

AP Biology Summer Homework 2021 – 2022

Welcome to AP Biology with Dr. Clarke!

This course is designed to be the equivalent of a two---semester introductory biology course usually taken in the first year of college. Throughout the course, you will become familiar with major recurring ideas that persist throughout all topics and material. The 4 Big Ideas are:

- 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.

To successfully complete the course and meet all of the required objectives, you will need to do independent work both during the summer and throughout the school year. This summer, you will complete an investigation of the four aspects of AP Biology on your own. We do not have enough time allotted to cover every single topic in AP Biology so additional work outside of class is vital. **During the school year, you will be reading chapters in the book and taking your own notes (using the Flipped classroom method) to supplement notes taken in class.**

On the pages that follow, there is a four---part assignment; the first and second part is related to microscopy and cell biology. The third is focused on ecology and population biology and the fourth involves using '5 STEPS to a 5' for AP Biology. This assignment will be due on the first day of class August 2021.

If you are working on the assignment over the summer and find that any of the links do not work, try and find a similar link. **Some links you may have to copy and paste it into your browser.** If you have any questions, feel free to email me at chantal.bodkin-clarke@lakemaryprep.com . I hope you find time to relax and spend time with family and friends!

Stay safe and have a great summer!

~ Dr. Chantal Bodkin-Clarke

Please purchase '5 STEPS to a 5' AP Biology for 2020 – 21 school year. The 19-20 version is also acceptable. Publisher is McGraw---Hill Education. There is an assignment in this packet using this book.

Part 1: An Introduction to Cell Biology

Cell biology is one of the cornerstones of any general biology course. It is important to understand how cells are classified, the structures that make up a typical cell and the processes cells carry on as part of their metabolism. Often, when people think of cells, they imagine a typical round animal cell or rectangular plant cell. But in reality, there is a tremendous amount of diversity among cells in terms of their shapes, structures and functions. By viewing the Web sites below, you will be introduced to the variety of cell types, how cells are classified, the organelles that make them function and how they interact with the external environment.

A. Electron Microscopy

Images captured using electron microscopes have transformed the way we view cells and other biological specimens. Much of what is known about the structure and function of cell organelles is due to electron microscopes. Use the virtual electron and light microscope tutorials on the web pages below to learn more about the technique of electron and light microscopy.

SEM: http://virtual.itg.uiuc.edu/training/EM_tutorial/

Light Microscopy: http://virtual.itg.uiuc.edu/training/LM_tutorial/

1) What are some major differences you notice between electron and light microscopy? (be specific and detailed than “one uses light, the other uses electrons”) Name at least 5, contrasting both.

B. Cell Biology

Structural evidence supports the relatedness of all eukaryotes. Use the link below to look and interact with a Prezi presentation and answer the questions that follow.

http://prezi.com/wkzsj_esclk2/enduring-understanding-1b/

1. What are the three (3) main domains that are mentioned who all come from a common ancestor?
2. List the three (3) conserved core elements that provide evidence for evolution.
3. List and describe the three structural and functional pieces of evidence used to support the relatedness of all three domains.
4. Look at all the different organelles on the cell picture. **Using other websites (or a search engine like Google), give the function of each organelle:**

Nuclear Envelope, Nucleus, Plasma Membrane, Rough Endoplasmic Reticulum, Ribosomes, Golgi Apparatus, Peroxisome, Microtubules/Microfilaments, Microvilli,

Centrioles, Mitochondrion, Lysosome Cytosol, Smooth Endoplasmic Reticulum, Nucleolus, Chromatin

Organisms must exchange matter with the environment to grow, reproduce and maintain organization. Use the link below and answer the 2 questions that follow.

http://www.brooklyn.cuny.edu/bc/ahp/LAD/C5/C5_ProbSize.html

- 1) Why is surface – area – to – volume – ratio important to cells and unicellular organisms?
- 2) Which of the three ratios seem to be the best for a cell?
---so as the ratio becomes (*circle one*) LARGER / SMALLER transfer of materials in and out of the cell become more efficient.

Use another website or search engine (like Google) to find the answers to the next two questions.

- 3) What are root hairs and how do they affect surface area?
- 4) Neatly draw a picture of villi in the small intestine and give the function.

Timing and coordination of specific events are necessary for the normal development of an organism.

