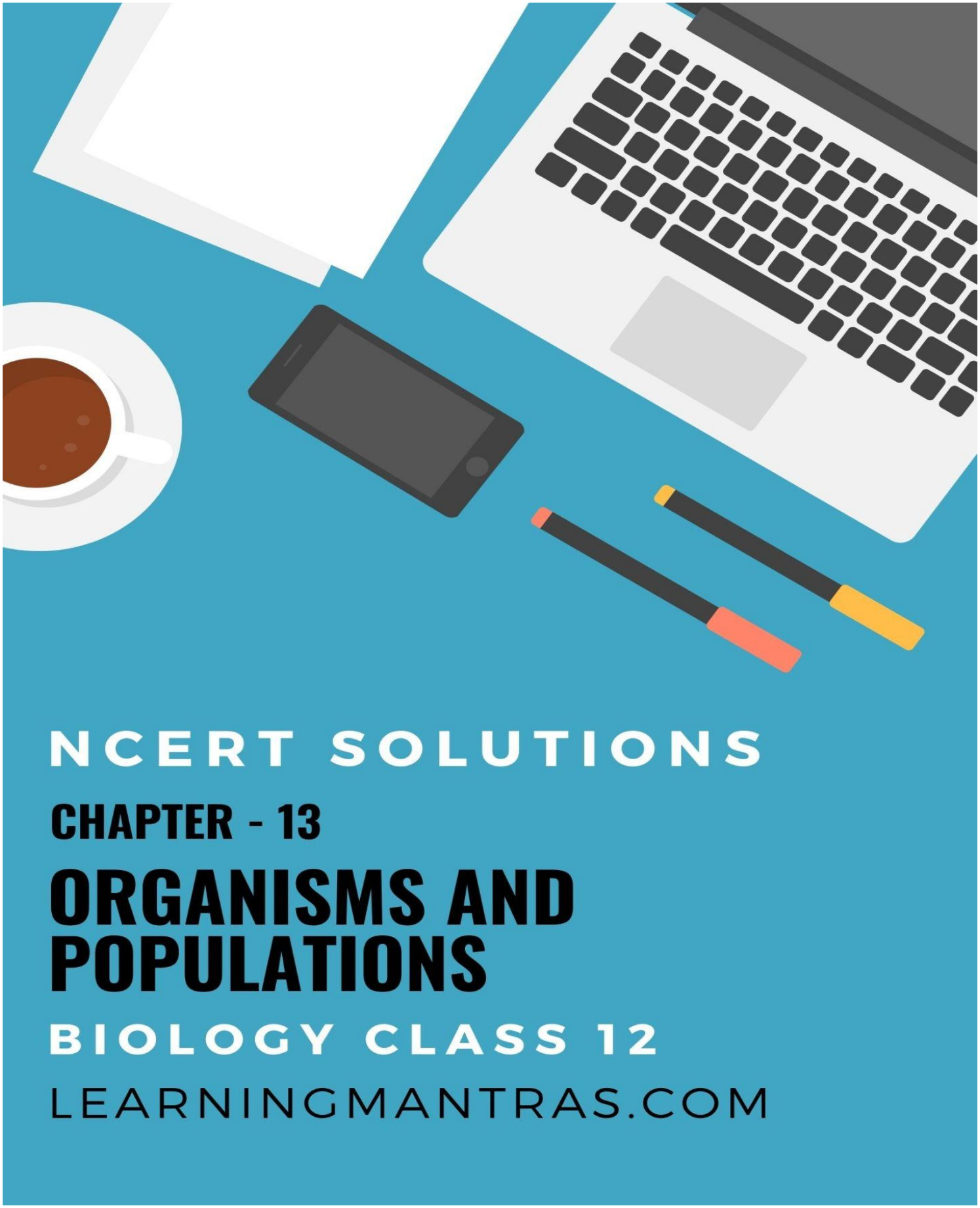
NCERT SOLUTIONS
CHAPTER - 13
ORGANISMS AND POPULATIONS
BIOLOGY CLASS 12
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Q1. How is diapause different from hibernation?

