

# Heritage High School - AP Biology Summer Assignment - 2017-2018

Instructor: Mrs. Leslie

Hi! According to my class list, you are registered for AP Biology next year. Congratulations on deciding to take on this challenge! I'm looking forward to working with you. ☺

AP Biology is not a college prep class. It IS a college course, with college level expectations for behavior, attendance, participation, & effort. AP Biology is an interdisciplinary field of study, & the goal of the class is to integrate what you know about biology, chemistry, physics, math (including statistics), history, sociology, etc., to come to an understanding of the natural world & the forces that affect it.

**YOU WILL BE REQUIRED TO STUDY INDEPENDENTLY!**

Please watch this video to learn about the AP Biology Exam.

<http://www.bozemanscience.com/new-ap-biology-exam-users-guide>

Here is a page that you will want to bookmark & use throughout the year. You may want to start looking through the videos. Pay close attention to the videos that cover the labs. **Many questions on the AP Biology Exam are about these lab investigations.**

<http://www.bozemanscience.com/ap-biology/>

Here is a page full of AP Biology notes that we may find very beneficial.

<https://prezi.com/user/knuffke/prezis/>

HHMI: <http://www.hhmi.org/biointeractive>

AP Biology is a vigorous, yet manageable & rewarding class. In order to meet the demands of the curriculum it is necessary for you to complete some work during the summer. This will also give us common background knowledge to build upon throughout the year. **ALL AP Biology students are REQUIRED to complete the summer assignment. This includes students who join the class late.**

There are 2 parts to your summer assignment. Part 1 is about experimental design. This is an area that students typically struggle in and it is the foundation of most science courses. We will start the year going over this topic so I wanted to give you an opportunity to begin practicing over the summer. This work is due the 4<sup>th</sup> day of class. Again, you will have class time to review and ask questions **before** the assignment is due. You are also encouraged to email me if you need guidance. (lesliea@friscoisd.org)

Part 2 is a reading assignment. Simply read the book and answer the corresponding questions in the provided Google Form. This is my favorite science book and students seem to really enjoy it as well. Students talk about this book throughout the year and refer to it when answering various questions. Please make sure that you take your time and really think through the questions. This work is also due the 4<sup>th</sup> day of class.

**You will have a test over your summer assignment on the 4<sup>th</sup> day of class.**

**Please use your answers to the questions as a study guide for this test.**

**Part 1: We've collected data, now what?**

**Grade = 1 minor grade AND a Punctuality grade**

**Due Date: By the 4<sup>th</sup> Day of Class**

**Data Analysis**

1. Please analyze the data below & answer the questions that follow.

**Amount of Water Transpired in 1 Hour(mL)**

<b>Plants</b>	<b>Normal</b>	<b>Heater</b>	<b>Fan</b>	<b>Lamp</b>
Weeping fig	3.3	4.9	6.1	2.5
English Ivy	1.8	3.2	5.1	2.1
Devils Ivy	2.9	4.1	4.6	3.0
Zebra plant	4.2	6.1	7.6	3.2
Coleus	0.9	3.9	6.0	3.0
Arrowhead	3.6	6.6	7.5	4.0
Geranium	1.2	5.8	4.7	2.4
Rubber Plant	4.9	6.8	8.4	4.3
Dieffenbachia	4.1	6.0	7.7	3.9

- a. What is the null hypothesis for this study?
- b. What is the independent variable in this study?
- c. What is the dependent variable in this study?
- d. What are confounding variables? Describe some possible confounding variables for this study.

**Controlled variables kept constant - reasoning and method**

<b>CONTROLLED VARIABLES</b>	<b>WHY it must be controlled</b>	<b>HOW it is controlled</b>

- e. What is the control group in this study? Why is a control group needed?

2. Bob and Sue marry and decide to have a child.
- What is the probability that they will have a baby girl?
  - Bob & Sue's first child is a boy. They decide to have a second child. What is the probability that they will have a baby girl?
  - Bob & Sue's second child is a boy. They decide to have a third child. What is the probability that they will have a baby girl?
  - Bob & Sue ended up with 4 boys and 2 girls. Is this statistically significant? Please explain using a chi square test.
    - The Null Hypothesis is that the Punnett Square Ratios are expected.
    - The Alternative Hypothesis is that the Punnett Square Ratios are not expected.
    - A chi square test uses categorical data to determine if the difference between the observed and expected is due to chance or some other reason. If the calculated chi square is greater than the critical value then the null hypothesis is not accepted.

