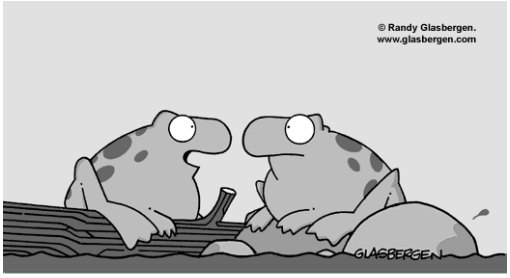
AP Biology Summer Assignment



"Looks aren't everything. It's what's inside you that really matters. A biology teacher told me that."

Welcome to AP Biology!

The two main goals of AP Biology are to help you develop a conceptual framework for modern biology and to gain a deeper appreciation of science as a process (as opposed to an accumulation of facts). 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 centers around the four Big Ideas and you will need to not only know these but also understand how they all relate:

- **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.**

What to do before the first day of school:

- **(Highly suggested but not mandatory)** Purchase a copy of **5 Steps to a 5 by Mark Anestis** (Amazon or your local book store). **It must be the NEWEST addition.**
- AP Biology was designed by a select group of college professors and high school science teachers to be equivalent to an introductory college biology course. Visit the below College Board site to explore what an AP Biology course is like:
    - https://apstudent.collegeboard.org/exploreap?affiliateId=apcentral&bannerId=exploreap1
- We have a small problem in AP Biology. Each year new advances in science are discovered but the length of the school year (and when the test occurs) stays the same. To make matters worse, we start school almost a full month later than many schools. What does this mean? We are short on time. In order to cover ALL of the material, you are responsible for reviewing the Chemistry section on your own. Here is what you are to do:
    - Your 5 Step book is an amazing resource, if you get it, use it!!! It will definitely help you to review some of the chemistry that you will need!
    - Watch the following two YouTube videos. These are called Crash Courses with Hank Green. These two videos are great chemistry reviews.
      http://www.youtube.com/watch?v=HVT3Y3_gHGg&list=PL6C159EF1A62143A2&index=11
      http://www.youtube.com/watch?v=QnQe0xW_JY4&list=PL6C159EF1A62143A2&index=8
    - **Complete the Chemistry Worksheet.** As an AP Biology student the expectation is that if you don't know it, find it out!! Use all of your resources!!!
    - **Evolution Packet** – This packet is designed to help you review the concepts of evolution. YOou may have learned most of this material n your first biology course. This material is essential to any other topics that will be covered in AP Biology. Follow the directions in the packet carefully. There are video links and other resources that will help you to answer the questions.
    - **Seed Lab** – This is the first lab you will complete in AP biology. You must complete a pre-lab assignment as part of your summer assignment.
- You're almost done!! This portion of the summer assignment is a review over GOOD graphing skills and practice. I know it sounds elementary but every year there is a graphing portion on the AP exam and students don't get full credit because they miss tiny details like titles and legends. **DUE FIRST DAY OF SCHOOL.**
    - A. Watch this video to review graphing:
      http://www.youtube.com/watch?v=GUYRMdcEs00&list=PLllVwaZQkS2omBpLjQm_BAQKsQ7lq86ku
    - B. Complete the Graphing Practice packet by copying and pasting the following URL into your browser window: biologyjunction.com/**Graph**ing%20PracticeREVISED.doc

You can expect a quiz over Chemistry, Evolution & Graphing assignments the first week of school ☺

- **Finally…….Complete the AP BIOLOGY SURVEY**

I truly am looking forward to working with you next year! Don't procrastinate on this assignment but don't let it keep you from having a wonderful summer!!!

