

AP Biology

An Introduction to Your AP Biology Course

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.

In addition, much of the course will be dedicated to the understanding of science as a process. This, however, goes well beyond the steps of the scientific method that you learned in third grade. To be a successful scientist, you must understand the process of experimental design and how to critically analyze not only the results of your experiments, but the procedure and data collection methods as well. You must be able to create and understand a variety of different charts and graphs, each important for different varieties of data. You must be able to point out flaws in arguments based on both qualitative and quantitative data. You must be able to create and analyze visual interpretations of various biological concepts. And finally, you must be able to relate what you've discovered back to classic biological concepts and use your depth of knowledge to explain those experimental results.

All these skills, in addition to general biology knowledge, are included in the AP Course Description and will be tested on the AP test in May!

Your summer assignment is below. The due dates are spaced throughout the summer to keep you from having a big, scary assignment hanging over your head all summer long. (I expect the assignment to take about 10-12 hours overall.) I look forward to working with you this coming school year and I hope you have an amazing, relaxing summer. After a tough 2021-22 school year, you absolutely deserve it!

Mr. Matthew Jurkiewicz

AP Biology
Summer Assignment Guidelines

PART A – Due Date: Monday, June 27, 2022
Introductory Video

Watch this introductory video: <https://youtu.be/ADZeb7KRwWo>

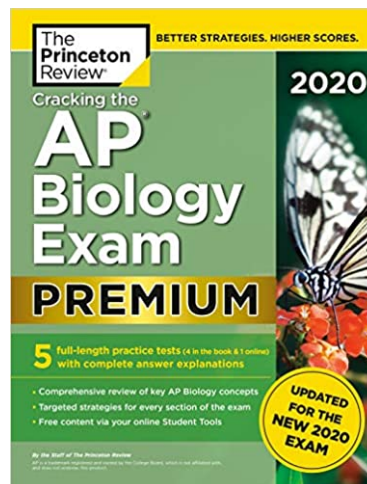
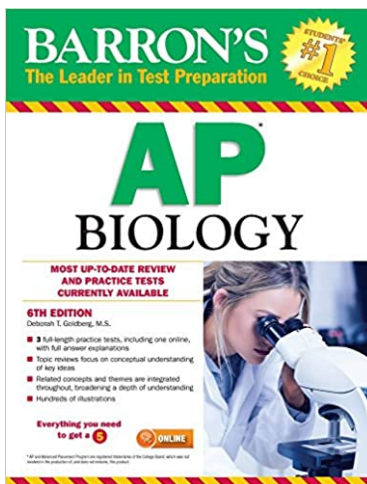
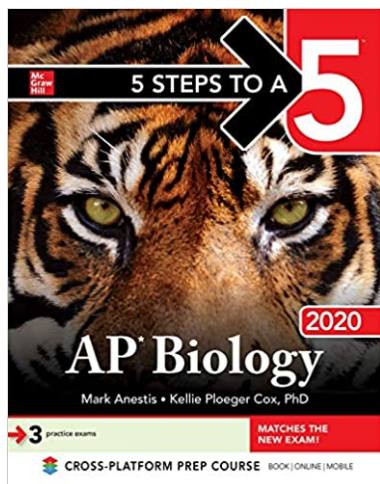
Complete the task given to you in the video and e-mail it to mjurkiewicz@msjacad.org.

PART B – Due Date: Friday, July 1, 2021
AP Guide Book

I highly recommend that you purchase an AP Biology study guide. We *will not* normally utilize them during class (so buy the one *you* like best), however they're great resources to help you prepare for tests throughout the year and for the AP test in May.

In addition, having a guide book to reference will help you complete Part C of the summer assignment.

These are my favorite AP Biology study guides. I'd suggest purchasing the one (*not* more than one) you are more comfortable with from other AP courses. Either is a fine choice, but *make sure* it's the newest edition (2020 or later), especially if you purchase from Amazon.com, etc.!



PART C – Due Date: Monday, July 18, 2022

Chemistry and Terminology Reviews

Suggested Time: 4-5 hours

On the following few pages, you will find reviews of general chemistry knowledge (pages 6 to 18) and general biology terminology (pages 19 to 21). Some if it you'll be very familiar with while some might be new to you (because [1] you haven't taken a high school Biology course yet and [2] your Chemistry course was completed virtually and surely some concepts had to be cut for time).

