NCERT solutions for class 12 biology chapter 13 organisms and populations

Q1. Bacteria cannot be seen with the naked eyes, but these can be seen with the help of a microscope. If you have to carry a sample from your home to your biology laboratory to demonstrate the presence of microbes with the help of a microscope, which sample would you carry and why?

Answer:

If you have to carry a sample from your home to your biology laboratory to demonstrate the presence of microbes with the help of a microscope, you can take curd with you because it consists of numerous lactic acid bacteria.

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

Answer:

Marine water fishes will not be able to survive in fresh water because marine water fishes are adapted to live in salt water conditions. If they are shifted to freshwater, the process of osmoregulation in them will be affected. Due to the internal high salt condition in fish, the freshwater will come inside the body of fish causing fishes to swell up, ultimately bursting.

Q3. Most living organisms cannot survive at temperature above 45ºC. How are some microbes able to live in habitats with temperatures exceeding 100ºC?

Answer:

Some microbes can survive in temperatures as high as 100^oC because these microbes are adapted to live at high temperatures. These organisms contain enzymes which can work at high temperature. This is why they can be found at thermal vents, hot springs etc. The organisms which are unable to survive high temperatures have enzymes that gats deactivated at high temperatures.

Q4. List the attributes that populations possess but not individual

Answer:

The term population refers to a group of individuals of any species living in a well-defined geographical area, sharing or competing for similar kind of resources and potentially interbreed.

Population Attributes: A population has certain attributes that an individual organism does not have. For example, individuals may have births and deaths, but a population has birth rates and death rates. The various population attributes are as follows:

1. 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.

2. Death rate(mortality)- It refers to the live deaths in an area to the population of an area. It is expressed as the number of individuals removes from the population.

3. Sex ratio- It is the ratio of the number of male or female individuals per 1000 individuals.

4. Age distribution- A population at a given time is composed of different individuals belonging to different age groups. If the age distribution is plotted for the population, the resulting structure is called age pyramids. The shape of pyramids reflects the growth status of the population.

5. Population density- The number of individuals of a population present per unit area at a given time.

Q5. If a population growing exponentially double in size in 3 years, what is the intrinsic rate of increase (r) of the population?

Answer:

$$t = log^2 rorr = log^2 t = 0.7931/3 = 0.264$$

Thus, if a population growing exponentially double in size in 3 years, the intrinsic rate of increase (r) of the population will be 0.264.

Q6. Name important defence mechanisms in plants against herbivory.

Answer:

The defence mechanisms in plants against herbivory are as follows:

1. Presence of thorns, spines, prickles and bristles

2. Stinging hirs

3. Hairy coating

4. Harbouring ants e.g. *Acacia*

5. Sticky glandular hairs e.g. *Gnaphalium*

6. Chemicals like latex, alkaloids and tannins having a bitter taste, offensive smell, silica and poisonous cardiac glycosides which herbivore animals do not like.

Q7. An orchid plant is growing on the branch of mango tree. How do you describe this interaction between the orchid and the mango tree?

Answer:

An orchid that grows on mango tree represents an interaction called commensalism. In this type of interaction, one species is benefitted while another one remains unaffected. Orchid acts as an epiphyte on the mango tree as it does not derive nutrition from it but uses it for support while mango tree remains unaffected.

Q8. What is the ecological principle behind the biological control method of managing with pest insects?

Answer:

The biological principle involved in the biological control method of managing pest insects is checking their population through predators and parasites. The predators act as biological control by preying upon insect pests.

Q9. Distinguish between the following: (a) Hibernation and Aestivation

Answer:

The differences between hibernation and aestivation are as follows

Hibernation	Aestivation

A state of reduction in activity in some organisms to escape winters	A state of reduction in activity in some organisms to escape extreme summers
E.g. Bears and squirrels	E.g. Fishes and snails

Q9. (b) Ectotherms and Endotherm

Answer:

The differentiation between ectotherms and endotherms is as follows:

Ectotherms	Endotherms
These are cold-blooded animals	These are warm-blooded animals
The change according to the variation in the environment	They maintain a constant internal environment despite the changing environment

Q10. Write a short note on

(a) Adaptations of desert plants and animal

Answer:

Plants found in deserts are well adapted to overcome the harsh desert conditions such as water scarcity and scorching heat. Adaptations of desert plants include

1. To reach to underground water, plants have an extensive root system.

2. They bear thick cuticles and sunken stomata on the surface of their leaves to reduce transpiration.

3. In Opuntia, the leaves are entirely modified into spines and photosynthesis is carried out by green stems.

4. A special pathway that is C4 pathway is found to synthesize food. It enables the stomata to remain closed during the day to reduce the loss of water through transpiration.

