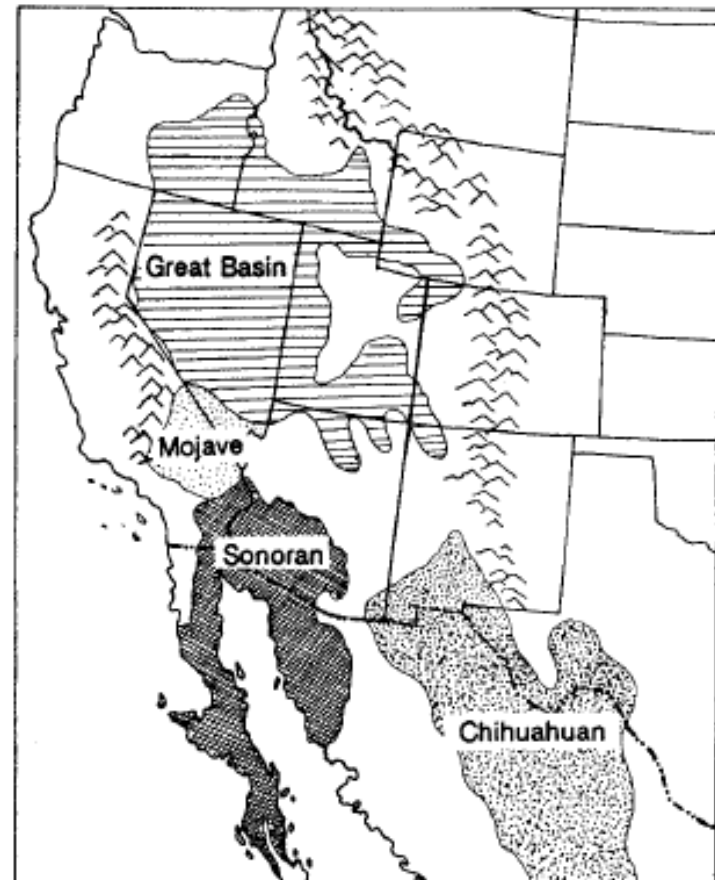


**Populations and
Community
Sample Questions**

The location of the Sonoran Desert results in unique climatic conditions. It has a warmer average temperature, less frequent frosts, and more rainfall than other deserts. This unique climate results in more diversity in the organisms that occupy this particular desert.

—from *Naylor, 1995*



In the Sonoran Desert, all the populations of all the organisms occupying that desert represent

- A. a habitat
- B. a community**
- C. a geographic range
- D. an ecological niche

Given a further increase in the snow goose population, in the Churchill, Manitoba nesting area

- A. interspecific competition will increase because of decreased species diversity
- B. interspecific competition will increase and intraspecific competition will decrease
- C.** intraspecific competition will increase because available food supplies are decreasing
- D. intraspecific competition will decrease because fewer snow geese will be able to find nesting sites

Gause's principle states that when two different populations occupy the same ecological niche, one of the populations will be eliminated. Both the mallard duck and the red-winged blackbird occupy wetland areas. The duck and the red-winged blackbird can live in the same habitat because there is

- A. little intraspecific competition for food and breeding areas
- B.** little interspecific competition for food and breeding areas
- C. significant intraspecific competition for food and breeding areas
- D. significant interspecific competition for food and breeding areas

In winter, snowshoe hares found in Jasper National Park create pathways in the snow between feeding and resting sites. These travel lanes are then used by porcupines, making the porcupines' movement through deep snow easier.

What relationship exists between the snowshoe hare and the porcupine?

- A. Mutualism
- B. Predator-prey
- C. Commensalism
- D. Intraspecific competition

Use the following information to answer the next question.

Examples of Ecological Relationships

- 1 Tropical acacia trees are hosts to a particular species of ants. The ants are provided with shelter and nutrients from the trees. The trees are protected from other predatory insects by the ants.
- 2 The protozoan *Opalina ranarum* lives in the digestive tract of some frogs and obtains nutrients in this way without harming the frog.
- 3 The protozoan *Plasmodium* is the cause of malaria. *Plasmodium* lives in the bloodstream of humans and reproduces inside red blood cells causing the red blood cells to burst.

Numerical Response

8. Match the ecological relationships, as numbered above, with the types of symbiosis given below.

(Record your three-digit answer in the numerical-response section on the answer sheet.)

