NCERT Solutions for Class-XII Biology

Chapter -11

NCERT Biology Class 12

1. How is diapause different from hibernation?

1.

Diapause	Hibernation
It is a stage of suspended development in an organism to cope with unfavourable conditions.	It is a resting stage in an animal to escape harsh environmental condition
It can occur in summer and winter.	It occurs only in winters, so also winter sleep in which animal passes the winter in dormant conditions.
It is a dormant stage in the development of an organism.	It is a stage of inactivation of few organisms.
E.g.: It is common among insects such as monarch butterflies and in the embryos of many oviparous species of fish.	E.g.: It is shown by kangaroo mouse, small birds. Several insects and bats.

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

2. If a marine fish is placed in a fresh water aquarium, then its chances of survival will diminish. This is because their bodies are adapted to high salt concentrations of the marine environment. In fresh water conditions, they are unable to regulate the water entering their body (through osmosis). Water enters their body due to the hypotonic environment outside. This results in the swelling up of the body, eventually leading to the death of the marine fish.

3. Define phenotypic adaptation. Give one example.

3. Any change that occurs in the body of an organisms in response to changing environmental conditions is termed as Phenotypic adaptation. It includes non-genetic changes in individuals such as physiological modification, acclimatization or behavioural changes to escape or adapt to the environmental conditions.

Examples:

(a) Kangaroo rat: Internal fat oxidation occurs to produce water as by product, which helps it to survive in desert conditions.

(b) Desert plants: Thick cuticle, stomata in deep to minimize transpiration

(c) Cold climate Mammals: short ears and limbs to minimize heat loss.

(d) People at high altitude: increased R.B.C production and increased breathing rate.

(e) Desert lizards: bask in sun when cold and move to shade when hot.

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

4. 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.

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

5. A population has certain attributes that an individual organism does not. An individual may have births and deaths, but a population has birth rates and death rates. Each population has a certain pattern of distribution, variation in number, natality, mortality, dispersal, biotic potential, growth forms and sex ratio. All these attributes are not possessed by individuals. Further, a population has a gene pool shared by its member.

6. If a population growing exponentially double in size in 3 years, what is the intrinsic rate of increase (r) of the population?

6. A population grows exponentially if sufficient amounts of food resources are available to the individual. Its exponential growth can be calculated by the following integral form of the exponential growth equation:

$N_t = N_O e^{rt}$

Where,

N_t = population density after time t

N_O = 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.

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:

$\Rightarrow 3x = x\, e^{3r}$

$\Rightarrow 2 = e^{3r}$

Applying log on both sides:

$\Rightarrow \log 2 = 3r \log e$

$\Rightarrow \frac{\log 2}{3 \log e} = r$

$\Rightarrow \frac{0.301}{3 \times 0.434} = r$

$\Rightarrow \frac{0.301}{1.302} = r$

$\Rightarrow 0.2311 = r$

Hence, the intrinsic rate of increase for the above illustrated population is 0.2311.

7. Name important defence mechanisms in plants against herbivory.

7. For plants, herbivores are the predators. Nearly 25 per cent of all insects are known to be phytophagous (feeding on plant sap and other parts of plants). Plants cannot escape from predator like animals. So, plants have developed a variety of morphological and chemical defence to escape herbivores animals. The various methods adapted by plants are enlisted below:

1. Morphological defence mechanism:

(a) Sharp thorns present in plants such as Acacia and Cactus is the most common morphological means of defence.

(b) In some plants, the margins of their leaves are spiny or have sharp edges that prevent herbivores from feeding on them.

2. Chemical defence mechanism:

(a) Chemical substances such as nicotine, caffeine, quinine, and opium are produced in plants as a part of self-defence.

(b) Calotropis weeds contain toxic cardiac glycosides, which can be fatal if ingested by herbivores.

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

8. 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.

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

9. The principle behind using of various biological control methods is the use of predator to control the growth of pest. Predation can be termed as a biological interaction between the two species in which one organism feed on other. The organism that feed on other is termed as predator and the other one is termed as prey. The predators help in regulating the population of preys in a given habitat and helps in the management of pest insects thus preventing the crop from getting damaged.

