## Course Outline/Scope and Sequence Using B:S4NM The rAmylase Project

### Semester 1 (18 weeks) – Biotechnology Standard Laboratory Operating Procedures

<table>
<thead>
<tr>
<th>Concepts/Lectures/Readings</th>
<th>Process/Laboratory Work/Computer Work/Out of class work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch 1 (4 wk.) Intro to Biotechnology</td>
<td>Activity 1.1 What is Biotechnology?</td>
</tr>
<tr>
<td>Who/What/Where/How of Biotech</td>
<td>Activity 1.2 The Business Side of Biotechnology</td>
</tr>
<tr>
<td>Biotech Facilities and Careers</td>
<td>Activity 1.3 Investing in Biotechnology (Semester Stock Project)</td>
</tr>
<tr>
<td>Scientific Methodology</td>
<td>Lab 1b Safety in the Biotech Laboratory</td>
</tr>
<tr>
<td>Data Processing/Reporting</td>
<td>Lab 1c Biotech Cheese Production - Scientific Methodology Lab</td>
</tr>
<tr>
<td>Bioethics Dilemma</td>
<td>Internet/WWW, Word®, Excel®, PowerPoint®</td>
</tr>
<tr>
<td>Ch 2 (3 wk.) Biotech Biology</td>
<td>Activity 1.5 Staying Current in Biotechnology</td>
</tr>
<tr>
<td>Levels of Biological Organization</td>
<td>Using Animals in Science and Industry</td>
</tr>
<tr>
<td>Bioethics Dilemma</td>
<td>Activity 2.1 Biohazards</td>
</tr>
<tr>
<td>Ch 3 (3 wk.) Biotech Chemistry</td>
<td>Labs 2c/2d Microscopy</td>
</tr>
<tr>
<td>Activity 2.2 What is the American Type Culture Collection</td>
<td>Stem Cells “Stop! You cannot use THOSE Cells.”</td>
</tr>
<tr>
<td>Ch 4 (4 wk.) DNA Studies</td>
<td>Labs 3a/3b Volume Measurement/Pipets and Micropipets</td>
</tr>
<tr>
<td>Measurement</td>
<td>Activity 3.3 Hazardous Chemicals</td>
</tr>
<tr>
<td>Bioethics Dilemma</td>
<td>Labs 3c Mass Measurement/Balances</td>
</tr>
<tr>
<td>Molarity and Solution Preparation</td>
<td>Activity 3.4 Finding Molecular Weights</td>
</tr>
<tr>
<td>Bioethics Dilemma</td>
<td>Labs 3e, 3g, 3h Solution and Dilution Preparation</td>
</tr>
<tr>
<td>Ch 5 (3 wk.) Protein Studies</td>
<td>Is Honest Always the Best Policy?</td>
</tr>
<tr>
<td>Protein Function - Antibodies</td>
<td>Biotech Online: Know Your Genome</td>
</tr>
<tr>
<td>Protein Function - Enzymes</td>
<td>Activity 4.2 E.coli: Model Organism</td>
</tr>
<tr>
<td>Bioethics Dilemma</td>
<td>Labs 4f/4g Sterile Technique and Bacterial Cell Culture</td>
</tr>
<tr>
<td>Ch 6 (1 wk.) End of Semester (1 wk.)</td>
<td>Activity 4.3 Isolation</td>
</tr>
<tr>
<td>Media Prep</td>
<td>Lab 4h Bacterial DNA Extraction</td>
</tr>
<tr>
<td>Sterile Technique and Cell Culture</td>
<td>Lab 4j Agarose Gel Electrophoresis to Study DNA</td>
</tr>
<tr>
<td>Section 4.1 DNA Structure</td>
<td>The Promise of Gene Therapy</td>
</tr>
<tr>
<td>Section 4.3 Isolation and Manipulating DNA</td>
<td>Activity 5.1 Structure and Function of Proteins</td>
</tr>
<tr>
<td>Section 4.4 DNA Electrophoresis</td>
<td>Lab 5a Ouchterlony Ab-Ag Testing</td>
</tr>
<tr>
<td>Bioethics Dilemma</td>
<td>Lab 5b Enzyme Activity Testing</td>
</tr>
<tr>
<td>Ch 6 (1 wk.) End of Semester (1 wk.)</td>
<td>Biotech Online: Enzymes: Catalysts for Better Health</td>
</tr>
<tr>
<td>Media Prep</td>
<td>Testing and/or Project Presentations</td>
</tr>
</tbody>
</table>

