

Unit 00 Biotechnology

Introduction

In this unit you will familiarize yourself with basic biotechnology methods. Not only are these the methods that we will use in class, but they also are the methods used in both medicine and research. It is essential that you understand how the techniques work and when they are used.

The AP Biology curriculum is set up so that we will be doing experiments the first day back to school. We will be using gel electrophoresis, extracting your DNA, and performing PCR within the first two days of class. We need to do this because we do not have a lot of time in class and the short investment of your time on the assignments during the summer will make the curriculum during the school year run better.

For each topic there is a set of readings, simulations (when available), and videos for you to watch, answer questions and use to complete worksheets. If you do not understand a topic you can always email me for help. You are to have the work completed by the first day of school. We will begin the week with lab experiments, using some of the techniques that you have learned.

All of the files can be found with this link to the google folder:

<https://drive.google.com/drive/folders/0B1GYCYLOCILkYXNvUDhDX0dPMUk?usp=sharing>

In the Unit 00 folder, the activities are all numbered 00-15. This is my system – I number the worksheets in the order in which they are used. You will start with the file numbered 00 and go through 15. The assignments are broken up by topic. The topics are listed in this document.

Each part should take between 15 minutes to one hour to complete. The idea is that you become familiar with the concepts and understand how they work. You may have already encountered these concepts before, so this may be a review for you. You may not need all the readings and videos to understand a topic. They are there to help you understand the topic and are there if you need them.

Due Date

All worksheets are due 8/24/17. Any assignments handed in after that will be worth 50% of the total points up until 8/30/17. Any worksheets handed in after 8/30/17 will be worth **zero points**.

All of the worksheets combined are worth 50 points.

Topics and Assignments

All topics and assignments are outlined in this document and can be found in the google drive. Complete them in the order given.

Topic 1: Gel Electrophoresis- We use gel electrophoresis to “see” DNA fragments, RNA fragments, and proteins.

Assignment 1:What is gel electrophoresis?
Read the article and take your own notes.

Article is available at Your Genome:

<http://www.yourgenome.org/facts/what-is-gel-electrophoresis>

Assignment 2: YouTube Mr. Simple Science Video
Watch the video about gel electrophoresis and take any notes.
Use the link below:

<https://www.youtube.com/watch?v=XSO4ZBzu4jA>

Assignment 3: Gel electrophoresis-Learn Genetics (worth 10 points)

Use this link to go along with the worksheet:

<http://learn.genetics.utah.edu/content/labs/gel/>

And if the simulation does not work on your computer, you can use the YouTube link for the simulation:

<https://www.youtube.com/watch?v=QrUL2W9fj3U>

The worksheet is available here (as well as in the folder):

<http://www.learnnc.org/lp/media/uploads/2010/11/gel-electrophoresis-lab-sheet.pdf>

Topic 2: DNA Restriction Enzymes- known as genetic scissors, restriction enzymes cut DNA at specific sequences.

Assignment 4: Restriction Enzymes Short Reading – in the folder
Read the article and take your own notes

Assignment 5: McGraw Hill Restriction Enzyme Tutorial

Watch the tutorial and take your own notes

http://highered.mheducation.com/sites/dl/free/0072421975/196644/restriction_endonucleases.html

Assignment 6: Restriction Enzymes: How is DNA Manipulated? (Worth 10 points)
Read the worksheet and complete it.

Topic 3: Plasmid Technology- Plasmids allow us to create more copies of a specific piece of DNA. It is used to study genes and grow up medicines such as insulin.

Assignment 7: How can recombinant DNA be used to solve problems?
Read the article and take your own notes.

Assignment 8: Features of a Plasmid Reading
Read the article and take your own notes

Assignment 9: Plasmid Cloning Tutorial (Worth 10 points)
Follow along the tutorial and answer the questions on the worksheet

Topic 4: PCR- This allows for rapid amplification of DNA for analysis
Assignment 10: What is the polymerase chain reaction?
Read the article and take your own notes

Assignment 11: YouTube video about PCR
Watch it and take any notes
<https://www.youtube.com/watch?v=iQsu3Kz9NYo>

Assignment 12: The PCR Wrap-Up Worksheet (Worth 10 points)

Topic 5: DNA Sequencing- The method described allows researchers to see the actual base pair sequence of a gene or a stretch of DNA.

Assignment 13: DNA Sequencing Background Information
Read and take your own notes.

Assignment 14: Video-DNA Sequencing: The Chain Termination Method (Sanger Method)
<https://www.youtube.com/watch?v=vK-HlMaitnE>

Assignment 15: Sanger Sequencing Worksheet (Worth 10 points)