

## مراجعة نهائية وفق الهيكل الوزاري المسار A-101-M



### تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ← المناهج الإماراتية ← الصف الحادي عشر العام ← علوم ← الفصل الثالث ← ملفات متنوعة ← الملف

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ملفات اكتب للمعلم اكتب للطالب | اختبارات الكترونية | اختبارات | حلول | عروض بوربوينت | أوراق عمل  
منهج انجليزي | ملخصات وتقارير | مذكرات وبنوك | الامتحان النهائي | للمدرس

المزيد من مادة  
علوم:

إعداد: MOHAMMED VERUPURATH RAHNA

### التواصل الاجتماعي بحسب الصف الحادي عشر العام



صفحة المناهج  
الإماراتية على  
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

### المزيد من الملفات بحسب الصف الحادي عشر العام والمادة علوم في الفصل الثالث

حل مراجعة اعتماداً على صفحات وفق الهيكل الوزاري

1

الهيكل الوزاري الجديد 2025 منهج بريدج الخطة 101-M

2

تجميعية شاملة وفق الهيكل الوزاري منهج بريدج الخطة M

3

مراجعة مع حل أسئلة اختبارات وزارية وفق الهيكل الوزاري

4

مراجعة عامة مع حل أسئلة امتحانات سابقة وفق الهيكل الوزاري

5



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# BIOLOGY

## END OF TERM 3 REVISION

### 11 GENERAL-M.101.A

### 2024-2025

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Cycle 3 Biology Teacher

مدير المدرسة  
الأستاذة : وضحة الكلباني

مدير النطاق  
الأستاذة : عائشة الشامسي



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## 11 GENERAL BIOLOGY TERM 3 EXAM CONTENT

### ❑ MODULE 4:

### **POPULATION ECOLOGY**

Lesson 1: Population Dynamics

Lesson 2: Human Population



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## Population-Limiting Factors

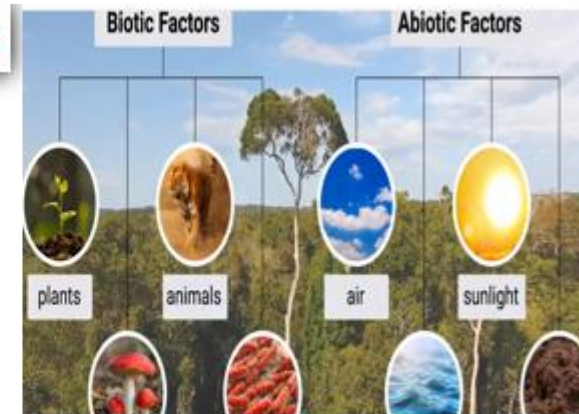
Limiting factors are biotic or abiotic factors that keep a population from continuing to increase indefinitely. Decreasing a limiting factor, such as the available food supply, often changes the number of individuals that are able to survive in a given area. In other words, if the food supply increases a larger population might result, and if the food supply decreases a smaller population would likely result.

2. **Summarize** the concepts of carrying capacity and limiting factors, and their effects on reproductive patterns.

The carrying capacity represents the maximum number of individuals in a population that the environment can support over time. Limiting factors control the numbers of individuals in a population, sometimes maintaining it at or near the carrying capacity.

### population-Limiting Factors

are **biotic** or **abiotic** factors



That **keep** a population from continuing to increase **indefinitely**

There are **two** categories of limiting factors

Density-dependent  
factors

Density **-independent**  
factors





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Contrast density-dependent and density-independent factors. Provide examples with your answer.

Differentiate between density-dependent and density-independent factors in terms of how they affect population growth.

### Density-Independent Factors

Any factor in the environment that does not depend on the number of members in a population per unit area is a **density-independent factor**.

These factors are usually **abiotic**. They include:

- Weather events
- Fire
- Human alterations of the landscape
- Air, land, and water pollution



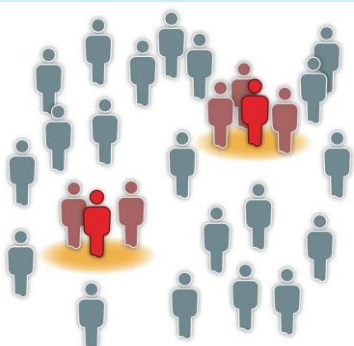



### Density-Dependent Factors

- Any factor in the environment **that depends on the number of members in a population** per unit area is a **density-dependent factor**.
- These factors are often **biotic**. They include:
  - Predation
  - Disease
  - Competition
  - Parasites





## DENSITY DEPENDENT FACTORS

DISEASE	COMPETITION	PARASITES	PREDATION
<p><b>Outbreak of disease is <u>high</u> when population size is <u>increased</u>, and population density is <u>high</u>.</b></p> 	<p>Competition between organisms <u>increases</u> when <u>density is high</u>. This occurs between two different species that use same resources.</p>  <p><b>Figure 6</b> A decrease in the food supply can trigger competition between members of the same species.</p>	<p>Parasites <b>negatively</b> affect population growth at <u>higher densities</u>.</p> 	<p>Predation, where <u>one animal (the predator) eats another (the prey)</u>, is a density-dependent factor. Predation affects population size.</p> <p><b>Example: Increasing wolf population cause decrease of moose population</b></p> 





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Populations can be limited by the results of human interference. For example, over the last 100 years, building dams and other human activities on the Colorado River have significantly reduced the river's water flow and changed its temperature. In addition, the introduction of nonnative fish species altered the river's biotic factors. Because of the changes in the river, the number of small fish called humpback chub was reduced. During the 1960s, the number of humpback chub dropped so low that they were in danger of disappearing from the Colorado River altogether. Air, land, and water pollution are the result of human activities that also can limit populations. Pollution reduces the available resources by making some of the resources toxic.

Pollution can limit the size of a population by reducing the **available resources** needed for survival, such as clean air, water, and food.

### population-Limiting Factors

### Density -independent factors

#### Human activities ( unintended )



Air pollution



Water Pollution



Causing:

Reduce the available  
resources by making  
some of the  
resources **toxic**

↓  
Limit populations

### Result of human activities on the Colorado River :

**1-Reduce** the amount  
of the water flow

**2-Change** the water  
temperature of the river

2



The introduction of  
**nonnative fish species**

Colorado River



Number of native small fish  
( **Humpback chub** )  
reduced



Sort the following factors as either density dependent or density independent.

Density-independent	Density-dependent
<b>DROUGHT</b> <b>HURRICANE</b> <b>FLOODING</b> <b>TEMPERATURE</b>	<b>PREDATION</b> <b>SYMBIOTIC RELATION</b> <b>DISEASE</b> <b>COMPETITION</b>

drought	flooding	hurricane	predation relationships	symbiotic relationships	disease	competition	temperature
---------	----------	-----------	-------------------------	-------------------------	---------	-------------	-------------

Why is disease considered a density-dependent environmental factor?

- ☒ Population density affects amount of contact.
- ☐ Disease spreads easily in a low-density population.
- ☐ Disease won't spread in high-density populations.
- ☐ Disease may be influenced by weather.

Classify each limiting factor below as either *density-independent* or *density-dependent* by placing an X in the appropriate column.

Factor	Density-Independent	Density-Dependent
Lava flow	X	
Number of predators		X
Spread of disease		X
Especially cold winter	X	
Toxic chemical spill into a stream	X	
Another species competing for the same resources		X
Diverting a river for irrigation	X	
Fungus that attacks elm trees		X





Which of the following is a density-dependent factor?

a.

The competition

b.

The drought

c.

The flooding

d.

The hurricane

Which of the following depends on the  
number of members in a population per  
unit area?

أي مما يلي يعتمد على عدد الأعضاء في المجتمع لكل  
وحدة مساحة؟

0

An abiotic factor عامل غير حيوي

0

A density-dependent factor عامل يعتمد على الكثافة

0

A density-independent factor عامل لا يعتمد على الكثافة

0

A biotic factor عامل حيوي



The figure below shows the long-term study of the wolf and moose populations on Isle Royale. The figure shows the relationship between the number of predators and prey over time, Study

it and then answer the question

What was the approximate ratio of moose to wolves in 1985?



18:1 approx.

50:1 approx.