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

← Accept Hypothesis     Reject Hypothesis →

Percentage Points of the Chi-Square Distribution

Not due to chance alone

Degrees of Freedom	Probability of a larger value of $\chi^2$								
	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
1	0.000	0.004	0.016	0.102	0.455	1.32	2.71	3.84	6.63
2	0.020	0.103	0.211	0.575	1.386	2.77	4.61	5.99	9.21
3	0.115	0.352	0.584	1.212	2.366	4.11	6.25	7.81	11.34
4	0.297	0.711	1.064	1.923	3.357	5.39	7.78	9.49	13.28
5	0.554	1.145	1.610	2.675	4.351	6.63	9.24	11.07	15.09

3. Examine the following data.

Stomata per Examination Area								
Plant	1	2	3	4	5	6	7	8
Stomata	76	72	80	94	88	78	97	84

- Calculate the mean number of stomata for these leaves.
- Calculate the standard deviation of the number of stomata for the leaves.
- Calculate the standard error in the number of stomata for the leaves.
- Create a bar graph with the mean of the number of stomata for the 8 leaves. Draw the error bars on the graph and interpret the standard error values.

$$S = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}} \quad SE_{\bar{x}} = \frac{S}{\sqrt{n}} = \frac{\sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}}{\sqrt{n}}$$

4. Now that you have some basics, let's add on. Examine the **Clover Stomatal Density Data**.

Most plant leaves contain stomata. Stomata are little openings surrounded by guard cells that allow for gas exchange (let CO<sub>2</sub> in & oxygen out during photosynthesis). They also let out water through these openings during transpiration. An investigation was conducted to determine if the number of stomata on each leaf (stomatal density) differed between different phenotypes of one species of clover. The stomata on three phenotypes on the same species of clover were counted. The data from the study are shown in the table.

	Phenotype 1	Stomata Density (stomata/mm <sup>2</sup> )	Phenotype 2	Stomata Density (stomata/mm <sup>2</sup> )	Phenotype 3	Stomata Density (stomata/mm <sup>2</sup> )
1	Standard	76	Purple/hairy	97	Variegated	107
2	Standard	94	Purple/hairy	153	Variegated	66
3	Standard	97	Purple/hairy	109	Variegated	189
4	Standard	123	Purple/hairy	197	Variegated	233
5	Standard	121	Purple/hairy	266	Variegated	231
6	Standard	107	Purple/hairy	309	Variegated	182
7	Standard	133	Purple/hairy	153	Variegated	230
8	Standard	99	Purple/hairy	141	Variegated	129

- What is the independent variable in the study?
- What is the dependent variable in the study?
- What is the control group in this study?
- Research the topic, finding previous research in the area. Summarize the prior research and introduce the study. This serves as the introduction of the poster. Remember that you need to learn all aspects of the topic. Have other investigations been done on this topic? What were the findings? The introduction is written in paragraph format.
- Decide how to analyze the data using statistical methods. Analyze the data.
- Write out the steps of what you did in your analysis. Be sure to explain each step. Also, remember that ALL graphs need to be properly labeled. The graph title needs to be specific. What does the data in the graph show? Are there any patterns? The meaning behind these patterns is discussed in the conclusion.
- Form conclusions about what the data show. Write a conclusion. A conclusion starts with an overview of the topic. What did you set out to do? What did you do? What specifically did you find? What does this mean? Do your findings support the research? Remember that a conclusion is a long summary of the entire investigation. It is written in paragraphs.
- Make a poster of the background, results, and conclusions of the study. (A small tri-fold poster would be perfect but I will accept any poster. Remember that I will be grading the quality of your work.)**

## Part 2: Reading Assignment over "Survival of the Sickest"

Grade = 1 minor grade AND a Punctuality grade

Due Date: **By the 4<sup>th</sup> Day of Class**

Book: *Survival of the Sickest: A Medical Maverick Discovers Why We Need Disease*

