



## Population Ecology

### SYI-1.G.1

**Populations comprise individual organisms that interact with one another and with the environment in complex ways.**

#### RELEVANT EQUATION

Population Growth—

$$\frac{dN}{dt} = B - D$$

where:

$dt$  = change in time

$B$  = birth rate

$D$  = death rate

$N$  = population size

#### RELEVANT EQUATION

Exponential Growth—

$$\frac{dN}{dt} = r_{max}N$$

where:

$dt$  = change in time

$N$  = population size

$r_{max}$  = maximum per capita growth rate of population



## Population Ecology

### SYI-1.G.2

Many adaptations in organisms are related to obtaining and using energy and matter in a particular environment—

- a. Population growth dynamics depend on a number of factors. Reproduction without constraints results in the exponential growth of a population.

# AP BIO INSTA-REVIEW

TOPIC

# 8.3



**Which of the following add to a population size?**

- A. Births & Immigration**
- B. Birth & Emigration**
- C. Death & Emigration**
- D. Death & Immigration**

# AP BIO INSTA-REVIEW

TOPIC

# 8.3

**Which of the following  
add to a population size?**

**A. Births & Immigration**



**When an individual is born, this is  
an addition of a new individual  
which increases the population size.**

**When an individual immigrates, the  
addition of the individual into the  
area will increase the population  
size.**



**Which of the following remove  
from a population size?**

- A. Births & Immigration**
- B. Birth & Emigration**
- C. Death & Emigration**
- D. Death & Immigration**

# AP BIO INSTA-REVIEW

TOPIC

# 8.3

**Which of the following  
remove from a population  
size?**

**C. Death & Emigration**



**Death will remove individuals  
from the population as they are  
no longer in the population.**

**Emigration will remove  
individuals from the population  
as they are no longer in the  
population.**

# AP BIO INSTA-REVIEW

TOPIC

# 8.3



**In the rate of increase formulas,  
what does  $b$  stand for?**

- A. Births per capita**
- B. Deaths per capita**
- C. Total births/year**
- D. Total deaths/year**

# AP BIO INSTA-REVIEW

TOPIC

# 8.3

In the rate of increase formulas, what does  $b$  stand for?

**A. Births per capita**



$b$  = per capita birth rate

$d$  = per capita death rate

$$r = b - d$$

$N$  = population size

$dN/dt$  = change in population size



# AP BIO INSTA-REVIEW

TOPIC

# 8.3



**In the rate of increase formulas,  
what does  $d$  stand for?**

- A. Births per capita**
- B. Deaths per capita**
- C. Total births/year**
- D. Total deaths/year**

# AP BIO INSTA-REVIEW

TOPIC

# 8.3

In the rate of increase formulas, what does  $D$  stand for?

**B. Deaths per capita**



$b$  = per capita birth rate

$d$  = per capita death rate

$$r = b - d$$

$N$  = population size

$dN/dt$  = change in population size

# AP BIO INSTA-REVIEW

TOPIC

# 8.3



If  $b = 4$  and  $d = 8$ , what is  $r$ ?

- A. -12
- B. -4
- C. 4
- D. 12

# AP BIO INSTA-REVIEW

TOPIC

# 8.3

If  $B = 4$  and  $D = 8$ ,  
what is  $r$ ?

B.  $-4$



$b$  = per capita birth rate

$d$  = per capita death rate

$$r = b - d$$

$$r = 4 - 8$$

$$r = -4$$

# AP BIO INSTA-REVIEW

TOPIC

# 8.3



If  $r = 0.5$  and  $N = 1000$ ,  
what is  $dN/dt$ ?

- A. 500
- B. 1000
- C. 1500
- D. 2000

# AP BIO INSTA-REVIEW

TOPIC

# 8.3

If  $r = 0.5$  and  $N = 1000$ , what is  $dN/dt$ ?

A. 500



$N$  = population size

$$dN/dt = rN$$

$$dN/dt = 0.5(1000)$$

$$dN/dt = 500$$



**Type of growth from  
reproduction without constraint**

- A. Decreasing**
- B. Increasing**
- C. Logistic**
- D. Exponential**

Type of growth from reproduction without constraint

D. Exponential



Exponential growth will allow for the population to grow without any restrictions on size. This is the carrying capacity.

These individuals have no predators and unlimited resource.





**What makes up a population?**

- A. Different species in the same area**
- B. Different species that interbreed to make hybrids**
- C. Same species in the same area**
- D. Same species separated by geographical barrier**

**What makes up a  
population?**

**C. Same species in the  
same area**



**By definition, a population is  
group of individual of the same  
species living in an area.**



**How does a population increase  
in individuals?**

- A. Births and Deaths**
- B. Births and Immigration**
- C. Deaths and Emigration**
- D. Immigration and Emigration**

How does a population increase in individuals?



**B. Births and Immigration**

**Births add new individuals and immigration allow for addition of new individuals. This together leads to an increase in the population.**



**What decreases a population size?**

- A. Births and Deaths**
- B. Births and Immigration**
- C. Deaths and Emigration**
- D. Immigration and Emigration**

**What decreases a population size?**

**C. Deaths and Emigration**



**Deaths will remove individuals from a population and emigration will lead to individuals leaving the area. This leads to a decrease in population size.**



**How do you solve for the rate of increase?**

- A. Birth Rate + Death Rate**
- B. Birth Rate – Death Rate**
- C. Birth Rate x Death Rate**
- D. Birth Rate/Death Rate**

# AP BIO INSTA-REVIEW

TOPIC

# 8.3

How do you solve for the rate of increase?

**B. Birth Rate -  
Death Rate**



**Per capita rate of increase in the birth rate minus the death rate. This is logical as we subtracting the deaths from the births which tells us how much the population increased by.**





**Type of growth rate with  
unlimited resources**

- A. Exponential**
- B. Logarithmic**
- C. Logistic**

# AP BIO INSTA-REVIEW

TOPIC

# 8.3

**Type of growth rate with unlimited resources**

**A. Exponential**



**Exponential growth rate curves are also known as J shaped curved since the population size grows exponentially in the presence of unlimited resources.**



**What maintains the logistic growth?**

- A. Carrying Capacity**
- B. Rate of Increase**
- C. Birth Rate**
- D. Death Rate**

**What maintains the logistic growth?**

**A. Carrying Capacity**



**The carrying capacity is the maximum individuals that can support by the environment in an area.**

# AP BIO INSTA-REVIEW

TOPIC

# 8.3



If  $r = 0.5$  and  $N = 200$ , how many individuals remain after 1 generation?

- A. 200
- B. 250
- C. 300
- D. 350

# AP BIO INSTA-REVIEW

TOPIC

# 8.3

If  $r = 0.5$  and  
 $N = 200$ , how many  
individuals remain after 1  
generation?

c. 300



$$dN/dt = rN$$
$$dN/dt = 0.5 (200)$$
$$dN/dt = 100$$

$$200 + 100 = 300$$

# AP BIO INSTA-REVIEW

TOPIC

# 8.3



If  $r = 0.5$ ,  $N = 200$  and  $K = 400$ , how many individuals remain after 1 generation?

- A. 200
- B. 250
- C. 300
- D. 350

# AP BIO INSTA-REVIEW

TOPIC

# 8.3

If  $r = 0.5$ ,  $N = 200$   
and  $K = 400$ , how many  
individuals remain after 1  
generation?

**B. 250**



$$dN/dt = (K-N)/K$$

$$dN/dt = (400 - 200)/400$$

$$dN/dt = 200/400$$

$$dN/dt = 50$$

$$50 + 200 = 250$$