

## Curriculum Alignment Tools

Ponitz Career and Technical Center/Sinclair Community College  
Biotechnology (11th and 12th grade) Year-long Pacing Guides  
Dayton, OH

This an effective example of a pacing guide that maps across educational levels. In this year-long pacing guide, a detailed map links the K-12 curriculum to the appropriate college courses.

PCTC/SCC Pacing Guide provided by Ron Kindell.

## PCTC/Sinclair Pacing Guide

Teacher: **Joshua Roark**

Sinclair Faculty: **Angie Currier**

Class: **Biotechnology (11<sup>th</sup> Grade)**

*E.D. = Elynn Daugherty Text/Lab Book*

BioRad = Labs from Biolab Manual

*All labs are Inquiry Based (Writing Lab Reports)*

**2010 – 2011**

Weeks	Career Technical Competencies Reference	Academic Curriculum Reference	Activities/Blue Prints	Content/Project Based (✓)	College Connection <i>(credit, event, faculty support, use of Sinclair Equipment)</i>	Major Materials + Equipment
<i>Week 1</i>	Exploring Biotechnology + Industry (unit 49) <i>Sc. Mth./Exp. (34, 35)</i>	Communications E (11,12)	Syllabi, <i>Reviewing Rules and Regulations</i> , Who Am I Powerpoint, <i>Biotechnology Review</i> , Chemistry Demos	2 lecture slideshows, Student powerpoint presentation, 3 activities, teacher demos <i>Inquiry-Based</i>	ENG 111-112 COM 225 BTN 120 BTN 110	Paper Based Materials, Chemicals, Glassware, Table Top Balances
<i>Week 2</i>	Laboratory Safety, Chemical Materials & Chemical Handling (35.0/ 36.1 – 36.6) <i>Chemical Materials Handling &amp; Biohazard Storage</i> (38.1 – 38.2.7 & 40.1 – 40.3.10) Conducting Experiments Review (35.1 – 35.3) <i>Scientific Method Review</i> (34.1.1 – 34.2.3)	Writing Applications D (11,12) Reading Process B (8 - 12) Reading Process- C (8-10) Research- B (11,12) Math Data Analysis A (11,12), F (8-10) Math Processes- B (11,12) Science Inquiry- A (9,10) Government- A (11,12) Social Studies Skills A (11,12)	Chemical Safety + Handling Slideshow, <i>Biohazard Storage Slideshow</i> , Conducting Experiments and Scientific Method Slideshow (Review), <i>and Labs</i>	daily quizzes, 3 slideshows, teacher demos, 5 day lab, student teach-backs <i>Inquiry-Based</i> <i>Web-Based</i>	ENG 111-112 COM 225 BTN 120 BTN 110	Lab T Tops, Acids/Bases (Chemicals), Pipet Pumps, Glassware, Analytical Balance, Table Top Balances, Magnetic Machines, pH Meter Machines, Thermometers

<p><b>Week 3</b></p>	<p>Concepts of Measurement (39.1.1 – 39.1.12) <i>Pipeting &amp; Analytical Balance Skills</i> (37.1.1, 2, 4) Chem. Lab Skills (42.2, 3, 4) <i>Micro-Centrifuging</i> (37.3) Chemical Calculations (38.1.8) (42.1, 2, 7, 8)</p>	<p>Vocabulary- D (11,12) Vocabulary Acquisition F, E (8- 12) Math- Measurement D, E (8 – 10) A, B (11 – 12) Math-Data/Probability D (8-10)</p>	<p>Knowing Your Equipment Slideshow, <i>Preparing Solutions and Different Concentrations Slideshow</i> <b>E.D.: Chpt. 3</b></p>	<p>daily quizzes, 3 slideshows, 5 day lab, student teach-backs <b>Web-Based</b></p>	<p>BTN 120 BTN 110 MAT 106</p>	<p>Lab Tops, Chemicals, Pipet Pumps, Micropipets, Table Top Balances, Magnetic Machines, Microcentrifuges,</p>
<p><b>Week 4</b></p>	<p>Chemistry Content A Physical + Chemical Properties (38.1.1 – 38.1.3) Sc. Mth./Exp. (34, 35)</p>	<p>Vocabulary- D (11,12) Vocabulary Acquisition F, E (8 – 12) Algebra- D (8-10) Physical Science A, B, C, F (9-10) Physical Science A (11,12)</p>	<p>Role of Chemistry Slideshow, <i>Physical/Chemical Properties Lab,</i></p>	<p>daily quizzes, 1 lecture slideshow, 3 day lab, <b>Inquiry-Based Web-Based</b></p>	<p>ENG 111-112 CHE 131 COM 225 BTN 120 BTN 110 MAT 106</p>	<p>Lab Tops, Chemicals, Glassware, Table Top Balances, Magnetic Machines, Thermometers</p>
<p><b>Week 5</b></p>	<p>Chemistry Content B Characterizing Physical Properties (g, l, s) (39.2.1 – 39.2.7) Sc. Mth./Exp. (34, 35)</p>	<p>Math Measurement- A (11,12) Math Algebra- I (8 – 10) Physical Science- C (9,10)</p>	<p>States of Matter Slideshow, <i>Law Lab,</i> Teacher Demos</p>	<p>daily quizzes, 1 lecture slideshow, 5 day lab, teacher demos <b>Inquiry-Based Web-Based</b></p>	<p>ENG 111-112 CHE 131 COM 225 BTN 120 BTN 110 MAT 106</p>	<p>Lab Tops, Chemicals, Dry Ice, Canisters, Glassware, Table Top Balances, Magnetic Machines</p>
<p><b>Week 6</b></p>	<p>Chemistry Content C Atomic Structure (38.1.4 – 38.1.6) Sc. Mth./Exp. (34, 35)</p>	<p>Vocabulary- D (11,12) Vocabulary Acquisition F, E (8 – 12) Algebra- D (8-10) Physical Science A, B, C, F (9-10) Physical Science A (11,12)</p>	<p>Atomic Structure Slideshow, <i>Atomic Structure Art Project,</i> Bohr Theory Slideshow, <i>Electron Configuration Drawing Project</i> and Worksheets</p>	<p>daily quizzes, 2 lecture slideshows, 2 projects, 2 worksheets, and many student drawings <b>Inquiry-Based Web-Based</b></p>	<p>ENG 111-112 CHE 131 COM 225 BTN 120 BTN 110</p>	<p>Lab Tops, Periodic Tables, Project Materials</p>

<p><b>Week 7</b></p>	<p>Chemistry Content <b>D</b>  Bohr Theory (38.1.4 – 38.1.6)  Sc. Mth./Exp. (34, 35)</p>	<p>Vocabulary- D (11,12) Vocabulary Acquisition F, E (8 – 12) Algebra- D (8-10) Physical Science A, B, C, F (9-10) Physical Science A (11,12)</p>	<p>Bohr Theory Slideshow Review, <i>Bohr Theory Drawings</i>, Poisonous Metals Lab</p>	<p>daily quizzes, student drawings, 5 day lab (student unknowns)  <i>Inquiry-Based Web-Based</i></p>	<p>ENG-111-112 CHE 131 COM 225 BTN 120 BTN 110</p>	<p>Lab Tops, Chemicals, Table Top Balances, Glassware, Magnetic Machines, Bunsen Burners</p>
<p><b>Week 8</b></p>	<p>Chemistry Content <b>E</b>  Cation/Anion Discovery (38.1.7, 38.1.13)  Sc. Mth./Exp. (34, 35)</p>	<p>Vocabulary D (11,12) Vocabulary Acquisition F, E (8 – 12) Algebra D (8-10) Physical Science A, B, C, F (9-10) Physical Science A (11,12)</p>	<p>Concept Overview Slideshow, <i>Cation/Anion Lab</i>, Anion/Cation Art Project, <i>Worksheets</i>, and Reviewing Test</p>	<p>daily quizzes, 1 slideshow, 4 day lab (student unknowns), art project and 2 worksheets over naming chemicals  <i>Inquiry-Based Web-Based</i></p>	<p>ENG-111-112 CHE 131 COM 225 BTN 120 BTN 110</p>	<p>Lab Tops, Chemicals, Table Top Balances, Glassware, Magnetic Machines</p>
<p><b>Week 9</b></p>	<p>Chemistry Content <b>F</b>  <i>Chemical Reactions, Balancing, Stoichiometry</i>, (38.1.9 – 38.1.12)  <i>Endothermic/Exothermic</i> (38.1.20) Sc. Mth./Exp. (34, 35)</p>	<p>Vocabulary- D (11,12) Vocabulary Acquisition F, E (8 – 12) Algebra- D (8-10) Physical Science A, B, C, F (9-10) Physical Science A (11,12)</p>	<p>Atomic Structure &amp; Bonding Test, <i>Chemical Reactions and Balancing Slideshow</i>, Chemical Reactions Lab, <i>Teacher Demos</i></p>	<p>1 test, daily quizzes, 1 slideshow, 4 day lab, (student unknowns) balancing + endo./exothermic worksheets, teacher demos  <i>Inquiry-Based Web-Based</i></p>	<p>ENG-111-112 CHE 131 COM 225 BTN 120 BTN 110</p>	<p>Lab Tops, Chemicals, Table Top Balances, Glassware, Magnetic Machines</p>
<p><b>Week 10</b></p>	<p>Chemistry Content <b>G</b>  <i>Chemical Reactions, Balancing, Stoichiometry</i>, (38.1.9 – 38.1.12) Sc. Mth./Exp. (34, 35)</p>	<p>Vocabulary- D (11,12) Vocabulary Acquisition F, E (8 – 12) Physical Science C, F (9,10)</p>	<p>Precipitant Slideshow, Precipitant Lab</p>	<p>daily quizzes, 1 slideshow, 5 day lab, student unknowns  <i>Inquiry-Based Web-Based</i></p>	<p>ENG-111-112 CHE 131 COM 225 BTN 120</p>	<p>Lab Tops, Chemicals, Table Top Balances, Glassware, Magnetic Machines</p>