Answer: Diapause is a period of suspended growth or development occurring in many insects and other invertebrates during which metabolic activities are greatly reduced. On the other hand, hibernation is a sleep-like state in which a few animals, such as fishes and amphibians, pass the winter season as a way of surviving food scarcity and cold weather.

Q2. If a marine fish is placed in a freshwater aquarium, will the fish be able to survive? Why or why not?

Answer: When a marine fish is placed in a freshwater aquarium, the fish will not be able to survive because marine fish are adapted to live in saline seawater. In fresh water, it will not be able to cope with the outside hypotonic environment because of osmoregulation problems. In fresh water, the concentration of water, the difference between the concentration of the water and inside of the fish are increased and therefore, the osmotic pressure is also increased.The fish has to take more water into the body to be able to survive and to get rid of the excess salt present in its body.

Q3. Define phenotypic adaptation. Give one example.

Answer: Phenotypic adaptation involves changes in the body of an organism in response to genetic mutation or certain environmental changes. These responsive adjustments occur in an organism in order to cope with environmental conditions present in their natural habitats. For example, desert plants have thick cuticles and sunken stomata on the surface of their leaves to prevent transpiration. Similarly, elephants have long ears that act as thermoregulators.

Q4. Most living organisms cannot survive at temperatures above 45°C°. How are some microbes able to live in habitats with temperatures exceeding 100°C?

Answer: Archaebacteria (Thermophiles) are ancient forms of bacteria found in hot water springs and deep sea hydrothermal vents. They are able to survive in high temperatures (which far exceed 100°C) because their bodies have adapted to such environmental conditions. These organisms contain specialized thermo-resistant enzymes, which carry out metabolic functions that do not get destroyed at such high temperatures.

Q5. List the attributes that populations but not individuals possess.

Answer: A population can be defined as a group of individuals of the same species residing in a particular geographical area at a particular time and functioning as a unit. For example, all human beings living at a particular place at a particular time constitute the population of humans.

The main attributes or characteristics of a population residing in a given area are:-

(a) Birth rate (Natality): It is the ratio of live births in an area to the population of an area. It is expressed as the number of individuals added to the population with respect to the members of the population.

(b) Death rate (Mortality): It is the ratio of deaths in an area to the population of an area. It is expressed as the loss of individuals with respect to the members of the population.

(c) Sex ratio: It is the number of males or females per thousand individuals.

(d) Age Distribution: It is the percentage of individuals of different ages in a given population. At any given time, the population is composed of individuals that are present in various age groups. The age distribution pattern is commonly represented through age pyramids.

(e) Population density: It is defined as the number of individuals of a population present per unit area at a given time.

Q8. An orchid plant is growing on the branch of the mango tree. How do you describe this interaction between the orchid and the mango tree?

Answer: An orchid growing on the branch of a mango tree is an epiphyte. Epiphytes are plants growing on other plants which however, do not derive nutrition from them. Therefore, the relationship between a mango tree and an orchid is an example of commensalisms, where one species gets benefited while the other remains unaffected. In the above interaction, the orchid is benefited as it gets support while the mango tree remains unaffected.

Q9. What is the ecological principle behind the biological control method of managing pest insects?

Answer: The ecological principle behind the biological control method of managing pest insects is predator – prey relationship. It is based on the ability of the predator to regulate prey population.

Q10. Distinguish between the following:

(a) Hibernation and Aestivation

(b) Ectotherms and Endotherms

Answer:

(a) Hibernation and Aestivation

	Hibernation		Aestivation
1.	Hibernation is a state of reduced activity in some organisms to escape cold winter conditions.	**1.**	Aestivation is a state of reduced activity in some organisms to escape desiccation due to heat in summers.
2.	Bears and squirrels inhabiting cold regions are examples of animals that hibernate during winters.	**2.**	Fishes and snails are examples of organisms aestivating during summers.