This ecological principle is used in integrated pest management where instead of chemical pesticides, the population of the insect in a farm is controlled by its ecological enemy. This will also not let the insect species to increase to a level where it can damage the crop or decrease to a level where it may disturb the ecological balance.

10. Distinguish between the following:

(a) Hibernation and Aestivation

(b) Ectotherms and Endotherms

10. (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 ectothermal animals.	**2.**	Birds and mammals are endotherm animals.

11. 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.

11. (a) Adaptations of desert plants and animals

Adaptations of desert plants: Plants found in deserts are well adapted to cope with harsh desert conditions such as water scarcity and scorching heat. Plants have an extensive root

system to absorb underground water. They bear thick cuticles and sunken stomata on the surface of their leaves to reduce transpiration. In Opuntia, the leaves are modified into spines and the process of photosynthesis is carried out by green stems. Desert plants synthesize food through C4 pathway. It enables the stomata to remain closed during the day to reduce the loss of water through transpiration.

Adaptations of desert animals: the common animals that are found in deserts are desert kangaroo rats, insects, reptiles such as lizards and snakes, etc. The integument of Insects and reptiles that are found in desert is impervious tp prevent any loss of water. They excrete nitrogen in the form of uric acid. Rodents stay in burrows during the day to avoid evaporation and water loss and conserve water by excreting highly concentrated urine and by not using water for temperature regulation. Desert lizards and snakes bask in the sun during early morning and burrow themselves in the sand during afternoons to escape the heat of the day.

(b) Adaptations of plants to water scarcity

The plant shows following adaptations to water scarcity:

1. Succulents such as cacti (Opuntia) and Euphorbia possess thick cuticles which prevents water loss, by cuticular transpiration.
2. In succulents, the stem is flattened, and the function of leaf is performed by stem. In Opuntia, leaves are reduced to spines.
3. Desert plants have special pathways to synthesize food, called CAM (C4 pathway). It enables the stomata to remain closed during the day to reduce the loss of water through transpiration.
4. Absence of broad leaves and abundance of spines further protect desert plants from being eaten by animal consumers.
5. The roots in perennial xerophytes are very deep to absorb ground water.

(c) Behavioural adaptations in animals

Adaptations help organisms survive in their ecological niche or habitat; adaptations can be anatomical, behavioural or physiological. The adaptations in the behaviour of an organism are termed as behavioural adaptations. It includes hibernation, aestivation, migration, etc. which enable the organisms to escape environmental stress.

For example, Ectotherms are cold blooded animals and they cannot regulate their own body temperature e.g. fish, amphibians, reptiles, etc. To maintain their body temperature, they have shown various behavioural changes such as, the desert lizard basks in the sun during early hours when the temperature is low. As the temperature rises, the lizard escapes the scorching sun by burrows itself inside the sand. Certain endotherms (warm-blooded animals) such as birds and mammals also show behavioural adaptation. They escape cold hibernating during winters and hot weather conditions by aestivating during summers.

(d) Importance of light to plants

Sunlight is considered as the ultimate source of energy. Plants are termed as autotrophic organisms as they require light for carrying out the photosynthesis process. The amount of light and intensity of light effect plant distribution, flowering and fruiting. Many species of small plants (herbs and shrubs) growing in forests are adapted to photosynthesise optimally under very low light conditions because they are constantly overshadowed by tall, canopied trees. Many plants are also dependent on sunlight to meet their photoperiodic requirement for flowering. The amount of light in aquatic habitats is responsible for the vertical distribution of plants in oceans.

(e) Effect of temperature or water scarcity and the adaptations of animals.

Temperature is the most ecologically relevant environmental factor. The average temperature on land varies seasonally, decreases progressively from the equator towards the poles and from plains to the mountain tops. It ranges from sub-zero levels in polar areas and high altitudes to more than 50°C in tropical deserts in summer. These variations in temperature affect the distribution of animals on the Earth. Some animals can tolerate a wide range of temperature, such animals are termed as eurythermal animals. While others which can tolerate a narrow range of temperature are termed stenothermal animals. Animals also shows various adaptations to suit their natural habitats. For example, animals found in colder areas have shorter ears and limbs that prevent the loss of heat from their body. This rule is known as allen's rule. Animals found in Polar regions or cold conditions have thick layers of fat below their skin and thick coats of fur to prevent the loss of heat. These all adaptations help the organism to survive in the adverse conditions of their habitat.