<p><b>Week 11</b></p> <p>Chemistry Content <i>H Writing Hydrocarbon Compounds</i> (38.1.14 – 38.1.17) Chemical Nomenclature for Organic/Inorganic Compounds (38.2.4 – 38.2.7)</p>	<p>Vocabulary- D (11,12) Vocabulary Acquisition F, E (8 – 12) Physical Science- A (9, 10)</p>	<p>Chemical Nomenclature Slideshow, <i>Functional Groups Slideshow</i>, IUPAC Worksheets, <i>Flashcards</i>, Hydrocarbon Models</p>	<p>daily quizzes, 2 slideshows, flashcards, worksheets, student models <i>Web-Based</i></p>	<p>CHE 131</p>	<p>Lab Tops, 3 - dimensional building units for models</p>
<p><b>Week 12</b></p> <p>Chemistry Content <i>I Spectrophotometer</i> (37.5.1 – 37.5.6) <i>Adjusting pH Solutions</i> (37.1.3, 42.1.5) Sc. Mth./Exp. (34, 35)</p>	<p>Math Algebra- C, D (8 – 10) Physical Science- G (9,10)</p>	<p>Spectrophotometer Slideshow, <i>pH Slideshow</i>, Making Buffers Slideshow, <a href="#">E.D.: Chpt. 7</a></p>	<p>daily quizzes, 3 slideshows, 5 day lab, student unknowns <i>Inquiry-Based Web-Based</i></p>	<p>CHE 131 BTN 110 MAT 106</p>	<p>Lab Tops, Chemicals, Biological Samples, Table Top Balance Spectrophotometers, pH paper, pH meter machines</p>
<p><b>Week 13</b></p> <p>Chemistry Content <i>J Explain, Interpret, Run, + Evaluate Chromatograms</i> (45.1, 45.2, 45.3, 45.4) Sc. Mth./Exp. (34, 35)</p>	<p>Vocabulary Acquisition D (11,12) Writing Applications- D (11,12) English Research- E (8 – 12) Physical Science- B, C (9,10) Scientific Inquiry- A (9 – 12)</p>	<p>Chromatography Slideshow, <i>Drug Analysis Slideshow</i>, Chromatography Lab</p>	<p>daily quizzes, 2 slideshows, 5 day lab, student unknowns <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112 CHE 131 COM 225 BTN 120 BTN 110 MAT 106</p>	<p>Lab Tops, Chemicals, Glassware, Glass Plates, Electrophoresis Machines, Fume-hood</p>
<p><b>Week 14</b></p> <p>Chemical Reactions/Endothermic rxn (38.1.11, 38.1.20) <i>Proficiency in Microscopes</i> (37.4.1 – 37.4.3) Operating Compound Microscopes (41.3.1) Sc. Mth./Exp. (34, 35)</p>	<p>Scientific Inquiry- A <i>Scientific Ways of Knowing B (6) C (8-11)</i> Science + Technology- A Life Sciences- A</p>	<p>Blood Analysis Slideshow, <i>Fiber Analysis Slideshow</i>, Blood and Fiber Labs</p>	<p>daily quizzes, 2 slideshows, 5 day lab, student unknowns <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112 CHE 131 BIO 111-113 COM 225 BTN 120 BTN 110</p>	<p>Lab Tops, Chemicals, Fibers, Glassware, Compound Microscopes, Table Top Balances, Analytical Balance</p>
<p><b>Week 15</b></p> <p>Chemical Reactions (38.1.11, 38.1.20) <i>Proficiency in Microscopes</i> (37.4.1 – 37.4.3) Operating Compound Microscopes (41.3.1) Sc. Mth./Exp. (34, 35)</p>	<p>Scientific Inquiry- A <i>Scientific Ways of Knowing B (6) C (8-11)</i> Science + Technology- A Life Sciences- A</p>	<p>Fingerprint Analysis Slideshows, <i>Fingerprint Lab</i></p>	<p>daily quizzes, 2 slideshows, 5 day lab, student unknowns <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112 CHE 131 COM 225 BTN 120 BTN 110</p>	<p>Lab Tops, Chemicals, Powders, Brushes, UV lights, UV machine, Glassware, Compound Microscopes, Table Top Balances</p>

<p><b>Week 16</b></p>	<p>Isolate + Characterize DNA (43,41, 3, 4, 5, 6, 7)  Reference BioRad Kit- Competencies  Sc. Mth./Exp. (34, 35)</p>	<p>Life Sciences- A (11,12)  Physical Science- A, B (9,10)</p>	<p><i>Forensics Test, Faces 4.0 Slideshow, Faces Computer Lab, Dna Profiling Slideshow, (Dna Fingerprinting Kit) "BioRad"</i></p>	<p><i>Forensics Test, daily quizzes, 5 day lab (Faces 4.0), BioRad Kit- Dna Profiling Lab Student Unknowns Inquiry-Based Web-Based</i></p>	<p>ENG 111-112 BIO 111-113 BTN 230 COM 225 BTN 120 BTN 110 MAT 106</p>	<p>Lab Tops, (Faces 4.0 software), Chemicals, Glassware, Electrophoresis Machines, Micropipets, Microcentrifuge Machines, Water Bath, Rocking Platform, UV Machine</p>
<p><b>Week 17</b></p>	<p><b>REVIEW ALL COMPETENCIES</b></p>	<p><b>REVIEW ALL CONTENT STANDARDS</b></p>	<p><b>REVIEW ALL LABS + MATERIALS FOR FINAL EXAM</b></p>	<p><b>REVIEW ALL LABS + MATERIALS FOR FINAL EXAM</b></p>	<p>CHE 131 BIO 111-113 COM 225 BTN 120 BTN 110 MAT 106</p>	<p>All Machinery Since Week 1</p>
<p><b>Week 18</b></p>	<p>Forensic Crime Scene A  Final Exam Week 1 <i>Reference all Competencies Since Week 1</i></p>	<p><i>Reference All Standards Since Week 1</i></p>	<p>FINAL EXAM  Student teams are assigned, crime scene visited, unknowns to determine the suspect(s), victim(s), where, when, why, how</p>	<p><b>Project Based</b> ✓ <i>(Radio/T.V.) (English) (Graphics) (Mathematics) (History) Inquiry-Based</i></p>	<p>ENG 111-112 CHE 131 BIO 111-113 COM 225 BTN 120 BTN 110 MAT 106 BIS 160</p>	<p>Glassware, Chemicals, Microcentrifuge Machines, Brushes, Analytical + Table Top Balances, Compound Microscopes, Water Baths, Rocking Platform, Electrophoresis Machines</p>
<p><b>Week 19</b></p>	<p>Forensic Crime Scene B  Final Exam Week 2 <i>Reference all Competencies Since Week 1</i></p>	<p><i>Reference All Standards Since Week 1</i></p>	<p>FINAL EXAM  Student teams are assigned, crime scene visited, unknowns to determine the suspect(s), victim(s), where, when, why, how</p>	<p><b>Project Based</b> ✓ <i>(Radio/T.V.) (English) (Graphics) (Mathematics) (History) Inquiry-Based</i></p>	<p>ENG 111-112 CHE 131 BIO 111-113 COM 225 BTN 120 BTN 110 MAT 106 BIS 160</p>	<p>Glassware, Chemicals, Microcentrifuge Machines, Brushes, Analytical + Table Top Balances, Compound Microscopes, Water Baths, Rocking Platform, Electrophoresis Machines</p>