3:1 approx.

20:1 approx.

Which of the following is a density-independent factor?

أي عامل مما يلي لا يعتمد على الكثافة؟

a. طفيل في الأمعاء an intestinal parasite

b. الازدحام الشديد severe overcrowding

c. فيروس قاتل a fatal virus

d. الجفاف الشديد a severe drought



Which is a density-independent factor for a flock of Canada geese on a large lake?

العامل الذي لا يعتمد على الكثافة وراء تواجد  
ليع من الإوز الكندي على بحيرة كبيرة؟

- ☐ Intestinal worms الديان المعوية
- ☐ Infectious virus فيروس معدي
- ☐ Dwindling food supply إمداد غذاء متضائل
- ☒ Unusually cold winter شتاء أبرد من العادة

Lemmings are mammals that produce offspring in large numbers when food is plentiful. When the food supply diminishes, lemmings starve and many die. Which of the following factors influences Lemmings population size?



إن قوارض اللاموس هي ثدييات تتكاثر بأعداد كبيرة عند توفر الغذاء، وعندما يشح هذا الأخير، يموت العديد منها جوعاً. أي عامل مما يلي يؤثر في حجم جماعة القوارض؟

#### Learning Outcomes Covered

○ BIO.3.4.03.012

- a. Predation الأفراس
- b. Disease المرض
- c. Parasites الطفيليات
- d. Competition التنافس



PDF	PDF	17
Demonstrate Understanding Question 1	169	18



## 1. Compare and contrast spatial distribution, population density, and population growth rate.

SPATIAL DISTRIBUTION	POPULATION DENSITY	POPULATION GROWTH RATE
describes <u>the dispersal pattern</u> displayed by a population in its habitat.  The pattern of <u>spacing of a population within an area</u>	refers to the <u>numbers of individuals</u> living in a given area	refers to <u>how fast a given population is growing</u> .

The number of organisms per unit of living area is called **Population density**

The pattern of spacing of a population within an area is called **Spatial Distribution**

18	Identify population limiting factors to include density independent factors and density dependent factors	PDF	PDF	35
		Demonstrate Understanding Question 1	169	36





## POPULATION DENSITY

- The **number of organisms per unit area** is the **population density**.
- Population density can be calculated by **dividing the number of organisms in the population by the area the population occupies**.

The formula for population density is:

No. of individuals ÷ area (units<sup>2</sup>) = population density



The **population density** of Cattle egrets is **greater** near the Cape buffalo.

The **population density** might be **zero** farther away fifty meters from the Cape buffalo.

## SPACIAL DISTRIBUTION - DISPERSION

- The **pattern of spacing of a population within an area** is called **dispersion**.
- One of the **primary factors** in the pattern of dispersion for all organisms **is the availability of resources such as food**.

### 3 types of dispersion



1- Calculate the population density for a group of 30 birds that live in an area of 3 km<sup>2</sup> ?

**Population density = 30 ÷ 3**  
**=10 birds per km<sup>2</sup>**



Which of the following is an example of population density?

- a. Country with a large population
- b. Maximum number of wolves in a forest
- c. Total number of alligators in Florida
- d. Two deer per thousand hectares

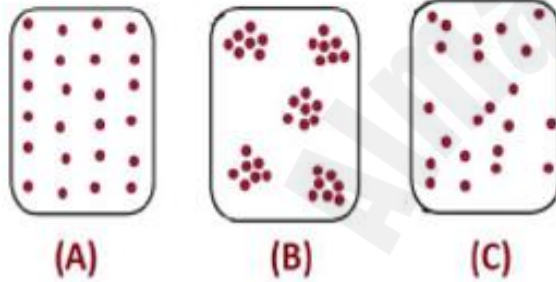
Which of the following is an example of the uniform dispersion?

- a. One large American Bison herd
- b. Random White tailed dears groups
- c. School of silverside fish
- d. American black bear males



The figure below shows dispersion of a population within an area. study it and then answer the question:

Which letter(s) of the following indicates uniform dispersion?



a. Only A

b. B and C

c. Only C

d. A and B

5. If an aquarium holds 80 L of water and contains 170 guppies, what is the approximate density of the guppy population?

☒ 1 guppy/L

☒ 3 guppies/L

☒ B 2 guppies/L

☒ 4 guppies/L

CORRECT

12. What is the dispersion pattern of herding animals, birds that flock together, and fish that form schools?

A. clumped

C. uniform

B. random

D. unpredictable



10. Why is the life span of this finch with an eye disease most likely reduced?

A. The bird cannot mate.

B. The bird cannot find food or water.

C. The bird spreads the disease to others.

D. The bird cannot survive a temperature change.

11. Which is a possible reason for the relatively quick spread of the shown disease?

A. an abiotic factor

B. a decreased food supply

C. increased population density

D. increased immunity





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Get It?

Describe two reasons why a species might not be able to expand its range.

The following can prevent a species from expanding its range:

1. **Abiotic factors** that prohibit survival such as harsh weather
2. **biotic factors**, such as competitors, predators, less availability of food

Hawaiian  
honeycreeper  
(Song bird)



Hawaiian honeycreeper

Found on some of the  
islands of Hawaii

Very limited distribution

Peregrine  
falcons



Peregrine falcon

Found on all continents  
except Antarctica

Vast distribution

A species may fail to thrive in a new environment if the Abiotic factors factors, such as temperature or soil type, are not suitable for its survival.





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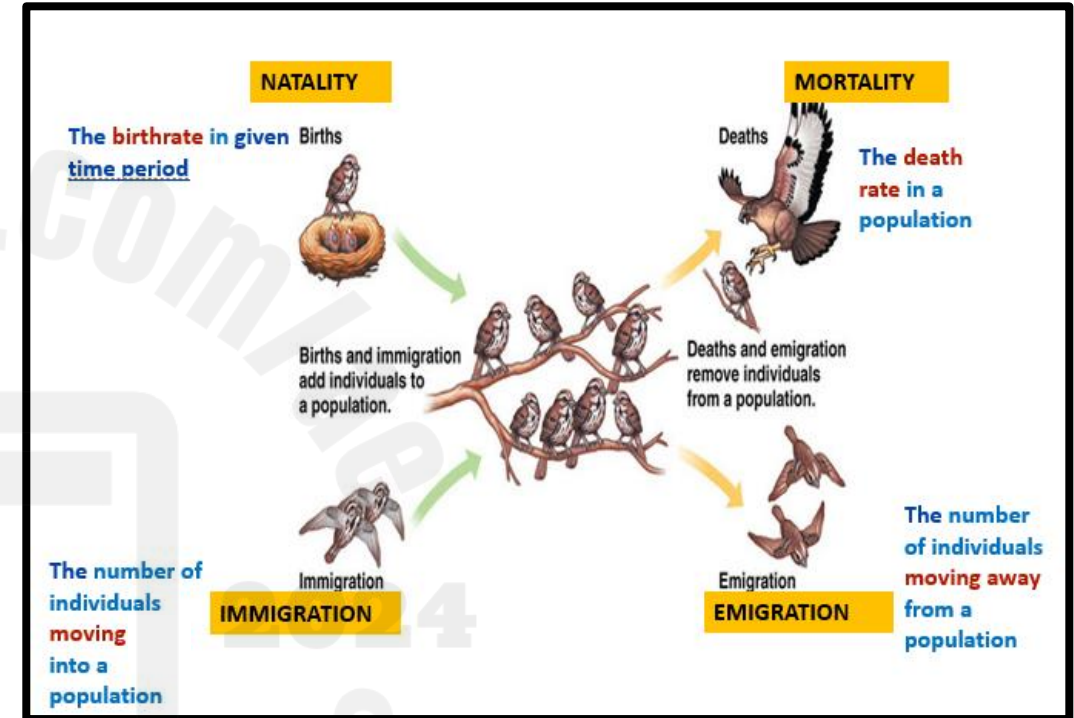
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Match each term with its correct definition.