Author: Dr. Sharon Moalem with Jonathan Prince (2007)

ISBN-10: 0060889667 ISBN-13: 978-0060889661

My copy is ISBN 9780060889654

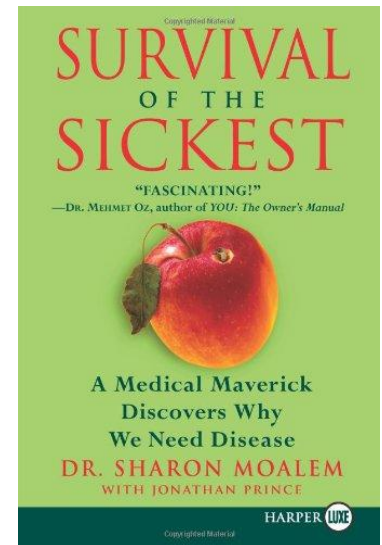
Price: \$10-15 (Amazon, Barnes & Noble)

### ***Survival of the Sickest*** Reading Comprehension Questions

**Directions:** As you read the book, answer the questions in complete sentences within the provided Google Form. Please explain all answers using complete thoughts and **in your own words**. You may have to conduct additional research on some of the questions. Again, all answers must be entered into the Google Form provided. Please be sure that you have access to this form. Please email me immediately if you are not able to see this form in your Google Share Folder ([lesliea@friscoisd.org](mailto:lesliea@friscoisd.org)).

Google Form for "Survival of the Sickest" questions:

<https://goo.gl/forms/IRYYQ1RBHqMrOyh1>



Be sure that you are able to access the resources in our AP Biology Google Classroom. The class code is: beju4e

**There will be an Exam over these two assignments. All grades for the summer assignment will count during the 1<sup>st</sup> Grading Period. Summer assignments will NOT be accepted after 4:30 pm the Friday of the 4<sup>th</sup> week of the school year.**

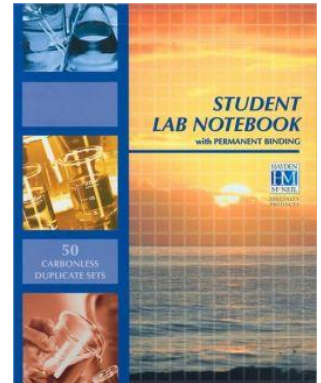
**\*Please note, if you are absent on an assessment day then you will be taking the assessment during your next class.\* It is your responsibility to get caught up on assignments missed while absent or while making up an assessment during class.**

## Be Prepared for Every Class!

Due Date: **1<sup>st</sup> Day of Class**

### Supplies:

- ✎ lab notebook - any kind will work (the one with carbon paper is **optional** & is based on university requirements; it is your responsibility to find out if this is needed by the university that you will be attending)
- ✎ paper (loose leaf, college ruled)
- ✎ graph paper
- ✎ #2 pencils with erasers (need every class)
- ✎ highlighters (various colors)
- ✎ colored pencils &/or thin markers
- ✎ glue sticks &/or tape
- ✎ notecards (you choose the style)
- ✎ sticky notes (you choose the style)
- ✎ 3-ring binder (at least 1½")
- ✎ tabbed dividers (you will not need more than 8)
- ✎ 4-function calculator (a basic 4-function calculator is the only allowable calculator for the AP Biology exam; you are responsible for having your own 4-function calculator)



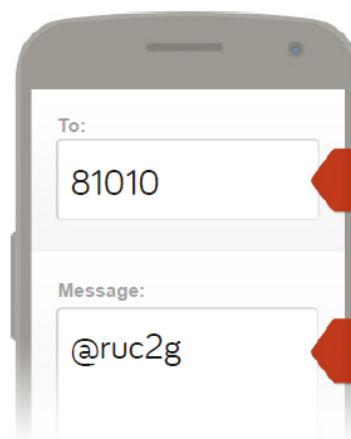
Be sure that you are able to access the resources in our AP Biology Google Classroom. The class code is: **beju4e**

Mrs. Leslie would like you to join AP Biology!



