Design Journal Entry</i> Lesson 8, Day 3 <i>Phases of Drug Approval and Development—assignment and rubric</i> <i>Think-Pair-Share—strategy, assessment at teacher discretion</i> <i>Exit Ticket—strategy, assessment at teacher discretion</i>

Standard	Description	Assessed
		<p>Lesson 8, Day 4 <i>ClinicalTrials.gov</i>—assignment and presentation rubric <i>Design Journal Entry</i></p> <p>Lesson 8, Day 2 <i>Ball-Toss Discussion</i>—strategy, assessment at teacher discretion <i>Drug Discovery</i>—assignment and rubric <i>Design Journal Entry</i></p>
A9.2	Identify several products obtained through recombinant DNA technology.	<p>Lesson 1, Day 4 <i>Macromolecule Medicine</i>—guide and rubric <i>Gallery Walk</i>—strategy, assessment at teacher discretion</p> <p>Lesson 1, Day 5 <i>Design Journal Entry</i></p> <p>Lesson 6, Day 3 <i>Nucleic Acid-Based Assay Review</i>—activity <i>Nucleic Acid-Based Tests Used in Medicine</i>—assignment and rubric</p> <p>Lesson 6, Day 4 <i>Nucleic Acid-Based Drugs Model</i>—assignment and rubric <i>Design Journal Entry</i></p> <p>Lesson 9, Day 1 <i>Drug Administration Sort Paper</i>—activity, assessment at teacher discretion <i>Round Table</i>—strategy, assessment at teacher discretion <i>Raise a Righteous Hand</i>—strategy, assessment at teacher discretion <i>Drug Administration</i>—anticipation guide <i>Drug Delivery Systems</i>—capture sheet <i>Biologics Exit Ticket</i>—strategy, assessment at teacher discretion <i>Placemat Strategy</i>—strategy, assessment at teacher discretion</p> <p>Lesson 9, Day 2 <i>Drug Delivery WebQuest</i>—capture sheet</p> <p>Lesson 9, Day 3 <i>Which Therapy?</i>—capture sheet <i>Stand and Share</i>—strategy, assessment at teacher discretion <i>Design Journal Entry</i></p> <p>Lesson 9, Day 5</p>

Standard	Description	Assessed
		<p><i>Mystery Drug Presentation—also referred to as Mystery Disease Conference</i></p> <p><i>Social Awareness Campaign Guidelines and Planning, Project Components: Research, 2-D Model or Animation, Clinical Trial Flowchart or Timeline, and Pecha Kucha Slideshow</i></p> <p><i>Patient Profiles</i></p> <p><i>Design Journal Entry</i></p> <p>Laboratory Investigation, Day 1</p> <p><i>Part 1: Pre-Lab—Questions 1 and 2</i></p> <p><i>Bacterial Transformation with Gene Regulation—Questions 1–10</i></p> <p><i>Bacterial Transformation—vocabulary tool</i></p> <p>Laboratory Investigation, Day 3</p> <p><i>Part 4: Making a Model—Question 1</i></p> <p>Laboratory Investigation, Day 5</p> <p><i>Part 2: Protein Purification—student protocol</i></p> <p><i>Protein Purification—background reading and vocabulary tool, assessment at teacher discretion</i></p> <p><i>Part 1: Pre-Lab—Question 1</i></p> <p>Laboratory Investigation, Day 6</p> <p><i>Part 2: Protein Purification—student protocol</i></p> <p><i>Part 3: Data Analysis—Question 4</i></p> <p><i>Part 4: Making a Model—Questions 2–4</i></p>
A9.3	Outline the steps in production and delivery of a product made through recombinant DNA technology.	<p>Lesson 6, Day 2</p> <p><i>Nucleic Acid Assays Presentation—assignment and rubric</i></p> <p>Lesson 6, Day 4</p> <p><i>Nucleic Acid-Based Drugs Model—assignment and rubric</i></p> <p><i>Design Journal Entry</i></p> <p>Lesson 6, Day 5</p> <p><i>Nucleic Acid Assay Scramble—capture sheet</i></p> <p>Lesson 8, Day 4</p> <p><i>Design Journal Entry</i></p> <p>Lesson 9, Day 1</p> <p><i>Drug Administration Sort Paper—activity, assessment at teacher discretion</i></p> <p><i>Round Table—strategy, assessment at teacher discretion</i></p> <p><i>Raise a Righteous Hand—strategy, assessment at teacher discretion</i></p> <p><i>Drug Administration Anticipation Guide</i></p> <p><i>Drug Delivery Systems—capture sheet</i></p>

Standard	Description	Assessed
		<p><i>Biologics Exit Ticket</i>—strategy, assessment at teacher discretion</p> <p><i>Placemat Strategy</i>—strategy, assessment at teacher discretion</p> <p>Lesson 9, Day 2</p> <p><i>Drug Delivery WebQuest</i>—capture sheet</p> <p>Lesson 9, Day 3</p> <p><i>Which Therapy?</i>—capture sheet</p> <p><i>Stand and Share</i>—strategy, assessment at teacher discretion</p> <p><i>Design Journal Entry</i></p> <p>Lesson 9, Day 5</p> <p><i>Mystery Drug Presentation</i>—also referred to as <i>Mystery Disease Conference</i></p> <p><i>Social Awareness Campaign Guidelines and Planning, Project Components: Research, 2-D Model or Animation, Clinical Trial Flowchart or Timeline, and Pecha Kucha Slideshow</i></p> <p><i>Patient Profiles</i></p> <p><i>Design Journal Entry</i></p> <p>Laboratory Investigation, Day 1</p> <p><i>Part 1: Pre-Lab</i>—Questions 1 and 2</p> <p><i>Bacterial Transformation with Gene Regulation</i>—Questions 1–10</p> <p><i>Bacterial Transformation</i>—vocabulary tool, assessment at teacher discretion</p> <p>Laboratory Investigation, Day 3</p> <p><i>Part 2: Lab</i>—Question 2</p> <p><i>Part 3: Data Analysis</i>—Questions 1–3</p> <p><i>Part 4: Making a Model</i>—Question 1</p> <p>Laboratory Investigation, Day 1</p> <p><i>Part 4: Making a Model</i>—Question 2</p> <p>Laboratory Investigation, Day 1</p> <p><i>Protein Purification</i>—background reading and vocabulary tool, assessment at teacher discretion</p> <p><i>Part 1: Pre-Lab</i>—Question 1</p> <p>Laboratory Investigation, Day 6</p> <p><i>Part 3: Data Analysis</i>—Question 4</p> <p><i>Part 4: Making a Model</i>—Questions 2–4</p>



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