

AP Biology 2011-2012

Welcome to what should be a challenging and exciting year in AP Bio!

On the pages that follow, there is a two-part assignment; the first part is related to cell biology and the second is focused on ecology. This assignment will be due in early October. If you would like to get ahead, you are welcome to work on the assignment over the summer, but you could also work on it once the school year has begun. It's up to you, depending on how busy you are this summer and how busy you will be once the school year starts. Either way, you don't need a textbook, but will need to access the Internet. If you are not able to access the Internet at home, the public library is an option, or you would be welcome to use our school computers in September.

Please print out a copy of the assignment and write in your answers. Or, if you're not able to print the assignment, you may write your answers on a separate sheet of paper. If you would like to type your answers directly on the document, please email me and I will send you a copy in Word format.

If you are working on the assignment over the summer and find that any of the links do not work, just skip that section and complete it once we are back at school. If you have any questions at all, feel free to email me at CCZschoche@fcps.edu.

In the meantime, I hope you'll find some time to relax and get some rest so that you can come back to school refreshed and ready to work!

Thank you,
Mrs. Zschoche

Have a great summer!

5. _____ <http://www.cbs.dtu.dk/staff/dave/roanoke/elodeacell.jpg>
6. _____ http://www.scienceclarified.com/images/uesc_07_img0394.jpg
7. _____ http://www.ruf.rice.edu/~rau/phys600/whitesides_files/0001D63A-2F47-1C6F-84A9809EC588EF21_arch2.jpg
8. _____ http://www.bio.miami.edu/~cmallery/150/proceuc/c27x3proc_shapes.jpg
9. _____ <http://www.microscope-microscope.org/applications/pond-critters/protozoans/images/stentor.jpg>
10. _____
http://biology.clc.uc.edu/fankhauser/Labs/Cell_Biology/Cells_Lab/onion_stained_PA021960.JPG

11. A common theme in biology is the idea that, in living organisms, structure reflects function. It is no accident that there is such diversity among cells: a cell's shape often helps it to carry out its specific function. Choose one of the pictures above and explain how its structure may aid its function.

C. Classifying Cells

One of the major ways to classify cells is to determine whether they are prokaryotic or eukaryotic. Do you remember the difference between prokaryotic and eukaryotic cells? The *Cells alive* site will review the major differences. <http://www.cellsalive.com/cells/3dcell.htm>

1. List the major characteristics of eukaryotic cells and examples of organisms that are made of **eukaryotic cells**:

2. List the major characteristics of prokaryotic cells and examples of organisms that are **prokaryotic**:

3. Look at the animal, plant and bacterial cell models. What do you notice about the number of cell organelles found in each type of cell?

D. Comparison of Prokaryotic and Eukaryotic Cells

http://www.wiley.com/legacy/college/boyer/0470003790/animations/cell_structure/cell_structure.htm

1. Start with the Introduction and then move on to the Prokaryotic Cell link. List the name and function of several *important organelles found in prokaryotic cells*:
2. Try the 6 Pop-Up Questions. How many did you get right?
3. On the Animal Cell page, view the organelles that differ between prokaryotic and eukaryotic cells. List the name and function of several *organelles found in eukaryotic but not prokaryotic cells*. Then try the 6 Pop-Up Questions.
4. On the Plant Cell page, view the organelles that differ between plant and animal cells. List the function of *organelles found in plant but not animal cells* (chloroplasts, cell wall, central vacuole). Then try the 6 Pop-Up Questions.
5. Which type of cell did you construct?

E. Cells: The Basic Units of Life

On the following site, go to Chapter 4 and read the Interactive Summaries page.

<http://bcs.whfreeman.com/thelifewire/default.asp?s=&n=&i=&v=&o=&ns=0&t=&uid=0&rau=0>

1. Which organelles make up the **endomembrane system**?
2. Describe the function of the endomembrane system.
3. Compare and contrast *mitochondria and chloroplasts*.

4. What is the function of the **cytoskeleton**?

5. What components make up the cytoskeleton?

6. List two examples of **extracellular structures**:

7. On the same page, view the “Tour” on [Animated Tutorial 4.1](#). What is one thing you learned from the mini-tutorial?

