

Ann Sobrato High School AP Biology Summer Assignment

Welcome to AP Biology!

I love teaching biology and I truly look forward to teaching AP Biology this coming school year! Because of the rapid pace of discovery in the life sciences our primary emphasis is on developing an understanding of unifying concepts that connect the major topics of biology.

The AP Biology Curriculum is rigorous, but it centers around four “Big Ideas” and you will need to learn basic underlying concepts, but more importantly, you must understand how they all relate to explain more complex biological phenomena. You **MUST** focus on analytical thinking and applications in order to see the big picture after you are taught the basic concepts:

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.

*****Your first assessments will cover material from portions of the summer chemistry review assignments defined below. **Please show your work, and handwrite your answers on titled, dated notebook paper.** Organize assignments #2 & #3 below on separate papers and *bring to AP Bio the second day of class.***

Summer Assignment #1 - familiarize yourself with “Command Terms in AP Biology”

AP Biology was designed by a select group of college professors and high school science teachers to be equivalent to the entire first year (3 quarters in UC) of introductory college biology. There are so many sub-topics in Biology, some of which are more or less interesting to each individual learner. I will introduce and explain these introductory college topics with our limited class time, but *it will be up to you to put in more time and effort to expand your understanding and tie all the concepts together* to become proficient. **Read over these and just mentally note what you will be asked to do often in this class and on the AP Bio exam.** The AP Bio Exam will require you to respond with details to the following “command terms”:

<https://drive.google.com/a/mhusd.org/file/d/0B7fDehFBDRXbR3JIQTQ0cWJZQUtBb1Z4OXo2RVNEcFVzbElr/view?usp=sharing>

Summer Assignment #2 – Essential Chemistry review

We have a particular challenge in AP Biology. Each year new advances in science are discovered and there's more to know, but the length of the school year and test time stay the same. What does this mean? *We are always short on time!* In order to cover ALL of the material, I will cover the overarching principles, but to be most successful YOU need to focus in on the details through additional study. We will move quickly this year, so you need to apply your best effort to stay up with the work load. An understanding of basic chemistry is considered prior knowledge for this course. Here is what you are to do:

I. Brush up on your chemistry! Refer to Chapter 2 (The Chemical Context of Life) of your new textbook if your chemistry is weak or you forgot!

YOUR TEXT WILL BE GIVEN TO YOU, but for your reference now, you can **use this temporary pdf copy** of chapter 2 by accessing:

<https://drive.google.com/file/d/0BybbYu4jWNWdWmRleTRMRU1qaHc/view?usp=sharing>

II. For further explanations and generally entertaining instruction, watch the following videos. These are called Crash Courses with Hank Green. Get to know him as we will tune into him quite a bit during the year. These particular videos are good chemistry reviews. **Take your own notes on the things in these videos with which you are less familiar from your previous science education.**

Crash Course Chemistry series, starting with youtube video #1:

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

Crash Course Biology: Water

http://www.youtube.com/watch?v=HVT3Y3_gHGg&list=PL6C159EF1A62143A2&index=11

Crash Course Biology: Carbon

http://www.youtube.com/watch?v=QnQe0xW_JY4&list=PL6C159EF1A62143A2&index=8

For various topics we will also use “Bozeman Biology” videos, with AP Biology instructor Paul Anderson. Check out his very informative videos, especially this one about the importance of electronegativity of oxygen:

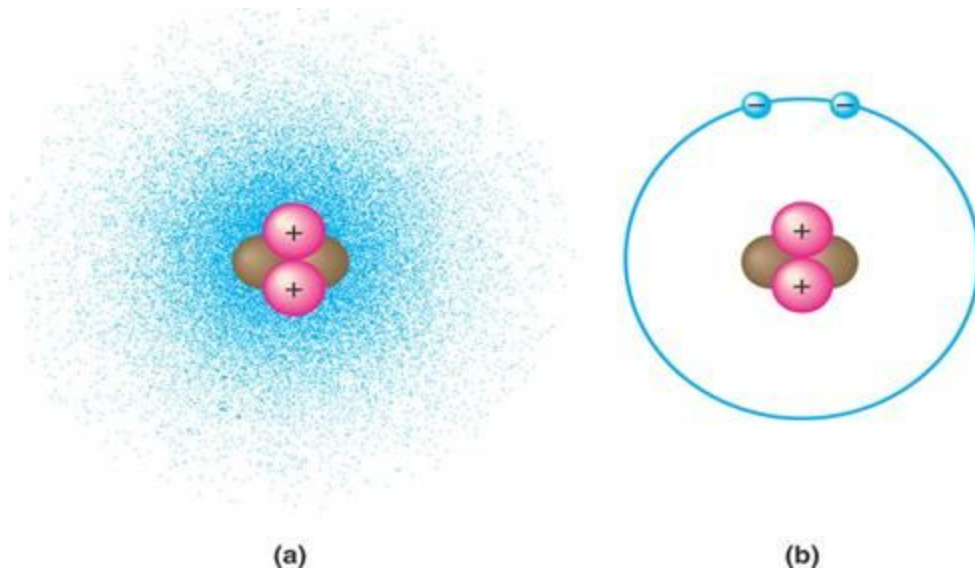
<https://www.youtube.com/watch?v=o61dTk4J9AU>

III. Complete the chemistry worksheet below. As an AP Biology student the expectation is that *if you don't know it, problem solve to figure it out* by using all of your resources and studying with others. This is a review of basic chemistry – we spend little to no class time on these basic concepts as they should have been learned in chemistry, but truly understanding biology requires you to know and understand these chemistry concepts! Please make sure that you know them and if not, be sure to study through them.

