

# Fulton Science Academy Private School

## AP Biology 2026-2027: Summer Work

Welcome to AP Biology!

The AP Biology Curriculum centers around the 4 Big ideas and you will need to not only know these but also understand how they are interconnected.

1. The process of evolution drives the diversity and unity of Life
2. Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis
3. Living systems store, retrieve, transmit, and respond to information essential to life processes
4. Biological systems interact, and these systems and their interactions possess complex properties

These four big ideas are the framework for the 8 main units of the course:

AP Biology Overview Video: A great resource to use to review but also give you a good idea of what to expect from this course: <https://youtu.be/Kuxic6y6pwkn>

1. Chemistry of Life
2. Cell Structure and Function
3. Cellular Energetics
4. Cell Communication and Cell Cycle
5. Heredity
6. Gene Expression and Regulation
7. Natural Selection/Evolution
8. Ecology

### **Suggested Materials:**

1. AP Biology Review Book 2024 Edition
  - a. There are several different companies that come out with these review guides. The consensus of my class this past year was that the Princeton Review was their preferred. They usually start coming out with the current editions in the fall and early spring. You can usually find past years edition for cheap online or used copies that may also be a good idea
2. OpenStax: AP Biology Textbook: <https://openstax.org/details/books/biology-ap-courses>
  - a. This is a free online textbook that I always recommend to students as another study tool and resource
3. Khan Academy: <https://www.khanacademy.org/science/ap-biology>
  - a. Khan Academy again is another good free online resource that includes helpful videos, articles, and practice questions that follow the AP Biology curriculum
4. YouTube Videos:
  - a. There are several YouTube channels dedicated to short science review videos
    - i. My favorite are the Amoeba Sisters, Bozeman Science, AB Bio penguins and Crash Course
5. Fiveable Review: <https://library.fiveable.me/ap-bio>
  - a. Several students used this a resource. I have not looked over much of the material, but they seem to have good videos and review games
6. Albert.io AP Biology: <https://www.albert.io/ap-biology>
  - a. This is another resource several students used for practice questions. I have not reviewed this resource as you need a subscription. I would recommend speaking with past students who have used this resource.

# **AP Biology Survival Guide: Modified from J. Rosenblum**

## **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 on what college-level workload is. A good way to begin this adjustment is to consider the ways in which AP science and college coursework differs from high school or even middle school coursework

- Material is presented more rapidly and in larger quantities
- Each exam covers a vast amount of material
- Keeping up with previous material is essential to understand the new material
  - Almost all the material is intertwined
  - You will especially see the interconnectedness of the material in FRQs
- You may need to invest out-of-class time to effectively learn course material
  - Cramming the night before will not be a viable option to do well in the course and exams
  - Balancing extra-curriculars and academics is a skill you will need to develop through your academic career especially into college
- Critical thinking is much more important than rote memorization
  - AP Biology is a conceptual exam and course. You must know the material well enough to be able to apply it
  - Biology is not as black and white as people seem to think, there is a lot of gray area.
- Students are expected not only to understand the specific examples given in class, but also to apply their own knowledge broadly
- No one but you must ensure that necessary coursework gets done on time
  - That means if you miss school, whether it be for illness or a school approved absence, YOU are responsible for getting the make-up work and completing it in a timely manner, so you don't get behind
  - This is a college level course; I will not hunt you down for missing work
- The most important thing: help is always alliable, but YOU must take the initiative to seek it out, and not at the last possible minute.
- Develop effective note-taking skills
  - Don't record every word said during a lecture or words on PowerPoint slides
  - Focus on main ideas and the big picture as well as relevant examples to enforce these big ideas

## **Part 1: Welcome Letter Assignment** (Please email your welcome letter assignment for AP Biology to [dkala@fultonscienceacademy.org](mailto:dkala@fultonscienceacademy.org) by July 25, 2026.)