Utilize the Internet, YouTube videos (suggested below), and your AP Biology guide book to complete the reviews to the best of your ability. Pay specific attention to the Chemistry review and highlight the concepts you find most difficult. We have time to do a brief Chemistry review during the first few days of class next year so you'll want to be ready with questions about specific topics that you find most confusing!

Hank from "Crash Course" discusses Chemical Bonding: <https://www.youtube.com/watch?v=QXT4OVM4vXI>

Hank from "Crash Course" discusses Water: https://www.youtube.com/watch?v=HVT3Y3_gHGg

Hank from "Crash Course" discusses Molarity: <https://www.youtube.com/watch?v=9h2f1Bjr0p4>

Hank from "Crash Course" discusses Acids and Bases: <https://www.youtube.com/watch?v=LS67vS1005Y>

Get to know Hank! He's one of my favorite YouTubers!

When you're finished, e-mail your completed work to mjurkiewicz@msjacad.org

PART D – Due Date: Monday, August 15, 2022

Science Practice Guides

Suggested Time: 5-6 hours

Paul Anderson, of Bozeman Science on YouTube, is on the most respected educators in the AP Biology world. Some of his videos can be a little “dry” compared to other YouTubers who are more focused on *entertainment* than science, but Mr. Anderson has one goal in his videos – to educate you with the most essential information and **get you a 5 on the AP test!**

He has uploaded videos (under 10 minutes each) that break down the six science practices tested on the AP test. I’d like you to watch a video on each of the six science practices below and summarize it in 1-2 pages. However, **don’t** write an essay or set of paragraphs!

Each one of your summaries should be visual, eye-catching, and unique. I am envisioning a set of mini-posters that you can put in the *front* of a three-ring binder and look at frequently throughout the course to remind yourself that **these are exactly the concepts that the AP test will be testing you on.**

Things you might want to include:

- Lots of colors (to organize concepts, not just to make it “pretty”)
- Essential Terminology **in bold**
- Examples
- Images or Illustrations
- Flow Charts
- Definitions (of most important terms)
- Diagrams
- Short bulleted lists

Maximum size – front side OR front and back of a single sheet of paper (some might be one page and others might be two pages. That’s OK!)

Submit your work as a single PDF with the science practices labeled.

Rubric

Have you included the most important concepts relating to each science practice?
Have you defined important vocabulary?
Have you included examples, either from the videos or from other sources?
Are concepts explained concisely using lists, diagrams, and flow charts?
Have you used various colors and images to make your work eye-catching?

When you’re finished, e-mail your completed work to mjurkiewicz@msjad.org

Science Practice Videos:

#1: Models and Representations	https://www.youtube.com/watch?v=v5Nemz_cVew
#2: Using Mathematics Appropriately	https://www.youtube.com/watch?v=jgqYISKoXak
#3: Formulate Questions	https://www.youtube.com/watch?v=2zB272Ak63A
#4: Data Collection Strategies	https://www.youtube.com/watch?v=AzTXnne40wU
#5: Analyze Data and Evaluate Evidence	https://www.youtube.com/watch?v=0JqkouOtZA
#6: Scientific Explanations and Theories	https://www.youtube.com/watch?v=3gK1xWNM7kk

Finally, now that you have met Hank from Crash Course and Paul Anderson from Bozeman Science, I'd like to introduce you to the third YouTube channel that we'll use frequently during AP Biology: The Amoeba Sisters!

The Amoeba Sister's videos are cartoons, filled with little jokes and memes along with wacky characters, but the science is solid and quite in-depth. It wouldn't surprise me if this channel became your "go to" review spot next semester!

The Amoeba Sisters discuss "The Nature of Science": <https://www.youtube.com/watch?v=3nAETHZTObk>

Name: _____

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AP Biology
Essential Chemistry Review