Organisms exhibit different behavioural changes to adapt to their natural habitat. The changes in the behaviour of an organism that help it to escape environmental stresses are called behavioural adaptations. For example, desert lizards are termed as ectotherms as they cannot regulate their body temperature. So, they show various behavioural changes to escape temperature variations. For example, . Desert lizards and snakes bask in the sun during early morning and burrow themselves in the sand during afternoons to escape the heat of the day. Certain endothermic animals (warm-blooded animals) such as birds and mammals escape cold and hot weather conditions by hibernating during winters and aestivating during summers respectively.

Water is an important component and scarcity of water forces an animal to undergo various adaptation methods. Animals found in deserts such as desert kangaroo rats, lizards, snakes, etc. are well adapted to stay in their habitat. The kangaroo rat stays in burrows during the day to avoid water loss through evaporation. They conserve water by excreting highly concentrated urine. Reptiles like the Texas horned lizard have thick and tough integument that doesn't let water out. Desert mammals have fewer sweat glands than their counterparts in less extreme environments. Such adaptations can be seen to prevent the loss of water.

12.

12.

13. Give an example for:
(a) An endothermic animal
(b) An ectothermic animal
(c) An organism of benthic zone

13. **(a) An endothermic animal**

Animals which can regulate their body temperature are termed as endothermic animals. It includes birds such as crows, sparrows, pigeons, cranes, etc. and mammals such as bears, cows, rats, rabbits, etc. are endothermic animals.

(b) An ectothermic animal

Animals which cannot regulate their body temperature are termed as ectothermic animals. It includes fishes such as sharks, amphibians such as frogs, and reptiles such as tortoise, snakes, and lizards are ectothermic animals.

(c) An organism of benthic zone

It is the ecological region at the lowest level of a water body. Organisms living here are called as benthos. Light does not reach to this zone. In this zone sessile organisms such as sea anemones, sponges, hydrozoans and Decomposing bacteria are found.

14. Define population and community.

14. **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.

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

15. **(a) Commensalism**

It is a interaction between two organism, in which one species is benefited and the other is neither harmed nor benefited under normal conditions.

Examples of Commensalism

(i) Clown fish living among tentacles of sea anemone: The anemone protects the clownfish and provides a safe place to sleep and breed.

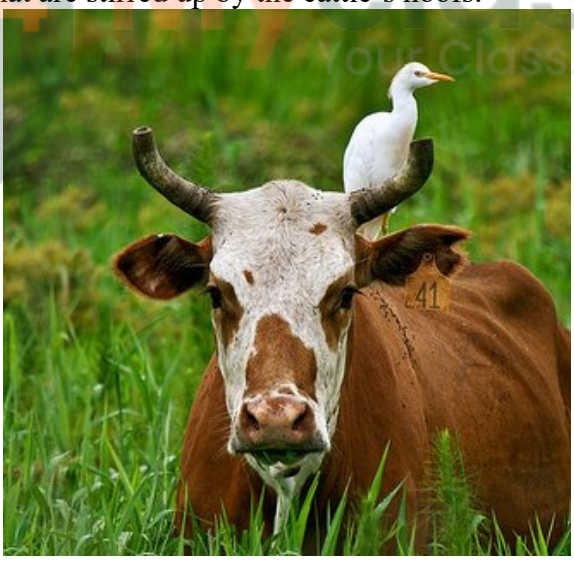
(ii) Pilot fish (Remora) accompanies sharks: pilot fish feeds on falling pieces of food when the shark is eating the prey.

(iii) Orchid growing on mango tree: the orchid is benefited as it gets support while the mango tree remains unaffected.

(iv) Sea anemone on the shell of hermit crab: sea anemone is sedentary while hermit crab is free swimming. Hermit crab resides in an empty snail shell for protection and sea anemone also uses snail shell as portable home. Anemone is benefited as it is able to find more food.

