

AP Biology Summer Assignments

Welcome to AP Biology! I can't wait to meet you (or see you again) in August. I hope you will find AP Biology to be as fun as I do; but it is intense. There is a lot of material that needs to be covered in a relatively short amount of time, so be aware that it is going to take A LOT of independent work and you will spend many hours learning content on your own outside of class. Keep in mind, AP Biology is a college course (not college prep) with college level expectations for behavior, attendance, participation, and effort. This course is designed to help you develop a conceptual framework of modern Biology, to gain a deeper appreciation of science as a process and to prepare you for the AP Biology exam.

The 4 Big Ideas for AP Biology
Big Idea #1 - The process of evolution drives diversity and unity of life.
Big Idea #2 - Biological systems utilized 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.

I know the words “summer assignment” may send chills down your spine, but these assignments will be very beneficial to you as we start the school year. The reason I am giving you a summer assignment is to not only get you thinking about Biology, but to keep your mind sharp so you are ready to hit the ground running come the first day of school. On the pages that follow, you will find detailed instructions of the assignments that comprise your summer work for AP Biology. Hopefully you find some fun along the way.

I am looking forward to “working” with you next year. AP Biology is a lot of work for me as well. It is my job to make sure that you are adequately prepared to take the AP Exam and get at least a 4 so that your college will give you credit for your hard work. Please know that I will be working on ways to help me achieve this goal during the summer. Don't wait until 8/11 at 11:59 PM to email or try to share an assignment and realize you don't have internet- it will be late! Please do not procrastinate on these assignments; but don't let them keep you from having a wonderful summer. Do not hesitate to contact me over the summer with any questions you have. I am happy to help!

Summer Assignment Tasks - Bring the completed worksheets to class on the first day of school and follow the expectations listed below.

- Show all work on math problems. Answers alone will receive no credit.
- Please box final answers for quick grading.

1. Watch the videos assigned.
2. Complete the attached review sheet over Graphing and Statistics.
3. Complete the Using Spreadsheets to do Basic Statistical Tests Assignment
4. Complete AP Biology Essential Chemistry Review Sheet
5. Familiarize yourself with Biology Prefixes and Suffixes
7. Review Safety Procedures and sign safety contracts.

These concepts will be reviewed in the first few days of class to address any questions students may have on parts of the assignment. There will be a quiz, taken for a minor

daily grade, over the content of the summer assignment during the second week of school. These practices will also be continually reviewed throughout the year.

Materials to be Purchased:

- Lecture Notebook
- Lab Notebook
- Latex free gloves

Internet Links to be Used:

- <https://openstax.org/details/books/biology-2e>
- <http://www.bozemanscience.com/statistics-graphing> (Videos linked on site)
- <http://www.bozemanscience.com/water-a-polar-molecule>
- Biology - Lab Safety Contract

Please note that any student who turns in LATE or INCOMPLETE summer assignments will receive consequences – NO EXCEPTIONS!

AP BIOLOGY SURVIVAL GUIDE – Read Thoroughly

General Study Habits

Your college professors will expect you to exceed the accomplishments of your high school coursework, and that means you must adjust your study habits to meet this challenge. AP Biology will give you a good idea of what the college-level workload is like. A good way to begin this adjustment is to consider the ways in which AP Biology and college coursework differs from high school coursework:

*Material is presented more rapidly and in larger quantities.

* Each exam covers a vast amount of material; labs are an essential part as well.

*Keeping up with previous material is essential to understand the new material. Much of the material is intertwined.

*Unlike some other AP classes, considerable out-of-class time investments are required to effectively learn course material.

*Critical thinking is much more important than rote memorization.

*Students are expected to not only understand the specific examples given in class, but also to apply their knowledge broadly.

*Only you can ensure that necessary coursework gets done on time.

*Help is always available, but you must take the initiative to seek it out, and not at the last minute possible.

Take Studying Seriously

One of the keys to academic success is learning to balance often conflicting pressures. You must devote the necessary time to study to achieve academic success. Generally, speaking for every class you have, approximately 1-2 hours of work outside of class is required to master the material. Of course this varies from person to person.

Study Often and Early

The coursework that accompanies this class is demanding. It is therefore essential that you stay ahead of the class by studying often and early and completing the work on time. You will be given classwork and homework daily. You may work ahead but there are strict due dates. Many times, you will be responsible

for the lecture portion on your own in order for class time to be spent either on labs or understanding certain concepts in greater detail.