<b>Week 20</b>	<b>Chemical Energy + Transport</b> (47.2.3) Microscope Analysis (37.4) <b>Laboratory Skills + Measurements</b> (42.3, 42.5) Sc. Mth./Exp. (34, 35)	<b>Scientific Inquiry- A</b> <b>Scientific Ways of Knowing B</b> (6) C (8-11) Science + Technology- A Life Sciences- A	<i>Plant Growth/Structure, Cells, Tissues, Organs, Meristematic Tissue, Plant Dna, Mitosis + Growth Slideshow,</i> Botany Slide Lab, Seed + Flower Dissection Lab <b>E.D.: Chpt. 10a – 10c</b>	daily quizzes, 2 slideshows, 5 day lab <b>Inquiry-Based Web-Based</b>	ENG 111-112 BIO 111-113 COM 225 BTN 120 BTN 110	Lab Tops, Compound Microscopes, Analytical Balance, Dissecting Microscopes, Fast Plants Material
<b>Week 21</b>	<b>Genetics/Heredity</b> (43.1) Microscope Analysis (37.4) <b>Laboratory Skills + Measurements</b> (42.3, 42.5) Sc. Mth./Exp. (34, 35)	<b>Scientific Inquiry- A</b> <b>Scientific Ways of Knowing B</b> (6) C (8-11) Science + Technology- A Life Sciences- A	<i>Alternation of Generations, Genotype/Phenotypes Slideshows,</i> Breeding Plants Labs (5 week ending results) <b>E.D.: Chpt. 10d – 10e</b>	daily quizzes, 2 slideshows, 2 labs (5 days) <b>Inquiry-Based Web-Based</b>	ENG 111-112 BIO 111-113 COM 225 BTN 120 BTN 110 MAT 106	Lab Tops, Compound Microscopes, Analytical Balance, Dissecting Microscopes, Fast Plants Materials Plant Light System
<b>Week 22</b>	<b>Genetics/Heredity</b> (43.1) Microscope Analysis (37.4) <b>Laboratory Skills + Measurements</b> (42.3, 42.5) Sc. Mth./Exp. (34, 35)	<b>Math- F, H, J, K</b> (8 – 10) Scientific Inquiry- A <b>Scientific Ways of Knowing B</b> (6) C (8-11) Science + Technology- A Life Sciences- A	<i>Selective Breeding + Punnett Squares, 10% Rule, Standard Deviation, Chi Square Analysis Slideshows,</i> <b>Asexual Reproduction Labs E.D.: Chpt. (11a – 11b)</b>	daily quizzes, 3 slideshows, 2 labs (5 days) <b>Inquiry-Based Web-Based</b>	ENG 111-112 BIO 111-113 COM 225 BTN 120 BTN 110 MAT 106	Lab Tops, Compound Microscopes, Analytical Balance, Dissecting Microscopes, Fast Plants Materials, Plant Light System
<b>Week 23</b>	<b>Genetics/Heredity</b> (43.1) Microscope Analysis (37.4) <b>Laboratory Skills + Measurements</b> (42.3, 42.5) Sc. Mth./Exp. (34, 35)	<b>Math- F, H, J, K</b> (8 – 10) Scientific Inquiry- A <b>Scientific Ways of Knowing B</b> (6) C (8-11) Science + Technology- A Life Sciences- A	<i>Selective Breeding + Punnett Squares, 10% Rule, Standard Deviation, Chi Square Analysis Slideshows,</i> <b>Asexual Reproduction Labs E.D.: Chpt. (11a – 11b)</b>	daily quizzes, 3 slideshows, 2 labs (5 days) <b>Inquiry-Based Web-Based</b>	ENG 111-112 BIO 111-113 COM 225 BTN 120 BTN 110 MAT 106	Lab Tops, Compound Microscopes, Analytical Balance, Dissecting Microscopes, Fast Plants Materials, Plant Light System
<b>Part 2</b>	<b>Sc. Mth./Exp.</b> (34, 35)					
<b>Week 24</b>	<b>Microscope Analysis</b> (37.4) <b>Laboratory Skills + Measurements</b> (42.3, 42.5) Sc. Mth./Exp. (34, 35)	<b>Scientific Inquiry- A</b> <b>Scientific Ways of Knowing B</b> (6) C (8-11) Science + Technology- A Life Sciences- A	<i>Asexual Plant Propagation, Plant Tissue Culture, Plant Hormones, Maintaining Cultures Slideshows,</i> <b>Plant Tissue Culture + Plant Hormones Lab E.D.: Chpt. (11c)</b>	daily quizzes, 4 slideshows, 1 lab (5 days) <b>Inquiry-Based Web-Based</b>	ENG 111-112 BIO 111-113 COM 225 BTN 120 BTN 110 MAT 106	Lab Tops, Compound Microscopes, Analytical Balance, Dissecting Microscopes, Fast Plants Materials, Plant Light System

<p><b>Week 25</b> <i>Part 1</i></p>	<p>Microscope Analysis (37.4) <i>Laboratory Skills + Measurements (42.3, 42.5)</i> Sc. Mth./Exp. (34, 35)</p>	<p>Scientific Inquiry- A <i>Scientific Ways of Knowing B (6) C (8-11)</i> Science + Technology- A Life Sciences- A</p>	<p><i>Plant Test,</i> Selective Breeding, Inbreeding, Genetic Testing, GMO's, Hydroponics, Plant Pharmaceuticals Slideshows, <i>Cloning African violets, + hydroponics Labs</i> <b>E.D.: Chpt. (11d – 11e)</b></p>	<p>Plant Test, daily quizzes, 4 slideshows, 2 labs (5 days) <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112 BIO 111-113 COM 225 BTN 120 BTN 110 MAT 106</p>	<p>Lab Tops, Biological Organisms, Chemicals, Glassware, Cloning Tools, pH Meters, Flow Hood, Pipet Pumps, Table Top Balances, Autoclave, Plant Light System</p>
<p><b>Week 26</b> <i>Part 2</i></p>	<p>Microscope Analysis (37.4) <i>Laboratory Skills + Measurements (42.3, 42.5)</i> Sc. Mth./Exp. (34, 35)</p>	<p>Scientific Inquiry- A <i>Scientific Ways of Knowing B (6) C (8-11)</i> Science + Technology- A Life Sciences- A</p>	<p><i>Plant Test,</i> Selective Breeding, Inbreeding, Genetic Testing, GMO's, Hydroponics, Plant Pharmaceuticals Slideshows, <i>Cloning African violets, + hydroponics Labs</i> <b>E.D.: Chpt. (11d – 11e)</b></p>	<p>Plant Test, daily quizzes, 4 slideshows, 2 labs (5 days) <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112 COM 225 BTN 120 BTN 110 MAT 106</p>	<p>Lab Tops, Biological Organisms, Chemicals, Glassware, Cloning Tools, pH Meters, Flow Hood, Pipet Pumps, Table Top Balances, Autoclave, Plant Light System</p>
<p><b>Week 27</b> <i>Part A</i></p>	<p><i>Isolating Plant Dna (43.4.1)</i> Microscope Analysis (37.4) <i>Laboratory Skills + Measurements (42.3, 42.5)</i> Sc. Mth./Exp. (34, 35) <i>Spectrophotometer (37.5.1 – 37.5.6)</i></p>	<p>Math Algebra- C, D (8 – 10) <i>Physical Science- A, B (9,10) G (9, 10)</i> Scientific Inquiry- A <i>Scientific Ways of Knowing B (6) C (8-11)</i> Science + Technology- A Life Sciences- A</p>	<p>Isolating/Characterizing Plant Dna Slideshow Dna concentration/Purity Assays Labs <b>E.D.: Chpt. (11f – 11h)</b></p>	<p>daily quizzes, 1 slideshow, 2 labs (5 days) <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112 COM 225 BTN 120 BTN 110 MAT 106</p>	<p>Lab Tops, Chemicals, Glassware, Pipet Pumps, Micropipets, Electrophoresis Machines, Water Baths, Table Top Balances, Spectrophotometer Machines, Biological Organisms</p>
<p><b>Week 28</b> <i>Part B</i></p>	<p><i>Isolating Plant Dna (43.4.1)</i> Microscope Analysis (37.4) <i>Laboratory Skills + Measurements (42.3, 42.5)</i> Sc. Mth./Exp. (34, 35) <i>Spectrophotometer (37.5.1 – 37.5.6)</i></p>	<p>Math Algebra- C, D (8 – 10) <i>Physical Science- A, B (9,10) G (9, 10)</i> Scientific Inquiry- A <i>Scientific Ways of Knowing B (6) C (8-11)</i> Science + Technology- A Life Sciences- A</p>	<p>Isolating/Characterizing Plant Dna Slideshow Dna concentration/Purity Assays Labs <b>E.D.: Chpt. (11i)</b></p>	<p>daily quizzes, 1 slideshow, 2 labs (5 days) <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112 COM 225 BTN 120 BTN 110 MAT 106</p>	<p>Lab Tops, Chemicals, Glassware, Pipet Pumps, Spectrophotometer Machines, Table Top Balances, Biological Organisms</p>

