

CHAPTER 5—POPULATION BIOLOGY

MULTIPLE CHOICE

- Which of the following problems do immigration and emigration pose for demographers?
 - Demographers must provide for more city services.
 - Demographers cannot identify the age structure of immigrants.
 - Demographers find it difficult to make predictions about populations.
 - Demographers study growth rates, age structures, and geographic distributions of populations.

ANS: C DIF: B OBJ: 5-6
- The effect of local population fluctuations in rapidly expanding suburbs may _____ schools, roads, and police and fire services.
 - stress
 - reduce the need for
 - have no effect on
 - none of these

ANS: A DIF: B OBJ: 5-6
- The effect of movement of people between countries has _____ effect on total world population.
 - a damaging
 - little
 - a great
 - no

ANS: D DIF: B OBJ: 5-6
- A country that is not growing is characterized by an age structure that is _____.
 - about the same among all groups
 - largest among pre-reproductive years
 - largest among reproductive years
 - largest among post-reproductive years

ANS: A DIF: B OBJ: 5-5
- Bacteria employ a(n) _____ reproductive strategy, a characteristic determined by their small size, rapid maturation, and short life span.
 - unusual
 - early
 - rapid
 - slow

ANS: C DIF: B OBJ: 5-4

5-1

- The giant land tortoises of the Galapagos Islands and sequoias of California have among the longest life spans of any organisms. This indicates that they likely employ a strategy of _____.
 - rapid reproduction
 - slow growth
 - early sexual maturity
 - all of these

ANS: B DIF: B OBJ: 5-4
- Organisms that employ a strategy of slow reproduction usually require an environment that _____.
 - is stable
 - fluctuates from year to year
 - has cold days
 - has 24-hour growing periods

ANS: A DIF: B OBJ: 5-4
- A population that stays within its carrying capacity is usually shown on a graph that has the shape of a(n) _____.
 - I
 - J
 - S
 - none of these

ANS: C DIF: B OBJ: 5-1
- Density-independent factors are limiting factors whose effects are _____.
 - confined to the habitat of the population
 - determined by the degree of competition for resources
 - not influenced by population densities
 - determined by the difference between birthrate and population density

ANS: C DIF: B OBJ: 5-3
- For a particular species, the carrying capacity is the maximum number of individual organisms that _____.
 - the species could reach in a given time period if all the offspring survive and reproduce
 - could be supported by a given environment indefinitely
 - are in their post-reproductive years
 - could be supported by any environment over a period of one year

ANS: B DIF: B OBJ: 5-3
- Unrestricted populations of organisms experience _____.
 - exponential growth
 - linear growth
 - fertility
 - biotic growth

ANS: A DIF: B OBJ: 5-1

5-2

12. The statement, "proportions of a population expressed in terms of the reproductive years of the individual organisms," refers to the population's _____.
- fertility rate
 - reproductive strategy
 - age structure
 - carrying capacity

ANS: C DIF: B OBJ: 5-5

13. When you study all the growth characteristics of a population, you are studying its _____.

- reproductive pattern
- exponential growth
- life-history pattern
- demography

ANS: D DIF: B OBJ: 5-5

14. Population control factors whose effects increase as the size of the population increases are _____.

- abiotic factors
- density-dependent factors
- limiting factors
- density-independent factors

ANS: B DIF: B OBJ: 5-3

COMPLETION

1. Demographers collect and study data about the age structure, geographic distribution, and _____ of populations.

ANS: growth rate DIF: B OBJ: 5-5

2. Instead of growing explosively, population growth tends to level off because the population reaches the _____ of a particular environment.

ANS: carrying capacity DIF: B OBJ: 5-2

3. The production of many offspring in a short period of time is characteristic of a _____ life-history pattern.

ANS: rapid DIF: B OBJ: 5-2

4. The number of offspring produced by a female during her reproductive years defines the _____ rate.

ANS: fertility DIF: B OBJ: 5-4

5. _____ would be a density-dependent limiting factor on the growth of a population.

ANS: Food availability DIF: B OBJ: 5-3

5-3

6. A population of bacteria that doubles its size every 20 minutes exhibits _____ growth.

ANS: exponential DIF: B OBJ: 5-1

7. A(n) _____-shaped curve describes the tendency of a population to grow without limit to its size.

ANS: J DIF: B OBJ: 5-1

SHORT ANSWER

1. Discuss the effects you would expect on two fictional countries, Desertland and Agriland, if large numbers of people immigrate to Agriland from Desertland.

ANS: Answers will vary. Students should include the effects on the population growth of both countries and the problems caused in political, social, and economic systems of both countries. Opinions will vary about which country will benefit by the change in population numbers.

DIF: A OBJ: 5-6

2. The United States is largely populated by descendants of immigrants from other nations. During the past 165 years, 52.5 million people have immigrated to this country, resulting in a 25 percent growth in total population. Hypothesize about the effects such immigration has had on the population growth rate.

ANS: Answers will vary. There is no way to know for certain what the population growth rate would have been without the immigration of a large part of the total population. It is most likely that the total population would be much less than what it is today. However, in the long run, the shape of the graph showing the population increase would probably be much the same as it is for other countries and the world.

