Spring Sting Packet 2017
Due: First day back from spring break

Below is a checklist of what you should complete over spring break.

- □ Lab Review Poster – directions below (due___)
- □ Ch 11 & Ch 45 RG (Due ____ & ____)
- □ MB Cellular Controls (due___)
- □ Human Hormone chart (started in class) (due___)
- □ Plan to complete your plant hormone infomercial (due after break) (due___)
- □ HHMI bacterial identification lab & questions (in packet) (due___)
  http://www.hhmi.org/biointeractive/vlabs/bacterial_id/index.html
- □ **Extra Credit:** Build a paper model of an antibody (due Monday 4/11) see the link below for instructions and to print the paper model template
  http://pdb101.rcsb.org/learn/resource/antibody-activity-page#about

Do you want to get prepared?
You should be reviewing for the AP exam in May. Meet with your study group and review.

Lab Review Poster
Poster format:
Include the following on your poster

1. Title and # of the lab
2. Big ideas & Science Practices that were met by doing this lab
3. Purpose or goal of the lab
4. Overview of procedure (short!)
5. Sample data – what data did you need to collect? It should be in a table with a title!
6. Analysis of data – what calculations were needed, how should data be presented? What should graphs look like etc.
7. If this was an inquiry lab what types of different questions were asked? For example in the transpiration lab include all factors that can affect the rate of transpiration and how they affected the rate
8. Conclusion statement(s) ex: Wind increases the rate of transpiration
9. List essential knowledge at the bottom of your poster (E.K 2.A.3, 2.C.1, etc)

Table 1 – WFP Artificial selection
Table 2– Hardy Weinberg
Table 3 & 14– Enzymes
Table 4– Diffusion and Osmosis
Table 6– Photosynthesis (leaf disk)
Table 7– Cellular Respiration
Table 8– Bacterial Transformation & Gel electrophoresis
Table 9- Energy Dynamics
Table 11 & 15-Transpiration
Table 12– Animal Behavior
Table 13 –BLAST

10. Each group is responsible for one lab. We will present the labs during class and then hang the posters. It is your responsibility to come in and review them if you need extra time.

    Science Practice 1: The student can use representations and models to communicate scientific phenomena and solve scientific problems.
    Science Practice 2: The student can use mathematics appropriately.
    Science Practice 3: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.
    Science Practice 4: The student can plan and implement data collection strategies appropriate to a particular scientific question.
    Science Practice 5: The student can perform data analysis and evaluation of evidence.
    Science Practice 6: The student can work with scientific explanations and theories.
    Science Practice 7: The student is able to connect and relate knowledge across various scales, concepts and representations in and across domains.

Howard Hughes Medical Institute: BioInteractive Virtual Lab Bacterial Identification Lab

Prepared by Ann Brokaw, Rocky River High School

Introduction

1. Go to www.hhmi.org/biointeractive/vlabs/.
   2. Scroll down and click on The Bacterial Identification Lab. 3.
2. Maximize the screen if you wish.

Instructions: Answer the following questions in the spaces provided.

1. What is the overall purpose of this virtual lab?

2. What are the four basic steps involved in this bacterial identification lab?
   a.
   b.
   c.
   d.
3. To what does "16S rDNA" refer, and how does it relate to this lab and to different species of bacteria?

Click to Enter the Lab (Click the window on the left-hand side of the screen to enter the lab.)
As you enter the lab, follow the instructions in the lab (left-hand window) and answer the following questions pertaining to each part using the information Notebook window on the right.

Part 1: Sample Preparation

1. As the pathology lab technician, what is your task in this virtual lab?

2. Extracting DNA involves what initial step? _____. This step utilizes proteolytic enzymes, which need to be disposed of before proceeding. How do you dispose of the enzymes?

3. After removing the enzymes, what happens to the cellular debris and how?

4. Where is the DNA once the cellular debris is centrifuged?
   _____

5. What is supernatant? _____ What type of tube is the supernatant transferred to? _____

Part 2: PCR Amplification

1. What does PCR stand for? What is the purpose of PCR?

2. How is the desired portion of DNA obtained?

3. **Step 1: Add Master Mix**
    1. What does the Master Mix contain?
    2. What are primers?
    3. Once the primers bind, what occurs next?
    4. What does "highly conserved" mean?
    5. Why is this important in this lab?
    6. What does "highly variable" mean?
    7. Why is this important in this lab?
    8. What is missing in the negative control tube?
    9. What is present in the positive control that is not in the negative control?

4. **Step 2: Run PCR**
    1. Be sure to watch the virtual lab animation before proceeding to the following questions.
    2. What is the name of each step of a cycle, the temperature of each, and time?
        i. _____
        ii. _____
        iii. _____
    3. Define "melt" (also called Denature):
    4. Define "anneal":
    5. Define "extend":

6. After 8 cycles, how many copies of the desired DNA have been synthesized? _____
7. After 29 cycles?_____

Part 3: PCR Purification

1. Approximately how long is the 16s rDNA (bp)? _____
2. Running an electrophoresis gel at this point is very useful. Why?

3. The gel should contain three lanes. What should you see in each lane after running the gel?
   a.

   b.

   c.

4. The gel is not run in this virtual lab. In order to purify the PCR product, you use a microconcentrator column. (Proceed through the virtual lab steps.) What should the final collection tube contain?

Part 4: Sequencing Preparation

1. Click on "Learn about cycle sequencing before proceeding." What is cycle sequencing? (From the first two paragraphs, take notes on this technique in the space provided.) What is the significance of the fluorescently tagged dideoxynucleotides?

2. One problem that arises in this technique is that replication must start at the same place on the target DNA each time. How is this problem avoided?

3. (Click to go back to Part 4.) Where do scientists obtain primers to be used in PCR and in this technique?

4. What do the green and blue tubes contain?

5. Be sure to watch the virtual lab animation before proceeding to Part 5.

Part 5: DNA Sequencing

1. What does each of the tubes contain?

2. What remains to be done?

3. What is gel electrophoresis?

4. How do DNA molecules move in relation to charge? Why?

5. What is the purpose of the laser beam? Why is its purpose significant?

6. Be sure to watch the virtual lab animation before proceeding to Part 6.

Part 6: DNA Sequence Analysis

1. Click on "Learn about the science behind sequence matching." What is the ultimate goal of this analysis?

2. What is "homology"?

3. A comprehensive database is needed for this analysis as well as an adequate program for searching the database. BLAST is one such program, because it offers a good combination of what?

4. What is the major assumption when drawing evolutionary relationships between organisms based on DNA sequences?

5. Click to go back to Part 6 and click on "Learn more about BLAST search results." Explain what the "Score (bits)" means on an actual BLAST search result.

6. What does an E-value of 3 or less represent?

7. Click to go back to part 6 and proceed through the instructions in the right-hand notebook window. Hints: "Ctrl A" will select all the data in the pop-up window, "Ctrl C" will copy it, and "Ctrl V" will paste it into the NCBI website (large yellow box at top of the blast search page).

8. When the blast results appear, scroll down below the color key to the significant alignments, and then go back to the virtual lab window (left) and follow the instructions.

9. What is the scientific name of the bacteria you sequenced?
   _____

10. Write a brief description of this bacterium in the space provided.

11. After completing Sample A, perform DNA sequence analysis on three of the other five samples. Write in the letter of the samples you choose, the scientific name of the bacteria (after doing a BLAST search), and a brief description of each.

Sample Letter	Bacteria Scientific Name	Brief Description