<p><b>Week 29</b></p>	<p><i>Chemical Energy + Transport</i> (47.2-3)  <i>Microscope Analysis</i> (37.4)  <i>Laboratory Skills + Measurements</i> (42.3 - 42.5)  <i>Sc. Mth./Exp.</i> (34, 35)</p>	<p>Scientific Inquiry- A  <i>Scientific Ways of Knowing B</i> (6) C (8-11)  Science + Technology- A  Life Sciences-  C, J (9,10) A, C (11-12)</p>	<p><i>Cross Breeding Slideshow Review, Finish Plant Breeding Lab</i> (Genotypes)  <i>E.D.: Chp. 10d – 10e</i></p>	<p>daily quizzes,  1 slideshow,  1 Lab (5 days)  <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112  COM 225  BTN 120  BTN 110  MAT 106</p>	<p>Lab Tops,  Compound Microscopes,  Analytical Balance,  Dissecting Microscopes,  Biological Organisms,  Fast Plants Materials,  Plant Light System</p>
<p><b>Week 30</b>  <b>Part 1</b></p>	<p><i>Isolating Plant Dna</i> (43.4.1)  Laboratory Skills + Measurements (42.3 - 42.5)  <i>Sc. Mth./Exp.</i> (34, 35)</p>	<p>Math Algebra- C, D (8 – 10)  <i>Physical Science- A, B</i> (9,10) G (9, 10)  Scientific Inquiry- A  <i>Scientific Ways of Knowing B</i> (6) C (8-11)  Science + Technology- Life Sciences-  C, J (9,10) A, C (11-12)</p>	<p>Modifying Dna (Agrobacterium/Ti plasmid)  Arabidopsis Organism Slideshows,  <i>GMO's/Plant Transformation/Arabidopsis Lab</i> (Biotech Live + Bioethics)  <i>E.d.: Chpt. (11g – 11h)</i></p>	<p>daily quizzes,  2 slideshows,  1 lab (5 days)  <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112  BTN 230  COM 225  BTN 120  BTN 110  MAT 106</p>	<p>Lab Tops,  Chemicals, Glassware,  Bunsen Burners,  Flow Hood, Autoclave,  Biological Organisms</p>
<p><b>Week 31</b>  <b>Part 2</b></p>	<p><i>Isolating Plant Dna</i> (43.4.1)  Laboratory Skills + Measurements (42.3 - 42.5)  <i>Sc. Mth./Exp.</i> (34, 35)</p>	<p>Math Algebra- C, D (8 – 10)  <i>Physical Science- A, B</i> (9,10) G (9, 10)  Scientific Inquiry- A  <i>Scientific Ways of Knowing B</i> (6) C (8-11)  Science + Technology- Life Sciences-  C, J (9,10) A, C (11-12)</p>	<p>Modifying Dna (Agrobacterium/Ti plasmid)  Arabidopsis Organism Slideshows,  <i>GMO's/Plant Transformation/Arabidopsis Lab</i> (Biotech Live + Bioethics)  <i>E.d.: Chpt. (11g – 11h)</i></p>	<p>daily quizzes,  2 slideshows,  1 lab (5 days)  <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112  BTN 230  COM 225  BTN 120  BTN 110  MAT 106</p>	<p>Lab Tops,  Chemicals, Glassware,  Bunsen Burners,  Flow Hood, Autoclave,  Biological Organisms</p>

<p><b>Week 32</b></p>	<p>Characteristics and Principles of Water (16.1.1, 2) (5.2.3, 6, 7) Identify Water Sampling Techniques (16.2.4, 5) Technical Writing + Documentation (50.1 – 50.5) <i>Formal Presentations (3.9)</i> <i>Core Competencies</i></p>	<p>Math Measurement-B (11, 12) Math Processes-B (8 – 10) Earth and Space-C (11, 12) D (9, 10) Life Sciences- B C (11, 12) D F (9, 10) Scientific Inquiry- A (11, 12) Physical Science- C (9,10)</p>	<p>River Habitat Slideshows x 5 <i>Habitat Evaluation Index Test</i></p>	<p><b>Project Based (Radio/T.V.) (English) + (History)</b> ✓ <i>Inquiry-Based Web-Based</i></p>	<p>ENG-111-112 COM 225 BTN 120 BTN 110 MAT 106 BIS 160</p>	<p>Lab Tops, River Boots, Habitat Scientific Journals, Habitat Equipment</p>
<p><b>Week 33</b> <b>Part 1</b></p>	<p>Conducting Research + Experiments (34, 35) <i>Characteristics and Principles of Water (16.1.3, 4, 6, 7, 9)</i> Identify Water Sampling Techniques (16.2.1, 2, 3, 4, 7, 9, 10, 11) <i>Constituents of Water (16.4.1, 2, 3, 4)</i> Analyzing Water (16.5.1, 2, 5, 6, 8) (5.2.1, 2) Technical Writing/Documentation (unit 50)</p>	<p>Math Measurement-B (11, 12) Math Processes-B (8 – 10) Earth and Space-C (11, 12) D (9, 10) Life Sciences- B C (11, 12) D F (9, 10) Scientific Inquiry- A (11, 12) Physical Science- C (9,10)</p>	<p>Chemical Slideshows, Outdoor River Testing (DO, Turbidity, Nitrate, Phosphate, Ammonia, pH, conductivity, + TDS) “color-metric, titrations, and spectrophotometer”</p>	<p><b>Project Based (Radio/T.V.) (English) + (History)</b> ✓ <i>Inquiry-Based Web-Based</i></p>	<p>CHE 131 ENG-111-112 COM 225 BTN 120 BTN 110 MAT 106 BIS 160</p>	<p>Lab Tops, Chemical Test Kits, DO Meter, pH/conductivity/TDS Meters, BOD-5 Glassware, Turbidity Tubes, and a Spectrophotometer</p>
<p><b>Week 34</b> <b>Part 2</b></p>	<p>Conducting Research + Experiments (34, 35) <i>Characteristics and Principles of Water (16.1.3, 4, 6, 7, 9)</i> Identify Water Sampling Techniques (16.2.1, 2, 3, 4, 7, 9, 10, 11) <i>Constituents of Water (16.4.1, 2, 3, 4)</i> Analyzing Water (16.5.1, 2, 5, 6, 8) (5.2.1, 2) Technical Writing/Documentation (unit 50)</p>	<p>Math Measurement-B (11, 12) Math Processes-B (8 – 10) Earth and Space-C (11, 12) D (9, 10) Life Sciences- B C (11, 12) D F (9, 10) Scientific Inquiry- A (11, 12) Physical Science- C (9,10) <i>Formal Presentations (3.9) Core Competencies</i> ←</p>	<p>Chemical Slideshows, Outdoor River Testing “chemical testing using 2800 spectrophotometer”</p>	<p><b>Project Based (Radio/T.V.) (English) + (History)</b> ✓ <i>Inquiry-Based Web-Based</i></p>	<p>CHE 131 ENG-111-112 COM 225 BTN 120 BTN 110 MAT 106 BIS 160</p>	<p>Lab Tops, Chemical Test Kits, DO Meter, pH/Conductivity/TDS Meters, BOD-5 Glassware, Turbidity Tubes, and a Spectrophotometer</p>

<p><b>Week 35</b></p>	<p>Conducting Research + Experiments (34, 35) <i>Characteristics and Principles of Water</i> (16.1.5 8,10, 11) Identify Wastewater Techniques (16.2.1, 2, 3, 6) <i>Constituents of Water</i> (16.4.5) Analyzing Water (16.5.3, 4, 6, 7) Technical Writing/Documentation (unit 50)</p>	<p>Math Measurement-B (11, 12) Math Processes-B (8 – 10) Earth and Space-C (11, 12) D (9, 10) Life Sciences- B C (11, 12) D F (9, 10) Scientific Inquiry- A (11, 12) Physical Science- C (9,10) <i>Formal Presentations</i> (3.9) <i>Core Competencies</i> ←</p>	<p>Biological Slideshows, <i>Outdoor Biological Sampling</i> (macroinvertebrates, algae, and bacteria)</p>	<p><b>Project Based</b> (Radio/T.V.) (English) + (History) ✓ <i>Inquiry-Based Web-Based</i></p>	<p>ENG 111-112 BIO 111-113 COM 225 BTN 120 BTN 110 MAT 106 BIS 160</p>	<p>Lab Tops, Biological Photos, Dissecting Microscopes, Collection Glassware, Tweezers, Slides, + Kick Seines</p>
<p><b>Week 36</b></p>	<p>Water Quality Final Exam (All Competencies From Water Quality App'ly)</p>	<p>Water Quality Final Exam (All Standards From Water Quality App'ly)</p>	<p>Water Quality Final Exam <i>Habitat/Biological and Chemical Parameters</i></p>	<p><b>Project Based</b> (Radio/T.V.) (English) + (History) ✓ <i>Inquiry-Based</i></p>	<p>CHE 131 ENG 111-112 BIO 111-113 COM 225 BTN 120 BTN 110 MAT 106 BIS 160</p>	<p>Presentations include Video, Powerpoint, Projector, and Audio Equipment</p>

- All slideshow lectures and vocabulary are digital.
- Student Lab Reports are hand written and final copy submitted electronically.
- Online Software “Classjump” will be used as an interface module.