Don't be Afraid to Ask for Help

Sometimes it's difficult for students to admit that they are having trouble with a class. Pride, embarrassment, or just the shock of realizing for the first time in your school career that you are unable to quickly master a topic can all contribute to this situation. Experience has shown that AP Biology can be a "problem" course for students. Don't get discouraged! Unfortunately, many students wait too long before doing something constructive about their difficulties. Should you find yourself having problems with AP Biology, you must not be afraid to ask for help as early in the course as possible.

Time Management

In school, as in life, there never seems to be enough time. One of the most difficult challenges you will face is to recognize and deal constructively with the fact that you, and only you, are in charge of determining how your valuable time is spent. One of the most serious mistakes you can make is to commit the error of thinking that you have "plenty of time" to get things done. Your workload is getting heavier, you may be getting a job, plus sports, clubs, etc. True undertaking of a subject is more important than simple memorization of a concept. It is not a viable option to "cram" the night before a test and still expect a good grade. You really can't get by with only last-minute efforts on assignments, and thus you must learn to manage your time wisely.

You Must Take Studying Seriously and Make a Commitment to Your Work

This means prioritizing your academic and social activities to ensure that there is adequate time in your schedule to complete all course assignments. Please do not email me the night before an assignment is due (that you have had a week to do) saying that you have had a lot going in the last week with sport tournaments, other classes assignments to make up, and extra shifts at your job so would it be okay to be late – it will NOT be okay. Points will be taken off for late assignments!

Taking Notes and Reading

College professors expect you to follow a rapidly developing train of thought and to capture those thoughts in your own notes. The notes you take in Biology should:

- Capture the main points with examples if relevant
- Be organized in some coherent manner for later study
- Leave room to include additional information that makes sense to you
- Use a personalized shorthand notation that makes sense to you

Do NOT record every word said during lecture or copy, verbatim, words from PowerPoint slides. Filter out nonessential portions and concentrate on connections between the essential ideas and terms.

Find and Use Resources

I will share resources with you daily to help supplement your knowledge and understanding of the discussed concepts. Please do yourself a favor – if you truly want to do well not only in class but on the AP exam – purchase the AP Biology Exam Prep book! It is a valuable resource – it breaks down each unit into succinct explanation of topics.

Graphing and Statistics Review Sheet

On the AP test you will be expected to apply and use basic statistics along with graphing. Complete the following to help prepare you for this!

Review of (or Intro to) Statistics: Go to <http://bozemanscience.com/statistics-graphing>

1. **Beginner's Guide to Graphing Data:** (From site above)
 - a. What type of a graph uses a "best fit" line?
 - b. Explain the difference between a bar graph and a histogram.
 - c. Which type of graph shows a change over time?
 - d. Which type of graph displays a correlation of variables?
 - e. Distinguish between the independent variable and dependent variable in an experiment, and where their axes are on a graph.
 - f. Which type of graph is best for comparing 2 or more different groups?
 - g. Which type of graph is better for showing distribution of data?
 - h. Explain when a pie chart/graph should be used and give (draw, label) any example.
 - i. State at least 5 elements that any graph should always display.

2. Both videos are found at the main website listed in part A.

Watch Graphing Data by Spreadsheet. Take notes for reference.

Watch Bozeman: Statistics for Science (Statistics for Science — bozemanscience) and take notes:

- a. What is n ?
- b. What is x ?

- c. What is M?
- d. What was the range of the sample in his video?
- e. Explain “degrees of freedom” (with any example) and why the formula for it is $n-1$.

3. Watch Bozeman: Standard Deviation Standard Deviation and take notes:

- 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.

4. Watch Kevin Piers: Standard Deviation & Standard Error of the Mean (Standard Deviation and Standard Error of the Mean)

- a. What do SEM bars that have overlapping means on a graph indicate?
- b. Explain the significance if SEM bars overlap, but the means do not overlap.
- c. Explain the significance if there is no overlap between SEM bars.

Using Spreadsheets to do Basic Statistical Tests

Part 1: Reviewing Basic Statistics and Ways of Representing Data.

Mode is the number found most often in a set. Mode is good for reflecting the most common answer. Surveys often use mode.

