Advanced Placement Biology
SUMMER ASSIGNMENT 2018
Mr. Gauthier

As many of you know, a surprising number of students have *elected* to take AP Biology in the fall. Hopefully you have really considered the prerequisites for the course. All advanced courses have high expectations, and the requirements to succeed in such a program are great. *THE BAR WILL NOT BE LOWERED,* or the success/reputation of the course will be compromised. Be sure you consider the following before making a "full commitment" to the course:

- Are you appropriate for the course? (i.e. level-2 success *in all* sciences - not just biology)
- How do you perform on standardized tests? (tests are structured on AP exams)
- Do you actually have an interest in science and biology? (if not, then why take it?)
- Can you balance this course with all your other courses and activities?
- What are your realistic expectations in achievement (class standing, honor roll, etc.)?
- Will you be immune from "senioritis?" (it is a marathon course that tests endurance) ** "all this while trying to get into college and enjoy your last year of high school"**

Your experience in AP Biology will be quite different compared to freshman biology. The course spends more than half of the year on biochemistry and molecular biology (cellular respiration, photosynthesis, DNA, genetics, biotechnology, and other cellular processes). It is assumed that you have a good understanding and working knowledge of these concepts prior to taking this class. We only do a quick survey of plants and animals with an overview of human anatomy and physiology. The curriculum also emphasizes working with data sets and incorporation of statistical analyses. *Past students have been quickly disappointed by the amount of chemistry, modeling, and data analysis encountered in the course. A student with a different perception of biology or has career goals outside of science may get frustrated and regret having made a commitment to the course.* Please consider your decision carefully and talk to me or your counselor if you need to. Remember, YOU are **"electing"** to take this. **Other level-2 science options may still be available if you need to change your schedule.**

Since you are a high-ability student, there is no time to waste. Therefore, to help us cover the amount of material required, I have organized an extensive summer assignment to prepare you. Much of the material covered throughout the year is review. However, we will add more detail and make connections to knowledge that you should have acquired in biology and chemistry as underclassman.

THIS ASSIGNMENT IS EXPECTED TO BE HANDED IN THE 1st DAY OF SCHOOL!!!

** Assignments not turned in on the due date results in a zero!

OVERVIEW OF AP BIOLOGY SUMMER ASSIGNMENT

KEEP ASSIGNMENTS SEPARATE!! I WILL BE COLLECTING ASSIGNMENTS IN SEPARATE PILES!!

**** Look over the summer assignment** before the end of school so that you can clarify any questions.

** I **strongly suggest** purchasing an AP Biology **review book** such as Princeton Review, Kaplan, or Cliff's. Go to a bookstore to determine the one that you prefer. This is a good reference for the summer assignment and test preparation during the year. *Reading and completing the practice questions for the 1st chapter (chemistry) will give you an advantage when we review this material the first few days in the fall.*

SUMMER ASSIGNMENTS:

1. **Water assignment**: (make a table, list, or choose another way to organize items below). **Type assignment!**
    - List and describe the properties of water.
    - What is it about the water molecule that allows it to have these properties?
    - How is each property significant as a medium for life?

    Use the text, review book, and Internet for this assignment.

2. **Vocabulary Flashcards** – directions on assignment.

3. **Annotated Course Outline** – directions on assignment. ***This assignment is very time consuming!*** Please give yourself plenty of time to complete. This assignment should be typed!!

4. **Biology Collection** – directions on assignment.

Expect to have quizzes on the Chemistry review material, vocabulary flashcards, and/or the properties of water the 1st week of school (not the 1st day – I'm not that mean.)

Hope you all have a nice summer and I look forward to meeting you in the fall. Pay attention to any "new discoveries" in biology over the summer – there is something publicized practically every day!!!