1. Compare/contrast the term element with compound.
2. *Know* the symbols of the following elements and their respective charge:
 - a. Carbon
 - b. Hydrogen

- c. Oxygen
- d. Nitrogen
- e. Phosphorus
- f. Sulfur

3. Label all parts of the diagrams below and define the terms that you label.



4. What is an isotope and what is "special" about radioactive isotopes?
5. What determines interactions between atoms? Why are valence electrons important?
6. Define the following terms:
 - a. Chemical bond
 - b. Covalent bond
 - c. Single bond
 - d. Double bond
 - e. Electronegativity
 - f. Nonpolar covalent bond
 - g. Polar covalent bond
7. What is the difference between a structural and molecular formula?
8. Give the molecular formula for the following compounds.
 - a. diatomic Oxygen
 - b. Carbon dioxide
 - c. Phosphate
 - d. Sulfate
 - e. Water (you would be surprised at how many people don't know this!!!)
9. Compare and contrast ionic attractions and covalent bonds.
10. Compare and contrast hydrogen bonds and van der Waals interactions.
11. Explain how/why water is considered a polar molecule
12. For each of the below listed properties of water – briefly define the property and then explain how water's polar nature and polar covalent bonds contribute to the water special property.

- a. Cohesion
- b. Adhesion
- c. Surface tension
- d. High specific heat
- e. Heat of vaporization
- f. Evaporative cooling
- G. density

13. Explain how these properties of water are related to the phenomena described in the statements below. More than one property may be used to explain a given phenomenon.

- a. During the winter, air temperatures in the northern United States can remain below 0°C for months; however, the fish and other animals living in the lakes survive.
- b. Many substances—for example, salt (NaCl) and sucrose—dissolve quickly in water.
- c. When you pour water into a 25-ml graduated cylinder, a meniscus forms at the top of the water column.
- d. Sweating and the evaporation of sweat from the body surface help reduce a human's body temperature.
- e. Water drops that fall on a surface tend to form rounded drops or beads.
- f. Water drops that fall on your car tend to bead or round up more after you polish (or wax) the car than before you polished it.
- g. If you touch the edge of a paper towel to a drop of colored water, the water will move up into (or be absorbed by) the towel.

14. Define the following terms:

- a. Solute
- b. Solvent
- c. Aqueous solution
- d. Hydrophilic
- e. Hydrophobic

15. Define the following:

Concentration –
hypertonic-
isotonic-
Hypotonic-

Concentration gradient -
pH -

16. Explain characteristics of acids versus bases.
17. Why are small changes in pH so important in biology?
18. What is a buffer? Give an example on how they would work in a living organism.
19. What is acid precipitation and why is this significant? How does this relate to worldwide ocean chemistry?
20. What is special about carbon that makes it the central atom in the chemistry of life?

Summer Assignment #3 – Quantitative Skills Review

The 2012 revisions to the AP Biology course attempt to get biology students to hypothesize, design, analyze, and justify experimentation in biological science more than before. You must be able to think critically to do well on the AP Biology exam. As part of the curriculum, students must now employ the use of some analytical math (statistics and probability), using formulas and graphing skills. Throughout the year we will practice use of these quantitative skills, but you may use an “Equations and Formulas” sheet, provided by College Board, on the AP exam in May. **Please download and print a copy of this formula sheet for frequent use in class:**

https://drive.google.com/open?id=17phtnsTC1fmKmlgoZ_usteVylKIA3WXp

Along with the use of equations and formulas, you must be able to create clear and accurate graphs from given data, as well as use a graphical representation of data to draw conclusions.


Constructing Line Graphs – Appendix B AP Biology Investigative Lab Essentials

Directions: Reading, constructing and interpreting graphs are essential skills for any Biology/Science student. **We will spend a significant time this year interpreting graphical data. Many AP Bio exam questions present data in graphs or ask you to create a graph from given data.** Please work through the following assignment, while carefully reading the College Board lab handout entitled, *Constructing Line Graphs*. Find *Constructing Line Graphs* at:


<https://drive.google.com/file/d/0BybbYu4jWNWda2xtRHFadWtCbDA/view?usp=sharing>

(Note: a ‘lightbulb’ after the question means that the answer is not found verbatim in the reading and that you may have to ‘think’ about it.)

1. What TWO pieces of information does each dot represent in Figure A3?
2. If the dots represents measurements that we made, what are the lines between the dots representative of?
3. In this line graph, is it possible to obtain a measurement/time, for which there is no ‘dot’
How is this measurement denoted on the graph in A.3?

