# Organisms and Popul ations



### 1. List the attributes that populations but not individuals possess.

- **Ans:** A population is defined as a group of individuals belonging to the same species living together in a particular geographic area at the same time. For example, all individuals living at a particular place at a particular time represent the population of humans. The most attributes or characteristics of a population residing during a given area are:
  - Birth rate (Natality): It is the ratio of live births per thousand people in an area. It is expressed because the range of number of individuals added to the population with respect to the members of the population.
  - Death rate (Mortality): This is a measure of the percentage of deaths in an area to the total population. It is expressed as the loss of individuals with respect to the members of the population age groups. The age distribution pattern is usually represented through age pyramids.
  - Population density: It is defined as the number of individuals of a population present per unit space at a given time.
- 2. If a population grows exponentially in size in 3 years, what is the intrinsic rate of increase (r) of the population?

Ans: If there are sufficient amounts of food resources available to an individual population, it will grow exponentially. The exponential growth equation can be expressed as the following integral form: Where,

N Population density after time t

No-Population density at time zero

r-Intrinsic rate of natural increase

e=Base of natural logarithms (2.71828)

From the above equation, we can calculate the intrinsic rate of increase (r) of a population.

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Now, as per the question,
Present population density=x
Then.
Population density after two years = 2x
t = 3 years
Substituting these values in the formula, we get:
⇒2x=xe3r
=2=e3r
Applying log on both sides:
\Rightarrow \log 2 = 3r \log e
\log 2/3 \log = r
\log 2/3x0.434 = r
0.301
3×0.434
=0.301/1.302
=\mathbf{r}
=0.2311=r
Hence, the intrinsic rate of increase for the above illustrated population is 0.2311.
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## 3. Name important defense mechanisms in plants against herbivory.

**Ans :** The presence of morphological and chemical shielding mechanisms is present in several plants in order to defend themselves against herbivores.

#### (1) Morphological defense mechanisms:

- Cactus leaves (*Opuntia*) are modified into sharp spines (thorns) to deter herbivores from feeding on them.
- Besides leaves, Acacia has sharp thorns to deter herbivores.
- Some plants have margins of their leaves that are spiny or have sharp edges that stop insects from eating them.

#### (2) Chemical defense mechanisms:

- A herbivore might be fatally affected if they eat any part of a Calotropis weed.
- Several chemicals are produced in plants as a part of self-defense, including nicotine, caffeine, quinine, and opium.

- 4. An orchid plant is growing on the branch of a mango tree. How do you describe this interaction between the orchid and the mango tree?
- **Ans:** An orchid growing on a mango tree branch is an epiphyte. Epiphytes are plants growing on other plants which however, do not derive nutrition from them. This relationship therefore exists as commensalism . There is a commensalism between a mango tree and an orchid, where one species benefits from the other while the other remains unaffected. The orchid is benefited by the above interaction because it receives support, while the mango tree remains unaffected.

## 5: What is the ecological principle behind the biological control method of managing pest insects?

**Ans:** Variable biological control methods are based on a concept known as predation. In predation, the predator feeds on the prey. Hence, predators regulate the population of prey in a habitat, helping in the control of pest insects.

#### 6. Define population and community.

#### Ans:

- **Population:** A population can be thought of as a group of individuals belonging to the same species that exist in the same geographical area at the same time and function as a unit. For example, all human beings living at a particular place at a particular time constitute the population of humans.
- **Community:** A group of individuals belonging to a particular species, living in a particular geographical area. Such individuals can be similar or dissimilar, but cannot reproduce with the members of other species.

- 7. Define the following terms and give one example for each:
  - (a) Commensalism
  - (b) Parasitism
  - (c) Camouflage
  - (d) Mutualism
  - (e) Interspecific competition
- Ans: (a) Commensalism: Commensalism is an interaction between two species in which one species gets benefited while the other remains unaffected. An orchid growing on the branches of a mango tree and barnacles attached to the body of whales are examples of commensalisms.
- (b) Parasitism: It is an interaction between two species in which one species (usually smaller) gets positively affected, while the other species (usually larger) is negatively affected. An example of this is liver fluke. Liver fluke is a parasite that lives inside the liver of the host body and derives nutrition from it. Hence, the parasite benefits as it derives nutrition from the host, while the host is negatively affected as the parasite reduces the host fitness, making its body weak.
- Ans: (c) Camouflage: is a strategy adapted by prey species to escape their predators.
   Organisms are cryptically coloured so that they can easily mingle in their surroundings and escape their predators. Many species of frogs and insects camouflage in their surroundings and escape their predators.
- (d) Mutualism: It is an interaction between two species in which both species involved are benefited. For example, lichens show a mutual symbiotic relationship between fungi and blue green algae, where both are equally benefited from each other.
- **Ans:** (e) Interspecific competition: It is an interaction between individuals of different species were both species get negatively affected. For example, the competition between flamingoes and resident fishes in South American lakes for common food resources i.e, zooplankton.
  - 8. With the help of a suitable diagram describe the logistic population growth curve.
- Ans: Yeast cells grown under laboratory conditions commonly exhibit the logistic population growth curve. There are five phases: the lag phase, the positive acceleration phase, exponential phase, negative acceleration phase, and stationary phase.

(a) Lag phase: Initially, the population of the yeast cell is very small. This is because of the limited resources present in the habitat.

(b) Positive acceleration phase: In this phase, yeast cells adapt to the new environment and start to multiply. However, at the beginning of this phase, the growth of the cell is very limited.

(c) Exponential phase: During this phase, the population of the yeast cell increases suddenly due to rapid growth. Due to sufficient food resources, a constant environment, and the absence of interspecific competition, the population grows exponentially. As a result, the curve rises steeply upwards.

(d) Negative acceleration phase: During this phase, environmental resistance increases and the population growth rate decreases. This occurs because of an increased completion among the yeast cells for food and shelter.

(e) **Stationary phase:** During this phase, the population becomes constant. A population's number of cells equals its number of cells that die. Additionally, the species is said to have reached the carrying capacity of its habitat.



- 9. Select the statement which explains best parasitism.
  - (a) One organism is benefited.
  - (b) Both the organisms are benefited.

#### (c) One organism is benefited, the other is not affected.

#### (d) One organism is benefited, the other is affected.

#### **Ans :** (d) One organism is benefited, other is affected.

Parasitism is an interaction between two species, in which one species (parasite) benefits from the other. The other species (host) is harmed. For example, ticks and lice (parasites) can be found on the body. This means there is an interaction between parasites and the human body, from which ticks and parasites receive benefit (as they are Feeding on human blood). On the other hand, these parasites reduce host fitness and cause harm to the human body.

#### 10. List any three important characteristics of a population and explain.

**Ans:** A population is a collection of individuals of the same species living in a specific geographical area at a specific time and acting as a single unit. The population of people, for example, is made up of all human beings living in a specific location at a specific moment.

A population's three most significant qualities are:

(a) Birth rate (Natality): This is the ratio of live births to total births in a given year.

It is calculated as the number of people added to the population divided by the number of people in the population.

(b) Death rate (Mortality): This is the ratio of deaths per 100,000 people in a certain location. It's measured in terms of the number of people who have died as a result of the disease.

(c) Age distribution: This is the proportion of people of various ages in a given population. This is the percentage of people in a population who are different ages. At any given time, a population is made up of people of varying ages. Age pyramids are a frequent representation of the age distribution pattern.