8. View [Animated Tutorial 4.2](#). How do the **ER and Golgi apparatus** work together?

F. Typical Animal Cell

1. Complete the following chart based on the organelles listed on this visual.

<http://www.wisc-online.com/objects/ViewObject.aspx?ID=AP11403>

Organelle	Function	Draw Picture or Describe
Centrioles		
Chromatin		
Golgi apparatus		

Intermediate filaments		
Lysosome		
Microfilament		
Microtubule		
Microvilli		
Mitochondrion		
Nuclear envelope		
Nucleolus		
Nucleus		

Peroxisome		
Plasma membrane		
Ribosomes		
Rough Endoplasmic Reticulum		
Smooth Endoplasmic Reticulum		

2. Try the quiz identifying the animal cell organelles. (Use the descriptions to help you identify the highlighted organelles.)

G. The Evolution of Organelles

1. Based on what you have seen in the previous diagrams and animations, draw a picture of each of the following:

Mitochondrion	Chloroplast	Rod-Shaped Bacterial Cell (Bacillus)

2. What do you notice about these 3 structures? What does that indicate to you about the relationship between the mitochondria/chloroplast and the prokaryotic bacterial cell?
3. View the animation on the site below. Based on the information presented, what can you say about the relationship between mitochondria, chloroplasts and prokaryotic cells?

<http://www.sumanasinc.com/webcontent/animations/content/organelles.html>

4. List several pieces of evidence for the endosymbiosis hypothesis formulated by Lynn Margulis:

H. Cell Size and Scale

Use the scroll bar on the site below to get a unique perspective on the relative sizes of cells and cell components.

<http://learn.genetics.utah.edu/content/begin/cells/scale/>

1. How can an X chromosome be nearly as big as the head of the sperm cell? (Scroll down to see an explanation.)
2. How does the size of a phage virus compare to a bacterial cell?
3. Is there anything that was surprising to you about the cell scale shown?

I. Cell Signals

Please view the animation at the following site and give 3 examples of **how cells interact with each other or how they respond to signals.**

<http://www.dnalc.org/resources/3d/cellsignals.html>

Part 2: Ecology

Ecology is the scientific study of the interactions between organisms and the environment. Whereas cell biology focuses on the microscopic, ecology puts things in context of the larger world. One of the reasons it's exciting to study this area is because stories related to environmental issues are so frequently covered in the popular press. For example, just one issue of *National Geographic* magazine (May, 2011) included articles about all of the following:

- The potentially devastating effects of temperature and chemical conditions on the Great Barrier Reef
- How the people of Bangladesh are meeting the challenges of rising sea levels and population growth
- What urban planners and mathematicians can learn from the elaborate organization of Weaver ants
- How the nectar of balsa trees support species as diverse as hummingbirds and boa constrictors

To learn about other current environmental issues, check out the National Geographic site:

<http://environment.nationalgeographic.com/environment/>

In order to better understand current events, it's important to be familiar with some key concepts. Ecology is a broad topic, and there is a great deal of information presented in the references below. The questions that follow focus on the topics in required in the AP Bio curriculum.

Unless otherwise noted, please use the PowerPoint presentations (Ch. 50 – 55) on this Web site. If you are unable to view presentations, you may want to download a free PowerPoint viewer available online.

http://www.biologyjunction.com/ap_powerpoints_7th.htm

A. Intro to Ecology (Use the Ch 50 PowerPoint slides to answer these questions.)

1. What is a **species transplant** and how might it affect an ecosystem? (An example of a species transplant is kudzu, which you may have seen covering the trees growing along highways in the southeastern U.S.

<http://www.invasivespeciesinfo.gov/plants/kudzu.shtml>)

2. What are examples of **biotic** factors?

3. Explain what is shown in the graph on slide 25.

4. What are examples of **abiotic** factors?

5. The major types of ecological associations that occupy broad geographic regions of land or water are called _____ . These land areas have similar climates and vegetation.

6. Review the stratification of aquatic biomes shown on slide 49. These cross sectional diagrams show zones that are classified based on depth and distance from the shore.

- In which zone would you expect a lot of photosynthesis to occur?
- The benthic zone includes the sediment and organisms found along the floor of the aquatic biome. Which zone includes the deepest regions of the ocean floor where one would find extreme environments and organisms that survive in those extreme environments?
- Which zone would include the open waters of the ocean, far from the shore?

7. Review slides 51 – 69.

(You could also see the information on biomes on these sites:

http://www.blueplanetbiomes.org/world_biomes.htm, <http://www.ucmp.berkeley.edu/exhibits/biomes/>)

Give an example of each of the following biomes.