**Graduating Biotechnology seniors will receive college credit from Sinclair in the following classes below:**

*BTN 110 (Biotechnology and Bioethics) 3 credits*

*BTN 120 (Laboratory Safety and Regulatory Compliance) 3 credits*

Biotechnology students also have the potential to test out of the following classes below:

*BIS 160 (Introduction to Word, PP, Excel, Access) 3 credits*

*BIO 107 (Human Biology) 5 credits*

Teacher: Joshua Roark

Sinclair Faculty: Angie Currier

Class: Biotechnology (12<sup>th</sup> Grade)

PCTC/Sinclair Pacing Guide

*E.D. = Elynn Daugherty Text/Lab Book*

**BioRad = Labs from Biolab Manual**

*All labs are Inquiry Based (Writing Lab Reports)*

**2010 – 2011**

Week	Lecture + Lab Focus <i>(online activity, quizzes, and homework not shown)</i>	Key Skill Objectives	Major Equipment	Teaching Method	Career Technical Reference	Academic Curriculum Reference
1	Syllabi, Reviewing Rules and Regulations, Summer Update PPT, <i>Pre-Test</i> , Project-Demos, <i>Biotechnology Review</i>	Understand regulations + mission Recap of summer activities Inventory + scope of new lab equipment Work on team inquiry projects Recap of major 11 <sup>th</sup> grade competencies	All Biotech Equipment Exposed at the 10 <sup>th</sup> /11 <sup>th</sup> Grade Levels	<i>Inquiry, Problem, Case, Web, Discovery and Project- Based</i>	Laboratory Safety, Chemical Materials & Chemical Handling (35/0/36.1 – 36.6)  <i>Chemical Materials Handling &amp; Biohazard Storage</i> (38.1 – 38.2.7 & 40.1 – 40.3.10)  Conducting Experiments Review (35.1 – 35.3)  Sc. Mth./Exp. (34, 35) Exploring  Biotechnology + Industry (unit 49)  Bioethics (48)	Communications E (11,12) Writing Applications D (11,12) Reading Process B (8 - 12) Reading Process- C (8-10) Science Inquiry- A (11,12) Research- B (11,12) Math Data Analysis A (11,12), F (8-10) Math Processes- B (11,12) Government- A (11,12) Social Studies Skills A (11,12)
Q1	Chemical Safety + Handling, <i>Biohazard Storage</i> , Conducting Experiments, Scientific notebook, <i>Scientific Method</i> , Knowing 10 <sup>th</sup> + 11 <sup>th</sup> Grade Equipment Used	Review master competencies on chemical safety & handling, biohazard storage, conducting experiments, scientific method, and basic equipment that was used in lecture and labs from the 10 <sup>th</sup> and 11 <sup>th</sup> grade				
2	Master Lecture + Lab <u>Competencies Below:</u>  3.1 (A) Pipeting/Measuring Volumes (B) Micropipeting  3.2 (C) Mass <i>Measurement/Making Solutions</i> 3.3 (E) Mass (Vol. Sol.) 3.4 (F) Percent Mass (Vol. Sol.) 3.5 (G) Molar Solutions 3.6 (H) Dilutions	Review and Master Below:  A) Demonstrate skill using plastic pipets, manual pipet pumps, digital & electronic pipeters, and serpipeters.  B + C) <i>Demonstrate skill using micropipets</i>  E) Prepare various mass/volume solutions  F) <i>Prepare various percent mass/volume solutions</i>  G) Prepare various molar solutions  H) <i>Prepare dilutions of solutions</i>	Lab Tops, Reagents, Micropipeters, Serpipeters, Pipet Pumps, Glassware, Analytical Balances, Table Top Balances, Hot Plates/Mag. Stir	<i>Inquiry, Web, and Problem-Based</i>	Concepts of Measurement (39.1.1 – 39.1.12)  <i>Pipeting &amp; Analytical Balance Skills</i> (37.1.1, 2, 4)  Chem. Lab Skills (42.2, 3, 4)  Chemical Calculations (38.1.8) (42.1, 2, 7, 8)  Bioethics (48)	Vocabulary D (11,12)  Vocabulary Acquisition F, E (8 - 12)  Math- Measurement D, E (8 – 10) A, B (11 – 12)  Math-Data/Probability D (8-10)

3	<p>7.1 A) Spectrophotometers (DR2800, UV + V-Spec., Colorimeter)</p> <p>B) Using the Spectrophotometer to Study Molecules, Standard Wavelength Curves, and Beers Law Lab</p> <p>C) Determination of Chlorophyll in Olive Oil Lab</p> <p>D) Counting <i>E. Coli</i> Colonies Lab</p>	<p><u>Review and Master Below A+B:</u></p> <p>A) Learn how to operate a DR2800 water spectrophotometer and TNT Tests Results</p> <p>B) Learn how to operate a spectrometer/spectrophotometer and how light corresponds to colors of the visible spectrum in determining unknowns from knowns, construct standard curves, apply concepts to spectroscopic analytical methods</p> <p>C) Measure and analyze the visible light absorbance spectra of different olive oils with respect to chlorophyll</p> <p>D) Prepare serial dilutions of <i>E. Coli</i> and count cells using the Spectrophotometer</p>	<p>Spectrophotometer (DR2800), Spectrophotometers, Colorimeters, Reagents, Pipet Pumps, Glassware, Micropipeters, Bunsen Burners, and Water Baths</p>	<p><i>Inquiry, Web, and Problem-Based</i></p>	<p>Conducting Experiments Review (35.1 – 35.3)</p> <p>Spectrophotometer + Standard Curves (37.5)</p> <p>Spectroscopic Analytical Methods (37.7)</p> <p>Calibrate equipment accurately (37.9)</p>	<p>Patterns, Functions + Algebra C + D, 8-10</p> <p>Physical Science G (9-10)</p> <p>Vocabulary D (11.12)</p> <p>Writing Applications D (11.12)</p>
4	<p><u>Review: 2.3 Molecules of Cells (Carbohydrates, Lipids, Proteins, Nucleic Acids)</u></p> <p><u>New: 5.1 (A)</u></p> <p>(Structure &amp; Function of Proteins)</p> <p>Antibody Function</p> <p>5.2 Protein Structure (Insulin)</p> <p>5.3 Protein Catalysts</p> <p>(B) Enzyme Function Lab</p> <p>(C) Protease Assay Lab</p>	<p><u>Review: Macromolecules (structure/function)</u></p> <p><u>New Materials Listed Below:</u></p> <p>A) Simulate antibody-antigen testing</p> <p>B) Test enzyme activity at different concentrations</p> <p>C) Experimental design</p> <p>* <i>Protein Chemist Career Exploration</i></p>	<p>Petri-Dishes, Reagents, Table Top Balances, Pipet Pumps, Glassware, Micropipeters,</p>	<p><i>Inquiry, Discovery, Web, and Problem-Based</i></p>	<p>Molecular Behavior of Amino Acids + Peptides (42.7)</p> <p>Explain Protein Properties (42.8)</p> <p>Physical/Chemical Properties of Proteins (45.7)</p> <p>Perform Enzyme Assays (42.9)</p> <p>Conducting Experiments (35.1 – 3)</p> <p>Prepare Lab Reagents (42.1)</p> <p>Bioethics (48)</p>	<p>Physical Science B, C (9,10) A (11,12)</p> <p>Vocabulary D, E (11.12)</p> <p>Number Operations G (8-10)</p> <p>Writing Applications D (11.12)</p>

