AP Biology 2019-2020
Summer Assignment
Dr. Stefanie Hart

To complete this assignment, you should have downloaded the AP Biology textbook from the booklocker on your ipad. This textbook is broken into 3 parts due to its size. If you are registering during the summer, please contact the school about acquiring a text or ipad, so you will not be behind when school commences.

Part I:
Read the following chapters, or sections of chapters noted, and outline your reading. The reading and outlining of the chapters should take roughly 3 hours per each chapter so plan accordingly and don't wait until the end of the summer. The outlines will serve as your course notes for these chapters so be thorough, but don't write the book! We will discuss these chapters, but I will cover them rapidly. ***The outlines will be counted as 1 quiz grade.***

Reading:
Ch.52: 52.1-52.2; 52.4
Ch.53
Ch.54
Ch.55
Ch.56.1 p.1246-1250 and Ch.56.4 p.1260-1264 only

These outlines are due the first day of school. For every day an assignment is late, 20% will be deducted until all possible points are exhausted. The outlines may be typed **or** handwritten , however, you must **use pen** and no scratching out if hand written. You may submit these through **CANVAS or on paper. Please note the typing allowance is an exception for this assignment and will not be allowed on future assignments.** We will review this at the start of the school year. In addition, **this will be the only assignment allowed to be turned in on paper.**

Part II:
Answer the following reading guide questions and hand in for a quiz grade. ***These review questions will count for a second quiz grade.*** If not completing on the ipad - Use Pen!!! **Yes…..these should be hand written**. For every day an assignment is late, 20% will be deducted until all possible points are exhausted.

** Some of the sections of your 10th edition text book don't line up exactly with these designated sections in the reading guide (8th edition), however, all of the information is there!

Name_____ Period_____

Chapter 52: An Introduction to Ecology and the Biosphere

Overview

1. What is *ecology*?

2. Study Figure 52.2. It shows the different levels of the biological hierarchy studied by ecologists. Notice also the different types of questions that might be studied by an ecologist at each level of study. Use this figure to define or explain the following terms:

   organismal ecology

   population

   population ecology

   community

   community ecology

   ecosystem

   ecosystem ecology

   landscape ecology

   biosphere

   global ecology

Concept 52.1 Ecology integrates all areas of biological research and informs environmental decision making

3. Contrast the terms *ecology* and *environmentalism*. How does ecology relate to environmentalism?

4. What environmental issue was targeted in Rachel Carson's book, *Silent Spring*? What was the outcome of her efforts?

Concept 52.2 Interactions between organisms and the environment limit the distribution of species

5. What is *biogeography*? What factors determine the distribution of organisms?

6. Read this section carefully to understand different types of experiments and observations that help explain the distribution of species. As you conclude this section, list and describe five examples of *biotic factors*.

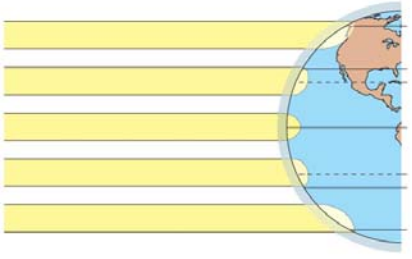
Biotic Factor	**Example and Description**

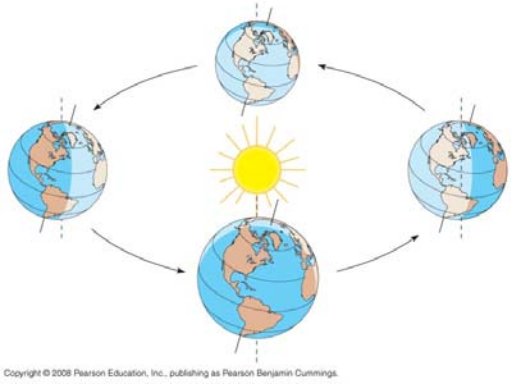
7. List five abiotic factors. Include an example and description of each factor's influence on living organisms.

Abiotic Factor	**Example and Description**

8. What is *climate*? What abiotic factors are its components?

9. Study Figure 52.10, which summarizes Earth's climate patterns and how they are formed. Explain how Earth's curvature and axis of rotation influence the amount of sunlight reaching a given area, and how these factors influence the temperature and precipitation in that area.