A student surveyed his classmates to see which period of the day they felt sleepiest. He wanted to determine if gender affected the body's natural biorhythms and sleep patterns. The results are below:

The Effect of Gender on Sleep Patterns

Period that Girls Felt Sleepiest	Period that Boys Felt Sleepiest
1, 1, 1, 1, 1, 1, 2, 2, 3, 4, 5, 5, 5, 6, 6, 7, 7, 7	1, 1, 2, 2, 2, 3, 4, 4, 5, 5, 6, 6, 6, 6, 6, 7, 7

1. What is the mode for girls? _____
2. What is the mode for boys? _____
3. Does the mode differ according to gender?
4. What are some possible reasons that the students might be sleepy at these times of the day?

Median is the middle number in a set of data. Median is a good representation of data that is highly variable. In other words, it is good to use if the data set has some numbers that are very different from the rest.

For example, a teacher wanted to see how well her students understood the concepts covered in a major project. She hopes that most students understood at least 80% of the material. The data is shown below:

Grades on Project	83, 82, 74, 86, 25, 92, 97, 86, 67, 79, 85, 0, 97, 90, 88, 78, 90
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5. What is the median of the project grade? _____
6. According to the median, did most of the class understand at least 80% of the concepts covered?

Mean is also called the average. Mean used to determine the trend when numbers are fairly similar to each other.

Using Google Sheets to calculate the mean of the class grades above.

- Title the second column on the Spreadsheet "Grades on Project."
- Enter the data into that column with one grade per row.
- Select the entire column.
- Click on the formulas tab at the top right of the spreadsheet (or at the bottom of the sheets app on the iPad).
- Choose Average then enter.
- The number produced in the next row is the mean.
- In the 1st column next to the value of the mean, type "mean" to label the calculation.

7. What is the mean of the project grade? _____
8. According to the mean, did most of the students understand 80% of the concepts?
9. Why is the mean so different from the median?

Standard deviation is a number that reflects how close the data numbers are to each other and to the mean. If the standard deviation is small, then the numbers are very close to each other. If the standard deviation is large, then the numbers vary greatly. **Standard deviation can be used only if there are 5 or more numbers in the data set.**

A student wanted to see if leaves grow longer if the plant is placed in sunlight. She hypothesized that leaves in the sun will grow longer than those in the shade. Here are her results.

Length of Leaf (mm)	
Leaves in Shade	Leaves in Sunlight
24.1, 26.3, 27.2, 30.7, 31.8, 32.4, 32.5, 33.3, 37.7, 38.5, 43.2	33.1, 34.9, 35.2, 35.3, 36.5, 36.2, 36.4, 37.5, 41.3, 42.1, 45.7

Using GOOGLE Sheets....

- On your Spreadsheet, label two columns- "Shade" and "Sunlight"
- Enter the data under the two labeled columns.
- Calculate the mean as described previously.
- To calculate Standard Deviation, click on an empty cell in the shade column.
- Begin to type =STDEV. Choose STDEV from the drop down menu that appears.
- Select your column of numbers for "shade" then hit Enter.
- The number produced is your standard deviation.
- Repeat for the numbers in your "sunlight" column.
- Label the columns and the standard deviations.

10. What is your STDEV for Shade? _____

11. What is your STDEV for Sunlight? _____

Standard error of the mean(SEM) tells you how close the mean of your sample is to the true mean of that group as a whole. If two groups have overlapping SEMs then they are very similar. (There is not a significant difference between them, and the variable did not affect the results.)

There is no preset formula for 2SEM. Here is how you can use Google Sheets to calculate it.

- Click on an empty cell in the shade column.
- Count the number of data points used in your calculation of mean and STDEV for shade.
- Use a calculator to calculate the square root of this number.
- A cell within your column, type the following formula including the equal sign.

=2* (CELL with STDEV/ your calculated square root of the number of data points)

Ex. If I had 7 data points and the STDEV was in cell B11, my formula would be =2*(B11/2.65)

- Hit enter to get your 2 SEM value for that data set.
- Repeat for the Sunlight data set

12. What is your 2SEM for Shade? _____

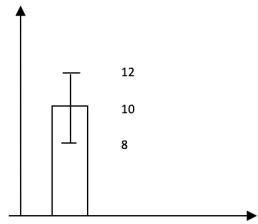
13. What is your 2SEM for Sunlight? _____

The mean $\pm$ 2 SEM represents a range of values that gives you 95% confidence that your mean represents the true mean. In other words, the "real answer" is in that range.

Error bars are used on graphs to indicate how variable the data is. They can be used to determine if two sets of data are significantly different from each other.