- **Activity 1.1 What is Biotechnology?**
- **Activity 1.2 The Business Side of Biotechnology**
- **Activity 1.3 Investing in Biotechnology (Semester Stock Project)**
- **Lab 1b Safety in the Biotech Laboratory**
- **Lab 1c Biotech Cheese Production - Scientific Methodology Lab**
- **Internet/WWW, Word®, Excel®, PowerPoint®**
- **Activity 1.5 Staying Current in Biotechnology**
- **Using Animals in Science and Industry**
- **Activity 2.1 Biohazards**
- **Labs 2c/2d Microscopy**
- **Stem Cells “Stop! You cannot use THOSE Cells.”**
- **Activity 3.3 Hazardous Chemicals**
- **Labs 3a/3b Volume Measurement/Pipets and Micropipets**
- **Activity 3.4 Finding Molecular Weights**
- **Labs 3e, 3g, 3h Solution and Dilution Preparation**
- **Is Honest Always the Best Policy?**
- **Biotech Online: Know Your Genome**
- **Activity 4.2 E.coli: Model Organism**
- **Labs 4f/4g Sterile Technique and Bacterial Cell Culture**
- **Activity 4.3 Isolation and Manipulating DNA**
- **Lab 4h Bacterial DNA Extraction**
- **Lab 4j Agarose Gel Electrophoresis to Study DNA**
- **The Promise of Gene Therapy**
- **Activity 5.1 Structure and Function of Proteins**
- **Lab 5a Ouchterlony Ab-Ag Testing**
- **Lab 5b Enzyme Activity Testing**
- **Biotech Online: Enzymes: Catalysts for Better Health**
- **Testing and/or Project Presentations**
Semester 2 (18 weeks) - The rAmylase Project, a model of recombinant protein product research and manufacturing

**Concepts/Lectures/Readings**

- **Ch 5 (3 wk.) Protein Structure**
  - Section 5.4 PAGE Electrophoresis
  - Amylase Protein Analysis
  - Bioethics Dilemma

- **Ch 6 (4 wk.) Potential Protein Products**
  - Amylase Protein Assays
  - Using ELISA Technology
  - Using Western Blotting
  - Bioethics Dilemma

- **Ch 7 (2 wk.) Protein Spectrophotometry**
  - Protein Concentration Assays
  - Bioethics Dilemma

- **Ch 8 (4 wk.) Products of Genetic Engineering**
  - Recombinant DNA/Plasmid Studies
  - Commercial Genetic Engineering
  - Recovery of Plasmid DNA

- **Ch 9 (2 wk.) Section 9.1 Protein Manufacturing**
  - Protein Concentration Assays

- **Ch 13 (2 wk.) Advanced DNA and Protein Studies**
  - Polymerase Chain Reaction
  - Applications of PCR (Human Genotyping)

**Process/Laboratory Work/Computer Work**

- **Activity 5.2 Determining the Amino Acid Sequence of Insulin**

- **Protein Gel Electrophoresis vs. DNA Gel Electrophoresis**

- **Lab 5f Kit: Characterizing Proteins using PAGE**
  - Who Owns the Patent on your Protein Codes

- **Activity 6.1 Exploring Potential Products**
  - Lab 6c Kit: Assaying for Amylase Activity
  - Biotech Online: ELISA Technology in Diagnostic Kits
  - Lab 6d Kit: Direct ELISA of Bacterial Alpha-Amylase
  - Lab 6d Kit: Western Blot to Identify Alpha-Amylase
  - Limited Medication: Who gets it?

- **Activity 7.1 Visual Spectrophotometry Virtually**
  - Lab 7g Kit: Determination the Concentration of Amylase in Solution
  - Test Results: Who Should Get Access to Them?

- **Biotech Online Restriction Digestion Enzymes**
  - Lab 8b Kit: Restriction Digestion to Verify pAmylase Plasmid
  - Lab 8c Kit: Transformation of *E. coli* by pAmylase Plasmid
  - Lab 8g Kit: Miniprep to Recover pAmylase

- **Biotech Online: Products in the Pipeline**
  - Lab 9c Kit: Protein Separation using Column Chromatography

- **Lab 13h Kit: PCR to Determine the Origin of Amylase Gene in pAmy**
  - Alu PCR Lab Kit, GBio #BE-305
  - Testing and/or Project Presentations

End of Semester (1 wk.)