AP Biology as a course involves a great deal of collaborative learning. It is important to me, as an instructor, that I get to know you as a person. It is also important that you now, as a young adult getting ready to enter college, work on email communication. I expect that you may struggle throughout the year, and I hope that you will keep an open line of communication with me as well as your other instructors. You will write a letter of introduction to the biology instructor. Please remember you're likely writing a letter that is making your first impression on a new teacher, so check for grammar/spelling and appropriate phrasing before sending.

When you are emailing an instructor, you need to ensure your email contains several things.

1. Subject Line:
  - a. The subject line needs to include your name, which class you are in, and which period the class is followed by a brief description on what the email is in relation too.
    - i. Example: Joe Smith 4<sup>th</sup> period AP Biology Questions about homework due date
2. Addressing the instructor properly
  - a. You need to include a proper introduction
    - i. Example: Dear Mr. Smith, Good Afternoon Mr. Smith, etc.
  - b. You are emailing an instructor, not texting your best friend

In your letter you will need to include:

1. Introduce yourself
  - a. What is your name?
  - b. Do you have a nickname you go by?
  - c. What grade are you in?
2. Courses:
  - a. What science classes have you taken so far?
  - b. How many AP classes have you taken before this year?
  - c. What subject area(s) are you most interested in continuing in college?
  - d. Is there anything that you've especially liked or disliked about your earlier biology/science classes?
3. Yourself
  - a. What do you like to do (hobbies, sports, music, interests, etc.)?
  - b. Tell me about your family (siblings, pets, who do you live with? how would you describe them?)
  - c. Do you have a job or plan on getting a job next year/ What kind?
4. Learning
  - a. What are your personal strengths when it comes to learning new material?
  - b. What causes you to struggle in a course? How do you address that challenge?
  - c. How would you describe yourself as a learner?
  - d. How would you describe yourself as a team or group member?
  - e. A lot of times students say that they will learn best with interactive activities, what does interactive mean to you?
5. AP Biology
  - a. Why are you taking this course? What do you hope to accomplish/gain from this course?
  - b. What are you looking forward to most in AP Biology?
  - c. Do you have any concerns coming into AP Biology this year?

## **Part 2: Foundational Skills for AP Biology:** (Please email your foundation skills assignment for AP Biology to [dkala@fultonscienceacademy.org](mailto:dkala@fultonscienceacademy.org) by July 25, 2026.)

### **Nature of Science:** <https://youtu.be/3nAETHZTObk>

1. What is the scientific method? Is there just one universal scientific method? Why or why not?
2. Reflect on what was discussed in the video. How would you complete these general sentence stems regarding the nature of science?
  - a. Science has a major goal of:
  - b. Science can lead to the development of:
  - c. It's important to know that science is:
3. Why is it important to verify the credibility of a source when researching a topic?
4. What does it mean if a science a paper is peer-reviewed?
5. Observations and inferences are important in science. How would you explain the difference between the two words?
6. Constant/Controlled variables and a control are easily confused by students! How would you explain the difference between the two words?
7. Why is a control group generally very important in an experiment?
8. Data Collection: Pinky's science fair project in junior high focused on an observation that the crickets outside her window chirped less frequently when the temperature was colder. Consider if data was collected consisting of the average number of cricket chirps at different temperatures in her backyard.
  - a. Which is the independent variable?
  - b. What is the dependent variable?
  - c. What variable would be plotted on the x-axis?
  - d. Which variable would be plotted on the y-axis?
  - e. What are three important constant/controlled variables?
  - f. What are three challenges or important points to consider when conducting the described data collection?

### **Scientific Questioning:** <https://youtu.be/2zB272Ak63A>

1. I should be able to ask you, "How do we...."
2. Students should be able to answer, "This is how..."
3. What is a good example of how you ask questions all the time?
4. What is the problem with?
  - a. Smallest bird population?
  - b. Universe question?
  - c. Genetically modified food question?
5. Why is the plant growth question more scientific? What is the problem with it too?
6. Why is the CO<sub>2</sub> question a good scientific question?
7. A good question is going to lead to two things:
8. What are the three things you have to be able to do during the practice of Scientific Questioning?
9. Write out one of the three questions he "posed" concerning the phylogenetic tree.
10. When you refine a question, you are taking it to another ...
11. What is the third part of scientific questioning?
12. What can you then do if you are good at scientific questioning?