(v) Barnacles on back of whales: Barnacles are arthropods. When the whales swim into plankton-rich waters to feed the barnacles also get food. They also get protection from predators.

(vi) Egret and grazing cattle: egrets are small white birds follow herds of livestock to eat the grasshoppers that are stirred up by the cattle's hoofs.



(b) Parasitism

Parasitism is a kind of relationship between two species in which one species which is termed as parasite, derives its food from the other species which is termed as host. Parasitism also involves shelter, in addition to food obtained by a parasite. Parasites may be ectoparasites or endoparasites. Ectoparasites live on the surface of their host while endoparasites live inside the body of the host.

Examples of Parasitism

(i) *Cuscuta* growing on shoe flower plant: cuscutta grows on the stem of shoe and derive nutrition from the plant.

(ii) Head lice is an ectoparasite and suck human blood

(iii) *Ascaris, Taenia, Plasmodium* causing diseases in humans

(iv) Koel laying its eggs in crow's nest is an example of Brood parasitism. Birds lay egg in the nest of its host and host incubate it.

(c) Camouflage

It is a type strategy that is adapted by the 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 a type of interaction between two organisms where both the interacting species are benefited mutually. It is also known as symbiosis.

Examples of Mutualism

(i) Mycorrhiza living in roots of higher plants: in this interaction the root provides food and shelter to the fungus and the fungus help in absorption of minerals, water uptake and also provide protection against pathogenic fungi.

(ii) Rhizobium in root nodules of legumes: plant root provide food and shelter to the bacteria and the bacteria help is fixing of nitrogen and absorption of nitrogen
(iii) Algae and fungi in lichens: the fungus provide water, mineral and shelter to the algae. Algae manufacture food not only for itself but also for the fungi.
(iv) Orchid Ophrys and bee for pollination: orchid is pollinated by the plant and in return they get rewards in the form of nectar.

(e) Interspecific competition

It is a type of interaction between individuals of different species where both species are harmed. For example, in some shallow South American lakes visiting flamingos and resident fishes compete for their common food, the zooplankton in the lake. The feeding efficiency of one species is reduced due to the interfering and inhibitory presence of the other species, even if resources (food and space) are abundant. Therefore, competition is best defined as a process in which the fitness of one species is significantly lower in the presence of another species.

16. With the help of suitable diagram describe the logistic population growth curve.

16. The logistic population growth curve is commonly observed in yeast cells that are grown under laboratory conditions. It includes five phases: the lag phase, positive acceleration phase, exponential phase, negative acceleration phase, and stationary phase.

- Lag phase: Initially, the population of the yeast cell is very small. This is because of the limited resource present in the habitat.
- Positive acceleration phase: During this phase, the yeast cell adapts to the new environment and starts increasing its population. However, at the beginning of this phase, the growth of the cell is very limited.
- Exponential phase: During this phase, the population of the yeast cell increases suddenly due to rapid growth. The population grows exponentially due to the availability of sufficient food resources, constant environment, and the absence of any interspecific competition. As a result, the curve rises steeply upwards.
- Negative acceleration phase: During this phase, the environmental resistance increases and the growth rate of the population decreases. This occurs due to an increased competition among the yeast cells for food and shelter.
- Stationary phase: During this phase, the population becomes stable. The number of cells produced in a population equals the number of cells that die. Also, the population of the species is said to have reached nature's carrying-capacity in its habitat.

A Verhulst − pearl logistic curve is also known as an S-shaped growth curve.

17. Select the statement which explains best parasitism.
(a) One organism is benefited.
(b) Both the organisms are benefited.
(c) One organism is benefited, other is not affected.
(d) One organism is benefited, other is affected.

17. (d) One organism is benefited, other is affected.
Parasitism is a kind of relationship between two species in which one derives its food from the other (host). Parasitism also involves shelter, in addition to food obtained by a parasite. Parasites may be ectoparasites or endoparasites. Ectoparasites live on the surface of their host while endoparasites live inside the body of the host.
Examples of Parasitism
(i) Cuscuta growing on shoe flower plant
(ii) Head lice and humans
(iii) Ascaris, Taenia, Plasmodium causing diseases in humans

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

18. 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.
Three important characteristics of a population are:

- **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.
- **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.

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