1. Contrast the term **element** with **compound**.

2. Know the symbols of the following elements and their charge:
 - a. Carbon

 - b. Hydrogen

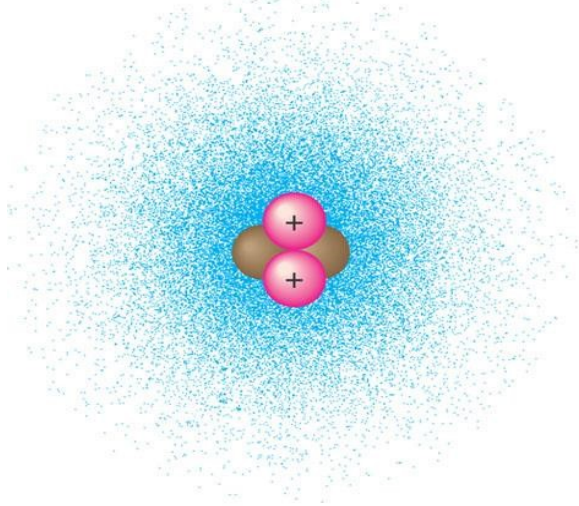
 - c. Oxygen

 - d. Nitrogen

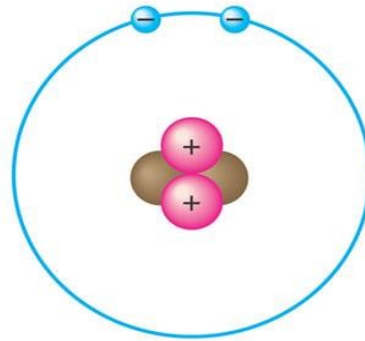
 - e. Phosphorus

 - f. Sulfur

3. Label the diagram below and define the terms that you label.



(a)



(b)

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.

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

Watch these videos for a review of the concept of molarity!

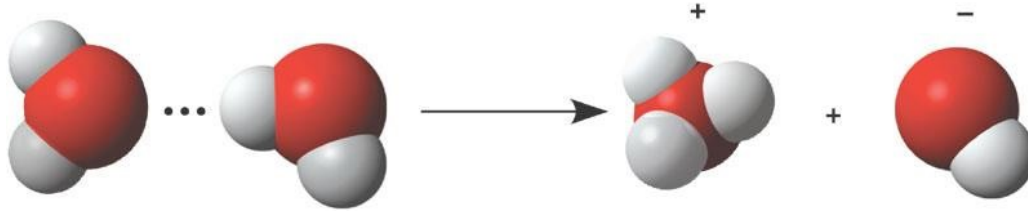
<http://www.wikihow.com/Calculate-Molarity> and

<https://www.youtube.com/watch?v=O7xi3SVbKw4&t=4s>

Example Problems

<p>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?</p>	<p>2. To prepare 10.5 L of a 2.50 M solution of KOH, how many grams of potassium hydroxide must be used?</p>
<p>3. How many moles of LiBr must be added to .650 L of water to make a 2.0 M solution?</p>	<p>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?</p>
<p>5. How many grams of KCl are needed to prepare 0.750 L of a 1.50 M solution?</p>	<p>6. What is the molarity of the solution produced when .594 mol of HCl is dissolved in 0.385 L of water?</p>
<p>7. To produce 3.00 L of a 1.90 M solution of sodium hydroxide, how many grams of NaOH must be dissolved?</p>	<p>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?</p>

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

Name: _____

Date: _____

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AP Biology
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.

Word	Meaning
a / an	
meso	
leuco	
aero	
anti	
amphi	
aqua / hydro	
arthro	
auto	
bi / di	
bio	
cephal	
chloro	
chromo	

Word	Meaning
hemo	
hyper	
hypo	
intra	
-itis	
lateral	
-logy	
-lysis	
-meter	
mono	
morph	
micro	
macro	
multi / poly	

cide	
cyto	
derm	
haplo	
ecto (exo)	
endo	
epi	
gastro	
genesis	
herba	
hetero	
homo	
ov	
kary	
neuro	
soma	
saccharo	
primi / archea	
phyll	

pod	
-phobia	
-philia	
proto	
photo	
psuedo	
synthesis	
sub	
troph	
therm	
tri	
zoo, zoa	
-tropism	
-taxis	
-stasis	
zyg / zygous	
phago	
path / pathy	
sym / syn	

Once you have completed the above table, use it to develop a definition, *in your own words*, for each of the following terms.:

1. Hydrology _____
2. Cytolysis _____
3. Protozoa _____
4. Epidermis _____
5. Spermatogenesis _____
6. Exoskeleton _____
7. Abiotic _____
8. Pathogen _____
9. Pseudopod _____
10. Hemophilia _____
11. Endocytosis _____
12. Herbicide _____
13. Anaerobic _____
14. Bilateral _____
15. Autotroph _____
16. Monosaccharide _____
17. Arthropod _____
18. Polymorphic _____
19. Hypothermia _____
20. Biogenesis _____