CBSE NCERT Solutions for Class 12 Science Chapter 13

Back of Chapter Questions

1. How is diapause different from hibernation?

Solution:

Diapause is a stage of suspended development under unfavourable conditions. For example, many zooplankton species in lakes and ponds undergo this suspended development under unfavourable conditions.

Hibernation is the winter sleep, which refers to the spending of winter in a dormant state by some organisms. For example, Frog is a cold-blooded animal. During severe cold, it buries itself deep in the mud.

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

Solution: No. Because of the outside hypotonic environment and osmoregulation problems, marine fish kept in fresh water will not be able to survive.

3. Define phenotypic adaptation. Give one example.

Solution:

Phenotypic adaptations are acquired non-genetic changes in individuals. They include physiological modification, adaptation or behavioural changes.

For example: If a person has never been to a place of high altitude, then on visiting such a place, he or she may have altitude sickness because the body does not get adequate oxygen. However, he or she gradually gets acclimatised and stops experiencing altitude sickness.

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?

Solution:

The microbes which are found in the high-temperature area are known as thermophiles. They can live in habitats with a temperature exceeding 100°C through:

(i) Reduction in the amount of free water.

(ii) The occurrence of branched-chain lipids which reduce the fluidity of the cell membrane.

(iii) Possession of thermo-resistant enzymes to carry out metabolic functions without undergoing degradation.

5. List the attributes which populations but not individuals possess.
Solution:
(i) Natality or birth rate
(ii) Mortality or death rate
(iii) Population density
(iv) Population growth
(v) Age distribution
(vi) Sex ratio

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

Solution:

We know the exponential growth equation.

Where,

\[
N_t = N_0 e^{rt}
\]

Since \( N_t = 2; N_0 = 1, e = 2.71828; t = 3 \)

\[
2 = (1 \times 2.71828)^3r
\]

\[
log \ log 2 = 3 r \ log \ log (2.71828)
\]

\[
0.3010 = 3 r \times 0.4343
\]

\[
r = 0.2310
\]

Intrinsic rate of increase = 23.1%

7. Name important defence mechanisms in plants against herbivory.

Solution:

Important defence mechanisms in plants against herbivory is a modification of leaves into thorns and development of spiny margins on leaves. Many plants produce and store chemicals which make herbivores sick. For example, *Calotropis* produces highly poisonous cardiac glycosides. Some other chemical substances such as nicotine, quinine, opium etc. are produced by plants and provide defence against grazing animals.
8. 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?

**Solution:**

The interaction between the orchid and the mango tree is an example of commensalism, where the orchid gets space (benefited), and the mango tree is neither benefited nor harmed.

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

**Solution:**

The ecological principle behind the biological control of pest insects is based on the ability of a predator to regulate the prey population in that habitat. For example, Gambusia fish prey upon the larvae of mosquito and acts as a biological controller of malaria.

10. Distinguish between the following:

(A) Hibernation and Aestivation

(B) Ectotherms and Endotherms

**Solution:**

**(A)**

<table>
<thead>
<tr>
<th>Hibernation</th>
<th>Hibernation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hibernation is the stage of dormancy in winter. Animals which undergo hibernation are bears, snakes, bats, etc.</td>
<td>Aestivation is the stage of dormancy in summer. Animals which undergo aestivation are crocodiles, salamanders, snails, etc.</td>
</tr>
</tbody>
</table>

Many animals use this technique to tide over unfavourable environmental conditions.

**(b)**

<table>
<thead>
<tr>
<th>Ectotherms</th>
<th>Endotherms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ectotherms are cold-blooded animals with body temperature matching the environmental temperature.</td>
<td>Endotherms are warm-blooded animals which can regulate their body temperature by physiological means and maintain more or less constant internal temperature.</td>
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</tbody>
</table>

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

**Solution:**

Adaptations of desert plants and animals:

Several desert plants have a thick cuticle on their leaf surfaces, and their stomata are arranged in deep pits to minimise water loss by transpiration.

They also have a unique photosynthetic pathway (crassulacean acid metabolism (CAM)), which allows their stomata to remain closed during the day time.

Some desert plants, such as Opuntia, have no leaves. The leaves are reduced to spines.

The flattened stems take over the photosynthetic function.

Animals living in the desert have a thick skin to prevent water loss.

They concentrate their urine to conserve water.

Camels have padded feet which enable a smooth walk in the desert.

The water requirements of kangaroo rat in North American deserts are met by its internal fat oxidation in which water is a by-product.

**Adaptations of plants to water scarcity:**

Plants in water-scarce areas are called xerophytes.

The reduced permeability of the epidermal layer, stomata and cuticle maintain optimal amounts of water in the tissues by reducing transpiration.