5	<p>5 (D) Protein Indicator Analysis Lab</p> <p>7.2 Adjusting Buffer pH Review</p> <p>7.3 (D) Making Buffers Review</p> <p>5 (E) Analysis of Protein by Vertical Gel Electrophoresis Lab</p>	<p>5 (D) Prepare a serial dilution of protein solution to differentiate between concentrations (biuret reagent)</p> <p>7 (D) Prepare a buffer to use in making a protein solution</p> <p>5 (E) Prepare a polyacrylamide gel electrophoresis (PAGE) running buffer and use it to prepare protein samples for gel analysis</p>	<p>Reagents, Tabletop Balances, Micropipeters, Spectrophotometers, Glassware, Analytical Balances, Plastic Syringes, Pipet Pumps, pH meters</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Perform Lab Reagents (42.1)</p> <p>Conducting Experiments (35.1 – 3)</p> <p>45.8.4 Protein Buffer</p> <p>Perform Electrophoresis of Protein Samples (45.10)</p> <p>Prepare Lab Reagents (42.1)</p>	<p>Vocabulary D, E (11.12)</p> <p>Number Operations G (8-10)</p> <p>Physical Science B, C (9,10)</p> <p>Writing Applications D (11.12)</p>
6	<p>5.4 (F) Studying Proteins Lab (PAGE Gel)</p>	<p>Prepare protein samples and load, run, stain and characterize proteins on a PAGE gel (<i>amylase, pectinase, cellulase, and lysozyme</i>)</p>	<p>Reagents, Tabletop Balances, Micropipeters, Spectrophotometers, Glassware, Analytical Balances, Plastic Syringes, Pipet Pumps, Microcentrifuges, Dry Block Heaters, Vertical Gel Boxes, Lab Rotators, Imaging Light Systems,</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Perform Electrophoresis of Protein Samples (45.10)</p> <p>Prepare Lab Reagents (42.1)</p> <p>Conducting Experiments (35.1 – 3)</p>	<p>Vocabulary D, E (11.12)</p> <p>Number Operations G (8-10)</p> <p>Physical Science B, C (9,10)</p> <p>Writing Applications D (11.12)</p>
7	<p>5.5 (G) Applications of Protein Analysis Lab (Identifying Proteins)</p>	<p>Prepare animal muscle tissue samples to run gels to study differences in protein composition/structure, apply protein electrophoresis, explore evolution, and construct cladograms</p> <p><i>Biorad's Protein Profiler Kit + Daugherty's Inquiry Lab</i></p> <p><i>* Pharmaceuticals Clinical Research Career Exploration</i></p>	<p>Reagents, Tabletop Balances, Micropipeters, Spectrophotometers, Glassware, Analytical Balances, Plastic Syringes, Pipet Pumps, Microcentrifuges, Dry Block Heaters, Vertical Gel Boxes, Lab Rotators, Imaging Light Systems, Mortars/Pestles</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Physical/Chemical Properties of Proteins (45.7)</p> <p>Perform Electrophoresis of Protein Samples (45.10)</p> <p>Conducting Experiments (35.1 – 3)</p> <p>Perform Sample Analysis (42.6)</p> <p>Prepare Lab Reagents (42.1)</p>	<p>Vocabulary D, E (11.12)</p> <p>Number Operations G (8-10)</p> <p>Physical Science B, C (9,10)</p> <p>Writing Applications D (11.12)</p>

8	<p>6.1 Sources of Potential Products (Assay Development) B) Starch and Sugar Assays Lab</p> <p>6.2 The Use of Assays C) Amylase Assay Lab</p> <p>6.3 Products From Nature D) Plant Substances Lab</p>	<p>A) Team Project- Prepare an Assay B) Conduct aldose and starch indicator tests</p> <p>C) Test saliva for alpha-amylase activity</p> <p><b>PART 1:</b> D) Extract compounds from plants and test the extracts' antimicrobial activity on the growth of <i>E. Coli</i>.</p>	<p>Reagents, Tabletop Balances, Micropipeters, Spectrophotometers, Glassware, Plastic Syringes, Pipet Pumps, Dry Block Heaters, Vertical Gel Boxes, Lab Rotators, Vortexers, Autoclave, Water Baths, Bunsen Burners, Petri Dishes Incubator</p>	<p><b>Inquiry Discovery, Web, and Problem-Based</b></p>	<p>Perform Enzyme Assays (42.9) Prepare Lab Reagents (42.1) Conducting Experiments (35.1 – 3) Biochemical assays of carbohydrates “Activity Assays” (42.13) Biochemical assays of lipids “Concentration Assays” (42.14) Perform Sample Analysis (42.6)</p>	<p>Life Sciences A (11.12) Physical Science A (11.12) Writing Applications D (11.12) Vocabulary D, E (11.12)</p>
9 Q2	<p>6.4 Plant Proteins as Products (Labs: D – H) D) Plant Substances F) Hydrogen Peroxidase Assay G) HRP Isolation-PAGE gel H) HRP Activity Using TMB</p> <p>6.5 Producing Recombinant DNA Protein Products E) Searching for Native Amylase Lab</p>	<p><b>PART 2:</b> D) Extract compounds from plants and test the extracts' antimicrobial activity on the growth of <i>E. Coli</i>.</p> <p>F) Testing plant/animal samples for oxygen gas (add <math>H_2O_2</math>)</p> <p>G) Isolation of HRP (plant enzyme) from Horseradish root on a PAGE Gel</p> <p>H) Isolate HRP enzyme and use TMB as a colorimetric assay for peroxidase activity (freeze samples for ELISA)</p> <p>E) Predict where amylase-producing bacteria might be found in nature and attempt to isolate colonies</p>	<p>Reagents, Tabletop Balances, Micropipeters, Spectrophotometers, Glassware, Plastic Syringes, Pipet Pumps, Dry Block Heaters, Vertical Gel Boxes, Lab Rotators, Vortexers, Autoclave, Water Baths, Bunsen Burners, Petri Dishes Incubator, Hotplates, Imaging Light Systems</p>	<p><b>Inquiry Discovery, Web, and Problem-Based</b></p>	<p>Microbiology (41.1-3) Prepare Lab Reagents (42.1) Perform Sample Analysis (42.6) Conducting Experiments (35.1 – 3) Perform Enzyme Assay (42.9) Bioethics (48)</p>	<p>Vocabulary D, E (11.12) Life Science A (9-12) Physical Science A (11.12) Writing Applications D (11.12)</p>

10	<p>7.4 Determining Protein Concentration</p> <p><i>F) Amylase Analysis Using Spectrophotometers Lab</i></p> <p>G) Determining Amylase Concentration Lab</p> <p>D) UV Spec to Study Proteins Lab</p>	<p><i>F) Determine the absorbance spectrum for amylase-Bradford reagent to learn Lambda max</i></p> <p>G) Use a best fit standard curve to determine the concentrations of unknown amylase solutions</p> <p>D) Use a VIS-Spec to determine the Lambda max for a sample of colorless proteins</p>	<p>Micropipets, Pipet Pumps, Reagents, Spectrophotometers, Glassware</p>	<p><i>Inquiry Discovery, Web, and Problem-Based</i></p>	<p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Conducting Experiments (35.1 – 3)</p> <p>Biochemical assays of lipids “Concentration Assays” (42.14)</p> <p><i>Spectrophotometer + Standard Curves</i> (37.5)</p> <p><i>Calibrate Equipment Accurately</i> (37.9)</p> <p>Bioethics (48)</p>	<p>Life Science A (9-12)</p> <p>Physical Science A (11,12)</p> <p>Writing Applications D (11,12)</p> <p>Vocabulary D, E (11,12)</p>
11	<p>Review Chapter 4.4 <i>Agarose Gel Electrophoresis</i></p> <p>Recombinant Biotechnology 8.1 Overview of Genetic Engineering</p> <p>A) Restriction Digestion of Lambda Phage Lab</p> <p>B) Restriction Digestion Used to Verify pAmylase Plasmid Lab</p>	<p>A) Conduct a restriction digest of the Lambda DNA to learn about restriction enzymes, and conduct a restriction digestion of the pAmylase to confirm prior to transformation of E. Coli cells</p> <p>B) Conduct a restriction digestion of pAmylase plasmid with HindIII and BamHI to confirm desired plasmid prior to transformation of E. Coli cells (Learn about different restriction enzymes)</p>	<p>Water Baths, Micropipeters, Reagents, Gel Drying System, Microcentrifuges, Ice Buckets, Horizontal Gel Boxes, Power Supplies</p>	<p><i>Inquiry Discovery, Web, and Problem-Based</i></p>	<p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Conducting Experiments (35.1 – 3)</p> <p>Apply Concepts of DNA Technology (43.3)</p> <p>Isolate/Characterize DNA (43.4)</p> <p>Relate Molecular Biology to Humans (43.7)</p>	<p>Life Science A, C (11,12), J (9,10)</p> <p>Physical Science A, B (9,10)</p> <p>Science Technology B (9,10)</p> <p>Vocabulary D, E (11,12)</p> <p>Writing Applications D (11,12)</p>
12	<p>Recombinant Biotechnology 8.2 Bacterial Transformation</p> <p>C) Transformation of E. Coli with pAmylase Lab</p> <p><i>* Start culture of cells at end of week 13 for Lab D on week 14</i></p>	<p>Prepare reagents and media for the transformation lab</p> <p>Transfer plasmids into E. Coli and select transformants</p>	<p>Water Baths, Micropipeters, Reagents, Glassware, Funnels, Ice Buckets, Bunsen Burners, Incubator, Pipet Pumps</p>	<p><i>Inquiry Discovery, Web, and Problem-Based</i></p>	<p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Historical Developments in Modern DNA Technology (43.2)</p> <p>Conducting Experiments (35.1 – 3)</p>	<p>Life Science A (11,12)</p> <p>Vocabulary D, E (11,12)</p> <p>Writing Applications D (11,12)</p>