10. Let's look at factors that affect climate on a smaller scale. Begin by studying Figure 52.11. Why is the Pacific Northwest so rainy? What causes the Mediterranean climate?

11. Explain the "rain shadow" effect.

12. What effect does elevation have on climate? Why do we say that hiking from Gatlinburg, Tennessee, at 393 meters of elevation in the Smoky Mountains region, to the top of Mount LeConte, at 2010 meters, is like traveling to Canada?

We no longer cover 52.3

Concept 52.3 Aquatic biomes are diverse and dynamic systems that cover most of Earth

13. What is a *biome*?

14. What is the largest marine biome, and how much of Earth's surface does it cover?

15. As you read this section and study Figure 52.18, you will encounter a number of new terms. Distinguish between each of the following pairs of terms:

photic/aphotic

benthic/pelagic

oligotrophic/eutrophic

littoral zone/limnetic zone

zooplankton/phytoplankton

neritic/abyssal

16. The aquatic biomes are listed in the chart. Give a description of the biome below its name, and then complete the other parts of the chart.

Aquatic Biome	**Typical Autotrophs**	**Typical Heterotrophs**	**Human Impact**
Lakes			
Wetlands			
Streams and rivers			
Estuaries			
Intertidal			
Oceanic pelagic			

Concept 52.4 The structure and distribution of terrestrial biomes are controlled by climate and disturbance

17. Figure 52.20 shows a *climograph* for some major biomes in North America. What two abiotic factors shown here are most important in determining the distribution of the biome?

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Chapter 53: Population Ecology

The next three chapters on population, community, and ecosystem ecology provide the academic backbone for this unit on ecology. Each chapter is a different organizational level in ecology, starting with population ecology. Before beginning your study of each chapter, be sure you have a clear understanding of the terms in the chapter title.

Concept 53.1 Dynamic biological processes influence population density, dispersion, and demographics

1. What two pieces of data are needed to mathematically determine *density*?

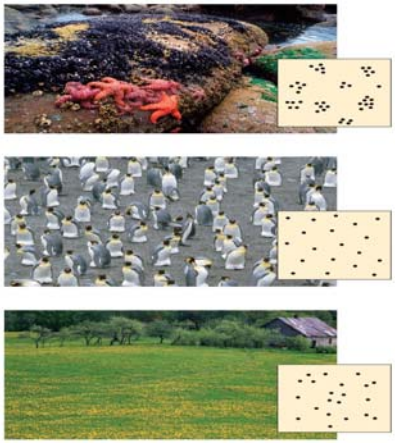
2. What is the difference between density and *dispersion*?

3. Work through Figure 53.2, doing the math to make sure you get the same answer as the text. Note and understand what the letters of the formula mean. Next, try the following problem.

   A population ecologist wished to determine the size of a population of white-footed deer mice, *Peromyscus leucopus*, in a 1-hectare field. Her first trapping yielded 80 mice, all of which were marked with a dab of purple hair dye on the back of the neck. Two weeks later, the trapping was repeated. This time 75 mice were trapped, out of which 48 of the mice were marked. Using the formula $N = mn/x$, what is the population of mice in the field? (Answer is at the end of this reading guide.)

4. Explain the impact of *immigration* and *emigration* on population density. (To avoid confusion between these two terms, it might help to use this memory trick: **i**mmigration is the movement **i**nto a population, while **e**migration is the **e**xiting of individuals from a population.)