Ecological Relationship: 2 1 3
Type of Symbiosis: Commensalism Mutualism Parasitism

Komodo dragons have up to 50 strains of bacteria living on the meat stuck between their teeth. If a deer that has been bitten by a Komodo dragon manages to escape, it will die within a week as a result of bacterial infection. Komodo dragons can then feast on the dead deer. The Komodo dragons themselves are resistant to bacterial infection.

Which of the following rows identifies the relationship between the Komodo dragon and bacteria and the relationship between the deer and bacteria?

Row	Komodo Dragon and Bacteria	Deer and Bacteria
A.	mutualism	predator–prey
B.	parasitism	predator–prey
C.	mutualism	parasitism
D.	parasitism	parasitism

The spermicide nonoxynol-9, which is applied to contraceptive devices such as diaphragms and condoms, has been linked to increased urinary tract infections in women. Although nonoxynol-9 is helpful in fighting the herpes virus and HIV, it also destroys beneficial bacteria (lactobacilli) that moderate the acidity of a woman's vagina. As a woman's vagina and external genitalia become more acidic, another bacterium, *Escherichia coli* (*E. coli*), increases in number and invades her urethra. This overpopulation of *E. coli* causes a bladder infection.

—from *Vergano, 1996*

The relationships described above between the human female, lactobacilli, and *E. coli* are identified in row

Row	Human female/lactobacilli	Human female/ <i>E. coli</i>	Lactobacilli/ <i>E. coli</i>
A	parasitic	mutualistic	interspecific competition
B	mutualistic	mutualistic	intraspecific competition
C	mutualistic	parasitic	interspecific competition
D	parasitic	parasitic	intraspecific competition

Use the following information to answer the next three questions.

In heavily populated regions of Canada, the landscape is now dominated by what scientists call “invasive” non-native species. Horticultural expert Bill Granger has described the Norway maple as a “tree on steroids” because of its dense rooting system. This tree reaches sexual maturity quickly and spreads many seeds over a wide area. Another invasive species, pampas grass, is described by Dr. Spencer Barrett as an “excellent opportunist.” Pampas grass relies on allies such as humans to cut out vegetative competition before it proceeds to dominate the landscape.

—from *Cundiff, 1996*

The relationship exhibited between pampas grass and other native plants is

- A. parasitism
- B. commensalism
- C. interspecific competition
- D. intraspecific competition

When limited food supplies have threatened to check human population growth, people have used technology and social organization to clear forests, plow grasslands, grow crops, and harness science to agriculture. This indicates that food is

- A. a biotic factor that humans can manipulate
- B. an abiotic factor that humans can manipulate
- C. a biotic factor that humans cannot manipulate
- D. an abiotic factor that humans cannot manipulate

The location of the Sonoran Desert results in unique climatic conditions. It has a warmer average temperature, less frequent frosts, and more rainfall than other deserts. This unique climate results in more diversity in the organisms that occupy this particular desert.

—from *Naylor, 1995*



The factors that contribute most to the relatively great diversity of organisms in the Sonoran Desert as compared with that in other deserts are

- A. biotic factors that increase the biotic potential
- B. abiotic factors that reduce reproductive isolation
- C. abiotic factors that reduce environmental resistance
- D. biotic factors that increase the carrying capacity of the area

Use the following additional information to answer the next question.

Predator–Prey Relationships				
Location	Animal 1	Animal 2	Density of Predators (number per 100 km²)	Number of Prey
Jasper National Park	Wolf	Elk	0.6	1 200
Northwest Territories	Wolf	Caribou	0.3	500 000

Numerical Response

7. The size of the wolf population in an area of 6 000 km² of the Northwest Territories is calculated to be 18 wolves.

(Record your **answer as a whole number** in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

A swimming pool 50 m long and 20 m wide is filled with water to a depth of 3 m. The population density of bacteria in the water is 2.5×10^6 bacteria/m³.

Approximately how many bacteria are there in the swimming pool?

- A. 2.5×10^9
- B. 7.5×10^9
- C. 2.5×10^{12}
- D. 7.5×10^{12}

The red-winged blackbird's adaptability has allowed it to become one of the most abundant birds in North America.

—photo from *Grolier Multimedia Encyclopedia, 1999*



A Study of a Red-Winged Blackbird Nesting Site

The initial population of red-winged blackbirds was 208.