Mr. Gauthier

Assignment 2: <u>Vocabulary Flashcards</u>

Biology has its own language. A good trick to learn this language is to become familiar with the prefixes that make up many of the words. For this assignment, you will make 100 vocabulary *<u>flashcards with definitions</u>*. If it is a prefix or suffix, also *<u>find a word</u>* with the prefix or suffix in it and <u>provide the definition</u>. I provide an example in #1. *Learn these terms prior to the school year. You will be quizzed the first week of school!*

1. **cyto-** = cell (cytosol = solution in the cell - also called cytoplasm)
2. **lyso-** =
3. **phago-** =
4. **pseudo-** =
5. **pro-** =
6. **trans-** =
7. **co-** =
8. **hyper-** =
9. **hypo-** =
10. **exo-** =
11. **glyco-** =
12. **endo-** =
13. **iso-** =
14. **hydro-** =
15. **an-** =
16. **chemi-** =
17. **auto-** =
18. **chloro-** =
19. **hetero-** =
20. **meso-** =
21. **photo-** =
22. **bi-/di-** =
23. **centro-** =
24. **gen-** =
25. **inter-** =
26. **mal-** =
27. **homo-** =
28. **syn-** =
29. **tetra-** =
30. **mono-** =
31. **pedi-** =
32. **poly-** =
33. **hemo**- =
34. **non-** =
35. **re-** =
36. **semi-** =
37. **neuro-** =
38. **anti-** =
39. **retro-** =
40. **eu-** =
41. **apic-** =
42. **bio-** =
43. **paleo-** =
44. **vestigi-** =
45. **intra-** =
46. **micro-** =
47. **post-** =
48. **sym-** =
49. **thermo-** =
50. **con-** =
51. **gymno-** =
52. **peri-** =

53. a-=
54. **cephal-** =
55. **ecto-** =
56. **gastro-** =
57. **-pod** =
58. **arthro-** =
59. **uni-** =
60. **vivi-** =
61. **aqua-** =
62. **myco-** =
63. **-phyto** =
64. **homeo-** =
65. **osteo-** =
66. **omni-** =
67. **cardi-** =
68. **erythro-** =
69. **leuko-** =
70. **myo-** =
71. **pulmo-** =
72. **counter-** =
73. **reni/nephr-** =
74. **epi-** =
75. **-ectomy** =
76. **soma-** =
77. **geo-** =
78. **de-**
79. **covalent bond** -
80. **hydrogen bond** -
81. **solute** -
82. **solvent** -
83. **denature** -
84. **dehydration synthesis or condensation reaction**
85. **hydrolysis** -
86. **protein** -
87. **substrate** -
88. **adaptations** -
89. **diffusion** -
90. **enzyme** -
91. **evolution** -
92. **molecule** -
93. **monomer** -
94. **protein** -
95. **symbiosis** -
96. **homeostasis** -
97. **taxonomy** -
98. **physiology** -
99. **ecology** -
100. **water potential** -

<u>Assignment 3:</u> Annotated Course Outline.

<u>You have not had biology since freshman year!!</u> Compared to other AP courses that are a continuation of last year, that puts you at a disadvantage already. By reviewing and familiarizing yourself with the material that you should have learned over *3 years ago*, you can start to regain ground. Over the course of the year, we will add to this knowledge and build an even better understanding of biology. The outline that you need to construct is presented as a series of questions that will help you with the major themes and topics covered in this course. To complete the outline, answer the questions for each topic. You do not need to write elaborate essays for each question. **Be concise**, and include the concepts that are needed. **Generation of answers must come FROM YOU!** Your textbook and prep books are your main research tools, but the Internet can also be incredibly helpful. However, getting quick answers from "yahoo answers" will not help you learn/review and ***I will not accept the shortcut*** (this is very easy for me to check). Learn to rely on yourself to conduct the research from reliable sources – not a random student in another state**! Also, plagiarism and copying others work has been a problem on this assignment – don't do it! – not a good first impression!** If you work together, don't just chop up the assignment and copy answers. If I read the same thing twice and/or notice a pattern of answers among "friends", you copied! Become an AP student…….

On topics that seem complicated, it might be better to explain more than less. Please remember, this outline is a tool for you to use as a reference source for the year.