Column A (Term)	Column B (Definition)
1. Natality	Number of individuals entering a population
2. Mortality	Number of individuals born in a population
3. Immigration	Number of individuals leaving a population
4. Emigration	Number of individuals dying in a population

The movement of individuals **out** of a population is called:

- A – Natality
- B – Immigration
- C – Emigration**
- D – Mortality



**Population growth rate** explains how fast population grows.

The factors that determine population growth rate are:

- **Natality** (birth rate) **and mortality** (death rate)
- **Emigration and immigration**



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What might be happening when a population stops increasing and begins decreasing?  
Select all that apply.

- ☐ A) Immigration exceeds emigration.
- ☒ B) The number of births is less than the number of deaths.
- ☐ C) The number of births exceeds the number of deaths.
- ☒ D) Emigration exceeds immigration.

The number of individuals **born**  
in a given **time period**

**NATALITY**  
(Birth rate)

The number of **deaths** in the  
population during a given  
**time period**

**MORTALITY**  
(death rate)

The number of individuals  
**moving away** from a population

**EMIGRATION**

The number of individuals  
**moving into** a population

**IMMIGRATION**

Twenty gray squirrels moving out of a forest into a new ecosystem is  
an example of Emigration.



Moving away of twenty gray squirrels in a forest to a new ecosystem is an example of .....

a. Emigration

b. Population density

c. Dispersion

d. Population ranges

Identify four main factors in a population's growth rate.

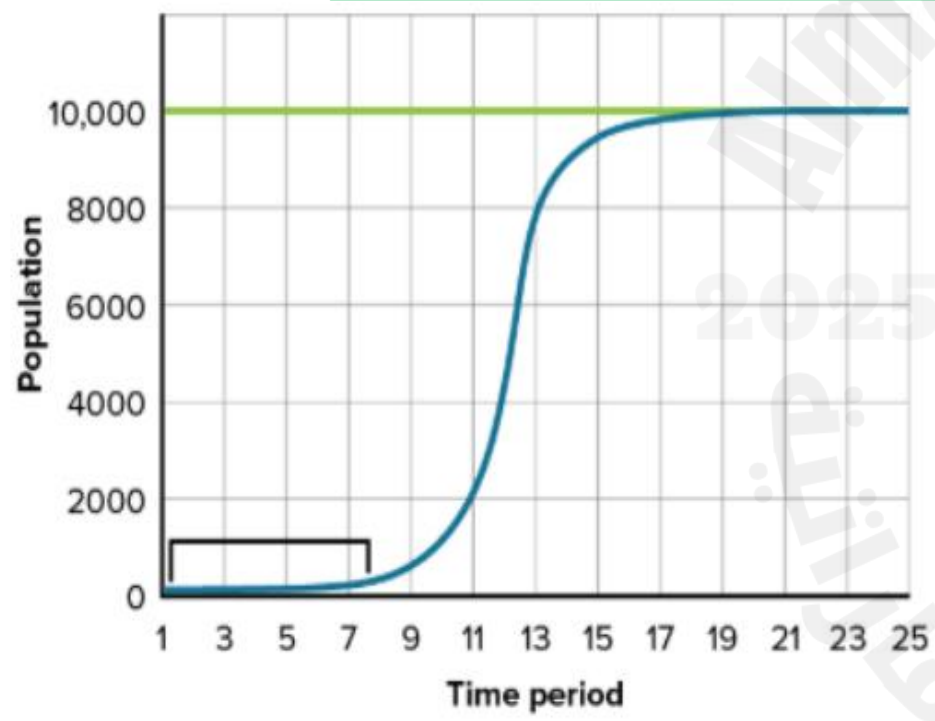
#### Factors in a Population's Growth Rate

- |                           |               |
|---------------------------|---------------|
| • birthrate or natality   | • emigration  |
| • death rate or mortality | • immigration |



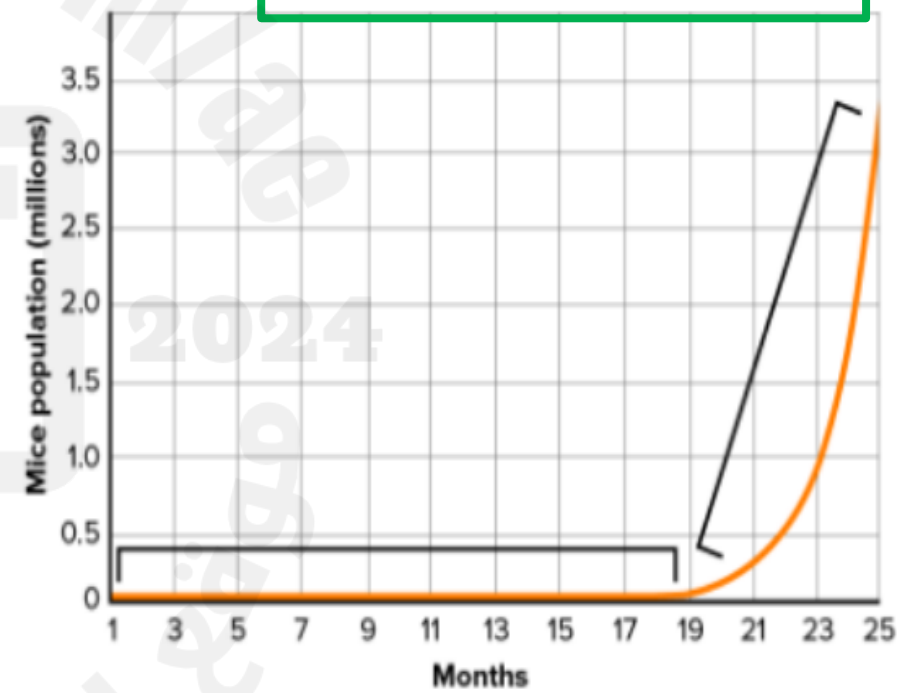
The type of growth represented by this graph is Select Choice population growth.

LOGISTIC GROWTH



What type of growth is represented by the J-shaped curve shown below?