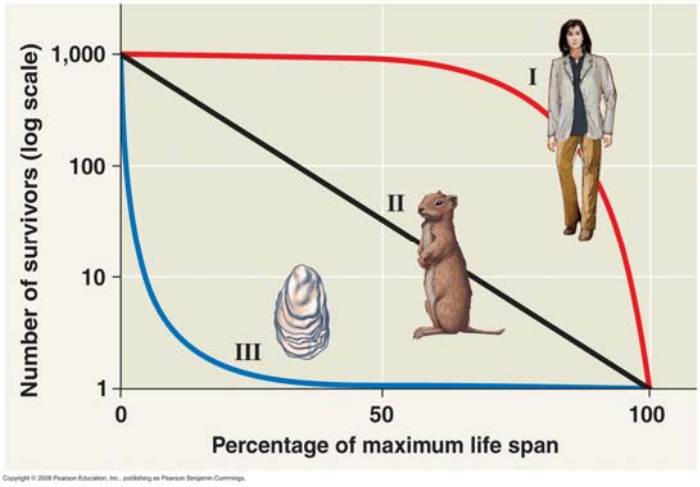
5. Label the dispersion pattern shown by each population in the figure below. Second, and most important, what do the dispersion patterns tell us about the population and its interactions?



6. In what population statistic do *demographers* have a particular interest? How is this data often presented?

7. Is your biology class a *cohort*? Explain.

8. *Survivorship curves* show patterns of survival. In general terms, survivorship curves can be classified into three types. Using the figure below, label and explain the three idealized survivorship patterns.



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9. In the natural world, many species show survivorship curves that are combinations of the standard curves. How would an open nesting songbird's survivorship curve appear if it was Type III for the first year and then Type II for the rest of its life span? Sketch this curve on the survivorship curve graph in question 8.

10. What does a *reproductive table* show?

Concept 53.2 Life history traits are products of natural selection

11. On what is the *life history* of an organism based?

12. What three variables form the life history of a species?

13. Explain the difference between *semelparity (big-bang reproduction)* and iteroparity *(repeated reproduction)* as life history strategies.

14. Explain how two critical factors influence whether a species will evolve toward semelparity or iteroparity.

15. Explain the effect of offspring care on parental survival in kestrels.

Concept 53.3 The exponential model describes population growth in an idealized, unlimited environment

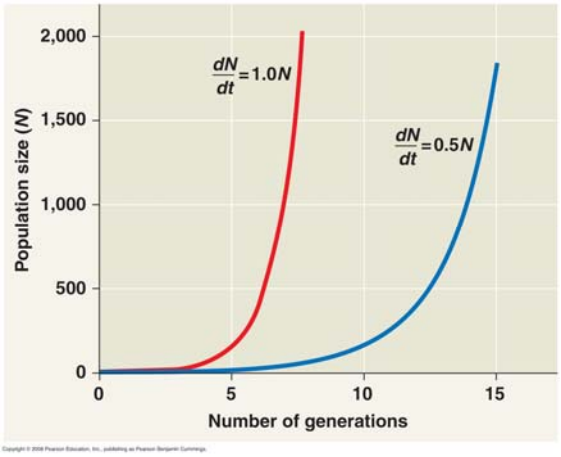
Do not let the math in this section be a problem. Instead of trying to understand the calculus involved, concentrate on the idea of exponential growth, how it is graphed, and what this type of growth indicates about a population.

16. What is the advantage to using per capita birth and death rates rather than just the raw numbers of births and deaths?

17. What will the per capita birth and death rates be if a population is demonstrating *zero population growth*?

18. What does it mean for a population to be in *exponential population growth*?

19. In the graph below, explain why the line with the value of 1.0 shows a steeper slope that reaches exponential growth more quickly than does the line with the value of 0.5. On this graph, add a third line that approximates a population with an exponential value of 1.25.



20. What are two examples of conditions that might lead to *exponential population growth* in natural populations?

Concept 53.4 The logistic model describes how a population grows more slowly as it nears its carrying capacity

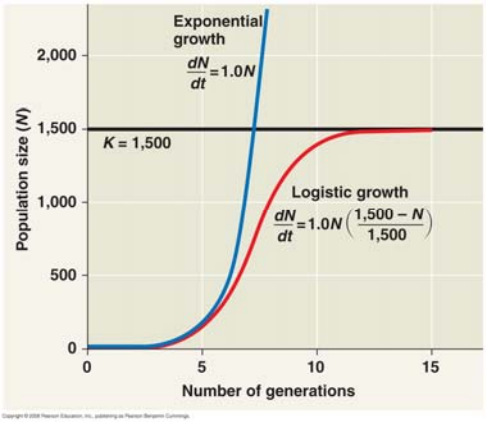
21. What is *carrying capacity*?