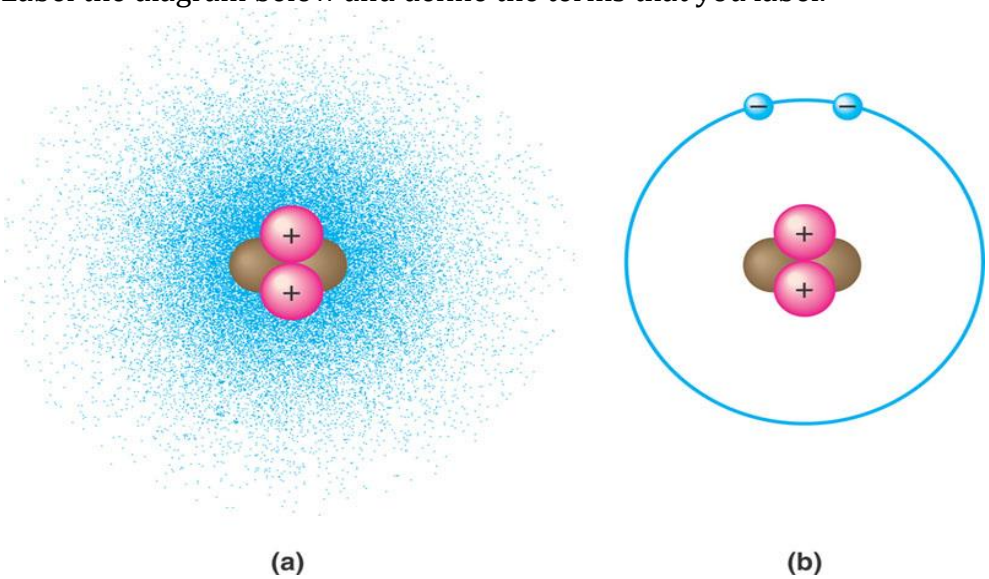
~ Mrs. Mills

AP Biology Essential Chemistry

This is a review of basic chemistry – we will not spend any class time on these concepts as they should have been learned in chemistry. Please make sure that you know them and if not, be sure to study through them. Please put this all in your AP Biology three ring (1 ½ or 2 in.) binder!

1. Contrast the term element with compound.

2. Know the symbols of the following elements and their charge:
   a. Carbon
   b. Hydrogen
   c. Oxygen
   d. Nitrogen
   e. Phosphorus
   f. Sulfur
3. Label the diagram below and define the terms that you label.



4. Contrast the terms atomic mass and atomic number.

5. What is the difference between the terms atomic mass and atomic weight?

6. What is an isotope and what is "special" about radioactive isotopes?

7. What determines interactions between atoms? Why are valence electrons important?

8. 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

9. What is the difference between a structural and molecular formula?

10. Know both the molecular and structural formula for the following compounds.
    a. Oxygen gas

    b. Carbon dioxide

    c. Glucose

    d. Phosphate

    e. Ammonia

    f. Water (you would be surprised at how many people missed this!!!)

11. How do ionic bonds compare with covalent bonds?

12. Compare and contrast hydrogen bonds and van der Waals interactions.

13. Define a dynamic chemical equilibrium in terms of quantities of reactants and products. This is a critical concept!

14. Why is water considered a polar molecule?

15. 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

16. What is special about water and density?

17. 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.

18. Define the following terms:

a. Solute

b. Solvent

c. Aqueous solution

d. Hydrophilic

e. Hydrophobic

f. Molarity

19. MOLARITY

A. Concentration – *comparison of solute to solvent* *(solute : solvent)*
   a. Concentrated – *large ratio of solute to solvent*
   b. Dilute – *small ratio of solute to solvent*

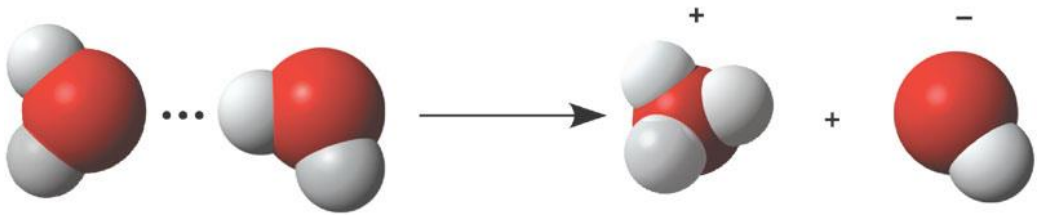
B. Molarity –
   a. Symbol – M
   b. Equation – in reference table

$$M = \frac{\text{moles of solute}}{\text{L of solution}} \qquad M = \frac{\frac{\text{mass}}{\text{molar mass}}}{\text{L of solution}}$$