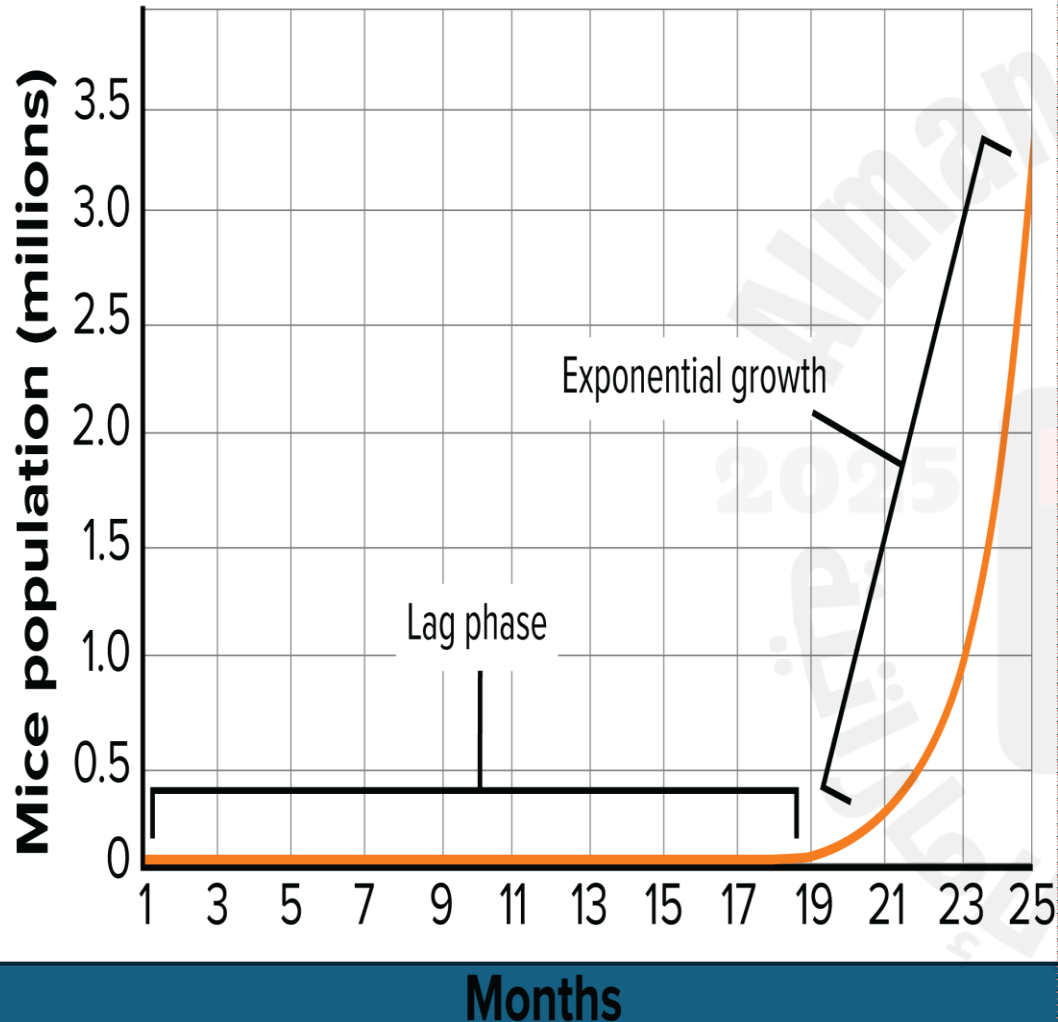
EXPONENTIAL GROWTH







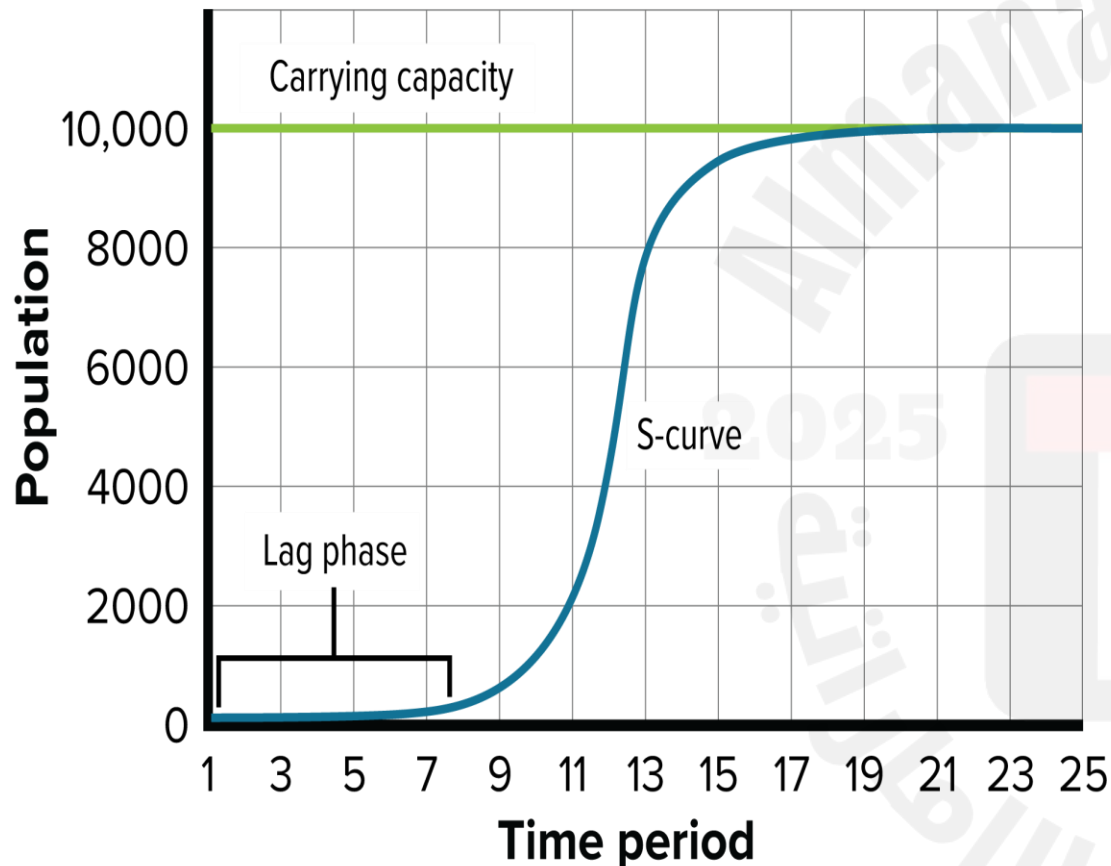
## Exponential Population Growth



1. Which growth model is illustrated in the graph?
  - **Exponential growth model.**
2. Which part of the graph is slow growth period?
  - **Lag phase (1-19 months)**
3. Why is there a slow growth in the beginning?
  - **Less number of individuals able to reproduce and limited resources.**
4. Which part of the graph shows mice began to reproduce rapidly?
  - **Exponential growth (J shaped)**
5. After how many years the mouse reached 3 million population?
  - **2 years( 24 months)**
6. Can this growth continue indefinitely?
  - **It slows down as they encounter a limiting factor**



## Logistic Population Growth



1. Which growth model is illustrated in the graph?
  - **Logistic growth model (S haped graph)**
2. Which part of the graph is slow growth period?
  - **Lag phase**
3. When does the population growth stops increasing?
  - **When carrying capacity has reached the population levels off at a limit**
4. Why does the population stop increasing?
  - **Birth rate less than death rate and emigration greater than immigration**
4. What happens during time period 11-15?
  - **Population increase rapidly( exponential growth)**



Which of the following is a characteristic of exponential population growth?

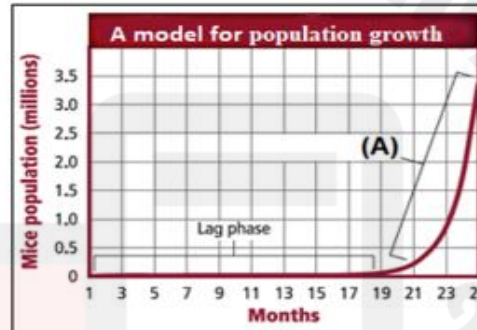
a. Growth rate is inversely proportional to population size

b. Initial population growth is rapid

c. Resources are consumed exponentially during all phases

d. The lag phase follows rapid growth

The graph below represents the mice population growth over time, what does the letter (A) refer to?



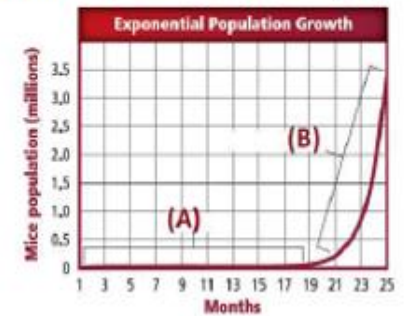
a. Exponential growth

b. Acceleration phase

c. Carrying capacity

d. Straight-line growth

The graph below represents the population growth of mice over time, What does the letter (A) refer to?



a. Exponential growth

b. Acceleration phase

c. Lag phase

d. Straight-line growth



**Carrying capacity** Ecosystems have limits to the numbers of organisms and populations they can support. The maximum number of individuals in a species that an environment can support for the long term is the **carrying capacity**. You will notice in Figure 8, on the previous page, that logistic growth levels off at the line on the graph identified as the carrying capacity.

Carrying capacity is limited by such factors as the availability of living and nonliving resources and from such challenges as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. When populations develop in an environment with plentiful resources, there are more births than deaths. The population soon reaches or passes the carrying capacity. As a population nears the carrying capacity, resources become limited.

If a population exceeds the carrying capacity, deaths outnumber births because adequate resources are not available to support all of the individuals. The population then falls below the carrying capacity as individuals die. The concept of carrying capacity is used to explain why many populations tend to stabilize.

2. Summarize the concepts of carrying capacity and limiting factors, and their effects on reproductive patterns.

- The **carrying capacity** represents the maximum number of individuals in a population that the environment can support over time.

**Carrying capacity is limited by factors such as:**

- the availability of living and nonliving resources
- challenges such as predation, competition, and disease

**If available resources are high:**

- More Birth than death**
- Population reaches or pass the **carrying capacity**

**If available resources are less:**

- More death than birth**
- Population falls below **carrying capacity**





The maximum number of individuals in a species that an environment can support for long term is the .....

a.

population density

b.

population ranges

c.

carrying capacity

d.

reproduction patterns

Based on the table below, which letter of the following corresponds to the correct definition of **carrying capacity**?