13	<p><b>Recombinant Biotechnology</b> 8.2 Bacterial Transformation</p> <p><i>Transform bacteria with jellyfish gene, turn the modified genes on or off, and study gene regulation</i></p> <p>* Transformation of E. Coli with pGLO Lab</p>	<p>Prepare reagents and media for the transformation lab</p> <p>Transfer plasmids into E. Coli and select transformants</p> <p><i>Biorad's PGL0 Kit</i></p> <p><i>* Biochemist/Molecular Biologist Research Career Exploration</i></p>	<p>Water Baths, Micropipeters, Reagents, Glassware, Funnelhood, Ice Buckets, Bunsen Burners, Incubator, Pipet Pumps</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Historical Developments in Modern DNA Technology (43.2)</p> <p>Conducting Experiments (35.1 – 3)</p>	<p>Life Science A (11,12)</p> <p>Vocabulary D, E (11,12)</p> <p>Writing Applications D (11,12)</p>
14	<p><b>Recombinant Biotechnology</b> 8.3 Scaling Up Cell Cultures</p> <p>D) Growing and Monitoring Bacterial Cultures Lab</p> <p>E) Scaling up E. Coli Culture for Amylase Production</p>	<p>D) Start, maintain, and monitor E. Coli broth cultures</p> <p>E) Select colonies and scale them up from a selection plate to selection broth media</p>	<p>Tabletop Balances, Glassware, Reagents, Hot Plate/Mag. Stir, Autoclave, Funnelhood, Bunsen Burners, Incubator, Water Baths, Pipeters, Pipet Pumps, Spectrophotometers</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Conducting Experiments (35.1 – 3)</p> <p>Cell Culturing (44.1 – 7)</p> <p>Bioethics (48)</p> <p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Conducting Experiments (35.1 – 3)</p>	<p>Life Science A,G (11,12)</p> <p>Vocabulary D, E (11,12)</p> <p>Writing Applications D (11,12)</p>
15	<p>9.1 Harvesting a Protein Product</p> <p>A) Harvesting Amylase Lab</p>	<p>Separate transformed cells from broth and test the broth for amylase activity</p> <p><i>“Use cultured cells from lab 8E or grow new culture and use Activity Assay to conduct Amylase activity”</i></p>	<p>Water Baths, Pipet Pumps, Reagents, Bunsen Burners, Funnelhood, Incubator, Glassware, Centrifuges</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Cell Culturing (44.1 – 7)</p> <p>Biochemical assays of carbohydrates “Activity Assays” (42.13)</p> <p>Basic Chromatographic Theory (45.1)</p> <p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p>	<p>Vocabulary D, E (11,12)</p> <p>Writing Applications D (11,12)</p> <p>Life Sciences A (11,12)</p> <p>Physical Science A (11,12), C (9,10)</p>
16	<p>9.2 Using Chromatography to Study and Separate Molecules</p> <p>Dialysis of Protein Buffers Lab</p>	<p>Use dialysis tubing to conduct a buffer exchange prior to column chromatography</p>	<p>Pipet Pumps, Reagents, Glassware, Centrifuges, Micropipets, Dry Block Heaters</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Conducting Experiments (35.1 – 3)</p>	<p>Vocabulary D, E (11,12)</p> <p>Writing Applications D (11,12)</p>
17 Q3	<p>Size Exclusion Chromatography Lab</p> <p>(hemoglobin/vitamin B12 mixture using P-60 columns</p>	<p>Separate a mixture of biomolecules, determine the number of components in a mixture, study the chemical and physical properties of biomolecules, apply the principles of chromatography</p> <p><i>Biorad's Size Exclusion Chromatography Lab Kit</i></p>	<p>Transfer Pipets, P-60 Columns, Reagents, Chromatography Poly-Prep Columns, Spectrophotometers</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Conducting Experiments (35.1 – 3)</p> <p>Perform Ion Exchange Chromatography (45.9)</p> <p>Interpret Chromatographic Results (45.2)</p>	<p>Vocabulary D, E (11,12)</p> <p>Writing Applications D (11,12)</p> <p>Scientific Inquiry A (9-12)</p>

18	9.3 Column Chromatography  C) Using Ion-Exchange Chromatography Lab	Separate lysozyme from albumin on an ion-exchange column  <i>* Protein Manufacturing Research Career Exploration</i>	Reagents, Glassware, Micropipets, Spectrophotometers, Chromatography Columns	<i>Inquiry Discovery, and Problem-Based</i>	Prepare Lab Reagents (42.1) Perform Sample Analysis (42.6) Conducting Experiments (35.1 – 3) Protein Bioprocessing Methods (42.1 – 4) Perform Ion Exchange Chromatography (45.9) Prepare Lab Reagents (42.1)	Vocabulary D, E (11,12) Writing Applications D (11,12) Research B (8-12)
19	9.4 Product Quality Control + 9.5 Marketing and Sales  D) Ion-Exchange Purification of Amylase	Use an ion-exchange column to determine the overall charge of amylase at pH 7.2 and isolate amylase from a broth culture	Micropipets, Reagents, Pipet Pumps, Chromatography Columns, Spectrophotometers	<i>Inquiry Discovery, Web, and Problem-Based</i>	Perform Sample Analysis (42.6) Conducting Experiments (35.1 – 3) Perform Ion Exchange Chromatography (45.9) Bioethics (48)	Vocabulary D, E (11,12) Writing Applications D (11,12) Research B (8-12)
20	Biotech Capstone Research Project  Part 1- Preparing for Local Science Fair	Students work on independent research as an inquiry project to present at Science Fair and to industry leaders during the senior capstone festival.	Any to all Biotech Equipment	<i>Inquiry, Project and Problem-Based</i>	Conducting Research + Experiments (34, 35) Prepare Lab Reagents (42.1) Perform Sample Analysis (42.6) Writing/Documentation (50)	Scientific Inquiry- A (11, 12) Writing Applications D (11,12) Research B (8-12)
21	Biotech Capstone Research Project  Part 2- Preparing for Local Science Fair	Students work on independent research as an inquiry project to present at Science Fair and to industry leaders during the senior capstone festival.	Any to all Biotech Equipment	<i>Inquiry, Project and Problem-Based</i>	Conducting Research + Experiments (34, 35) Prepare Lab Reagents (42.1) Perform Sample Analysis (42.6) Writing/Documentation (50)	Scientific Inquiry- A (11, 12) Writing Applications D (11,12) Research B (8-12)
22	Biotech Capstone Research Project  Part 3- Preparing for Local Science Fair	Students work on independent research as an inquiry project to present at Science Fair and to industry leaders during the senior capstone festival.	Any to all Biotech Equipment	<i>Inquiry, Project and Problem-Based</i>	Conducting Research + Experiments (34, 35) Prepare Lab Reagents (42.1) Perform Sample Analysis (42.6) Writing/Documentation (50)	Scientific Inquiry- A (11, 12) Writing Applications D (11,12) Research B (8-12)

23	<p>Biotech Capstone Research Project</p> <p>Part 4- <i>Local Science Fair Competition!</i></p>	<p>Students work on independent research as an inquiry project to present at Science Fair and to industry leaders during the senior capstone festival.</p> <p><i>Students present their research at the Local Science Fair</i></p>	<p>Any to all Biotech Equipment</p>	<p><b>Inquiry, Project and Problem-Based</b></p>	<p>Conducting Research + Experiments (34, 35)</p> <p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Writing/Documentation (50)</p>	<p>Scientific Inquiry- A (11, 12)</p> <p>Writing Applications D (11,12)</p> <p>Research B (8-12)</p>
24	<p>13.1 Making DNA Molecules (<i>in vivo and in vitro replication</i>)</p> <p>A) DNA Synthesis Lab</p> <p>B) Separating DNA Fragments on a PAGE Gel Lab</p>	<p>A) Replicate a DNA strand from a template, use Southern Blot, Colormetric Visualization</p> <p><i>Can DNA fragments at different lengths be synthesized in vitro? How does changing dNTP's affect DNA synthesis strand development?</i></p> <p>B) Prepare and load a DNA PAGE gel and separate DNA molecules on a gel for future study</p>	<p>Reagents, Glassware, Micropipets, Water Baths, Microcentrifuges, Dry Block Heaters, Vertical Gel Boxes, Power Supplies</p>	<p><b>Inquiry, Discovery, Web, and Problem-Based</b></p>	<p>Isolate DNA (43.4)</p> <p>Advanced DNA Techniques (43.6)</p> <p>Applications of Molecular Biology (43.7)</p> <p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Conducting Experiments (35.1 – 3)</p>	<p>Vocabulary D, E (11,12)</p> <p>Scientific Inquiry- A (11, 12)</p> <p>Writing Applications D (11,12)</p> <p>Life Sciences A (11,12)</p>
25	<p>13.2 DNA Synthesis Products (Southern Blotting and Primers)</p> <p>C) Conducting a Southern Blot Lab</p> <p>D) <i>Visualizing DNA on a Southern Blot Lab</i></p>	<p>C) Transfer DNA synthesis fragments from Lab A/B to a positively charge nylon membrane for staining and visualizing the fragment lengths</p> <p>D) <i>Use a colormetric method to visualize the DNA synthesis fragments on a Southern Blot membrane (or use Biorad methods to visualize blots)</i></p>	<p>Reagents, Glassware, Micropipets</p>	<p><b>Inquiry, Discovery, Web, and Problem-Based</b></p>	<p>Advanced DNA Techniques (43.6)</p> <p>Applications of Molecular Biology (43.7)</p> <p>Prepare Lab Reagents (42.1)</p> <p>Perform Sample Analysis (42.6)</p> <p>Conducting Experiments (35.1 – 3)</p>	<p>Vocabulary D, E (11,12)</p> <p>Scientific Inquiry- A (11, 12)</p> <p>Writing Applications D (11,12)</p> <p>Life Sciences A (11,12)</p>
26	<p>Biotech Capstone Research Project</p> <p>Part 5- Preparing for District Science Fair (Central State University)</p> <p><i>Research Presentation on Weekend!</i></p>	<p>Students work on independent research as an inquiry project to present at Science Fair and to industry leaders during the senior capstone festival.</p> <p><i>Students present their research at the District Science Fair- Central State</i></p>	<p>Any to all Biotech Equipment</p>	<p><b>Inquiry and Problem-Based</b></p>	<p>Conducting Research + Experiments (34, 35)</p> <p>Writing/Documentation (50)</p> <p>Other Biotech Standards that may apply (35 – 49)</p>	<p>Scientific Inquiry- A (11, 12)</p> <p>Writing Applications D (11,12)</p> <p>Scientific Inquiry- A (11, 12)</p>