Use this You Tube link to answer the following 3 questions on apoptosis:

<https://www.youtube.com/watch?v=9KTDz-ZisZO>

- 1) What is apoptosis?
- 2) The video looks very complex; give a 3 – 4 sentence summary of what goes on during apoptosis. If you need to look at a simpler video, search for one.
- 3) When might apoptosis occur? Give 2– 3 examples.

In eukaryotes, heritable information is passed to the next generation via processes that include the cell cycle and mitosis or meiosis plus fertilization. Using the Internet or other sources, answer the following 4 questions.

- 1) Interphase is the first phase of the cell cycle. What are the three main phases of interphase and give a brief explanation what happens in each phase.
- 2) The cell cycle has checkpoints.
 - a) What do cyclins do?
- b) How do cyclin---dependent kinases control the cell cycle? Research three (3) different types of cells in our bodies (nerve/brain, skin, and muscle...). Next to each, explain those types of cells divide, and how often they divide.

- 3) Mitosis passes a complete genome from the parent cell to daughter cells. Look up the phases of mitosis and give a brief explanation of each phase.

C. Ecology and Population Biology

Natural selection acts upon phenotypic variations in populations.

- 1) Go to the following link: <http://www.ncbi.nlm.nih.gov/pubmed/18409423> and read the abstract. Write down a brief summary on flowering time in Concord, MA.

Speciation and extinction have occurred throughout Earth's history.

- 2) Go to the following link: <http://www.guardian.co.uk/environment/2010/mar/07/extinction---species---evolve> and read the article (if it doesn't open, search for "why do scientists think that we are in the midst of a mass extinction" and answer the questions below based upon the site you selected).

- a) Why are scientists stating we may be in our 6th major mass extinction?
- b) How many species are currently being threatened? What ratios did you see Mammals, amphibians... etc... (if you used another link than the one above, list the numbers threatened per group – mammals, amphibians, insects, reptiles...)?

Organisms respond to changes in their external environments. *Click on or paste this link into your URL bar and a Power Point will download. Answer the next 3 questions based on the Power Point.*

<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&ved=0CFsQFjAJ&url=http%3A%2F%2Fwww.saburchill.com%2Fbiology%2Fchapters05%2Fimages%2FPHOTOPERIODISM.ppt&ei=NUYD6JPKq4APznIDoBA&usq=AFQjCNG35hXOWCYEITQzvwxZhuCVDooKTQ&bvm=bv.46340616,d.dmg>

- 1) What is photoperiodism? What organisms does it affect?
- 2) Which latitude lines does photoperiodism have the greatest affect? Why?
- 3) List the 3 types of plants considered to be affected by photoperiodism, and give the day length and examples of each.

All biological systems from cells and organisms to populations, communities and ecosystems are affected biotic and abiotic interactions involving exchange of matter and free energy. Use the following link to answer the next set of questions. If the first one does not work, try the second one.

http://ww2.mdsg.umd.edu/interactive_lessons/biofilm/

<https://www.mdsg.umd.edu/topics/k-12-lesson-plans/biofilms-and-biodiversity>

1) Click on "Introduction". Based upon the information and descriptions, what are biofilms?

2) Click on "How to calculate Biodiversity".

What is "Species Richness"? b) What is the "Simpson's Index"? Click on "Biodiversity and Depth".

a) Which level has the most richness?

b) What can you conclude about the relationship between richness and the environmental conditions (salinity, pH, temperature, dissolved O₂)? What is the proof?

This question (4) does not pertain to the link on the previous page.

4) You are given the following organisms from the Chesapeake Bay:

- a. Osprey
- b. Herbivorous Ducks
- c. Vegetation
- d. Phytoplankton
- e. Zooplankton
- f. Tundra Swan
- g. Bivalves
- h. Striped Bass
- i. Great Blue Heron
- j. Menhaden (fish)

Create a food web below of these 10 organisms; remember, the arrow points towards what is eating it.

Look up the organisms if you are not sure what they eat, or what the organism is.

Biological systems are affected by disruptions to their dynamic homeostasis.

Use the following link to answer the next question. If 1st one doesn't work, try the 2nd one.