استناداً إلى الجدول أدناه، أي حرف مما يلي يقابل تعريفاً صحيحاً للقدرة الاستيعابية؟

A	The number of organism per unit area.	عدد الكائنات الحية في كل وحدة مساحة.
B	The number of individuals moving away from a population.	عدد الأفراد الذين يغادرون الجماعة الأحيائية.
C	The number of individuals moving into population	عدد الأفراد الذين ينضمون إلى الجماعة الأحيائية.
D	The maximum number of individuals in a species that an environment can support for the long term	أقصى عدد من أفراد نوع ما تستطيع البيئة دعمه على المدى الطويل.



Compare and contrast the reproductive strategy of an *r*-strategy organism and a *k*-strategy organism.

<i>r</i> -strategy	<i>k</i> -strategy
Rate strategy	Carrying-capacity strategy
Adapted for fluctuating environment	Adapted to stable environment
Generally small	Generally large
Short life span	Long life span
Many offspring	Few offspring
Expend little energy to raise young	Invest more energy into nurturing young
Controlled by density independent factors	Controlled by density dependent factors

Place each organism with the correct reproductive strategy.

r-strategy

Locusts

Crickets

mice

k-strategy

Elephants

Primates

horses

elephants

primates

locusts

horses

crickets

mice



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## Carrying capacity -strategy (k-strategy)

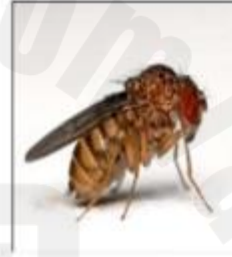


## rate-strategy (r-strategy)



Which of the following organisms follows a k-strategy for reproduction?

نات الحية التالية يعتمد استراتيجية k للتكاثر؟



A

B

C

D



Which of the following organism follows an *r*-strategy  
for reproduction?

أي من الكائنات الحية التالية يعتمد استراتيجية *r* - للتكاثر؟



(A)



(B)



(C)



(D)

a. A

b. B

c. C

d. D

Which of the following organisms follows a *k*-strategy for reproduction?

a.

A mouse

b.

Fruit fly

c.

The locusts

d.

Elephant



5 Define demography as the study of human population size, density, distribution, movement, death and birth rates

PDF	PDF	9
Information from text	170	10



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## Human Population Growth

The study of human population size, density, distribution, movement, and birth and death rates is **demography** (de MAH gra fee).

the study of human population, size, density,  
distribution, movement, and birth and death rates



demography

Demography is the study of .....

a.

available resources

b.

biosphere health

c.

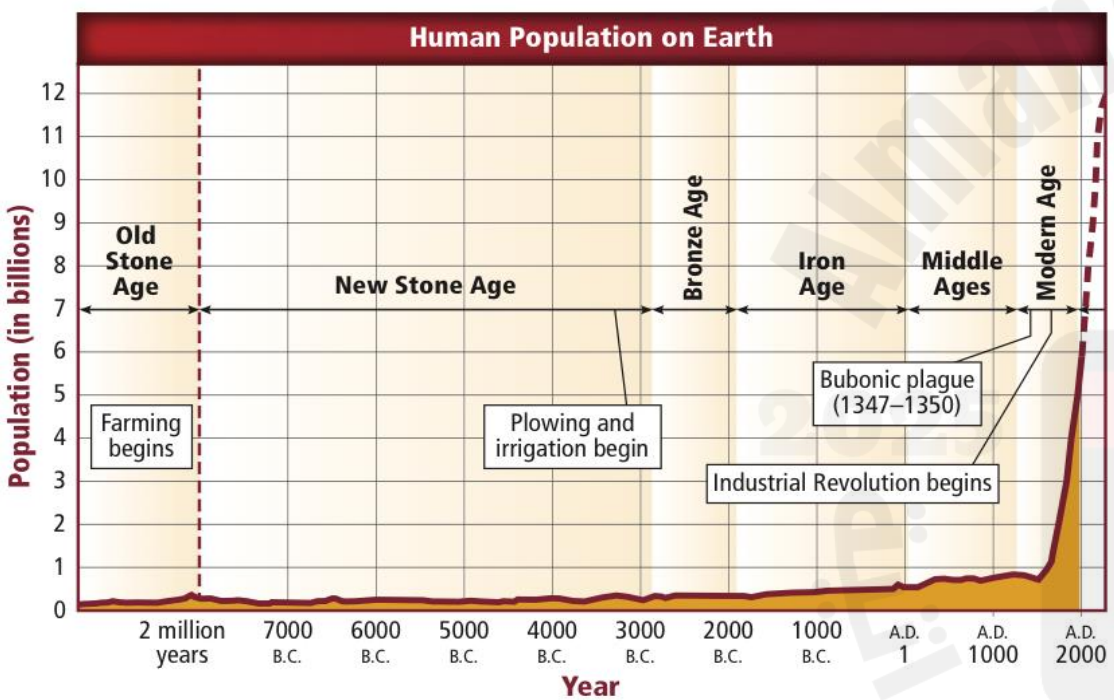
human population

d.

organism competition

Demonstrate Understanding Question 1	176	27
Demonstrate Understanding Question 4	176	28

1. Describe the change in human population growth over time.



The human population underwent a very long lag phase followed by an exponential growth in modern times.



What is the pattern of human population over thousand of years until recently?  
**Stable**

What is the pattern of human population in recent times?  
**Population increases ( exponential growth)**

What resulted in decline in human population in 1300s?  
**Bubonic plague**

Predict the population by 2025 and 2050?  
**8 billion by 2025 and 9 billion by 2050**

4. Summarize why the human population began to grow exponentially in the Modern Age.

- Factors that contributed to this exponential growth :
- a) Industrial revolution
  - b) Improvement in shelter and sanitation
  - c) Advanced medical care and medicines
  - d) Agriculture and increased food production



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Get It?

Explain the factors that have contributed to an increase in the survival rate of the human population.

Discuss how technological advances have affected human population growth.

1- Agriculture and domestication



increased the human food supply

2- Technological advances and medicine



reduced the number of death from disease and parasites

3- Improvement in shelter



less- vulnerable (at risk) to climate impact

The factors that have contributed to an increase in the survival rate of the human population are:

- **Developments in agriculture**
- **Domestication of animals**
- **medical advances**
- **Improvements in shelter**
- **Technological advancement**





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## Human population growth rate

Although the human population is still growing, the rate of its growth has slowed. **Figure 12** shows the percent increase in human population from the late 1940s through 2016. The graph also includes the projected population increase through 2050.

Notice the sharp dip in human population growth in the 1960s. This was due primarily to a famine in China in which about 60 million people died. The graph also shows that human population growth reached its peak at over 2.2 percent in 1963. By 2016, the percent increase in human population growth had dropped to less than 1.2 percent.

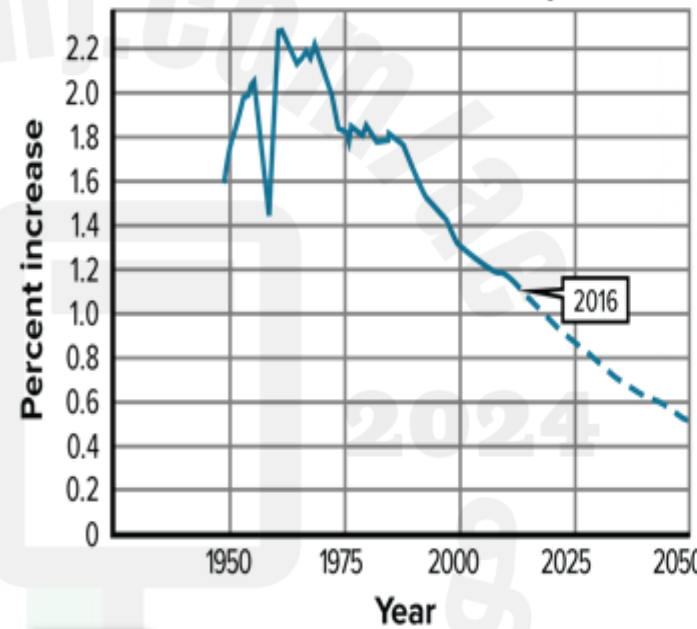
Population models predict the overall population growth rate to be below 0.6 percent by 2050. The decline in human population growth is due primarily to diseases such as AIDS and voluntary population control.

