

Name: _____

AP Biology

Chapter 40 Active Reading Guide

Population Ecology and the Distribution of Organisms

Overview

1. What is ecology?
2. Study Figure 40.2 in your text. 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:

Section 1

3. What is climate? What four factors are its components?

4. What is the difference between macroclimate and microclimate?

5. Study Figures 40.3 and 40.4 in your text, which summarize 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.

6. Let's look at factors that affect climate on a smaller scale. Begin by studying Figure 40.5. Why is the Pacific Northwest so rainy? What causes the Mediterranean climate?

7. Explain the "rain shadow" effect.

8. 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 2,010 meters, is like traveling to Canada?

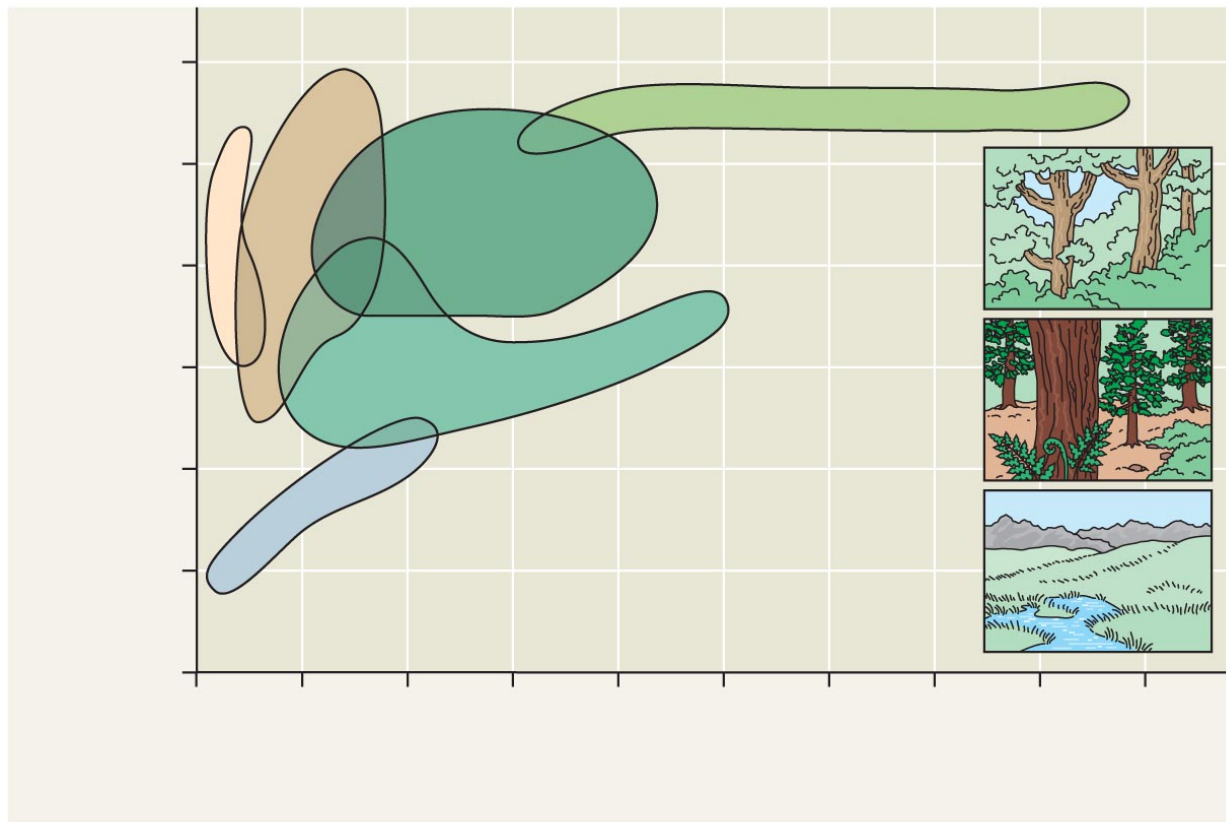
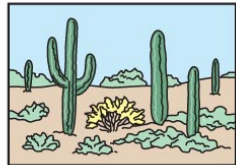
9. Every environment on Earth is characterized by _____ or nonliving factors and _____ or living factors.

10. Give two examples of how global climate change can alter the current range of species.

11. What is a biome?

12. Figure 40.8 in your text 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?

13. Label the axes of this figure, and identify each biome shown here. Try to do this based on your understanding of the figure, and then use the text to check your answers. You will use these biomes: temperate grassland, temperate broadleaf forest, tropical forest, northern coniferous forest, desert, tundra.



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14. Describe each major terrestrial biome as to rainfall, temperature, location, and representative flora and fauna.

tropical forest:

desert:

savanna:

chaparral:

temperate grassland:

northern coniferous forest/taiga:

temperate broadleaf forest:

tundra:

Section 2

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

16. As you read this section and study Figure 40.10 in your text, 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:

17. 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 & Rivers			
Estuaries			
Intertidal Zones			
Oceanic Pelagic			
Coral Reefs			
Benthic Zone			

Section 3

18. What role does dispersal play in the study of the distribution of species?

19. 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 five examples of biotic factors that may influence species distribution.