Animals found in deserts such as desert kangaroo rats, lizards, snakes, etc. are well adapted to their habitat. The kangaroo rat found in the deserts of Arizona never drinks water in its life. It has the ability to concentrate its urine to conserve water.

(b) Adaptations of plants to water scarcity

Answer:

Plants found in desserts are well adapted to cope with water scarcity and scorching heat of the desert. Some of these adaptations are as follows:

1. Plants have an extensive root system to tap underground water.

2. They bear thick cuticles and sunken stomata on the surface of their leaves to reduce transpiration.

3. In Opuntia, the leaves are modified into spines and the process of photosynthesis is carried out by green stems.

4. Desert plants have special pathways to synthesize food, called CAM (C4 pathway). It enables their stomata to remain closed during the day to reduce water loss by transpiration.

(c) Behavioural adaptations in animals

Answer:

Various organisms are affected by various environmental conditions. To overcome these environmental conditions, organisms undergo adaptations such as migration, hibernation, aestivation, etc. The adaptations in the behaviour of an organism are called behavioural adaptations. For example, ectothermic animals and certain endotherms exhibit behavioural adaptations. Ectotherms are cold-blooded animals such as fish, amphibians, reptiles, etc. Their temperature varies with their surroundings. For example, the desert lizard basks in the sun during early hours when the temperature is quite low. However, as the temperature begins to rise, the lizard burrows itself inside the sand to escape the scorching sun. Similar burrowing strategies are exhibited by other desert animals.

(d) Importance of light to plant

Answer:

The ultimate source of energy for plants is sunlight. Plants are autotrophic organisms, which need light in order to perform the process of photosynthesis. Plants need the sun because sunlight is made up of electromagnetic radiations which are given off as energy to the plants. These electromagnetic radiation acts as the key factor in a process that is

called photosynthesis. The photons of light energy are received by the chlorophyll molecules and they give off energy in the form of electrons. These electrons are than through a cyclic as well as non-cyclic flow are converted into chemical energy i.e. ATP and NADPH in the process of photosynthesis by which organic substances are formed in plants. Thus, light is a very important factor for plants and for the survival of all the components of Earth.

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

Answer:

Effects of temperature or water scarcity and the adaptations of animals: Temperature is considered to be the most important ecological factor. The average temperature varies from one place to another and these variations in temperature affect the distribution of plants as well as animals on the Earth. There are animals which cannot tolerate a wide range of temperature and these animals are called stenothermal animals. The animals which can tolerate a wide range of temperature are called eurythermal animals. Some animals also undergo adaptations to suit their natural habitats. For example, the animals found in colder areas have shorter ears and limbs in order to prevent the loss of heat from their bodies. Similarly, animals like polar bears have thick layers of fat below their skin and thick coats of fur to prevent the loss of heat in polar regions. Some animals show adaptations like hibernation and aestivation to escape harsh winter and summer conditions respectively in order to respond against the temperature conditions.

Water scarcity is another factor that forces animals to undergo certain adaptations to suit their natural habitat. Adaptations of desert animals are mainly to conserve the water. For example, Animals found in desserts such as desert kangaroo rats, lizards, snakes, etc.

are well adapted to their habitat. The kangaroo rat found in the deserts of Arizona never drinks water in its life. It has the ability to concentrate its urine to conserve water.

Q11. List the various abiotic environmental factors.

Answer:

Abiotic environmental factors- These are the non-living conditions present in an ecosystem. The various environmental factors are temperature, light, water, wind, humidity, precipitation, soil, minerals etc.

Q12. Give an example for:

(a) An endothermic animal

Answer:

Endothermic organisms are those which can regulate their body temperature. Examples of endothermic organisms include birds such as cow, sparrow, pigeons etc and mammals like bears, rats, cows.rabbits etc.

Q12. Give the example for:

(b) An ectothermic animal

Answer:

Ectothermic organisms cannot regulate their body temperature. Examples of ectothermic organisms include sharks, frogs, snakes, lizards, tortoises etc.

Q12. Give an example for:

(c) An organism of benthic zone

Answer:

Benthic zone refers to the floor of a water body. Decomposing bacteria are found in the benthic zone.

Q13. Define population and community

Answer:

Population- A group of individuals belonging to the same species and residing in a particular geographical area at a given period of time is called population. All humans living in a region constitute the population.