The projected decline in human population growth by 2050 is mainly due to improved food supply and better shelter.

A – True

B – False

Percent Increase in Human Population



### ANALYSE

What do you notice in human population growth in 1960? **dip**

#### Reason

Famine in china (60 million people died)

#### In 1963 :

Human population reached **its peak** at over **2.2** %

#### In 2016:

The **present increase** in human population had dropped to less than **1.2** %

#### By 2050 :

Population models predict the **overall population growth rate** to be **below 0.6** %

#### Reason

- 1- Diseases such as **AIDS**
- 2- **voluntary** population control





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Get It?

**Compare** the population growth rates in the United States and the United Kingdom, which has a birthrate of 12 (per 1000), death rate 8.8 (per 1000), and migration rate 2.5 (per 1000).

During one year, the birthrate in a country is 28 births per 1000 people, and the death rate is six deaths per 1000 people. What is the population growth rate?

$$\begin{aligned} \text{PGR} &= 28 - 6 \\ &= 22 \end{aligned}$$

$$\frac{\text{Birthrate} - \text{death rate} + \text{migration rate}}{10} = \text{PGR} (\%)$$

$$\begin{aligned} \text{PGR of UK} &= \frac{12 - 8.8 + 2.5}{10} \\ &= 0.57\% \end{aligned}$$

The population growth rate of the United Kingdom is 0.57%, so the population of the UK is growing more slowly than the population of the US.

Calculate the PGR of the United States using the following data.

Knowns:

- United States birthrate = 14.1 (per 1000)
- United States death rate = 8.3 (per 1000)
- United States migration rate = 2.9 (per 1000)

$$\frac{14.1 - 8.3 + 2.9}{10} = 0.87\%$$

$$\frac{\text{birthrate} - \text{death rate} + \text{migration rate}}{10} = \text{PGR}(\%)$$



The United States has birthrate of 14.1 (per 1000), death rate of 8.3 (per 1000), and migration rate of 2.9 (per 1000). What is the population growth rate?

a. %0.87

b. %0.78

c. %0.68

d. %0.53

Study the table below, which shows the population growth rates in some countries, and then answer the question: Which order of the following is **true** from the fastest to the slowest population growth rate?

Country	Population growth rate (percent)
Indonesia	1.18
Afghanistan	2.63
Bulgaria	-0.81
Niger	2.88
United States	0.88
Germany	-0.04

a. United states  $\Rightarrow$  Afghanistan  $\Rightarrow$  Indonesia  $\Rightarrow$  Niger

b. Indonesia  $\Rightarrow$  Afghanistan  $\Rightarrow$  Niger  $\Rightarrow$  United states

c. Afghanistan  $\Rightarrow$  United states  $\Rightarrow$  Indonesia  $\Rightarrow$  Niger

d. Niger  $\Rightarrow$  Afghanistan  $\Rightarrow$  Indonesia  $\Rightarrow$  United states



China has birthrate 51.9 (per 1000), death rate 3.3 (per1000), and migration rate 2.3 (per 1000).  
What is the population growth rate?

a.

%5.09

b.

%3.12

c.

%4.05

d.

%1.02

Which of the following best describes the current human population growth trend?

a.

Decreasing growth and increasing rate of growth

b.

Decreasing growth and rate of growth

c.

Increasing growth and slowed rate of growth

d.

Increasing growth and rate of growth





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population change from high birth rates and death rates to low birth rates and death rates



demographic transition

## Trends in Human Population Growth

The graph in **Figure 12** on the previous page is somewhat deceptive. Population trends can be altered by events such as disease and war. **Figure 13** (next page) shows a few historical events that have changed population trends. **Figure 12** could also easily be misinterpreted because human population growth is not the same in all countries. However, population growth trends are often similar in countries that have similar economies.

For example, one trend that has developed during the previous century is a change in the population growth rate in industrially developed countries such as the United States. An industrially developed country is advanced in industrial and technological capabilities and has a population with a high standard of living. Criteria for determining developed countries include average national income, individual average health and education, and national export and import of goods.

In its early history, the United States had a high birthrate and a high death rate. It was not uncommon for people to have large families and for individuals to die by their early forties. Many children also died before reaching adulthood. Presently, the birthrate in the United States has decreased dramatically and the life expectancy is greater than seventy years. This change in a population from high birth and death rates to low birth and death rates is called a **demographic transition**.

Early history

High birthrate



..High..death rate

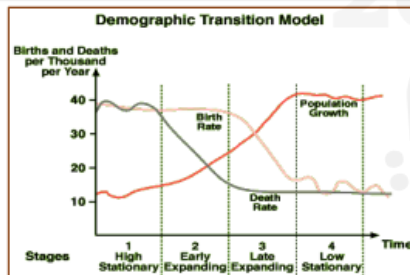


-Individuals die by their early forties  
-Many children die before reaching childhood



The change in a population from high birth and death rates to low birth and death rates is called

**Demographic transition**



Presently

Low birthrate



..Low..death rate



-The life expectancy is greater than 70 years

The change in a population from high birth and death rates to low birth and death rates is called a **demographic transition**.





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### Zero population growth

Another trend that populations can experience is zero population growth. **Zero population growth** (ZPG) occurs when births plus immigration equals deaths plus emigration for a generation. This will mean that the population has stopped growing, because births and deaths occur at the same rate. Once the world population reaches ZPG, the age structure eventually should be more balanced with numbers at pre-reproductive, reproductive, and post-reproductive ages being approximately equal.

Zero population growth is a goal of many countries and societies. Many population planners and environmentalists believe that ZPG will contribute to the sustainability of Earth's ecosystems.

### Zero population growth means

The number of Births  
=  
The number of Deaths.

The world population reaches **ZPG** = The **age structure** more balanced

### ZERO POPULATION GROWTH

**Birthrate + Immigration = Death rate + Emigration**

Zero population growth leads to an unbalanced age structure in the population.

A – True

B – False



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Which of the following is true of a population with a growth rate of zero with no emigration or immigration?

- ☐ The birthrate exceeds the death rate.
- ☒ The birthrate equals the death rate.
- ☐ The birthrate is less than the death rate.

When the birthrates and death rates of a country are equal, the country is experiencing Zero population growth

### Zero Population Growth

- Zero population growth (**ZPG**) occurs when **birth + immigration = death + emigration**.
- **At ZPG**, the age structure should be more balanced, with numbers at pre-reproductive, reproductive, and post-reproductive ages approximately **equal**.



In Italy, the high birthrate decades ago changing to a low-rate today is an example of a (n).....

a.

demographic transition

b.

zero population growth

c.

age structure

d.

carrying capacity

Which of the following equations represents zero population growth?

a.

$\text{births} + \text{immigration} = \text{deaths} + \text{emigration}$

b.

$\text{births} + \text{emigration} = \text{deaths} + \text{immigration}$

c.

$\text{deaths} + \text{births} = \text{emigration} + \text{immigration}$

d.