4. IN addition to making the graph easy to read, what else may be the purpose of the line? 
5. In a line graph, one may only represent measurements actually observed with dots and solid lines. What is the purpose of the dotted line which is located between 0-40mg/3-5hrs in Figure A.3? What is this part of the line called?
6. How is an 'extrapolation' different from an 'interpolation'?
7. Why must the reader of the graph be cautious about extrapolations?

Basic Requirements for a GOOD Graph!


8. Read over the suggested titles for the graphs on page A6, a-e. Why is 'e' the superior title?  (You will be expected to write *GOOD* titles for all of your graphs.)
9. What is 'wrong' with the graph at A.5 on page 6?
10. When marking an axis, units are marked at 'intervals' that correspond to intervals between the experimental points. What do we call these?

(NOTE: Be sure to examine the figure at A.7 carefully. The graphs you make in lab will be expected to appear in a similar fashion, including frames.)

11. What is the vertical scale (y-axis) called?
12. What is the horizontal (x-axis) called?
13. When time is shown on the abscissa and amount of quantity shown on the ordinate, we call this a 'progress' graph or 'progressive curve.' Why is it possible to represent TWO of these graphs/curves on Fig a.10 on page 9?

(Note that each of the lines are labeled – this is expected in our lab graphs!)

14. Which line on the graph at Fig A.10 shows a 'faster' process? How can you tell by looking at the graph?
15. What is the **rate** for Process I?
16. —xxxxxx
17. What is the **rate** from Process II?

 *(Note: Be sure you understand HOW the answers to 15 and 16 above are obtained by reading the graph!)*

18. What is meant by the term “slope?”

19. What visual aspect of a graph suggests the slope?



20. Study the two graphs at Fig. A11 on page 10. The graph on the left is called a

_____ graph/curve while the graph/curve on the right is called a

_____ graph. Which part of the graph is different? _____

21. On a rate graph, rate is shown on the y-axis and is known as the ***dependent variable***. Time, on the x-axis, is known as the ***‘independent’ variable***.

Why is the measure on the x-axis called INDEPENDENT?

22. What must a rate graph always show on one of its axes?



23. What other types of independent variables may be on the abscissa of a graph?

24. Refer back to question #22, what other types of independent variables may be placed on the abscissa when attempting to grow a plant, or to get seeds to germinate? (*Note: you will design an experiment like this soon*)

25. For emphasis here, state what a progress curve and a corresponding rate curve must show:

26. Examine the graph at Fig. A.12.

Why is the Process I line higher on the graph?

Why are the curves flat?

27. Examine the graphs at Fig A.13 on page 11. What is different about the line, or slope, on the progress curve when comparing this graph to the previous ones studied? Why?

28. How will this be reflected in the rate curve?

29. Study the figure at A.14, line C. Notice that the line is not straight. The average slope

is 2.5 units/hr.



(*Note: Be sure to understand this before moving on.*)

Why is this information misleading?

30. How can we find the ‘true slope’ at TWO hours?

31. Concept wrap-up...

So...a perfectly flat curve (Process I or II) means that the rate curve will be depicted as a **straight** line. However, a progress curve with changes in slope (Process III) will give a rate curve that looks like: **steps**.



IF the progress curve has mild changes indicating a more gradual change in slope, how will this be reflected in what the 'steps' look like in the corresponding rate graph?

Flatness in a progress curve and flatness in a rate curve mean different things:

32. Carefully read the material on pages 13-15 regarding the progress and rate curves showing the growth of pea plants. Study what happens to the rate curve and how it correlates with the progress curve. Fill in the chart:

What does the shape of the curve mean?	Progress curve/graph	Rate Curve/graph
Flat		
Curving upward	<i>(refer back to Fig A.8,9)</i>	
Curving downward	<i>(refer back to Fig A.8,9)</i>	

(Note: Be certain to read about how biologists use the terms "graph" and "curve." We will speak about them in a similar fashion.)

33. Other kinds of rate graphs are discussed on pages 15-18. Be certain to read over this, as you may need to refer to this for labs. This information will be included on your one of your first assessment.

Summer Assignment #4 – respond to me

~ Do this last, *only* when you have completed your summer assignments given above.

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*You already have a Morgan Hill Unified Google email account. Use it for this, please.

Email me to introduce yourself. I'd like to know some of your immediate and long term goals as well as why you decided to take AP Biology. My email is rottenbornh@mhusd.org and I will be checking it this summer. If you encounter problems with your summer assignment, please contact me through that email as well. I may not respond promptly, but I will try to respond to you when I can. Please give me your honest and most constructive responses to the following:

1. Full (official) name as listed on my class roster
2. Preferred name you wish me to call you
3. Previous science high school courses you took - which did you like the most and why
4. Other courses you are taking *this* year - and how rigorous you believe them to be
5. Majors you are considering studying in college
6. What career do you see yourself doing?
7. Extracurricular activities you love doing
8. Greatest strength as a student - I will see this in class
9. Greatest weakness as a student - I will be mindful of this and could help you with this
10. Ask AT LEAST one good question about something you'd truly like to know about AP Biology.