<http://www.sebiology.org/publications/magazine/article/spring-2015/salinity-tolerance-in-soybean-is-modulated-by-natural-variation-in-gmsalt3>

https://www.researchgate.net/publication/266679330_Salinity_tolerance_in_soybean_is_modulated_by_natural_variation_in_GmSALT3

- 1) Read over the salination article and write a paragraph or two summarizing it.

Timing and coordination of physiological events are regulated by multiple mechanisms.

Use this link to answer the next 2 questions:

<https://www.scientificamerican.com/article/how-to-prevent-jet-lag/>

- 1) What are circadian rhythms?
- 2) How can you “reset” or change your circadian rhythm to lessen the effects of jet lag?

Use the link below to answer the next two (2) questions. You may be surprised from what you read about bears and hibernation...

<http://www.nhfishandwildlife.com/seven.php>

- 3) Which of the seven (7) organisms are “true hibernators”? Why are they considered this?
- 4) Why are the other organisms not considered “true hibernators”?

Use the following link to answer the next few questions:

<http://www.cals.ncsu.edu/course/ent525/close/symbiosis.html>

- 5) What is symbiosis? What are the five types of symbiosis?
- 6) Give an example of each type of symbiosis (be sure to talk about both organisms). You can use some of the links on that web page or search for them on your own.

Individuals can act on information and communicate it to others.

Use the following link to answer the next question:

<http://www.sciencedaily.com/releases/2009/06/090619171244.htm>

- 1) What does this article seem to suggest?

Use the following link to answer the next 2 questions:

<http://www.bozemanscience.com> (website: Locate AP biology videos and watch: Fight or Flight response video)

- 2) What does norepinephrine and epinephrine do?
- 3) Imagine someone under constant severe stress all the time. What would stage three look like?

Use the following link to answer the next question:

<https://daily.jstor.org/how-do-fish-schools-work/>

- 4) Read over this article on schooling, list and explain three reasons why fish school the way they do.

Interactions among living systems and with their environment result in the movement of matter and energy.

Use the following link to answer the next 3 questions:

<http://www.sciencedaily.com/releases/2011/03/110331104003.htm>

- 1) The researchers have identified a range of historical and ongoing human activities that have damaged or restructured food webs in the Southern Ocean over recent decades. List the 5 activities they mention in the article.
- 2) The Antarctic Treaty and other conventions cannot address Global---scale threats. Pick two of the four bullets/points that are listed you think are the most important; explain why you feel this way.
- 3) What will the increasing amounts of CO₂ do to the oceans besides warm up the planet? Do a little search online to see why excess CO₂ in the atmosphere isn't good for the oceans, and explain what happens to at least two groups of organisms.

Use the following link to answer the next 4 questions:

<http://www.ramp-alberta.org/river/ecology/life+in+aquatic+ecosystems/food+chains+and+food+webs.aspx>

- 4) What is a food chain? Draw a food chain. No copy and paste food chains and webs 😊😊
- 5) What is a food web? Draw a food web.
- 6) What are cascade interactions? Give an example of this.
- 7) Click on the bottom "Next Page". What is primary and secondary production? Give an example of each.

Interactions between and within populations influence patterns of species distribution and abundance.

The diversity of species within an ecosystem may influence the stability of an ecosystem.

Use the following link to answer the following 2 questions:

<https://prezi.com/vdcuzcgoixss/gray-wolves-a-keystone-species/>

- 1) So we pretty much eliminated wolves from the Continental United States prior to 1995 (they were re-introduced then into Yellowstone National Park). So what? Why are they important to the environment?
- 2) What are steps that can be taken to preserve the salmon and wolf's habitats?

Distribution of local and global ecosystems over time.

Use any valid Internet site to answer the following questions.

- 1) What are invasive species, and why do they survive so well in their new habitats?
- 2) Why is it a big deal that invasive species need to be controlled or handled?
- 3) Name 3 current invasive species in the US, and what is trying to be done about them.
- 4) Name 3 to 4 invasive species here in Florida (not listed in questions number 3), what they are doing to the native species, and if there are any current control measures in place.

5 Steps to a 5 Assignment:

- 1) Complete the diagnostic/master exam and record your results. Check your answers.
- 2) **Read the chapters covering plants CAM3 and CAM4 plants, human physiology (the nervous system) and human reproduction. These are the topics/concepts that are usually in limited quantity on the AP Biology exam. We will not cover these during the year.**