Community- A community refers to groups of individuals of different species living in a particular area at a given period of time. Such individuals can not breed with the members of other species.

Q14. Define the following terms and give one example for each

(a) Commensalism

Answer:

Commensalism- It is a kind of population interaction in which one species gets benefitted while the other one remains unaffected. E.g. Orchid growing on trees.

Q14. Define the following terms and give one example for each:

(b) Parasitism

Answer:

Parasitism- It is the interaction wherein one species (parasite) depends on the other species (host) for food and shelter. This is a kind of negative interaction as parasite gets benefitted but the host is harmed.

E.g . *Taenia solium* living in the intestine of human

Q14. Define the following terms and give one example for each:

(c) Camouflage

Answer:

Camouflage- This is an adaptive strategy adapted by prey species to escape the predators. For example, many species of frogs and insects camouflage in their surroundings and escape their predators.

Q14. Define the following terms and give one example for each:

(d) Mutualism

Answer:

Mutualism: The symbiotic relationship between two species in which both species are benefited is called mutualism. For example, lichens show a mutual symbiotic relationship between fungi and blue-green algae, where both are equally benefited from each other.

Q14. Define the following terms and give one example for each :

(e) Interspecific competition

Answer:

Interspecific competition: In this interaction, both species (different) get negatively affected. For example, the competition between flamingoes and resident fishes in South American lakes for common food resources i.e., zooplankton.

Q15. With the help of suitable diagram describe the logistic population growth curve.

Answer:

Logistic population growth curve

Growth of a population takes place according to the availability of food, presence of predators and parasites, presence of other biotic and abiotic factors affecting a population and other condition in a particular environment. There are two main types of models i.e. exponential growth model and logistic growth model.

Logistic growth curve represents the logistic growth model. It represents growth when there is a competition between the individuals of a population for food and space. In this case, the fittest organism survives, reproduces and population growth is seen. In this type of growth, initially, a lag phase is shown which is followed by phases of acceleration and de-acceleration. The different phases of the logistic growth curve are:

1. Lag phase- In this phase, no growth is seen due to the absence of food and other resources.

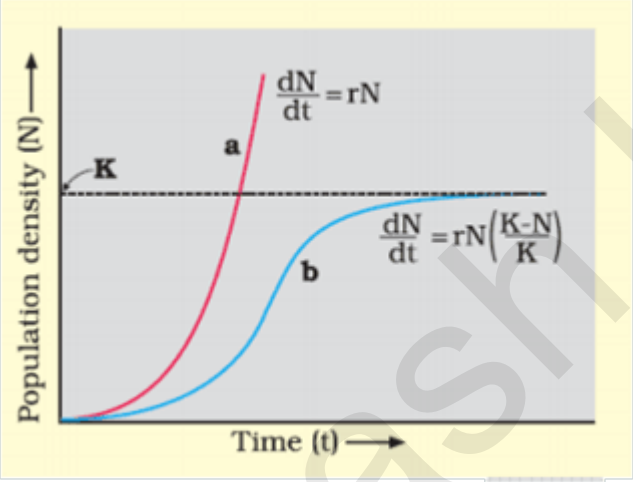
2. Positive acceleration phase- Limited growth in population is seen as the resources become available.

3. Exponential growth phase- The population grows suddenly and show very rapid growth. The curve rises steeply.

4. Negative acceleration phase- In this phase, environmental resistance increases and growth rate of the population decreases.

5. Stationary phase- In this phase, the growth becomes stationary and becomes stable. The population is said to have reached the carrying capacity of the habitat.

A diagrammatic representation of Population growth curves is given below. The curve a represents exponential growth and curve b represents logistic growth



The equation of the logistic growth curve is as follows:

$$dN/dt = rN(K - N/K)$$

Where N = Population density at time t

R = Intrinsic rate of natural increase

K = Carrying capacity

Since resources for growth for populations are finite and become limiting, the logistic growth model is considered a more realistic one.

Q16. 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.

Answer:

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

In parasitism, one organism lives on the body of another. In this interaction, the parasite gets benefitted while the host is negatively affected.

Q17. List any three important characteristics of a population and explain

Answer:

The term population refers to a group of individuals of any species living in a well-defined geographical area, sharing or competing for similar kind of resources and potentially interbreed. Some characteristics of the population are as follows:

1. 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.

2. Death rate(mortality)- It refers to the live deaths in an area to the population of an area. It is expressed as the number of individuals removes from the population.

3. Sex ratio- It is the ratio of the number of male or female individuals per 1000 individuals.

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