22. What are six examples of limiting resources that can influence carrying capacity?

23. In the *logistic population growth* model, the per capita rate of increase approaches zero as the _____ is reached.

24. If the carrying capacity (or *K*) is 1,000 and *N* is 10, the term $(K - N)/K$ is large. Explain why a large value for $(K - N)/K$ predicts growth close to the maximum rate of increase for this population.

25. In the graph below, explain why the logistic model predicts a sigmoid (S-shaped) growth curve when the population density is plotted over time. Hint: The critical part of this answer concerns why growth slows as *N* approaches *K*.



26. The end of this concept attempts to bring together the ideas of life histories and growth models. This is done with the introduction of two new terms: *K*-selection and *r*-selection. Explain the ideas behind the creation of these two terms.

27. Compare and contrast these two terms:

density-independent regulation

density-dependent regulation

28. Explain how negative feedback plays an essential role in the unifying theme of regulation of populations. Does negative feedback play a role in both density-independent and density-dependent regulation?

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29. Complete the following chart.

Density-Dependent Population Regulation

Negative Feedback Mechanism	Explanation	Example
Competion for resources		
Territoriality		
Disease		
Predation		
Toxic wastes		
Intrinsic factors		

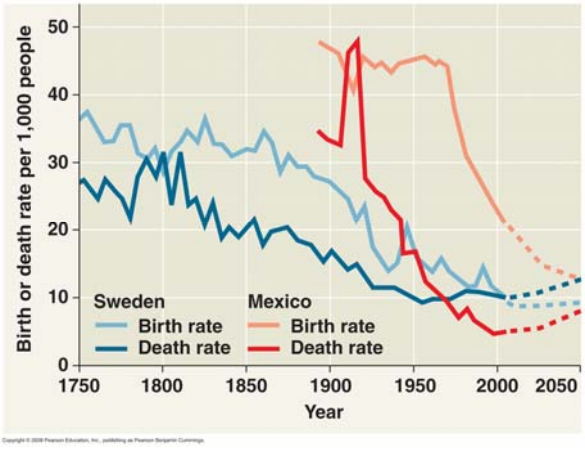
30. Give both biotic and abiotic reasons for population fluctuations over the last 50 years in the moose population on Isle Royale, based on *population dynamics*.

31. Explain the importance of immigration and emigration in *metapopulations*.

Concept 53.5 The human population is no longer growing exponentially but is still increasing rapidly

32. Summarize human population growth since 1650. (Of all the reported statistics, which one surprises you the most?)

33. What is *demographic transition*? Use the figure below to explain the process in Sweden and Mexico.



34. You should be able to look at *age-structure graphs* and make predictions about the future growth of the population. Using Figure 53.25, describe the key features for the three age-structure graphs and predict how the population of each country will grow.

Country	**Key Features**	**Predicted Future Growth**
Afghanistan		
United States		
Italy		

35. Why do *infant mortality* and *life expectancy* vary so greatly between certain countries?

36. Can the world's population sustain an *ecological footprint* that is currently the average American footprint? Explain.

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Chapter 54: Community Ecology

Concept 54.1 Community interactions are classified by whether they help, harm, or have no effect on the species involved.

1. What is a *community?* List six organisms that would be found in your schoolyard community.

2. This section will look at *interspecific* interactions. Be clear on the meaning of the prefix! To begin, distinguish between *intraspecific competition* and *interspecific competition.* Give an example of each.

Type of Competition	**Explanation**	**Example**
Intraspecific competition		
Interspecific competition		

3. What is G. F. Gause's *competitive exclusion principle*? Give one example.

4. Define *ecological niche*.

5. Several species of *Anolis* lizards live in the same types of trees and have a similar diet. Discuss *resource partitioning* to explain how interspecific competition is reduced. (Study Figure 54.2.)

6. What is the difference between the *fundamental niche* and the *realized niche*?

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7. Study Figure 54.5, and then explain what is meant by *character displacement*. (To do this, you will have to learn or review the difference between *sympatric* populations and *allopatric* populations. You will find this information in Chapter 24.)

8. *Predation* is a term that you probably already know. Can you give examples of some predator-prey combinations as listed below?