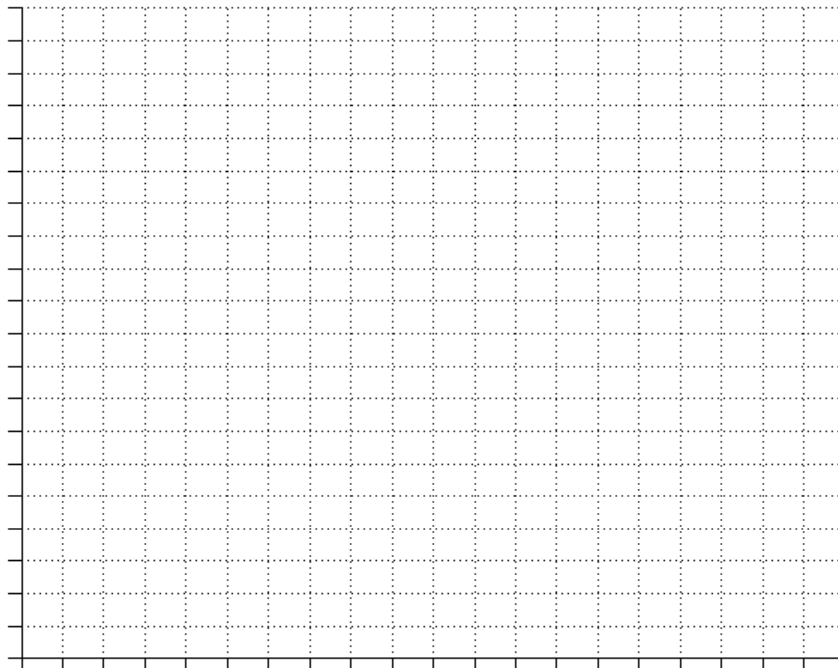
14. Create a bar graph (**using graph provided below**) of the mean leaf length in shade and in Sunlight.
15. Calculate the upper and lower range of each error bar by adding then subtracting 2SEM number from the mean.

Example:



16. For leaves in shade, what is your mean? For the *Leaves in Shade* bar, draw a line at your upper and lower error bar as shown above. Connect the lines.
 - a. What is the upper line of the error bar (mean + 2SEM)? _____
 - b. What is the lower line of the error bar (mean - 2SEM)? _____
17. For *Leaves in Sunlight*, what is your mean? For the *Leaves in Sunlight* bar, draw a line at your upper and lower error bar as shown above. Connect the lines.
 - a. What is the upper line of the error bar (mean + 2SEM)? _____
 - b. What is the lower line of the error bar (mean - 2SEM)? _____
18. Use 2SEM bars to determine if the means are significantly different. Look at the two error bars. Do they overlap many of the same numbers?
19. Is the data significant? or not?

Be sure to title your axis, title your graph properly, make a key and use a ruler to create your bars and error bars.



AP Biology Essential Chemistry Review Sheet

This is a review of basic chemistry – We will not spend a lot of class time on these concepts as these concepts should be a review and prior knowledge.

1. Watch the following videos and take appropriate notes and answer the review questions below.

- [Water: A Polar Molecule](#)
- [How polarity makes behave strangely -Christina Kleinberg](#)
- [Chemical Bonds: Covalent vs. Ionic](#)

- a. Contrast the terms atomic mass and atomic number/periodic table trends.
- b. What is an isotope and what is special about radioactive isotopes?
- c. Why are valence electrons important?
- d. Define the following terms and give an example:
 - i. Covalent bond
 - ii. Nonpolar covalent
 - iii. polar covalent
 - iv. Ionic bond
 - v. Hydrogen bond
 - vi. Electronegativity
 - vii. Catalyst
- e. Why is water considered a polar molecule?
- f. List the major properties of water and how water's structure contributes to the property.

g. What are the symbols for the following functional groups?

- i. Hydroxyl
- ii. Carbonyl
- iii. Carboxyl
- iv. Amino
- v. Phosphate
- vi. Methyl

h. What is an acid? Base?

i. Draw the pH scale and label acid/base/neutral in the appropriate sections.

j. How do we calculate pH?

k. As each number changes on the scale, what happens to the concentration of H⁺/OH⁻?

l. What is the purpose of a buffer? How does it work in the human body?

2. Watch the following videos and read the article and take appropriate notes and answer the review questions below.

- [Free Energy](#) (Bozeman Science)
- [Endergonic and Exergonic Article](#)

a. Which type of reaction releases energy into the surroundings?

b. Which type of reaction requires an energy input from the surroundings to proceed?

c. Is the following reaction exergonic or endergonic? $\Delta G = -20$ kcal/mol:

d. Is the following reaction exergonic or endergonic? $\Delta G = +30$ kcal/mol:

- e. Which of the following reactions is most likely to be spontaneous?
- f. True or False: Endergonic reactions can occur without the input of energy.
- g. In general, do exergonic or endergonic reactions occur faster?
- h. Draw a graph representing an endergonic and another graph showing an exergonic reaction.

