

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

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

<u>Concepts/Lectures/Readings</u>	<u>Process/Laboratory Work/Computer Work/Out of class work</u>
Ch 1 (4 wk.) Intro to Biotechnology Who/What/Where/How of Biotech Biotech Facilities and Careers Scientific Methodology Data Processing/Reporting Bioethics Dilemma	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
Ch 2 (3 wk.) Biotech Biology Levels of Biological Organization Bioethics Dilemma	Lab 2b Model Organism Growth Activity 2.1 Biohazards Labs 2c/2d Microscopy Activity 2.2 What is the American Type Culture Collection Stem Cells “Stop! You cannot use THOSE Cells.”
Ch 3 (3 wk.) Biotech Chemistry Measurement Molarity and Solution Preparation Bioethics Dilemma	Activity 3.3 Hazardous Chemicals Labs 3a/3b Volume Measurement/Pipets and Micropipets Lab 3c Mass Measurement/Balances Activity 3.4 Finding Molecular Weights Labs 3e, 3g, 3h Solution and Dilution Preparation Is Honest Always the Best Policy?
Ch 4 (4 wk.) DNA Studies Section 4.1 DNA Structure Media Prep Sterile Technique and Cell Culture Section 4.3 Isolation and Manipulating DNA Section 4.4 DNA Electrophoresis Bioethics Dilemma	Biotech Online: Know Your Genome Lab 4b DNA Isolation Lab 4e Media Preparation Activity 4.2 <i>E.coli</i> : Model Organism Labs 4f/4g Sterile Technique and Bacterial Cell Culture Lab 4h Bacterial DNA Extraction Lab 4j Agarose Gel Electrophoresis to Study DNA The Promise of Gene Therapy
Ch 5 (3 wk.) Protein Studies Protein Function - Antibodies Protein Function - Enzymes	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
End of Semester (1 wk.)	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)

End of Semester (1 wk.)

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