27	<p>13.3. Polymerase Chain Reaction (Primers, Taq Polymerase)</p> <p>E) Using PCR to Amplify Regions of Lambda Phage DNA Lab</p> <p><i>F) Extracting DNA from Human Cells for PCR and Sequencing Lab</i></p>	<p>E) How many regions of Lambda DNA are amplified using the Pf primer and Pr primer? What are the sizes of the PCR products?</p> <p><i>F) Collect cheek or hair cell samples, isolate DNA from cells</i></p>	<p>Thermocyclers, Reagents, Glassware, Micropipets, Horizontal Gel Boxes, Power Supplies, Air Gel Dryer, Tabletop Balances, Microcentrifuges, Dry Block Heaters, Vortexers, Rocking Platforms</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Isolate DNA (43.4) Advanced DNA Techniques (43.6) Applications of Molecular Biology (43.7) Prepare Lab Reagents (42.1) Perform Sample Analysis (42.6) Conducting Experiments (35.1 – 3)</p>	<p>Vocabulary D, E (11,12) Writing Applications D (11,12) Scientific Inquiry- A (11, 12) Life Sciences A (11,12)</p>
28 Q4	<p>13.3. Polymerase Chain Reaction (Primers, Taq Polymerase)</p> <p>G) PV92 Informatics Lab</p>	<p>G) Use DNA samples from lab F for PCR amplification, analyze student allelic frequencies, compare classroom genetic composition with other populations around the world <i>(determine Hardy-Weinberg analysis on results; web-based bioninformatics)</i></p> <p><i>Biorrad's PV92 Informatics Lab Kit</i></p>	<p>Thermocyclers, Reagents, Glassware, Horizontal Gel Boxes, Power Supplies, Microcentrifuges, Micropipets, Gel Air Dryer, Water Baths, Vortexers, Rocking Platforms</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Prepare Lab Reagents (42.1) Perform Sample Analysis (42.6) Conducting Experiments (35.1 – 3) Applications of Molecular Biology (43.7) Genetics and Heredity (43.1) Advanced DNA Techniques (43.6) Bioethics (48)</p>	<p>Vocabulary D, E (11,12) Writing Applications D (11,12) Scientific Inquiry- A (11, 12) Life Sciences A (11,12)</p>
29	<p>14.1 Advanced Protein Studies <i>Bioethics, Sanger Method</i></p> <p>14.2 + 14.3 Advanced DNA + Protein Studies <i>HIV, Mad Cow, SARS, West Nile, Biodefense, Cancer Treatment, Drug/Steroid Testing, Pregnancy, Reproduction, GMO's</i></p> <p>A) ELISA Immuno Explorer Lab</p>	<p><i>Apply genuine diagnostic procedures, simulate real-world HIV testing, simulate GMO, pregnancy, and drug testing</i></p> <p><i>Biorrad's ELISA Immuno Explore Lab Kit</i></p> <p><i>* Forensics, Genetics, Advanced Molecular Biologist Research Career Exploration</i></p>	<p>Micropipeters, Reagents, Glassware, Microplate Readers</p>	<p><i>Inquiry</i> <i>Discovery, Web, and Problem-Based</i></p>	<p>Prepare Lab Reagents (42.1) Perform Sample Analysis (42.6) Conducting Experiments (35.1 – 3) Antibody Mediated Immunity (44.8)</p>	<p>Vocabulary D, E (11,12) Writing Applications D (11,12) Scientific Inquiry- A (11, 12) Life Sciences A (11,12)</p>

30	14.3 Advanced Protein Studies B) Using a Western Blot to Identify Actin Lab	B) Conduct a Western Blot to identify actin in solution	Vertical Gel Boxes, Micropipets, Reagents, Glassware, Dry Block Heaters, Microcentrifuges	<i>Inquiry, Discovery, Web, and Problem-Based</i>	Prepare Lab Reagents (42.1) Perform Sample Analysis (42.6) Conducting Experiments (35.1 – 3) Antibody Mediated Immunity (44.8)	Vocabulary D, E (11,12) Writing Applications D (11,12) Scientific Inquiry- A (11, 12) Life Sciences A (11,12)
31	Review Lecture + Labs for State Core Exam <i>Senior Capstone Research and Documentation Part A</i>	Seniors Review Biotech Lecture and Labs in Preparing for State Core Exam <i>Seniors work on Biotech Research for Capstone Project</i>	Any to all Biotech Equipment and Reagents	<i>Inquiry, Project and Problem-Based</i>	Conducting Research + Experiments (34, 35) Technical Writing/Documentation (unit 50) Formal Presentations (3,9) Core Competencies (1-5)	Writing Applications D (11,12) Scientific Inquiry- A (11, 12)
32	<u>State Core Exam</u> <i>Senior Capstone Research and Documentation Part B</i>	Seniors take State Core Examination <i>Final Week to Finish Biotech Research for Capstone Project</i>	Any to all Biotech Equipment and Reagents	<i>Inquiry, Project and Problem-Based</i>	Conducting Research + Experiments (34, 35) Technical Writing/Documentation (unit 50) Formal Presentations (3,9) Core Competencies (1-5)	Writing Applications D (11,12) Scientific Inquiry- A (11, 12)
33	Senior Capstone Final Week (Trial Run) & <u>Final Presentation With Industry Partners</u>	Seniors Finalize Biotech Research and Practice Presenting Powerpoint/Video <i>Seniors Present Project to Industry Partners</i>	Any to all Biotech Equipment and Reagents	<i>Inquiry, Project and Problem-Based</i>	Conducting Research + Experiments (34, 35) Technical Writing/Documentation (unit 50) Formal Presentations (3,9) Core Competencies (1-5)	Writing Applications D (11,12) Scientific Inquiry- A (11, 12)
34	<u>Final Exam</u> Lab Cleanup + Inventory Last week of Senior Students	50% from the State Core Exam Score and 50% from the Senior Capstone Project Presentation Score <i>* Lab gets thoroughly cleaned!</i>	Chemical Reagents	<i>Inquiry, Project and Problem-Based</i>	Laboratory Safety, Chemical Materials & Chemical Handling (35.0/ 36.1 – 36.6) Chemical Materials Handling & Biohazard Storage (38.1 – 38.2,7 & 40.1 – 40.3,10)	Science Inquiry- A (9, 10)
35	NO SENIORS	X	X	X	X	X
36	NO SENIORS	X	X	X	X	X

- All slideshow lectures and vocabulary are digital.
- Student Lab Reports are hand written and final copy submitted electronically.
- Online Software “Classjump” will be used as an interface module.

**All Biotechnology content references the following Sinclair Community College classes:**

ENG 111-112  
COM 225  
BTN 120  
BTN 110  
MAT 106  
BIS 160

\* CHEM 131 is included in many lectures and labs.

**Graduating Biotechnology seniors will receive college credit from Sinclair in the following classes below:**

**Articulate Classes:**

**BTN 110 (Biotechnology and Bioethics) 3 credits**

**BTN 120 (Laboratory Safety and Regulatory Compliance) 3 credits**

Biotechnology students also have the potential to test out of the following classes below:

**BIS 160 (Introduction to Word, PP, Excel, Access) 3 credits**

**BIO 107 (Human Biology) 5 credits**