$\text{deaths} - \text{births} = \text{emigration} - \text{immigration}$

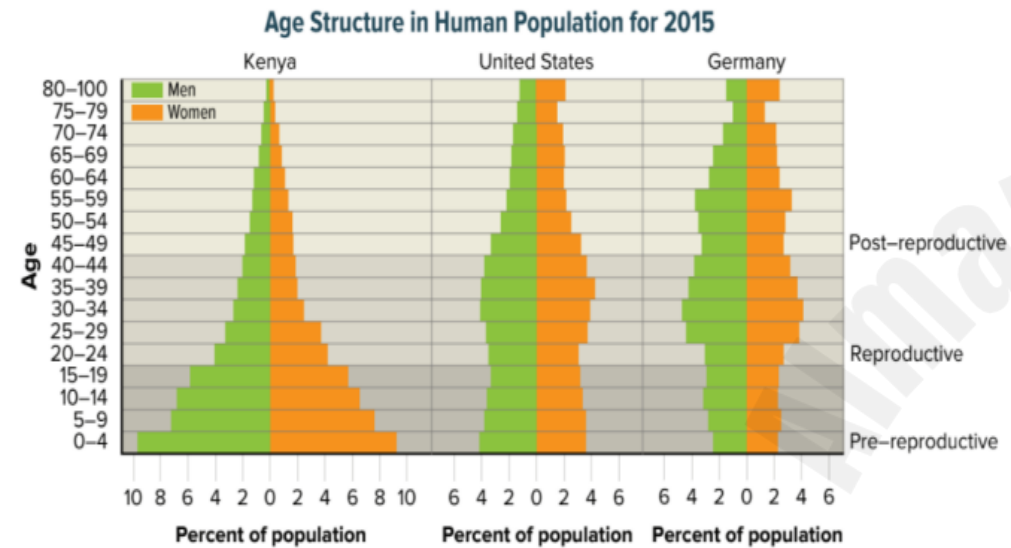


Figure 14 The relative numbers of individuals in pre-reproductive, reproductive, and post-reproductive

Age Structure

- A population's **age structure** is the number of males and females in each of three age groups:
  - pre-reproductive stage
  - reproductive stage
  - post-reproductive stage

**Get It?**  
Compare and contrast the age structures of the countries shown in Figure 14.

	RAPID GROWTH	SLOW GROWTH	NEGATIVE GROWTH
Post-reproductive			
Reproductive			
Pre-reproductive			

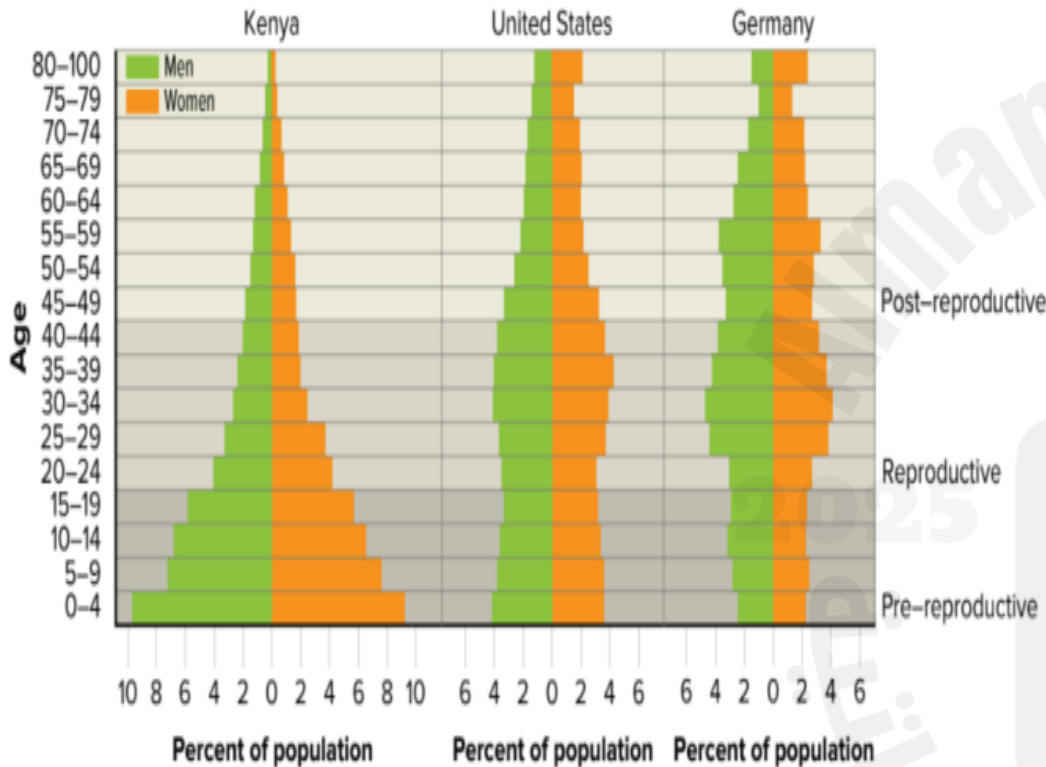




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### Age Structure in Human Population for 2015



**Figure 14** The relative numbers of individuals in pre-reproductive, reproductive, and post-reproductive years are shown for three representative countries.



Get It?

Compare and contrast the age structures of the countries shown in **Figure 14**.

COUNTRY	Type of growth	Largest age group
KENYA	RAPID	Pre reproductive
US	SLOW	Pre reproductive (but less than Kenya)
GERMANY	NEGATIVE	Post reproductive

Kenya has a large proportion of pre-reproductive and reproductive individuals. The U.S. has a smaller proportion of these two groups, and Germany has an even smaller proportion.

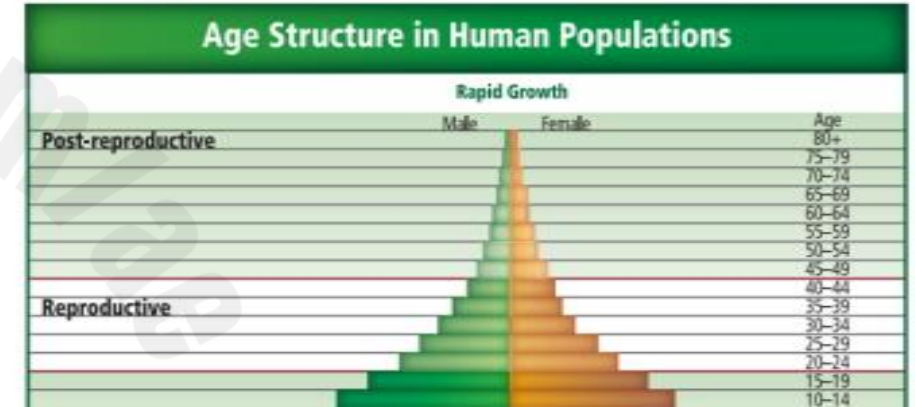


Which of the following is considered as an adverse effect of a negative-growth population trend?

- a. An excess burden on global natural resources
- b. Inadequate financial resources to care for children
- c. Too few jobs to support a large, young population
- d. Too few workers to support an aging population

Use the graph below to answer the question:

Which of the following is a disadvantage of a population that has this type of age structure?

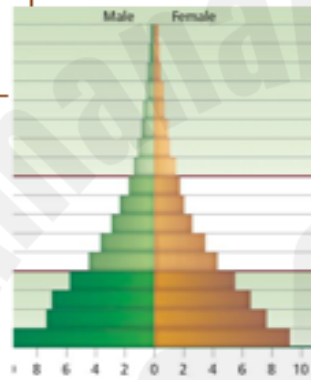


- a. High percentage of the population lies in the group of reproductive age
- b. The size of the workforce may be large
- c. The population grows slowly
- d. Adequate resources do not accompany it



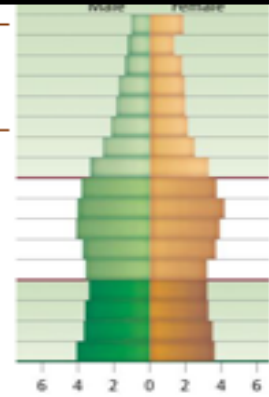
9-What is the type of growth in human population?

- A. Negative growth
- ☒ B. Rapid growth
- C. Slow growth
- D. All of the above



10-What is the type of growth in human population?

- A. Negative growth
- B. Rapid growth
- ☒ C. Slow growth
- D. All of the above

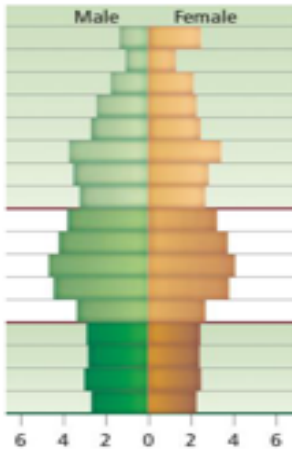


11-Describes the relative numbers of organisms of each age within a population and is often represented by a graph

- A. Demographic transition
- B. Population growth rate
- ☒ C. Age structure diagram
- D. Fertility rate

12-What is the type of growth in human population?