C. Example Problems

1. What is the molarity of a solution formed by mixing 10.0 g of H_2SO_4 with enough water to make 0.100 L of solution?	2. To prepare 10.5 L of a 2.50 M solution of KOH, how many grams of potassium hydroxide must be used?
3. How many moles of LiBr must be added to .650 L of water to make a 2.0 M solution?	4. What is the molarity of the solution produced when 145 g of NaCl is dissolved in sufficient water to prepare 2.75 L of solution?
5. How many grams of KCl are needed to prepare 0.750 L of a 1.50 M solution?	6. What is the molarity of the solution produced when .594 mol of HCl is dissolved in 0.385 L of water?
7. To produce 3.00 L of a 1.90 M solution of sodium hydroxide, how many grams of NaOH must be dissolved?	8. If 8.77 g of KI are dissolved in enough water to make 4.75 L of solution, what is the molarity of the solution?

20. Label the diagram below to demonstrate the dissociation of the water molecule and then relate this diagram to the term pH.



21. What defines an acid and a base?

22. Why are small changes in pH so important in biology?

23. What is a buffer? Give an example on how they would work in a living organism.

24. What is acid precipitation and why is it important to living organisms?

25. Why is organic chemistry so important in the study of biology?

26. What is special about carbon that makes it the central atom in the chemistry of life?

27. Describe and contrast the three types of isomers. Draw a sketch of each
    a. Structural –

    b. Geometric –

    c. Enantiomers –

28. Be familiar with each of the following functional groups – know it's chemical compound and the functional properties
    a. Hydroxyl

    b. Carbonyl

    c. Carboxyl

d. Amino

e. Sulfhydryl

f. Phosphate

Name:_____ **AP Biology**

Summer Packet

A) What Darwin Never Knew

Watch *What Darwin Never Knew* (http://video.pbs.org/video/1372073556) and answer the following questions. The questions are generally chronological with the movie.

1) Describe how Darwin used the following evidence to formulate his theory of natural selection. Include a description and example of each.

a) Fossil evidence-

b) Morphological(anatomy)-

c) Embryonic-

d) Biogeography-

e) Artificial Selection-

2) What was the significance of the observations that Darwin made about the various finch species that he collected?

3) In your own words, describe the theory of natural selection.

4) Use the example of the desert mice to describe the missing link in Darwin's theory of natural selection.

5) Describe the basic structure of the DNA molecule.

6) What was the purpose of the Human Genome Project?

7) Explain how organisms with the same genes can express traits differently. (Hint: fruit flies or identical twins)

8) Describe Carroll's experiment with fruit flies.

9) What happened to the stickleback fish that were geographically isolated in a lake? How did this occur?

10) What does the loss of spikes tell us about organisms, such as snakes, that have lost their limbs over time?

11) Darwin observed that different finches on different islands of the Galapagos had different beak structures. He determined that these changes were based on food sources. More recently, scientists determined that birds all share the same gene for beak structure, but the timing of gene expression is what leads to different beak shapes. How did scientists discover how genes are expressed in bird beak development?

12) Choose one topic from the human evolution portion of the video that you found interesting. Describe this topic.

B) Evolution Questions

Answer the questions below. Use the video links as a reference.