### **Root Word Investigation**

Scientific words can seem extremely overwhelming. They tend to be long and can often be hard to write and spell. One thing people don't realize about scientific words is that a lot of times the mix of smaller words they are made up of can tell us exactly what the word means. Most scientific vocabulary is a mix of small words that are linked together to have different meanings. If you learn the meaning of the little words, you'll find scientific vocabulary much easier to understand.

1. From the list below, research each root word and write the definition.

<b><u>Root Word:</u></b>	<b><u>Definition:</u></b>
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-	
-genisis	
Herba-	
Hetero-	
Homo-	
Ov-	
Kary-	
Neuro-	
Soma-	
Saccharo-	
Primi-/archea-	
-phyll	
Hemo-	
Hyper-	
Hypo-	
Intra-	
Inter-	
-itis	
Lateral	
-logy	

-lysis	
-meter	
Mono-	
Morph-	
Micro-	
Macro-	
Multi-/poly-	
-path/-pathy	
-ped/-pod	
Phago-	
-phobia	
-philia	
Proto-	
Photo-	
Pseudo-	
-stasis	
Sub-	
Sym-/syn	
-synthesis	
-taxis	
-troph	
-tropism	
-therm	
Tri-	

Zoo-, -zoa	
Zyg-/-zygous	

2. Once you have completed the list of root words above, use it to develop a simple definition, in your own words for each of the following terms

<u>Word</u>	<u>Definition</u>
Hydrology	
Cytolysis	
Protozoa	
Epidermis	
Spermatogenesis	
Exoskeleton	
Abiotic	
Pathogen	
Pseudopod	
Hemophilia	
Endocytosis	
Herbicide	
Anaerobic	
Bilateral	
Autotroph	
Monosaccharide	
Arthropod	
Polymorphic	
Hypothermia	

**CER (Claim, Evidence, Reasoning):** <https://youtu.be/15aWaGYheJs>

1. What can lead to being curious and lead to fascinating scientific investigations?
  - a. Questions
  - b. Answers
  - c. Qualitative measurements
  - d. Quantitative measurements
2. True or false: there is one universal scientific method.
3. What does CER stand for?
4. During research, what is important to examine?
  - a. That the information comes from credible sources
  - b. That the information is factual
  - c. That the information is peer reviewed
  - d. All of the above
5. What type of organisms use brumation?
  - a. Ectotherms
  - b. Endotherms
  - c. All hibernating organisms
  - d. All tortoises
6. What does reasoning provide?
  - a. Stats and data
  - b. How or why evidence supports a claim
  - c. A hypothesis of the phenomenon
  - d. A conclusion
7. What helps the turtles remain in the water during the winter?
  - a. Crepuscular changes
  - b. Seasonal changes
  - c. Physiological changes
  - d. What should you do next time you read a claim online? What questions should you ask before you believe the claim?
8. Read each statement and determine if it is a claim, evidence, or reasoning, Write C for claim, E for evidence, and R for reasoning
  - a. In a recent scientific study, 82% of students' grades improved with longer class periods
  - b. Students' grades would improve with longer class periods
  - c. Evidence shows that longer class periods improved most students' grades
  - d. If a balloon gets warmer, it will expand
  - e. Raising the temperature 5 degrees caused the balloon to expand from 80 cm to 100 cm

**Scientific Theory vs. Law:** <https://youtu.be/GyN2RhbhiEU>

1. Scientific laws and theories can be described as having different \_\_\_\_\_ to do.
2. What is the main job of a scientific law?
3. What is an example of a scientific law from the video?
4. How would you describe a scientific theory?
5. What is an example of a scientific theory from the video?
6. In simplest terms a law predicts \_\_\_\_\_ while a theory \_\_\_\_\_
7. True or False Theories always grow up into a law
8. We continually propose, \_\_\_\_\_, revise, or even \_\_\_\_\_ our scientific ideas as a work in progress
9. True or False: Laws usually resist change
10. Which theory do scientist tend to favor if there is more than one?
11. Name one example of a discarded theory from the video.
12. Why do discarded theories still have some scientific merit?