<u>Expectations:</u> PLEASE COPY/PASTE the question as it appears in the assignment and then provide your *concise* answer. This will make it easier for me to grade and for you to use as a resource during the course. – *The school website has a copy of this assignment for the ease of copy/paste!*

<u>From the University of Georgia:</u>

Students are encouraged to focus on understanding important relationships, processes, mechanisms, and potential extensions and applications of concepts. Less important is the memorization of specialized terminology and technical details. For example, understanding how protein structure affects enzyme action is more important than memorizing a list of enzyme names. Questions on Advanced Placement Biology Examinations will test students' abilities to explain, analyze, and interpret biological processes and phenomena more than their ability to recall specific facts.

I. Molecules and Cells: Cells are the structural and functional units of life; cellular processes are based on physical and chemical changes.

A. Chemistry of Life

1. *Basic Chemistry* –

   How are ionic, covalent (polar and nonpolar), hydrogen, and Van der Wahls (interactions) different. How are these different types of bonds *important* for life on earth?

2. *Organic molecules in organisms*
   a. What is the role of carbon in the molecular diversity of life?
   b. How do cells synthesize and break down carbon-based compounds?

3. How do structures of biologically important molecules (carbohydrates, lipids, proteins, nucleic acids) account for their functions (just give an overview here)?

4. *Free energy changes*
   How do the laws of thermodynamics relate to the biochemical processes that provide energy to living systems?

5. *Enzymes*
   a. How do enzymes regulate the rate of chemical reactions?
   b. How does the specificity of an enzyme depend on its structure?
   c. How is the activity of an enzyme regulated?

B. Cells

1. *Prokaryotic and eukaryotic cells*
   a. What are their similarities and differences?
   b. What are their evolutionary relationships?

2. *Membranes*
   a. What is the current model of the molecular architecture of membranes?
   b. How do variations in this structure account for functional differences among membranes?
   c. How does the structural organization of membranes provide for transport and recognition?
   d, What are various mechanisms by which substances cross membranes?

3. *Subcellular organization*
   a. How does compartmentalization organize a cell's functions?
   b. How are the structures of the various subcellular organelles related to their functions?
   c. How do organelles function together in cellular processes?
   d. What factors limit cell size?

4. *Cell cycle and its regulation*
   a. How does the cell cycle assure genetic continuity?
   b. How does mitosis allow for the even distribution of genetic information to new cells?
   c. What are the mechanisms of cytokinesis?
   d. How is the cell cycle regulated?
   e. How can aberrations in the cell cycle lead to tumor formation?

5. *Cell Communication*

   a. Describe do cells communicate by (1) cell-to-cell contact, (2) short distances, (3) long distances.

   b. Provide a model and describe “signal transduction pathways”

C. Cellular Energetics (FYI - this is a particularly challenging section)

1. *Coupled reactions*
   a. What is the role of ATP in coupling the cell's anabolic and catabolic processes?
   b. How does chemiosmosis function in bioenergetics?

2. *Fermentation and cellular respiration*
   a. How are organic molecules broken down by catabolic pathways?
   b. What is the role of oxygen in energy-yielding pathways?
   c. How do cells generate ATP in the absence of oxygen?

3. *Photosynthesis*
   a. How does photosynthesis convert light energy into chemical energy?
   b. How are the chemical products of the light-trapping reactions coupled to the synthesis of carbohydrates?

c. What kinds of photosynthetic adaptations have evolved in response to different environmental conditions?
d. What interactions exist between photosynthesis and cellular respiration?

II. Heredity and Evolution: Hereditary events control the passage of structural and functional information from one generation to the next.

A. Heredity

1. *Meiosis and gametogenesis*
   a. What features of meiosis are important in sexual reproduction?
   b. Why is meiosis important in heredity?
   c. How is meiosis related to gametogenesis?
   d. What are the similarities and differences between gametogenesis in animals and gametogenesis in plants?