DIF: A OBJ: 5-6

3. Discuss the demographic trends that have major effects on population growth rates in humans.

ANS: The combined effects of birthrate and death rate have pronounced effects on population growth. Countries with higher birthrates than their death rates tend to grow fastest. Countries that have low birthrates and death rates are usually slow growing and may even have stable population sizes. Age structure indirectly has an effect on population growth by dictating the numbers of people who are in their pre-reproductive, reproductive, or post-reproductive years. Immigration and emigration have no effect on total world population but may dramatically affect the population of individual countries.

DIF: A OBJ: 5-4

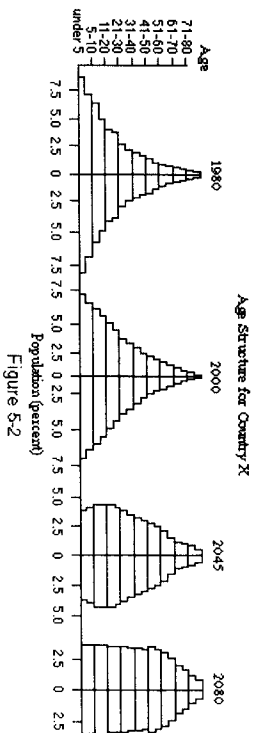
4. Describe the general characteristics and give two examples of organisms that employ a strategy of rapid reproduction that produces many offspring.

ANS: Typically, organisms that employ such a strategy have a small body size, mature rapidly, reproduce early, and have a short life span. Examples will vary but may include such organisms as flies and mosquitoes.

DIF: A OBJ: 5-2

5-4

In Figure 5-2, the first age structure graph for country X shows the percent of the population in each age group for the year 1980. The remaining three graphs are projections of how the age structure of country X will change.



5. Using Figure 5-2, what might account for the age structure predicted for the year 2080?

ANS: Answers may vary. The carrying capacity of the environment will be reached; the country will have become more industrialized; the birth, death, and/or fertility rates will have changed.

DIF: A OBI: 5-5

6. Describe the overall trend in population growth predicted in Figure 5-2.

ANS: Population growth will begin to slow down by the year 2045, with little to no growth expected by the year 2080.

DIF: A OBI: 5-5

7. Referring to Figure 5-2, what can you conclude about the stage of population growth country X is in now?

ANS: Country X is in a rapid growth, or exponential, stage.

DIF: A OBI: 5-5

8. How is the age structure, as shown in Figure 5-2, expected to change by the year 2000?

ANS: Very little change is projected; a slight decrease in the proportion of pre-reproductive individuals and a slight increase in the proportion of reproductive individuals is indicated.

DIF: A OBI: 5-5

9. In 1980, does country X exhibit an age structure more typical of a developing nation or an industrialized nation? Use Figure 5-2 to explain your answer.

ANS: The age structure is more typical of a developing nation, as indicated by the larger percentage of individuals in the pre-reproductive and reproductive years and a smaller percentage in the post-reproductive years.

DIF: A OBI: 5-5

A student grew a yeast culture on sterilized nutrient medium in a closed dish for five days. Each day, she took the same size sample from the dish and placed it on a special slide used for counting microorganisms (see the top half of Figure 5-3). She examined the samples under a microscope and drew the illustrations of her observations over the course of the investigation. Each dot represents ten yeast cells.

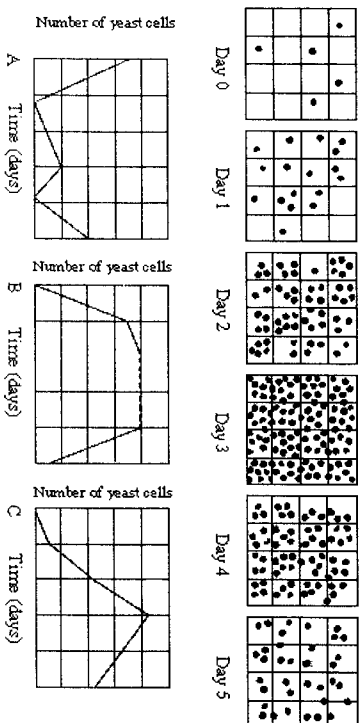


Figure 5-3

10. Which graph (A, B, or C in the bottom half of Figure 5-3) best pictures the growth of the student's yeast population?

ANS: Graph C

DIF: A OBI: 5-1

11. Referring to Figure 5-3, what steps could the student take to ensure the accuracy of her results?

ANS: Answers may vary. Grow more than one culture and average the results from each; have another student make counts using a second sample of equal size; have other students repeat the investigation and use the average of all the results obtained.

DIF: A OBI: 5-3

12. In Figure 5-3, how could the carrying capacity of the culture dish be increased?

ANS: Answers may vary. Adding more nutrient medium would increase the carrying capacity.

DIF: A OBI: 5-3

13. At what point did the population reach the carrying capacity of the culture dish in Figure 5-3?

ANS: The population reached its maximum number on day 3; after that, there were fewer yeast cells present.

DIF: A OBI: 5-1