**Models and Representations:** [https://youtu.be/v5Nemz\\_cVew](https://youtu.be/v5Nemz_cVew)

1. What is a model?
2. A \_\_\_\_\_ of how it works is a “Conceptual Model”.
3. What are the Four Big Ideas we will be discussing in AP Biology? List below along with associated examples:
  - a. \_\_\_\_\_ - example shows natural \_\_\_\_\_
  - b. \_\_\_\_\_ - example:
  - c. \_\_\_\_\_ - Genetics and Cell
  - d. \_\_\_\_\_ - Pyramid of
4. What are 5 things you will need to able to do using models and visual representation? List below and then answer
  - a. \_\_\_\_\_
    - i. Relating to beetles, draw/label the final graph he created below:
    - ii. Why do you think there were fewer light-colored beetles when the trees became darker?
  - b. \_\_\_\_\_
    - i. What was/is going to move in his example?
  - c. \_\_\_\_\_
    - i. They will give you a model and then \_\_\_\_\_ based on that ...
  - d. \_\_\_\_\_ means that you are \_\_\_\_\_ your knowledge to a visual representation
  - e. \_\_\_\_\_ asking you to \_\_\_\_\_ the knowledge that you have
5. Models allow us to make \_\_\_\_\_ of a \_\_\_\_\_ model.
6. What is the most famous model of all? Who was it created by?

## Statistics

Although this is a biology course, data and data analysis are an essential part of biology and is definitely a skill tested on the exam. Having a strong understanding of what graph to use to display information and the skill needed to interpret those results will help you become an even stronger scientist as we're learning content.

Great Video outlining important equation you may encounter on the AP Bio Exam:

<https://youtu.be/inXWxEbJWB0>

### 13. <https://youtu.be/jgqYlSKoXak>

- a. All sciences have what at their core?
- b. What is "Mathematical Biology" driven by:
  - i. \_\_\_\_\_: sequencing DNA – what is the trend?
  - ii. \_\_\_\_\_ Theory: being used to predict \_\_\_\_\_ Rule of \_\_\_\_\_
  - iii. Computing \_\_\_\_\_: computers are getting....
  - iv. Laboratory experiment in silico:
    1. In vitro:
    2. In vivo:
    3. In silico: simulating
- c. Four equations in the four big ideas: You want to be familiar with these
  - i. Evolution:
  - ii. Information:
  - iii. Free Energy:
  - iv. Systems:
- d. Understanding in using Mathematics:
  - i. \_\_\_\_\_ the \_\_\_\_\_ of a Mathematical Routine: Pause the video, try and do it and then click it. If you cannot do it, just take notes. (You need a calculator!)
  - ii. Apply \_\_\_\_\_ Routines: Again, try this problem.
  - iii. \_\_\_\_\_ quantities that \_\_\_\_\_ natural phenomena.
    1. Estimate which way water will go in each
    2. Potatoes you can do this, just use the graph: potatoes have \_\_\_\_\_ M of sucrose

### 14. Statistics: <https://youtu.be/jf9VT4V4aRI>

- i. What is  $n$ ?
  - ii. What is  $\bar{x}$ ?
  - iii. What is  $M$ ?
  - iv. What was the range of the sample in his video?
  - v. Explain "degrees of freedom" (with any example) and why the formula for it is  $n-1$
- b. Standard Deviation: <https://youtu.be/09kiX3p5Vek>
- i. What is meant by normal distribution?
  - ii. What does standard deviation (SD) measure?
  - iii. Can 2 sets of data have the same mean but different SD? Explain.
  - iv. 1 SD means \_\_\_\_\_% of the population falls within this range; while 2 SD means \_\_\_\_\_% falls within this range
  - v. Pause the video and calculate the SD from the 2<sup>nd</sup> set of data given by hand. Show your work!
- c. Standard Error: <https://youtu.be/BwYj69LAQOI> and <https://www.youtube.com/watch?v=3UPYpOLeRjg>