Predator	**Prey**	**Example**
Animal	Animal	
Animal	Plant	
Fungus	Animal	
Bacteria	Animal	
Fungus	Plant	

9. List three special adaptations that predator species possess for obtaining food.

10. List three ways prey species elude predators.

11. Compare the two types of mimicry.

Type of Mimicry	**Description**	**Example**
Batesian		
Müllerian		

12. What is *herbivory*?

13. Did you list any special herbivore adaptations for predation in your response to question 9? Or plant adaptations to avoid herbivory? List two adaptations for each category here.

14. Describe and give an example of each of the following interactions:

Type of Interaction	**Description**	**Example**
symbiosis		
parasitism		
commensalism		
mutualism		

15. Which category above includes the other three? Note that other texts may define this term more narrowly.

16. Your text uses +/– symbols to indicate how interspecific interactions affect survival and reproduction of the two species. Use this notation for each of these interactions.

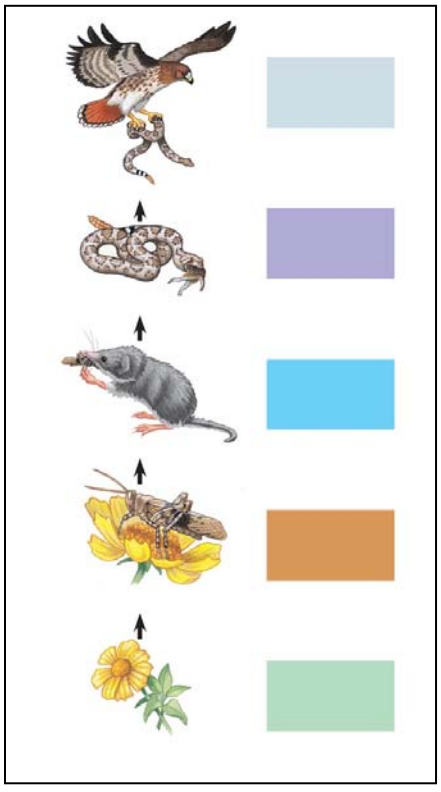
Type of Interaction	**+/+, +/–, –/–, +/0**
predation	
commensalism	
mutualism	
parasitism	
interspecific competition	
herbivory	

17. What is *species diversity*? What are its two components? Why is it important?

18. What does an ecologist summarize in a *food web*?

19. Know the levels of trophic structure in food chains. Give a food chain here, including four links that might be found in a prairie community, and tell the level for each organism.

20. Name every organism in the pictured food chain, and give the trophic level in the box.



21. According to the *energetic hypothesis*, why are food chains limited in length? How much energy is typically transferred to each higher level?

22. What is a *dominant species*? For the area where you live, what would be considered a dominant tree species?

23. How is a *keystone species* different from a dominant species?

24. Name one keystone species, and explain the effect its removal has on the ecosystem.

25. Explain *facilitator* or *foundation species* and give an example.

You may omit bottom-up and top-down controls.

Concept 54.2 Disturbance influences species diversity and composition

26. What is the *intermediate disturbance hypothesis*? Give an example of a disturbance event, and explain the effect it has on the community.

27. *Ecological succession* is the changes in species that occupy an area after a disturbance. What is the difference between *primary succession* and *secondary succession*?

Concept 54.3 Biogeographic factors affect community biodiversity

28. Explain *latitudinal gradients* in terms of species richness. Where is species richness greatest?

29. There are probably two key factors in latitudinal gradients. List and explain both here, and put a star next to the one that is probably the primary cause of the latitudinal difference in biodiversity.

30. Explain what is demonstrated by a *species-area* curve.

31. Renowned American ecologists Robert MacArthur and E. O. Wilson developed a model of *island biogeography*. While the model can be demonstrated with islands, any isolated habitat represents an island. What are the two factors that determine the number of species on the island?