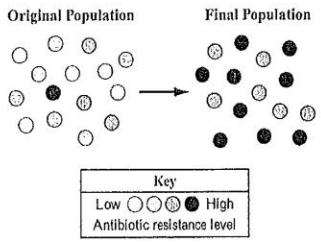
BozemanBiology: Natural Selection

http://www.youtube.com/watch?v=R6La6_klr9g&list=PLFCE4D99C4124A27A&index=2

BozemanBiology: Examples of Natural Selection

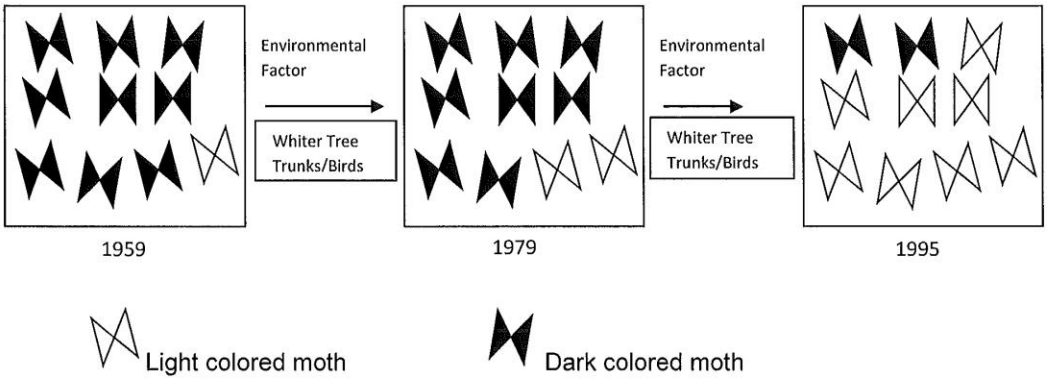
http://www.youtube.com/watch?v=S7EhExhXOPQ&list=PLFCE4D99C4124A27A

1) Antibiotic resistance can vary within a population of bacteria. The diagram below represents the changes in a population of bacteria as a result of exposure to an antibiotic over time.



Explain the changes that occur in this population in terms of natural selection.

2) In England, the trunks of trees were blackened for many years by soot from factories. After passage of the Clean Air Act in 1959, the trunks became lighter. Scientists in England studied the peppered moth (*Biston betularia*) which rests on these trees and is preyed upon by birds. They noticed the following change in frequencies over a period of time.



a. Write a verbal representation of the events depicted in the storyboards above.

b. Do you think natural selection is occurring during this time period? Provide a written justification of your answer.

c. How would the scenario have changed if there were no birds to eat the moths?

C) Essay

Variation, selection, and time are key components in describing how organisms evolve. Use the three terms to describe how organisms evolve. Be sure to use examples and evidence in your description of each term. Be sure to address the following question: How can one creature become another creature? (Note: Your essay should not be longer than 3-4 paragraphs.)

AP Biology Survey

Name:_____

Grade:_____

Are you planning on taking the AP Biology exam in May?

_____Yes _____No _____Maybe

List the other AP classes you are enrolled in or have taken:

Are you or have you taken an AP test for any of the classes above:

List the history of your science classes (include Honors/Academic):

9-

10-

11-

12-

Why are you taking AP Biology?

Resources

General Resources:
Bozeman Science is a great resource for AP Biology (and many other courses):
http://www.bozemanscience.com/
CrashCourse:
http://www.youtube.com/playlist?list=PL3EED4C1D684D3ADF
Vance Kite:
http://www.youtube.com/user/lab2oh7

Evolution Resources:
What Darwin Never Knew (PBS):
http://video.pbs.org/video/1372073556
What Darwin Never Knew(YouTube):
http://www.youtube.com/watch?v=NOHzY1fuOz4
Natural Selection:
http://www.bozemanscience.com/001-natural-selection
Examples of Natural Selection:
http://www.bozemanscience.com/002-examples-of-natural-selection
Evidence of Evolution:
http://www.bozemanscience.com/004-evidence-for-evolution
Natural Selection:
https://www.youtube.com/watch?v=aTftyFboC_M&list=PL3EED4C1D684D3ADF&index=15

Lab Resources:
Beginners Guide to Graphing Data:
http://www.bozemanscience.com/beginners-guide-to-graphing-data
Graphing Data by Hand:
http://www.bozemanscience.com/graphing-data-by-hand
Data Collection Strategies:
http://www.bozemanscience.com/apb-practice-4-data-collection-strategies

Name:_____ **AP Biology**

Lab 2: Seed Germination Lab

Introduction:

Germination is the process by which a plant sprouts from a seed. In this lab, each group will be given black eyed pea seeds and will design an experiment to determine the best environmental condition for seed germination. Germination can be affected when there is a change in environmental conditions such as temperature, pH, or light. In this lab, you will test the effect of light on the germination process. You will have the opportunity to test 3 different types of light sources: 24 hour grow lights (complete light), sunlight (partial light), and dark (no light).

1) How will you carry out your experiment?

2) What is your hypothesis (prediction)?

3) What is the independent and dependent variable in the experiment?

4) What factors will you control in the lab?

5) What will you measure before the lab begins? How will you obtain these measurements?

6) How will you collect data for the lab?