	End of Year 1	End of Year 2
Births	22	43
Deaths	4	7
Birds entering area	0	2
Birds leaving area	2	5

A conclusion about this nesting site study is that the red-winged blackbird population increased because

- A.** natality plus immigration exceeded mortality plus emigration
- B.** mortality plus emigration exceeded natality plus immigration
- C.** natality plus emigration exceeded mortality plus immigration
- D.** mortality plus immigration exceeded natality plus emigration

From 1968 to 1990, the population of snow geese nesting near Churchill, Manitoba, increased from about 2 000 pairs (4 000 individuals) to about 22 500 pairs (45 000 individuals) with a nesting density of around 1 000 nests per square mile. Snow geese winter along the coasts of Texas and Louisiana. Prior to 1960, marshes along these coasts provided the main food sources (reeds, roots, and tubers) for the geese. Destruction of these marshes and increased crop production of rice, corn, and soybeans has occurred since that time. The stubble from these crops and spilled grains are easily obtained food sources for the snow geese. Reduction in hunting and greatly increased food supplies from cultivation near their wintering ground has cut mortality rates of snow geese in half over this period.

The high nesting density of the snow geese has left little foraging or nesting space for other species of birds, and a decline in several duck species and shore birds has been observed. Simultaneously, intensive foraging by the snow geese erodes and dries out patches of Arctic soil, reduces regrowth of grasses and sedges, and greatly increases soil salinity.

—from *Brodie, 1997*

Due to copyright restrictions we are unable to post the photograph of snow geese.

Numerical Response

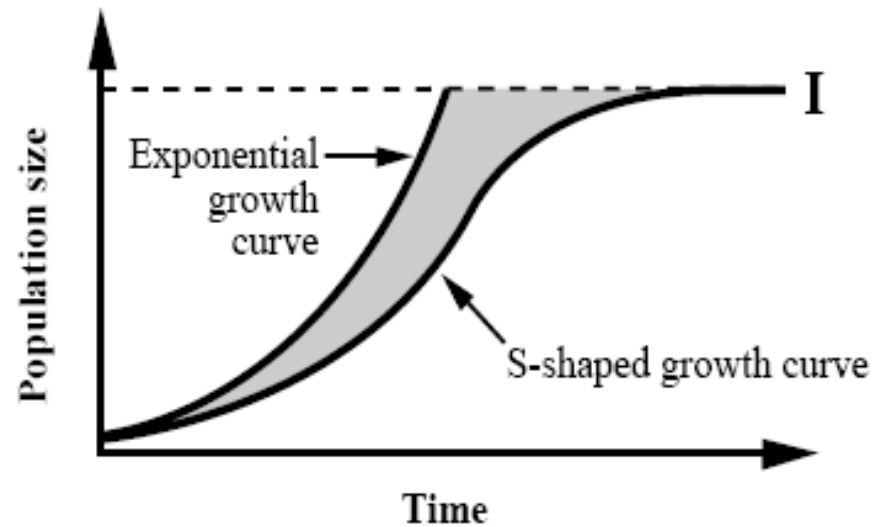
- 7.** Based on the information provided, what is the per capita growth rate of the snow goose population between 1968 and 1990?

(Record your answer rounded to one decimal place in the numerical-response section on the answer sheet.)

Answer: 10.3

A group of ecologists have studied the Jasper National Park animal populations and gathered data related to the growth of these populations.