- a marine biome –
- a terrestrial biome –
- a biome, with trees forming a canopy, that is habitat to a great variety of species –
- a biome in which a stream or river merges with the ocean; surrounded by wetlands –
- a biome characterized by extremely cold temperatures, permafrost, and the absence of tall plants –
- a biome characterized by rich soil, tall grasses, grazing mammals –

B. Population Ecology (Use the Ch 52 PowerPoint slides to answer these questions.)

1. A population is a group of individuals of a single species living in the same general area. What is *population density* and why is it difficult to measure?

2. Make a drawing that shows the **3 patterns of dispersion**:

3. Based on slide 18, what can be said about the *survivorship* of oysters vs. squirrels vs. humans? (For ex, which organisms' offspring tend to die at an early point in their life cycle?)
4. Draw 2 graphs – one that represents **exponential growth** and one that represents **logistic growth**. Show the **carrying capacity** on the second graph.

5. Of the 2 graphs above, which one is considered a **J-shaped curve** and which one is an **S-shaped curve**? Which one is more likely to be found in populations in nature and why?

6. Another way to describe populations is to compare traits that are important in their life histories, especially those traits that affect their reproductive strategies. The two major life histories are K-selection and r-selection. These are oversimplifications, but provide a basis for comparison.

K-selected species live in populations that are at or near equilibrium (carrying capacity) conditions for long periods of time. Competition for limited resources is important in these environments. These organisms tend to live longer, have fewer offspring, begin reproduction at a later age, and invest significant energy in care of offspring. Examples include lemurs, giraffes, elephants and bats. K-selection is also known as _____ - _____ selection.

r-selected species live in populations that are highly variable. The fittest individuals in these environments have many offspring and reproduce early. These organisms tend to have short life cycles and invest little or no parental care in their offspring. These are sometimes referred to as opportunistic populations. Examples include mosquitoes, *Daphnia* (water fleas) and goldenrod flowers. r-selection is also known as _____ - _____ selection.

7. Population size may be regulated by **density-dependent factors** and/or **density-independent factors**. Density-dependent factors have a greater effect as the population's density increases. Density-independent factors affect the population in the same way regardless of the population size. For example, climate or weather events are density-independent. An early spring freeze will kill certain plants regardless of how many plants were in the population.

See slide 59. What is an example of a density-dependent factor?

8. Review the field study on slide 64. What are the abiotic and biotic factors responsible for the fluctuations in population size? Make a prediction about the population size after the year 2000.
9. What factors might contribute to the situation described in slide 65?
10. Based on the graph on slides 68-69, what is a “boom-and-bust” cycle? (Is it regular or irregular?)
11. Describe the human population growth illustrated on slide 71-72.
12. What do the **age structure diagrams** on slide 78 show about the 3 countries depicted? Why is the population of Afghanistan likely to show rapid growth?

C. Population (Community) Ecology (Use the Ch 53 PowerPoint slides to answer these questions.)

1. What types of interactions might occur between the various species around the watering hole on slide 3 (interspecific interactions)?
2. See slides 7 - 10. What is the difference between an organism’s **niche** and its **habitat**?
3. Use the term “competitive exclusion principle” in a sentence, without restating the definition.
4. What does the experiment on slide 10 show about the competitive exclusion principle? What is the difference between a **fundamental niche** and a **realized niche**?

5. What is the function of **cryptic coloration**, **Batesian mimicry** and **Mullerian mimicry** as shown on slides 16 – 20?

6. Symbiotic relationships include **parasitism**, **mutualism** and **commensalism**. Why is commensalism described as +/0 and mutualism as +/+? Give an example of each of the three types of symbiosis.

7. Within an ecosystem, organisms interact in many ways. *Sometimes, the evolution of adaptations in one species coincides with the evolution of adaptations in another species.* For example, a flower may evolve brightly colored petals to attract pollinators, such as a particular insect. The insect may evolve specific structures to be able to pollinate this type of flower. This process, which involves reciprocal genetic change by interacting populations is known as _____.

8. The **decomposers or detritivores** are not shown on the food chain or food web on slides 37 - 38. What is their role? What kind of organisms are decomposers?