- i. Explain the significance of the standard error among 2 different sets of data with different sample sizes that have the same mean (in terms of precision)
- ii. What do SEM bars that have overlapping means on the graph indicate?
- iii. Explain the significance if SEM bars overlap, but the means do not overlap
- iv. Explain the difference if there is no overlap between SEM bars

15. Graphing: <https://youtu.be/9BkbYeTC6Mo>

- a. What type of graph uses a “best fit” line?
- b. Explain the difference between a bar graph and a histogram
- c. What type of graph shows a change over time?
- d. What type of graph displays a correlation of variables?
- e. Which type of graph is best for comparing 2 or more different groups?
- f. Which type of graph is better for showing distribution of data?
- g. Explain when a pie chart/graph should be used and give (draw/label) any example
- h. State at least 5 elements that any graph should always display

### Essential Chemistry

This is a review of basic chemistry necessary for the course since many of you are coming into the course without a background in chemistry. Use these videos below the answer some of the question. I also highly recommend taking additional notes on the videos to help you throughout the year.

[https://www.youtube.com/watch?v=QnQe0xW\\_JY4](https://www.youtube.com/watch?v=QnQe0xW_JY4)

[https://www.youtube.com/watch?v=HVT3Y3\\_gHGg&list=PL6C159EF1A62143A2&index=12](https://www.youtube.com/watch?v=HVT3Y3_gHGg&list=PL6C159EF1A62143A2&index=12)

[https://www.youtube.com/watch?v=HVT3Y3\\_gHGg](https://www.youtube.com/watch?v=HVT3Y3_gHGg)

<https://youtu.be/QXT4OVM4vXI>

<https://youtu.be/PVL24HAesnc>

<https://youtu.be/ASLUY2U1M-8>

1. Compare and contrast the terms element and compound
2. Complete the table below

Element	Symbol	Charge
Carbon		
Hydrogen		
Oxygen		
Nitrogen		
Phosphorus		
Sulfur		

3. Compare and contrast the terms atomic mass and atomic number
4. What is an isotope and what is “special” about radioactive isotopes?
5. What determines interaction 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 are the molecular formulas for each of the following compounds?
  - a. Oxygen gas

- b. Carbon dioxide
  - c. Glucose
  - d. Phosphate
  - e. Ammonia
  - f. Water
8. How do ionic bonds compare with covalent bonds?
  9. Compare and contrast hydrogen bonds with Van der Waals interactions
  10. Why is water considered a polar molecule?
  11. For each of the properties of water listed below: briefly define the property and then explain how water's polar nature and polar covalent bonds contribute to the special property of water.
    - a. Cohesion
    - b. Adhesion
    - c. Surface tension
    - d. High specific heat
    - e. Heat of vaporization
    - f. Evaporative cooling
  12. What is special about water and density?
  13. Explain how these properties of water are related to the phenomena describe 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 US can remain below 0 degrees Celsius for months; however, the fish and other animals living in the lakes survive.
    - b. Many substances, like 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 helps to 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/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. Hydrophilic
    - d. Hydrophobic
    - e. Molarity
  15. What defines an acid and a base?
  16. Why are small changes in pH so important in biology?
  17. What is organic chemistry?
  18. Why is organic chemistry so important in the study of biology?
  19. What is special about carbon that makes it the central atom in the chemistry of Life

## 20. Functional Groups

Functional Group	Chemical Compound	Functional Properties	Picture
Hydroxyl			
Carbonyl			
Carboxyl			
Amino			
Sulfhydryl			
Phosphate			