(b) Ectotherms and Endotherms

	Ectotherms		Endotherms
1.	Ectotherms are cold blooded animals. Their temperature varies with their surroundings.	**1.**	Endotherms are warm blooded animals. They maintain a constant body temperature.
2.	Fishes, amphibians, and reptiles are ectothermic animals.	**2**	Birds and mammals are endothermic animals.

Q11. Write a short note on
(a) Adaptations of desert plants and animals
(b) Adaptations of plants to water scarcity
(c) Behavioural adaptations in animals
(d) Importance of light to plants
(e) Effect of temperature or water scarcity and the adaptations of animals.
Answer: (a) Desert plants have very small leaves or no leaves at all, and carry out photosynthesis through the stems. Their stem could become succulent, and can store and retain water. Animals living in hot climatic regions tend to be smaller than those living in cold climates. This can be explained by the fact that the amount of heat gained from the environment is approximately proportional to the body surface area. The majority of animals living in the desert are small, like kangaroo rats. It feed on dry seeds and other dry plant material and does not drink,

(b) The evergreen trees such as Rhododendron, show water scarcity by an inward curling of the leaves. A more significant response is the closure of stomata, which reduces transpiration, but raises the internal temperature of the die leaf affecting the rate of synthesis of proteins and photosynthesis. Deciduous trees of the temperature region drop their leaves in autumn, avoiding winter drought. Some water stressed plant's accumulate excessive amounts of inorganic ions.

(c) Migrating temporarily to a less stressful habitat forms a more stressful habitat is a kind of behavioural adaptation in animals which enables them to survive in better environmental conditions. Desert lizards regulate their body temperature constant by behavioural means. They bask in the sun and absorb heat when their body temperature decreases below the optimum, but move into shady or underground places when the temperature of the surrounding area starts increasing.

(d) Light affects plants through its quality, intensity and duration. Duration of light affects phenology, photosynthesis, growth, reproduction, flowering. Quality of light influences flowering, seed germination and movements. Light is required for the production of chlorophyll in chloroplasts. Plants germinated under insufficient illumination cause the destruction of chlorophyll.

(e) Animals mainly are of two types as they are adapted to controlling their body temperature. Poikilothermous are the animals whose temperature fluctuates with that of the environment, e.g., invertebrates and vertebrates, other than birds and animals. In contrast, homeotherms are the animals which can maintain their body temperature at a constant level, e.g., birds and mammals.

Q12. List the various abiotic environmental factors.
Answer: Abiotic factors are nonliving factors and conditions of the environment which influence survival, function and behaviour of organisms. Various abiotic factors are :
(i) Temperature – Temperature is one of the most important environmental factors. The average temperature varies seasonally. It ranges from subzero level in polar areas and high altitudes to more than 50°C in tropical deserts in summer and exceeds 100°C in thermal springs and deep-sea hydrothermal vents.

(ii) Water – Next to temperature, water is the most important factor which influences the life of organisms. The productivity and distribution of land plants are dependent upon availability of water. Animals are adapted

according to the water availability. E.g., aquatic animals are ammonotelic while xerophytic animals excrete dry feces and concentrated urine.

(iii) Light – Plants produce food through photosynthesis for which sunlight is an essential source of energy. Light intensity, light duration and light quality influences the number of life processes in organisms, such as – photosynthesis, growth, trans-piration, germination, pigmentation, movement and photoperiodism.
(iv) Humidity – Humidity refers to the moisture (water vapour) content of the air. It determines the formation of clouds, dew and fog. It affects the land organisms by regulating the loss of water as vapour from their bodies through evaporation, perspiration and transpiration.
(v) Precipitation – Precipitation means rainfall, snow, sleet or dew. Total annual rainfall, seasonal distribution, humidity of the air and amount of water retained in the soil are the main criteria that limit the distribution of plants and animals on land.
(vi) Soil – The soil is one of the most important ecological factors called the edaphic factor. It comprises different layers called horizons. The upper weathered humus containing part of soil sustains terrestrial plant life.

