# Biotechnology

### Ms. Tuason – Fall 2022

### Semester 1 from August 17, 2022 – December 21, 2022 from 2:40 pm to 5:10 pm

The lecture is extremely important. It is the basic source of material for the course. It is where you will be introduced to new information, be involved in discussions with your instructor and peers, and have the opportunity to ask questions. **Attendance is therefore important!**

| Week | Meeting Days 2.5hrs/day | Semester 1 Lecture Topics | Key Lab Skill Objectives/Lab Activities<br>Reading Assignments in ED's Biotechnology book<br>ED=Ellyn Daugherty BO=Biotech Online BL=Biotech Live |
|---|---|---|---|
| 1 | 2 | **Introduction: Ch 1 What is Biotechnology**<br>1. Classroom procedures and grading<br>2. Laboratory Safety<br>a. Review Safety Rules<br>b. Emergency guidelines<br>c. Lab procedures and equipment<br>3. Introduction to Biotechnology<br>a. What is Biotechnology?<br>b. History of Biotechnology<br>c. Careers in Biotechnology | 1. Lab Safety Rules Exam<br>2. Learn how to maintain a scientific notebook<br>3. Bleach Lab on Tuesday<br>Read ED Ch. 1.1-1.3 pages 3-18<br>Do B.O. pg 13, 18 B.O. = Biotech Online<br>Read Bleach Lab pg 19-21 ED |
| 2 | 2 | 1. Scientific Methodology: Bleach Lab/Cheese Production<br>2. The Basic Skills of the Biotechnology Workplace<br>- Measuring Volumes | 1. Conduct controlled experiment; analyze and report data<br>2. Bleach Lab pg 19-21 ED<br>3. Cheese Lab<br>Read ED Ch. 1.4 - 1.5 pages 19-23<br>Do B.O. pg 26,29<br>Read Summary and Lab Practices pg 30-31 |
| 3 | 2 | **Ch 2 The RawMarterials of Biotechnology**<br>1. Atoms and molecular structure<br>2. Chemical bonds<br>3. Properties of acids and bases | 1. Microscope Lab<br>2.Cell Structure<br>3. Learn how to streak bacterial plates<br>Read ED Ch. 2.1 – 2.2 pages 41- 51<br>Do B.O. pg 45 ED |
| 4 | 2 | 1. Organic compounds and macromolecules of life<br>2. Cells | 1. Organic Lab: test for proteins, carbohydrates and lipids- teacher set up<br>2. Measuring pH Lab: Acids and Bases<br>Read ED Ch. 2.3 - 2.4 pages 52-63<br>Do B.O. pg 52,62 ED<br>Read Summary and Lab Practices pg 64-65 |
| 5 | 2 | **Ch 3 Basic Skills of the Biotechnology Workplace**<br>1. Unit Conversions and Molar Concentrations<br>2. Material Safety Data Sheet<br>3. Math Problems | 1. Pipetting Activity<br>2. Math Problems<br>Read ED Ch. 3.1 – 3.3 pages 71-91<br>Do B.O. pg 74,78 ED |
| 6 | 1 | 1. More Math Problems | Read ED Ch. 3.4-3.6 pages 84-91<br>Read Summary and Lab Practices pg 92-93<br>Download Amgen (ABE) Lab Manual<br>Read ABE Lab 1 |

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| 7-8 | 2 | **Ch 4 DNA Structure and Function:**<br>Prokaryotic, Eukaryotic, Viral<br>1. Physical and chemical properties<br>2. Universality of DNA<br>3. DNA Synthesis – Replication<br>**Using Gel Electrophoresis to Study Molecules**<br>1. Components of gel electrophoresis<br>2. Properties used for Separation of Molecules | 1. DNA Model<br>2. Lab on DNA Extraction and Isolation from Strawberries<br>3. ABE Lab 1 Gel Electrophoresis<br>a. Microvolumetric pipetting exercise<br>b. Prepare gel agarose<br>c. Gel Electrophoresis<br>Read ED Ch 4.1-4.3 pages 103-119<br>Do B.O. pg 112, 116<br>Read ABE Labs 1, 2, 3 |
| 9-10 | 4 | **Ch 4 The "New" Biotechnology – Genetic Engineering**<br>1. Overview of Genetic Engineering<br>2. Restriction Digest of Plasmid – Single Digest<br>3. Ligation of Restriction Fragments | 1 ABE Lab 2 Restriction digest of pARA and pKAN-R<br>2 ABE Lab 3 Construction of rpARA – digestion and ligation of plasmids, *rfp* gene into vector<br>Read ED Ch. 4.3-4.4 pages 116-125<br>Do B.O. pg 118<br>Read Summary and Lab Practices pg 126-127<br>Read Amgen Manual Labs 3, 4 and 5 |
| 11-13 | 4 | 1. Double Digest of Plasmid<br>2. Construction of pARA using 2 enzymes<br>3. Transformation<br>4. Gene Expression | 1. ABE Lab 4 Confirmation of Restriction and Ligation by gel electrophoresis<br>2. ABE Lab 5 Transformation of *E.coli* with pARA-R<br>Read ED Ch. 5.1- 5.2 pages 135-146<br>Do B.O. pg 124 |
| 14-15 | 4 | **Review Genetic Engineering: Transformation**<br>1. Competent cells<br>2. Transformation Efficiencies<br>3. Media Screen | 1. Isolation and screening of transformed *E. coli*<br>2. Preparing overnight *E. coli* culture for GFP expression Isolation of GFP using Affinity Column Chromatography<br>Read ABE Lab 6 Isolation of MFP protein Isolation of MFP using Affinity Column Chromatography<br>Read ED Ch. 5.3 – 5.5 pages 147-157<br>Do B.O. pg 51 |
| 16-17 | 4 | **Ch 5 Introduction to Studying Proteins**<br>1. The structure and Function of Proteins<br>2. Enzymes<br>3. Studying Protein<br>4. Applications: PAGE | 1.Analyze Fish Proteins/MFP by PAGE<br>2.Enzyme Catalysis – Potato Catalase Lab<br>3. Antibody-Antigen Testing<br>Do B.O. pg 156<br>Read Summary and Lab Practices pg 158-159 |
| 18 | 2 | **Final Exam – Chapters 1-5 & ABE Labs 1-5** | **REVIEW and Final Exam** |

Textbook: Ellyn Daugherty's Biotechnology: Science for the New Millenium
**Textbook: online**
https://libgen.lc/ads.php?md5=47a8320638f34d94dc20cca2b84df4e3 takes you to the page where you could download the textbook as a PDF. You have to click on "GET" at the top. It takes a few minutes to download, and it looks the same as our books. A virus checker was done and it is safe to download.
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