2. *Eukaryotic chromosomes*
   a. How is genetic information organized in the eukaryotic chromosome?
   b. How does this organization contribute to both continuity of and variability in the genetic information?

3. *Inheritance patterns*
   a. How did Mendel's work lay the foundation of modern genetics?
   b. What are the principal patterns of inheritance?

B. Molecular Genetics

1. *RNA and DNA structure and function*
   a. How do the structures of nucleic acids relate to their functions of information storage and protein synthesis?
   b. What are the similarities and differences between prokaryotic and eukaryotic genomes?

2. *Gene regulation*
   a. What are some mechanisms by which gene expression is regulated in prokaryotes and eukaryotes?

3. *Mutation*
   a. In what ways can genetic information be altered?
   b. What are some effects of these alterations?

4. *Viral structure and replication*
   a. What is the structure of viruses?
   b. What are the major steps in viral reproduction?
   c. How do viruses transfer genetic material between cells?

5. *Nucleic acid technology and applications*
   a. What are some current recombinant technologies?
   b. What are some practical applications of nucleic acid technology?
   c. What legal and ethical problems may arise from these applications?

C. Evolutionary Biology

1. *Early evolution of life*
   a. What are the current biological models for the origins of biological macromolecules?
   b. What are the current models for the origins of prokaryotic and eukaryotic cells?

2. *Evidence for evolution*
   What types of evidence support an evolutionary view of life?

3. *Mechanisms of evolution*
   a. What is the role of natural selection in the process of evolution?
   b. How are heredity and natural selection involved in the process of evolution?
   c. What mechanisms account for speciation and macroevolution?
   d. What different patterns of evolution have been identified and what mechanisms are responsible for each of these patterns?

III. Organisms and Populations: The relationship of structure to function is a theme that is common to all organisms; the interactions of organisms with their environment are the major theme in ecology.

A. Diversity of Organisms

1. *Evolutionary patterns*
   a. What are the major body plans of plants and animals?

2. *Survey of the diversity of life*
   a. What are representative organisms from the Archea and Eukarya, Fungi, and Protista?
   b. What are representative members of the major animal phyla and plant divisions?

3. *Evolutionary relationships*
   a. What is some evidence that organisms are related to each other?
   b. How do scientists study evolutionary relationships among organisms?
   c. How is this information used in classification of organisms?

B. Structure and Function of Plants and Animals

1. *Reproduction, growth, and development*
   a. What *patterns of reproduction* are found in plants and animals and how are they regulated?
   b. What is the adaptive significance of alternation of generations in the major groups of plants?

2. *Structural, physiological, and behavioral adaptations*
   a. How does the organization of cells, tissues, and organs determine structure and function in plant and animal systems?
   b. How are structure and function related in the various organ systems?
   c. How do the organ systems of animals interact?
   d. What adaptive features have contributed to the success of various plants and animals on land?

3. *Response to the environment*
   What are some responses of plants and animals to environmental cues, and how do hormones mediate them?

C. Ecology

1. *Population dynamics*
   a. What models are useful in describing the growth of a population?
   b. How is population size regulated by abiotic and biotic factors?

2. *Communities and ecosystems*
   a. How is energy flow through an ecosystem related to trophic structure?
   b. How do elements (e.g., carbon, nitrogen, phosphorus, sulfur, oxygen) cycle through ecosystems?
   c. How do organisms affect the cycling of elements and water through the biosphere?
   d. How do biotic and abiotic factors affect community structure and ecosystem function?

3. Global issues - In which ways are humans affecting biogeochemical cycles?

ASSIGNMENT #4
BIOLOGY COLLECTION

For this part of your summer assignment, you will continue familiarizing yourself with biology terms that we will be using at different points throughout the year.

On the next page is the list of terms.

The Task

Earn 50 points by "collecting" **25 items** from the list of terms that follows. When I say "collect," I mean you should collect that item by finding it and taking a **photograph (digital)** of that item. ***Place this photograph on a powerpoint slide along with the explanation of how it represents one of the terms***. This explanation need not be more than a couple of sentences, enough to prove to me that you understand the term.