- ☒ A. Negative growth
- B. Rapid growth
- C. Slow growth
- D. All of the above





## Earth's carrying capacity for humans

Calculating population growth rates is not just a mathematical exercise. Scientists are concerned about the human population reaching or exceeding the carrying capacity. As you learned in Lesson 1, all populations are limited by the carrying capacity of their ecosystems, and the human population is no exception. Many scientists suggest that human population growth needs to be reduced. In many countries, voluntary population control is occurring through family planning. Unfortunately, if the human population continues to grow—as most populations do—and areas become overcrowded, disease and starvation will occur. However, technology has allowed humans to increase the carrying capacity of Earth, at least temporarily. It might be possible for technology and planning to keep the human population at or below Earth's carrying capacity.

### 3. Assess the consequences of exponential population growth of any population.

**An exponentially growing population is likely to place stress on its environment by :**

- **Over crowding**
- **Less availability of resources- Food and water scarcity**
- **Starvation**
- **Spread of diseases**



Compare the population growth rate in industrially developed countries to that in developing countries.

Industrially developed countries	Developing countries
<ul style="list-style-type: none"><li>• Use more resources</li><li>• Low population growth rate</li></ul>	<ul style="list-style-type: none"><li>• Use less resources but growing rapidly</li><li>• High population growth rate</li></ul>

**Compare** trends in industrialized nations and developing countries in terms of the following factors.

Population growth rate: The population is growing at a faster rate in developing than in industrialized countries.

Resource use by individuals: Individuals in industrialized nations use far more resources than individuals in developing countries.

Another important factor in keeping the human population at or below the carrying capacity is the amount of resources from the biosphere that are used by each person. Currently, individuals in industrially developed countries use far more resources than those individuals in developing countries, as shown in Figure 15. This graph shows the estimated amount of land required to support a person through his or her life, including land used for production of food, forest products and housing, and the additional forest land required to absorb the carbon dioxide produced by the burning of fossil fuels. Countries such as India are becoming more industrialized, and they have a high growth rate. These countries are adding more people and are increasing their use of resources. At some point, the land needed to sustain each person on Earth might exceed the amount of land that is available. At that time the human population will likely have exceeded Earth’s carrying capacity.

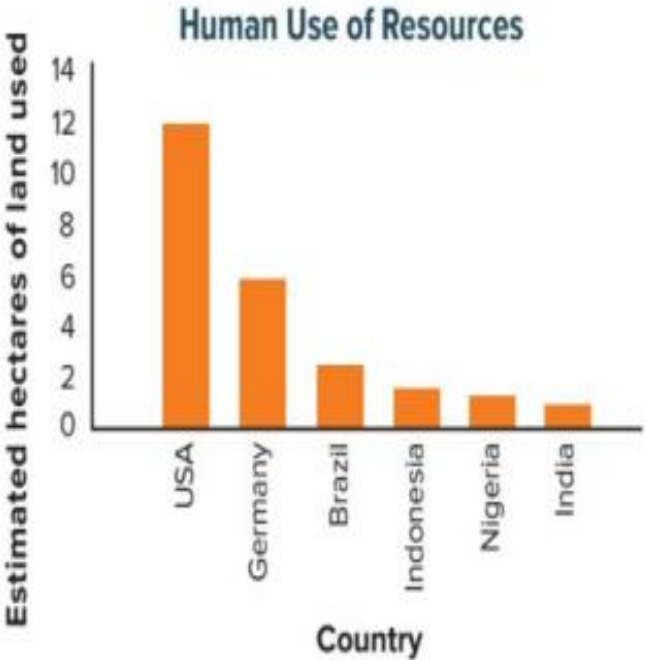


Figure 15 The amount of resources used per person varies around the world.



1. What does the graph illustrate?

- The estimated amount of land required to support person through his or her life
- Lands are used for food production, housing, forest land to absorb  $CO_2$ .

2. Which country utilizes more resources?

- USA

3. Individuals in industrially developed countries use far more resources .

4. Individuals in developing countries use less resources .

5. Why is industrialized countries using more resources?

Industrialized countries have **high growth rate** and adding more people thus increased use of resources

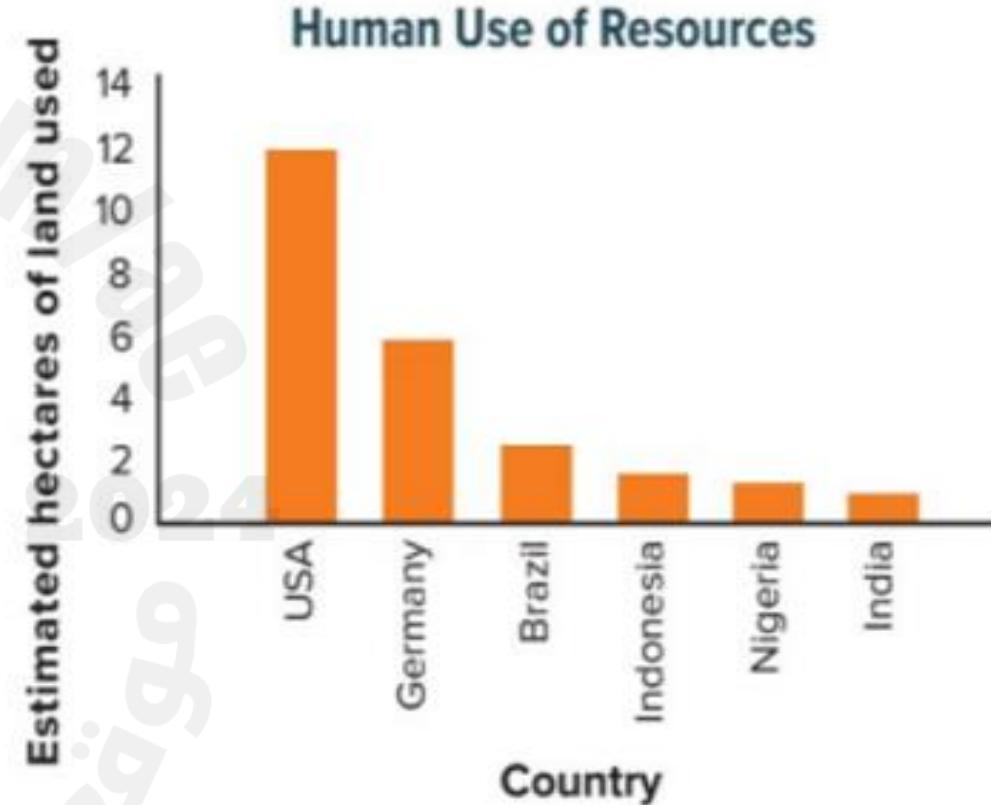


Figure 15 The amount of resources used per person varies around the world.



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Reducing individual resource use can help keep the human population within Earth's carrying capacity.

A – True

B – False

Which of the following human activities would most likely help maintain Earth's carrying capacity?

A – Overusing non-renewable energy resources

B – Practicing sustainable agriculture and water use

C – Increasing global meat consumption

D – Replacing forests with urban areas

**What are the three factors that could keep human population from reaching carrying capacity?**

- 1. Voluntary population control (Family planning)**
- 2. Improvement in technology**
- 3. Limiting the amount of resources each person uses**



Which could decrease the earth's carrying capacity for humans?

- a. Biodiversity
- b. Energy crisis
- c. Epidemic disease
- d. Unequally distributed resources

If a population grows larger than  
its environmental carrying  
capacity, then:

إذا كان عدد السكان ينمو أكبر من القدرة الاستيعابية للبيئة:

قد يرتفع معدل المواليد بشكل ملحوظ  
birth rate may rise significantly

قد يرتفع معدل الوفيات  
death rate may rise

قد يزيد معدل الهجرة الداخلية  
immigration rate may increase

قد ينخفض معدل الوفيات بشكل ملحوظ  
death rate may fall significantly





The total global use of resources by humans is measured  
by .....

- a. barrels of oil used per person
- b. hectares of land used per person
- c. industrial metals used per country
- d. total food consumed per country

This graph shows the estimated amount of resources required to support a person through his or her life in six different countries. Which of the following statements is correct?



Individuals in developing countries consume larger amounts of resources.

Individuals in industrially developed countries consume larger amounts of resources.

Indonesia is the least resources user.

Brazil is the largest resources user.



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