Adaptations of the root system to acquire water from deep underground sources or directly from humid atmospheres (as in epiphytic orchids) and succulence, or storage of water in the swollen stem, leaf or root tissues are the adaptations of xerophytes.

The typical morphological consequences of these adaptations are collectively called xeromorphism.

**Behavioural adaptations in animals:**

Some animals show behavioural adaptations by moving away temporarily (migration) from a stressful habitat to a more hospitable area and return when a stressful period is over.

The best example of this is shown by migratory Siberian cranes.

During winters, they migrate to India because Indian lakes are full of water and sufficient prey during this period.
When winter is over, Siberian cranes return to their native land.

Importance of light to plants:

Autotrophic plants can produce their food through photosynthesis, a process which is only possible in the presence of sunlight, which acts as a source of energy.

Many species of small plants (herbs and shrubs) growing in forests are adapted to photosynthesise optimally under low light conditions because they are constantly overshadowed by tall, canopied trees.

Some plants are also dependent on sunlight to meet their photoperiodic requirement for flowering.

Effect of temperature or water scarcity and the adaptations of animals:

In most animals, the metabolic reactions function optimally in a narrow temperature range. However, there are several microbes which live in hot springs where the temperature is more than 100°C.

They have branched-chain lipids in the cell membranes and special resistant enzymes which deal with the high temperatures of their habitat.

Similarly, during water scarcity, the kangaroo rat undergoes internal fat oxidation in which water is a by-product.

It can concentrate its urine so that minimal volume of water is used to remove excretory products.

12. List the various abiotic environmental factors.

**Solution:**

Abiotic factors include climatic factors, such as light, wind, water, temperature and humidity, and edaphic factors, such as soil texture, pH, minerals, topography and substratum.

13. Give an example for

(A) An endothermic animal
(B) An ectothermic animal
(C) An organism of benthic zone

**Solution:**

(A) An example of endothermic animal is a human being (mammal).
(B) An example of ectothermic animal is a frog (amphibian).
(C) An example of an organism of the benthic zone is bacteria (decomposers).

14. Define population and community.

**Solution:**
Population: A collection of inter-breeding organisms of a particular species living together in the same geographical area at a time is called population.

Community: A group of organisms belonging to several different species which live together in the same area or habitat and interact through trophic and spatial relationships is called a community.

15. Define the following terms and give one example for each:

(A) Commensalism
(B) Parasitism
(C) Camouflage
(D) Mutualism
(E) Interspecific competition

**Solution:**

(A) Commensalism: Commensalism is an interspecific interaction between two species where one species is benefitted, and the other remains unaffected. Example: Orchid and mango tree.

(B) Parasitism: Parasitism is a relationship between two organisms where the larger animal is at harm, and the smaller animal is benefitted. Example: Malarial parasite and human beings.

(C) Camouflage: Camouflage is the ability of animals to blend with their surroundings or background. In this way, animals remain unnoticed for protection or aggression. Example: Stick insect.

(D) Mutualism: Mutualism is a relationship between two organisms where both organisms are benefitted. Example: Fungal symbiotic association with algae in lichens.

(F) Interspecific Competition: Interspecific competition is an interaction between individuals of two species where both the interacting species are affected. Example: Monarch butterfly and Queen Monarch.

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

**Solution:**
dN/dt=rN[(K-N)/N]

Where,
N=Population size
K=Carrying capacity
r=intrinsic rate of natural increase
t=time

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

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

(B) Positive acceleration phase: In this phase, the yeast cell population increases as it adapts to the new environment. However, the growth of the cell is very limited at the beginning of this phase.

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

(D) Negative acceleration phase: In this phase, the environmental resistance increases and the growth rate of the population decrease due to increased competition among the yeast cells for food and shelter.

(E) Stationary phase: In this phase, the population becomes stable. The number of cells produced in a population and the number of cells that die is equal. 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 best explains parasitism.
(A) One organism is benefitted.
(B) Both the organisms are benefitted.
(C) One organism is benefitted, other is not affected.
(D) One organism is benefitted, other is affected.

**Solution:** (D)

One organism is benefitted, other is affected. This statement explains parasitism.

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

**Solution:**

Three significant characteristics of a population are:

(i) **Density:** Density is expressed as the total number of individuals per unit area or volume at a given time. The size of the population is determined by the available resources nutrients, water etc. at a given time and other group properties such as natality, mortality and age structure.

(ii) **Natality:** Natality is the increase in the number of individuals in a population under given environmental conditions. Birth, hatching, germination and even vegetative propagation cause an increase in the number of individuals.

(iii) **Mortality:** The loss of individuals due to death in a population under given environmental conditions is called mortality.