Each item is worth 2 points.

You are required to turn in the following:

✴ **Email me an attachment** of the powerpoint – ***send anytime*** over the summer but it is due the 1st day: dgauthier@hinghamschools.org

✴ ***A printed copy*** (black and white OK) = (3 slides per page) of your presentation for the 1st day of school. (This is in case it did not email successfully and I can give you on-time credit)

YOU CAN BE CREATIVE:

If you choose an item that is *internal* to a plant or animal, like the term "phloem," you could show a photograph of the whole organism or a close up of one part, and then explain what phloem is and specifically where phloem is in your specimen.

ORIGINAL PHOTOS ONLY – Choose a "mascot":

You cannot use an image from any publication or the Web. You must have taken the photograph yourself. The best way to prove that - is for you to be in the photo. *Last year, some students used a "mascot item" to be in all of their photos – some were very witty!*

NATURAL ITEMS ONLY:

All items must be from something that you have found in nature. Take a walk around your yard, neighborhood, and town. DON'T SPEND ANY MONEY! Research what the term means and in what organisms it can be found... and then go out and find an example.

TEAM WORK:

You may work with other students in the class to complete this project, but each student must turn in his or her own project with a unique set of terms chosen. So working with other students means brainstorming, discussing, going on collecting trips together. It doesn't mean using the same items! There are 100's of choices... probability says there is a very slim chance that any two students will have the same items chosen for their 50 points… and I believe in the statistics! If you share the item list, you will split the grade.

BIOLOGY COLLECTION TERMS

Below are the items you are to "collect." An individual organism can only be used once. For example, humans are acceptable for one category only. You must take all photos yourself; **NO Internet photos! REMEMBER – just pick 25 individual items!**

Each specimen is worth 2 points.

1. acid
2. adaptation of an animal
3. adaptation of a plant
4. altruistic behavior
5. alkaline (base)
6. amino acids
7. amniotic egg
8. analogous structures
9. angiosperm
10. animal that has a segmented body
11. asexual reproduction
12. autotroph
13. Basidiomycete
14. Batesian mimicry
15. bilateral symmetry
16. biological magnification
17. buffer
18. carnivorous plant
19. cartilage
20. Calvin cycle
21. cambium
22. cellular respiration
23. cellulose
24. chitin
25. coenzyme
26. coevolution
27. commensalism
28. connective tissue
29. cuticle layer of a plant
30. detritovore
31. disaccharide
32. dominant vs. recessive phenotype
33. ectotherm
34. endosperm
35. endotherm
36. enzyme
37. epithelial tissue
38. ethylene
39. eukaryote
40. exoskeleton
41. fermentation
42. flower ovary
43. fungi
44. genetic variation within a population
45. genetically modified organism
46. glycogen
47. gymnosperm cone – male or female
48. gymnosperm leaf
49. habitat
50. hermaphrodite
51. heterotroph
52. homeostasis
53. homologous structures
54. hybrid
55. hydrophilic
56. hydrophobic
57. introduced species
58. keystone species
59. Krebs cycle
60. K-strategist
61. lichen
62. lipid used for energy storage
63. littoral zone organism
64. mating behavior (Be Careful! PG-13 only!)
65. methane
66. modified leaf of a plant
67. modified root of a plant
68. modified stem of a plant
69. monosaccharide
70. Müllerian mimicry
71. mutation
72. mutualism
73. mycelium
74. mycorrhizae
75. niche
76. parasitism
77. phloem
78. pollen
79. pollinator
80. polysaccharide
81. population
82. predation
83. prokaryote
84. purebred
85. r-strategist

86. radial symmetry (animal)
87. redox reaction
88. rhizome
89. seed dispersal (animal, wind, water)
90. selective permeability
91. spore
92. succession
93. taxis
94. territorial behavior
95. tropism
96. unicellular organism
97. water adhesion
98. water cohesion
99. vestigial structures
100. xylem