# AP Biology Summer Assignment, 2020-21

## Ms. Broerman

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Welcome to AP Biology☺ I am looking forward to a great year with you and I hope you are excited as well!

This course is designed to be the equivalent of a two-semester introductory college level biology course.  In other words, it's a little like drinking water from a fire hose!  It will be a rewarding experience, but as with most things that are, it will also be challenging.  You will be taking in a great deal of content, researching and writing essays, carrying out experiments and analyzing data, as well as enhancing your critical thinking skills.  There is a fair amount of work to be completed on your own time so that we can maximize in-class time with labs, analysis, and discussion.  Throughout the course, you will become familiar with four major recurring ideas that persist throughout all the topics and material; these themes are the big ideas you will also see on the AP exam.

| The 4 Big Ideas of AP Biology |
| --- |
| **Big Idea 1:** The process of evolution drives the diversity and unity of life. |
| **Big Idea 2:** Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis. |
| **Big Idea 3:** Living systems store, retrieve, transmit, and respond to information essential to life processes. |
| **Big Idea 4:** Biological systems interact, and these systems and their interactions possess complex properties. |

The following directions detail my expectations of your summer work.  The objective with this summer assignment is to introduce yourself to me, review some foundational skills in scientific practices and have everyone on the same page with introductory statistics.

**Part 1: Google classroom – due July 1, 2020**

I will be utilizing Google class to post assignments, resources, and various materials for you to use in and out of class.  It is critical that you become proficient with using Google classroom – there are several video tutorials to choose from if you need some guidance.

Join the AP Bio class on Google classroom using the following code: ya3x2eb

Starting in July, I will be posting some readings and questions that I would like you to respond to.

**Part 2: Introductory letter – due July 6, 2020**

You will write an introductory letter to me and submit it via google class.  Most of you already know me from 9th grade biology, however, I am confident that you have grown and changed in different ways and I want to take this opportunity to get to know you a little better.  Although this is an introductory letter, please check for spelling and grammar.  Include the following elements:

Title in google docs: AP Biology 2020-21 and your name (ex: AP Biology 2020-21: Ms. Broerman)

Body:

1.  Introduce yourself with name and what you go by if you prefer something other than what is in Power School.
2.  What are your hobbies/interests/passions?
3.  What is your major and what do you love about it?
4.  Tell me about your family – siblings? Who do you live with?  Anything specific details you want me to know?
5.  Do you have a job or plan to get one during your senior year?  How do you or plan to manage your academic responsibilities with job related duties?

Courses:

6.  What science classes have you taken so far?  What was your final grade in each of them?  What did you like about the courses and what did you find challenging?
7.  What classes will you be taking your senior year? (in both academics and arts)
8.  What AP classes have you taken before this year?  What were your grades and scores on the AP exam?
9.  What subject(s) are you most interested in pursuing at the college level?

Learning:

10. What are your personal strengths when it comes to learning new material?
11. What causes you to struggle in a course?  How do you address that challenge?
12. What is the most effective way you have found to study for a test?
13. How would you describe yourself as a learner?
14. How would you describe yourself as a team or group member?
15. How would you rate yourself with reading informational text, writing, and math skills (specifically algebra)?

AP Bio:

16. What are you most looking forward to in this course?
17. Do you have any concerns about taking AP Bio?
18. **Why are have you chosen to take AP Bio and what do you hope to accomplish/gain from the course?**

**Closing:** Wrap up with any thoughts I didn't address and please attach a picture of yourself (hopefully doing something you love!)


**Part 3: Graphing and Stats Practice – due on the first day of school (this portion of the summer assignment needs to be written by hand and turned in as a hard copy)**

AP Bio students are expected to come to the course with a strong science background and solid math skills.  We will work together throughout the year to sharpen those skills, but this summer assignment is meant to review and get your mind thinking about some of the basics involved in analyzing authentic biological data and themes.

You may be thinking, "Stats??? I thought this was AP Bio!" You are totally right, it is!  Having a strong understanding of the type of graph to use to display information and the skills needed to interpret those results will help you become an even stronger scientist as we are learning content together.  Complete the following pages for graphing and stats practice.