9. Identify a **tertiary consumer** in the food web on slide 38.

10. Identify the following as **phytoplankton** or **zooplankton**. Then label them as **producers** or **consumers**.
 - crustaceans (such as daphnia), protozoans

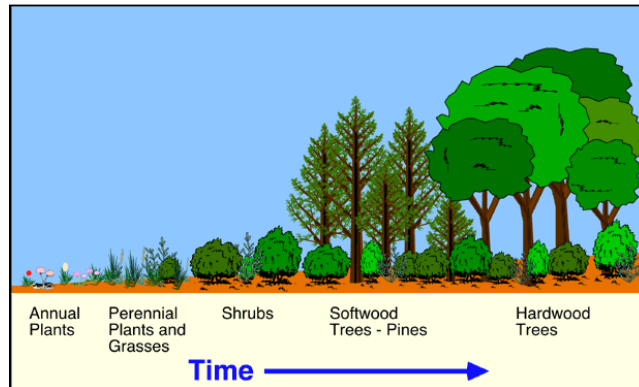
 - algae, silicon-containing diatoms, other autotrophic protists

11. What does the graph on slide 48 show about the role of the sea star *P. ochraceus*?

12. Slides 60 - 62 describe the role of fire as a disturbance in an ecosystem. See slide 66. Which type of succession would take place after a wildfire: **primary** or **secondary succession**?

13. a) How would you describe the process in the graphic shown on the next page? (What happens as time passes during the process of succession?)

b) In the case of primary succession, where would mosses and lichens (organisms that grow low to the ground and on the surface of rocks) belong on the diagram?



<http://www.physicalgeography.net/fundamentals/images/succession.gif>

14. Why do the retreating glaciers shown on slides 68 - 69 provide an opportunity to study succession?

D. Ecosystems (Use the Ch 54 PowerPoint slides to answer these questions.)

1. An ecosystem is...
2. See slides 12 – 21 and define the term **primary productivity**. What is the difference between **gross** and **net** primary productivity (GPP and NPP)? What are some factors that affect primary productivity?
3. Slide 24 shows the effect a single nutrient can have on an ecosystem. Summarize the results.
4. Sometimes a surplus of a nutrient enters an ecosystem because of _____. Even though it is a nutrient, it has a negative effect on a body of water, making it cloudy and murky and eventually choking off life. This effect is known as **eutrophication** and results in _____ lakes, as opposed to unpolluted **oligotrophic** lakes.
5. See slides 32 - 36. What does the pyramid of production show about the amount of energy transferred from one trophic level to the next? (What is the 10% rule?)

6. The pyramid of production on slide 36 shows the efficiency of energy transfer. What do the following pyramids show? (slides 38 and 40)
- Pyramid of Biomass –
 - Pyramid of Numbers –
7. Review slides 46 – 55. In your own words, explain the purpose of **biogeochemical cycles**.
8. Name several processes involved in the **water cycle**.
9. How is gaseous CO₂ converted to organic compounds such as sugars and starches? Other than consumers, what type of organisms return CO₂ to the atmosphere?
10. Neither plants nor animals can use nitrogen in its gaseous atmospheric form. a) What key organism is necessary for converting atmospheric nitrogen into a usable form through **nitrogen fixation**. b) What key organism is necessary for returning gaseous nitrogen back to the atmosphere?
11. a) **Phosphorus** does not enter the ecosystem from the atmosphere; instead it comes from
- b) How does phosphorus become available to plants?
12. What are the 2 roles of **decomposers** illustrated in the diagram on slide 54?

13. What happens to the *concentration of PCB (industrial toxins)* at progressively higher trophic levels (slides 72 - 73)? This phenomenon is called...

14. Describe the relationship between the 3 variables shown in the graph on slide 76.

15. According to slides 78 - 81, what is a positive effect of the **greenhouse effect**? If there is normally a positive effect, why is it problematic when the greenhouse effect is magnified by increased levels of atmospheric CO₂?

16. What is the benefit of the **ozone layer**? Describe what is shown in the satellite images shown on slide 83?

E. Conservation Biology and Restoration Ecology (Scroll through the Ch 55 PowerPoint slides and answer these two questions.)

1. What did you learn about **biodiversity**?

2. What would you tell a friend about *our role* in maintaining biodiversity?

* Out of all the slides, pictures, graphs and information you looked at in this ecology assignment, what was *the most thought-provoking or interesting to you*?

Congratulations...you've finished your first AP Bio assignment of the year! 😊