J- and S-shaped Growth Curves of Theoretical Populations



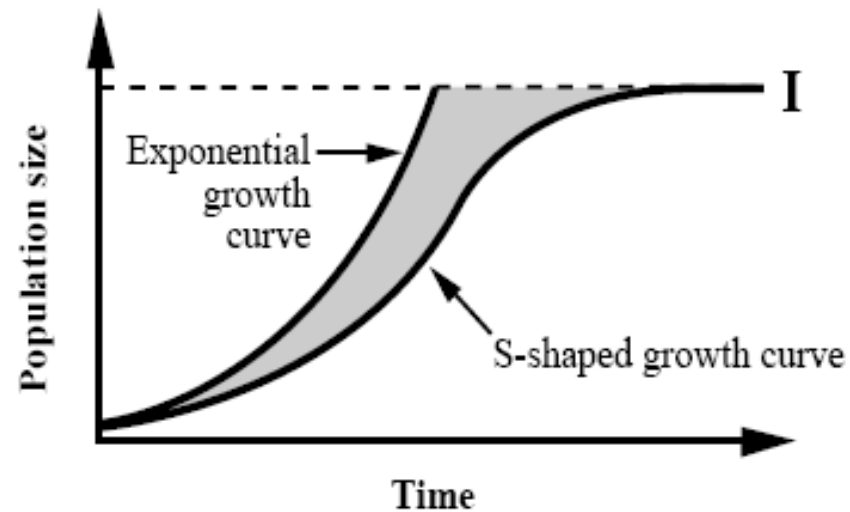
—from *Levine and Miller, 1991*

Ecological data gathered over a 20-year period indicate that the elk population fluctuates around the level marked I on the graph. The biotic factors that keep this population stabilized are

- A. density dependent
- B. density independent
- C. independent of natality and mortality
- D. independent of emigration and immigration

A group of ecologists have studied the Jasper National Park animal populations and gathered data related to the growth of these populations.

J- and S-shaped Growth Curves of Theoretical Populations



—from *Levine and Miller, 1991*

The level marked **I** on the graph represents the effect of factors such as climate, nutrients, soils, and water on the size of the elk population. A term to describe this section of the growth curve is

- A. lag phase
- B. biotic potential
- C. carrying capacity
- D. climax community

Characteristics of Komodo Dragons

- 1 Classified as reptiles
- 2 Can live up to 30 years
- 3 Females lay between 20 and 30 eggs per year
- 4 Sexually mature at about six years of age
- 5 Females mate once a year
- 6 Over three metres in length and weigh up to 70 kg
- 7 The young live in trees until they are one year old
- 8 Adult Komodo dragons will eat young Komodo dragons

Numerical Response

7. Four characteristics of Komodo dragons that allow scientists to classify them as relatively K-selected strategists are 2, 4, 5, and 6.

(Record all **four digits** of your answer in **lowest-to-highest numerical order** in the numerical-response section on the answer sheet.)

Data generated by ecologists working in Jasper National Park are used by park planners. Identifying a population as *r*-selected or K-selected may aid in wildlife management. Populations of caribou, elk, and wolves have been studied extensively.

Population Characteristic	Population Descriptors
Offspring Number	1 Few offspring
	2 Large numbers of offspring
Body Size	3 Small in size
	4 Large in size
Reproductive Maturity	5 Early reproductive maturity
	6 Delayed reproductive maturity
Lifespan	7 Long lifespan
	8 Short lifespan

Numerical Response

6. Identify the population descriptor, as numbered above, that **best** matches each of the population characteristics below for a K-selected population such as the caribou or elk.

Population Descriptor: 1 4 6 7
 Population Characteristic: Offspring Number Body Size Reproductive Maturity Lifespan

(Record your **four-digit answer** in the numerical-response section on the answer sheet.)

Use the following information to answer the next three questions.

In heavily populated regions of Canada, the landscape is now dominated by what scientists call “invasive” non-native species. Horticultural expert Bill Granger has described the Norway maple as a “tree on steroids” because of its dense rooting system. This tree reaches sexual maturity quickly and spreads many seeds over a wide area. Another invasive species, pampas grass, is described by Dr. Spencer Barrett as an “excellent opportunist.” Pampas grass relies on allies such as humans to cut out vegetative competition before it proceeds to dominate the landscape.

—from *Cundiff, 1996*

By maintaining a stronghold on the environment and preventing further environmental changes, the Norway maple could be described as

- A.** a climax species
- B.** a pioneer species
- C.** a seral stage species
- D.** an intermediate species

The following table describes characteristics of communities.

<i>A</i> Possible location	<i>B</i> Community present	<i>C</i> Number of species
1 in an area clear cut by logging	1 pioneer	1 increase
2 on land bared by a forest fire	2 climax	2 decrease
3 on land released from a retreating glacier		

Numerical Response

8. Use the numbered phrases or words from columns *A*, *B*, and *C* above to complete the statements below.

Primary succession would occur A , where the first organisms present are called a B community. During the first 20 years in the development of a community, the number of species would be expected to C .

Answer: 3 1 1
Letter: A B C

(Record your **three-digit answer** in the numerical-response section on the answer sheet.)