32. What two physical features of the island affect immigration and extinction rates?

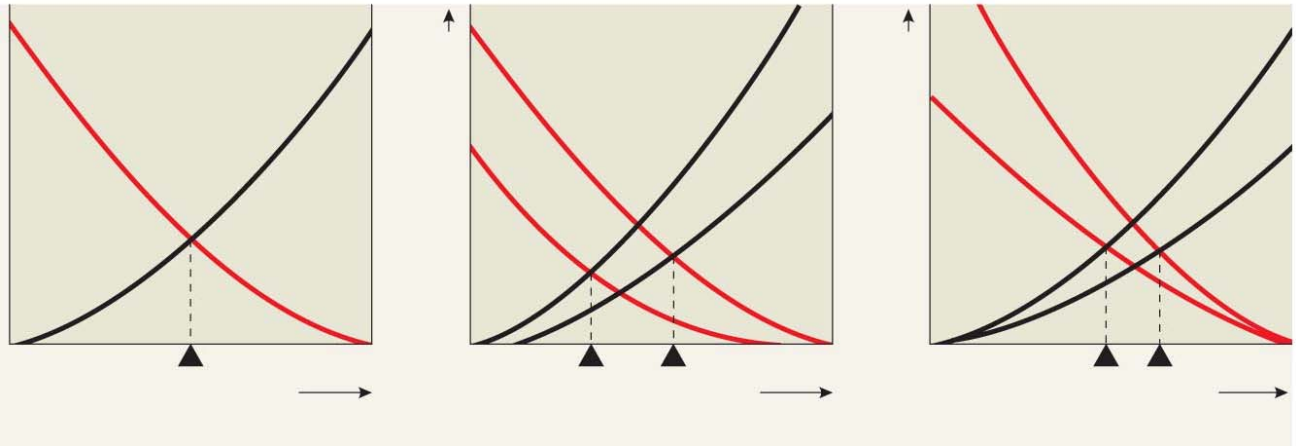
33. Why do small islands have lower immigration rates? Higher extinction rates?

34. Closer islands have _____ extinction rates and _____ immigration rates.

35. What is the *island equilibrium mode*l?

36. Use this model to describe how an island's size and distance from the mainland affect the island's species richness.

37. Label this figure to show immigration, extinction, island size, and equilibrium. Then explain what each figure shows.



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Concept 54.4 Community ecology is useful for understanding pathogen life cycles and controlling human disease

38. Let's pull a couple of ideas from this section: What is a *pathogen*?

39. What is a *zoonotic pathogen*? List three examples.

40. What is a *vector*? List three examples.

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Chapter 55: Ecosystems

Overview:

1. What is an *ecosystem*?

2. Where does energy enter most ecosystems? How is it converted to chemical energy and then passed through the ecosystem? How is it lost? Remember this: *energy cannot be recycled*.

3. Besides the energy flow that you described in question 2, chemicals such as carbon and nitrogen *cycle* through ecosystems. So energy _____ through an ecosystem and matter _____.

Concept 55.1 Physical laws govern energy flow and chemical cycling in ecosystems

4. Both energy and matter can be neither _____ nor

   _____.

5. We can measure the efficiency of energy conversion in an ecosystem, as well as whether a given nutrient is being gained or lost from an ecosystem. Let us take a second look at *trophic levels*. What trophic level supports all others?

6. List three groups of organisms that are *photosynthetic autotrophs*.

7. What are the *primary producers* of the deep-sea vents?

8. This concept reviews trophic relationships. Know all terms in your textbook that are bolded. What are *trophic levels*? What is always at the first trophic level?

9. What are *detritivores*? What is their importance in chemical cycling? Give some examples of detritivores.

10. State the trophic level of each of the following:

    cow _____ grass _____ man _____ mushroom _____

Concept 55.2 Energy and other limiting factors control primary production in ecosystems

11. What is *primary production*? Distinguish between *gross primary production* and *net primary production*.

12. Write an equation here that shows the relationship between gross and net primary production.

13. You may recall from Chapter 54 that *biomass* is the total mass of all individuals in a trophic level. Another way of defining net primary production is as the amount of *new* biomass added in a given period of time. Why is net primary production, or the amount of new biomass/unit of time, the key measurement to ecologists?

14. Which ecosystem would tend to have a greater biomass/unit area, a prairie or a tropical rain forest? Explain.

15. Describe a technique for measuring net primary production in an aquatic environment. (We will use this technique for AP Lab 12, *Dissolved Oxygen and Aquatic Primary Productivity*.)