Q13. Give an example for:
(a) An endothermic animal
(b) An ectothermic animal
(c) An organism of benthic zone
Answer:
(a) Endothermic animals: Birds such as crows, sparrows, pigeons, cranes, etc. and mammals such as bears, cows, rats, rabbits, etc. are endothermic animals.
(b) Ectothermic animals: Fishes such as sharks, amphibians such as frogs, and reptiles such as tortoises, snakes, and lizards are ectothermic animals.
(c) Organism of benthic zone: Decomposing bacteria is an example of an organism found in the benthic zone of a water body.

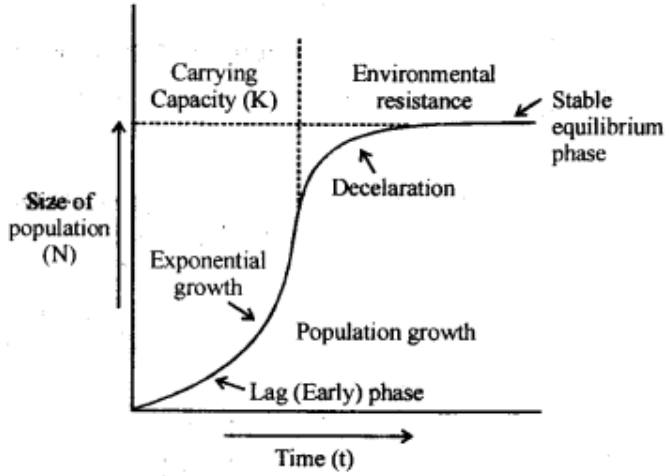
Q14. Define population and community.
Answer:

- **Population:** A population can be defined as a group of individuals of the same species residing in a particular geographical area at a particular time and functioning as a unit. For example, all human beings living at a particular place at a particular time constitute the population of humans.
- **Community:** A community is defined as a group of individuals of different species, living within a certain geographical area. Such individuals can be similar or dissimilar, but cannot reproduce with the members of other species.

Q15. Define the following terms and give one example for each:
(a) Commensalism
(b) Parasitism
(c) Camouflage
(d) Mutualism
(e) Interspecific competition
Answer:

(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 is benefited as it derives nutrition from the host, while the host is negatively affected as the parasite reduces the host fitness, making its body weak.
(c) Camouflage: It 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.
(e) Interspecific competition: It is an interaction between individuals of different species where 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.

Q16. With the help of suitable diagram describe the logistic population growth curve.
Answer: The S-shaped growth curve is also called a logistic growth curve. It describes a situation in which (in a new environmental condition) the population density of an organism increases slowly establishing itself then increasing rapidly, approaching an exponential growth rate. Many populations of microorganisms broadly follow this basic sigmoidal pattern. For example, when a fresh culture medium is inoculated with bacteria, sigmoidal or S-shaped growth curve is observed. The S-shaped curve is generated when a population approaches the environment's carrying capacity. Carrying capacity is the maximum number of individuals of a population that can be supported in a given time.



Logistic population growth curve or S-shaped curve

The S-shaped growth form is represented by the following equation- ” dNldt = rN[K-NIK]
Where, r = intrinsic rate of natural increase N = population density at time t K = carrying capacity

Q17. 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.

Answer:

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

Parasitism is an interaction between two species in which one species (parasite) derives benefit while the other species (host) is harmed. For example, ticks and lice (parasites) present on the human body represent this interaction where the parasites receive benefit (as they derive nourishment by feeding on the blood of humans). On the other hand, these parasites reduce host fitness and cause harm to the human body.

Q18.List any three important characteristics of a population and explain.

Answer: The three important characteristics of a population are:

(a) Density: The number of individuals per unit area or volume. For example, the number of frogs per m3 of forest region.

(b) Natality or Birth rate: The birth rate is determined by the number of individuals born to a given population during a given period of time.

(c) Mortality or Death rate: The death rate or mortality represents a decrease in a given population during a given period of time. Generally, the death of individuals in a population are expressed by specific mortality which is described as the mortality population are expressed by specific mortality which is described as the mortality for a given age group.

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