Review of (or intro to) Statistics

A. Go to http://bozemanscience.com/statistics-graphing (Mr. Anderson of Bozeman, MT)
   Take notes below and use additional paper if needed.
   1. Beginner's Guide to Graphing Data (from site listed above)

      a. What is the difference between a graph and a chart?

      b. What are the five major types of graphs?

      c. What type of graph uses a "best fit" line?

      d. Explain the difference between a bar graph and a histogram.

      e. Which type of graph shows change over time?

      f. Which type of graph displays a correlation of variables?

i. Distinguish between the independent and dependent variable in an experiment, and where their axes are on a graph.

g. Which type of graph is best for comparing 2 or more different groups?

h. Which type of graph is better for showing distribution of data?

i. Explain when a pie chart/graph should be used and give (draw, label) any example.

j. State at least 5 elements that any graph should always display.

B. Watch <u>Graphing Data by Spreadsheet</u> and <u>Graphing Data by Hand</u> (both are Bozeman science and are found in main website listed in A). Take notes on separate paper.

C. Watch Bozeman: Statistics for Science ([https://tinyurl.com/StatsforScience](https://tinyurl.com/StatsforScience)) – answer the following, take additional notes if needed

    a. What is n?

    b. What is $\bar{x}$ ?

    c. What is M?

    d. What was the range of the sample in his video?

    e. Explain "degrees of freedom" (with any ex) and why the formula for it is n-1.

D. Watch Bozeman: Standard Deviation ([https://tinyurl.com/y6ffcvtt](https://tinyurl.com/y6ffcvtt)) – answer the following and take additional notes if needed

    a. What is meant by *normal distribution*?

    b. What does standard deviation (SD) measure?

c. Can 2 sets of data have the same mean but a different SD?  Explain.

d. 1SD means _____% of the population falls within this range; while 2SD means _____% falls within this range

e. Pause the video and calculate the SD from the 2$^{nd}$ set of data given by hand. Show your work

f. Take notes on how to solve for SD using Excel.  You may want to save this video for quick reference for labs we will be doing throughout the course.

E. Watch Bozeman: Standard Error (https://tinyurl.com/y4ltazk3) and Kevin Piers: Standard Deviation & Standard Error of the Mean (https://youtu.be/3UPYpOLeRJg)

    a. From Bozeman: Explain the significance of the standard error among 2 different sets of data with different sample sizes that have the same mean (in terms of precision)

    b. From Piers:

        i. What do SEM bars that have overlapping means on a graph indicate?

        ii. Explain the significance if SEM bars overlap, but the means do not.

        iii. Explain the significance if there is no overlap between SEM bars.

F. Graphing and Stats Practice Problems:  Solve the following problems in pencil.  You must show all your work.  Make sure graphs have titles and axes are properly labeled with units. I've attached one graph paper template you can copy and cut down to fit next to each data table.  You could also cut down some of your own graph paper and attach next to each data table.

a. Graph the following sample data set showing the number of leaf disks that rise in a solution over time as photosynthesis occurs:

| Time (min) | # Disks floating |
|---|---|
| 1 | 0 |
| 2 | 0 |
| 3 | 0 |
| 4 | 0 |
| 5 | 0 |
| 6 | 0 |
| 7 | 1 |
| 8 | 1 |
| 9 | 1 |
| 10 | 2 |
| 11 | 5 |
| 12 | 8 |
| 13 | 10 |
| 14 | 14 |
| 15 | 14 |
| 16 | 15 |
| 17 | 20 |
| 18 | 20 |
| 19 | 20 |
| 20 | 18 |

b. Calculate the mean and SD for the following data set of annual monthly rainfall. Then use the data to sketch the appropriate type of graph.

| Month | Rainfall (cm) |
|---|---|
| Jan | 2.0 |
| Feb | 1.8 |
| Mar | 1.2 |
| April | 5.7 |
| May | 6.2 |
| Jun | 5.9 |
| Jul | 1.0 |
| Aug | 1.1 |
| Sept | 1.1 |
| Oct | 2.3 |
| Nov | 2.7 |
| Dec | 2.5 |

Mean =

SD =

G. Below are 2 samples of data that were collected (note: ignore labeling units and a title on this graph)

Sample A: 12, 13, 14, 15, 16, 17, 18 – Calculate the mean for Sample A:

Sample B: 10, 15, 20 – Calculate the mean for Sample B:

a. Are the calculated means sufficient in explaining the data?  Why or why not? (give specific evidence for your reasoning!)

b. Calculate SD for Sample A:

c. Calculate SD for Sample B:

d. Explain the significance of the results.

e. Calculate SEM for Sample A:

f. Calculate SEM for Sample B:

g. Graph your results, showing error bars for each.
   a. Do the bars overlap?
   b. Do the means overlap?
   c. Explain whether there are significant differences between the two populations or not.