16. What are some factors that limit primary productivity in aquatic ecosystems?

17. What is a *limiting nutrient*? What is the limiting nutrient off the shore of Long Island, New York? In the Sargasso Sea?

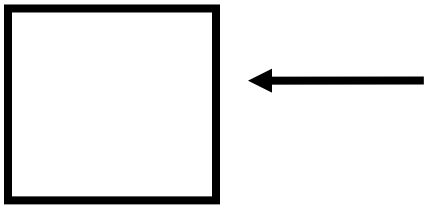
18. Phytoplankton growth can be increased by additional nitrates and phosphates. What are common sources of each of these?

19. What is *eutrophication*? What are factors that contribute to eutrophication?

Concept 55.3 Energy transfer between trophic levels is typically only 10% efficient

20. What is *trophic efficiency*?

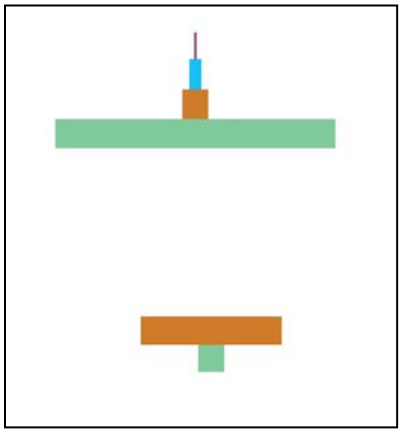
21. Generally, what percentage of energy available at one trophic level is available at the next?



This is important! Remember it.

22. Consider a food chain with 1,000 *joules* (an energy unit) available at the producer level. If this food chain is grass → grasshopper → lizard → crow, how much energy is found at the level of the crow? (See answer at the end of this Reading Guide.) Show your work here.

23. Notice that most biomass pyramids have greatest biomass on the bottom of the pyramid. Label the trophic levels on the figure. Explain why the second pyramid of biomass is inverted.



24. Why do people who have limited diets in overpopulated parts of the world eat low on the food chain?

Concept 55.4 Biological and geochemical processes cycle nutrients between organic and inorganic parts of an ecosystem

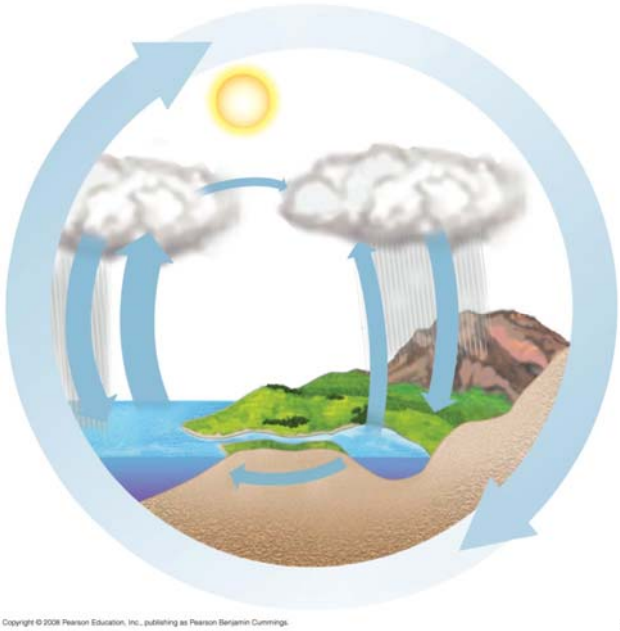
Pay particular attention to the nutrient cycles in Figure 55.14. Note the key processes in each cycle.

25. Use the figure below to describe the water cycle. Specify the roles of *evaporation*, *transpiration*, and *rainfall*.