Biology Prefixes and Suffixes-The Language of Science

The main reason students find it difficult to understand science is because of all the hard to write, spell and read words. Actually, scientific vocabulary is a mix of small words that are linked together to have different meanings. If you learn the meanings of the little words, you'll find scientific vocabulary much easier to understand. Find the meaning to the following Greek/Latin root words and study these.

Word	Meaning
a / an	
meso	
leuco	
aero	
anti	
amphi	
aqua / hydro	
arthro	
auto	
bi / di	
bio	
cephal	
chloro	
chromo	
cide	
cyto	
derm	
haplo	
ecto (exo)	
endo	
epi	
gastro	
genesis	
herba	
hetero	
homo	
ov	
kary	
neuro	
soma	
saccharo	
primi / archea	
phyll	

Word	Meaning
hemo	
hyper	
hypo	
intra	
-itis	
lateral	
-logy	
-lysis	
-meter	
mono	
morph	
micro	
macro	
multi / poly	
pod	
-phobia	
-philia	
proto	
photo	
psuedo	
synthesis	
sub	
troph	
therm	
tri	
zoo, zoa	
-tropism	
-taxis	
-stasis	
zyg / zygos	
phago	
path / pathy	
sym / syn	

Lab Safety Overview & Contract

Science is a hands-on laboratory class. Students will be performing many laboratory activities that may require the use of ***hazardous chemicals, sensitive laboratory equipment, and other items requiring careful handling.***

To ensure a safe science learning environment, a list of rules has been developed and provided to you in the student safety contract. Below are several reminders to keep in mind as we practice safety in the lab setting.

It is the responsibility of both the student and parent/guardian to read the **entire contract**** and **initial each line before signing** below. The signature indicates you will comply with the rules of the lab and will be strictly enforced. Students will not be allowed into the laboratory until they have shown mastery of laboratory safety (**minimum score of 80**) and an assigned contract is on file with the science teacher.

Student Initials	Parent Initials
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_____	_____	Engaging in practical jokes, boisterous conduct, or running in the laboratory, will result in removal.
_____	_____	The performance of unauthorized experiments is strictly forbidden.
_____	_____	Do not sit on laboratory tables.
_____	_____	Follow all written and verbal instructions carefully. If you do not understand a direction or part of the procedure, ask your teacher before proceeding with the activity.
_____	_____	Observe good housekeeping practices. Do not store articles of clothing, bags, and other personal items on the work area, keep the floor clear of all objects, and do not block the sink drains with debris.
_____	_____	Thoroughly clean your laboratory work space at the end of the laboratory session, properly dispose of any debris (i.e., gloves, filter paper, paper towels, matches, metals, and all other insoluble materials) in the proper waste containers, not in the sink, and return all equipment to its proper location.
_____	_____	When entering the laboratory, do not touch any equipment, chemicals, or other materials in the laboratory area until instructed to do so.
_____	_____	Wear appropriate personal protective equipment (i.e., chemical splash goggles, laboratory aprons or coats, and gloves) when working with chemicals, heat, projectiles, live animals, or noxious plants as directed by your teacher. Students will wear safety goggles any time heat, chemicals, or glassware are being used. No exceptions!
_____	_____	Keep your hands away from your face, eyes, mouth, and body while using chemicals, lab equipment or handling specimens.
_____	_____	Wash your hands with soap and water after performing any laboratory experiments involving chemicals, animals, and specimens including seeds and plants. Many times seeds and plants have chemicals such as pesticides or insecticides on them.
_____	_____	Never eat, drink, or chew gum while in the laboratory or storage area. Do not use laboratory containers for food or beverage.
_____	_____	Assume all chemicals are hazardous and handle them with care. Always check the label to verify it is the correct substance before using it.

The signature below denotes the student agrees to follow all of the safety rules set forth in the Lab Safety Contract, and the parent is aware of the measures taken to ensure the safety of all students in the science laboratory.

Student Name (Please PRINT)

Parent Name (Please PRINT)

Student Signature

Date

Parent Signature

Date

****Note:** The Lab Safety Contract was given in class today. This document is also posted on the CANVAS page.