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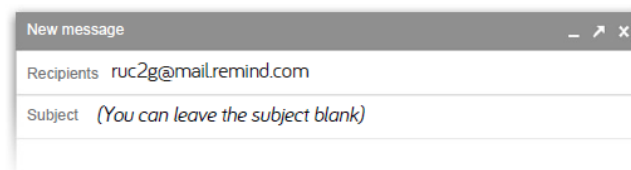


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## Please Review These Major Concepts from Biology 1

The following topics are concepts that you should already be familiar with from biology & chemistry. Please review these topics to the point that you are **confident** in your understanding of them.

- a. Biochemistry - atomic structure, major macromolecules (structure/functions), solutions, molarity, properties of water (e.g. adhesion, cohesion, specific heat capacity)
- b. Cell Structure & Function - organelles (structure/functions), compare & contrast different cell types, cell cycle, mitosis, cancer, plasma membrane, types of cellular transport (active vs. passive, osmosis, diffusion, endocytosis, exocytosis)
- c. Cellular Energetics - enzyme activity, cellular respiration, photosynthesis, factors that affect reaction rate, ATP
- d. Genetics & Sexual Reproduction - meiosis, Mendelian genetics, genotype, phenotype, monohybrid crosses, dihybrid crosses, Law of Independent Assortment, Law of Segregation, Law of Dominance, co-dominance, incomplete dominance, probabilities that relate to Punnett Squares, pedigrees
- e. Molecular Genetics - DNA vs. RNA, DNA replication, transcription, translation, types of mutations, genetic technology, gene regulation, cell specialization
- f. Evolution & Classification - patterns of evolution, evidence for evolution, natural selection, bacterial & pesticide resistance, artificial selection, mechanisms of evolution (e.g. gene flow, genetic drift), modern classification / taxonomy (characteristics of domains & kingdoms), binomial nomenclature, adaptations
- g. Ecology - cycles of matter (carbon, nitrogen, phosphorous), disruptions to nutrient cycles, decomposers, nitrogen-fixing bacteria, food chains & webs, energy movement through ecosystems, ecological pyramids, biological magnification, ecological succession, pioneer species, climax community, biological organization, biodiversity & conservation, biotic vs. abiotic factors, symbiotic relationships, characteristics of biomes, exponential growth, carrying capacity, competitive exclusion, niche, mimicry, effects of introducing a new species to an ecosystem (alien species or non-native species), eutrophication

\*Bozeman Biology on YouTube is an excellent source for reviewing these concepts!

\*Crash Course Biology with Hank Green is really good too!

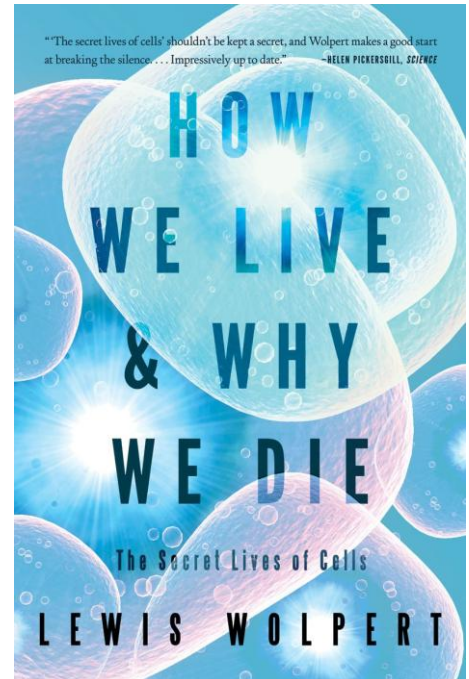


**\*I strongly recommend that you review the structure and function of different types of cells. Be sure that you can identify and describe the function(s) of each organelle. Also, there is a strong emphasis on cell communication in AP Biology. You will need to know detailed information about the immune system and the role of gene expression in embryology. Please begin learning about these topics.**

**Suggested Book to Read:**

"How We Live & Why We Die: The Secret Lives of Cells" by Lewis Wolpert

- ISBN-10: 0393339386
- ISBN-13: 978-0393339383



**Another Good Read**