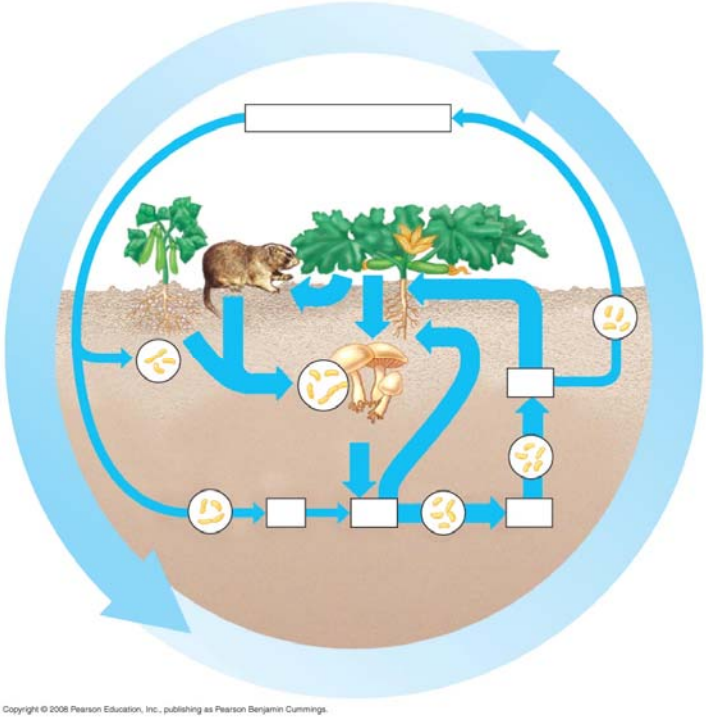
26. Use the second figure on the following page to describe the carbon cycle. In doing so, explain how carbon enters the living system and how it leaves, indicate the role of microorganisms in the cycle, and identify the reservoir for carbon.

Write the equation for photosynthesis here: _____

Write the equation for cellular respiration here: _____



27. Use the diagram below to describe the nitrogen cycle. In doing so, indicate the role of microorganisms in *nitrogen fixation*, *nitrification*, and *denitrification*.



28. Review the *Case Study*: *Nutrient Cycling in the Hubbard Brook Experimental Forest*. What effect has deforestation been shown to have on chemical cycling?

Concept 55.5 Human activities now dominate most chemical cycles on Earth

This section looks at human impact on ecosystems.

29. How has agriculture affected nitrogen cycling? What are some negative consequences of nutrient enrichment?

30. In what ways have human activities contributed to acid precipitation? What are some negative consequences of acid precipitation?

31. Explain the process of biological magnification. Discuss at least one example.

32. What is meant by the *greenhouse effect*? What would life on Earth be like without this effect?

33. What is contributing to the great increase in atmospheric carbon dioxide? What are potential effects of this increase?

34. How is atmospheric ozone depleted? What are projected effects of this depletion?

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Chapter 56: Conservation Biology and Restoration Ecology

In the overview at the beginning of the chapter, the author sets the stage for this final chapter of the book. This chapter will deal with both *conservation biology* and *restoration ecology*. Let's begin by comparing and contrasting these two terms.

conservation biology

restoration ecology

Concept 56.1 Human activities threaten Earth's biodiversity

1. Ecologists organize biodiversity on three levels. In the table below, explain the impact of decreasing diversity in each division. Begin reading on page 1248, where the topic changes to threats to biodiversity before answering this question.

Level of Biodiversity	Impact
Genetic diversity	
Species diversity	
Ecosystem diversity	

2. Explain the difference between *endangered species* and *threatened species*.

3. Use this table to organize your thoughts on how the following three threats affect biodiversity.

Threat to Biodiversity	How it reduces biodiversity
Habitat loss	
Introduced species	
Overexploitation	

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4. List five *introduced species* that present a serious threat to their new communities. Explain the damage done by each introduced species. ***Include two introduced species that are a threat in your own region of the country. Indicate these with an asterisk.

Introduced Species	**Damage**
(1)	
(2)	
(3)	
(4)	
(5)	

Concept 56.2 Population conservation focuses on population size, genetic diversity, and critical habitat

5. What do conservation biologists who adopt the *small-population approach* study?

6. Explain what an *extinction vortex* is, and describe one field study that supports this idea.

7. Why is genetic variation the key issue in the small-population approach?

8. On what type of population does the *declining-population* model focus?

9. What is the emphasis for study in the declining-population model?

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