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

Abiotic Factor

Example and Description

1.

2.

3.

4.

5.

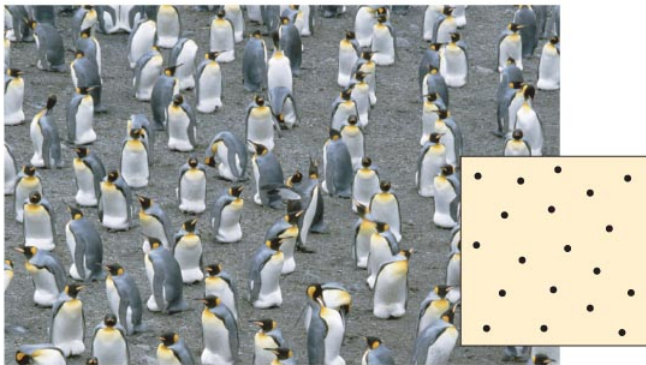
Section 4

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

22. What is the difference between density and dispersion?

23. 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: immigration is the movement into a population, while emigration is the exiting of individuals from a population.)

24. 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?



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25. In what population statistics do demographers have a particular interest? How is this data often presented?

26. Is your biology class a cohort? Explain.
27. Survivorship curves show patterns of survival. In general terms, survivorship curves can be classified into three types. Explain the three survivorship patterns.
28. 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.
29. What does a reproductive table show?

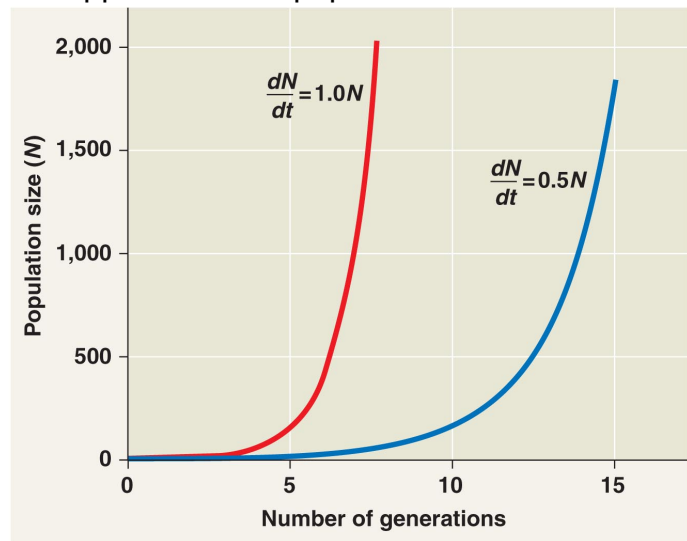
Section 5

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.

30. What is the advantage to using per capita birth and death rates rather than just the raw numbers of births and deaths?
31. What will the per capita birth and death rates be if a population is demonstrating zero population growth?

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

33. 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.



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

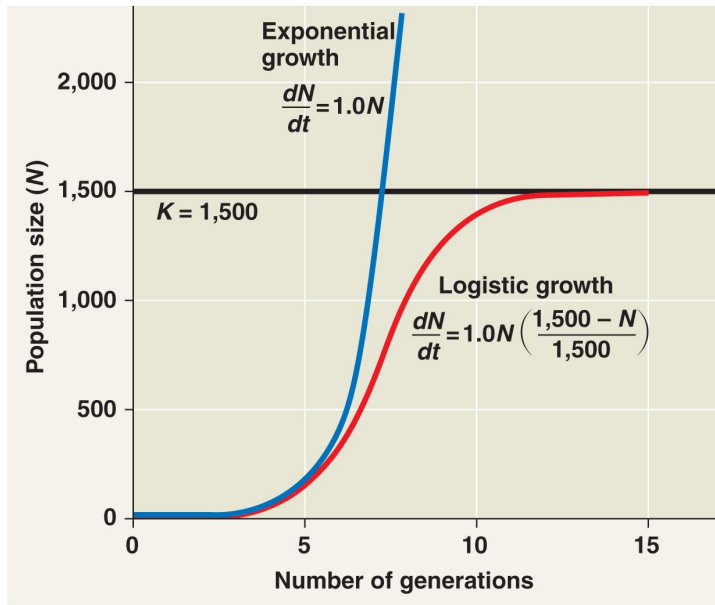
35. What is carrying capacity?

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

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

38. 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.

39. 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 .



40. 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.

Section 6

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

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

43. Compare and contrast these two terms:
density-independent regulation:

density-dependent regulation:

44. 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.

45. Complete the following chart.

Negative Feedback Mechanism	Explanation	Example
Competition for Resources		
Predation		
Toxic Wastes		
Intrinsic Factors		
Territoriality		
Disease		

46. Explain the importance of immigration and emigration in metapopulations.