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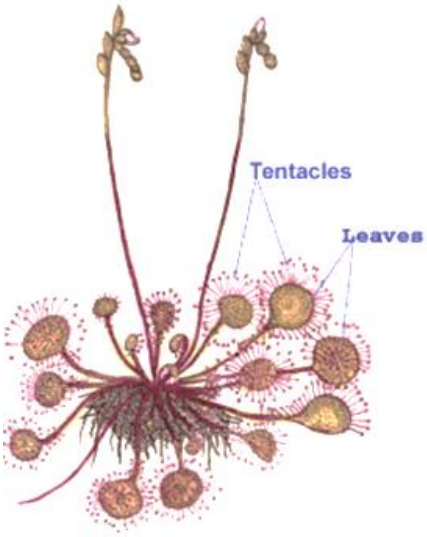
Class: XI
Subject: Biology
Topic: Mode of Nutrition
No. of Questions: 25

Q1. Make well labeled sketch of Drosera plant.

Sol:



Q2. Give an account of heterotrophic nutrition in plants.

Sol: Heterotroph organisms connot manufacture their own food. They are usually of three types, Saprophytes, Parasites, Insectivorous plants or carnivorous plants.

Saprophytes are non-green organisms which get their food from dead and decaying bodies. E.g. bacteria, fungi and some angiosperms. Monotrapa is known as indian pipe. It grows in the soil rich in humus. Birds nest orchid or Neottia also grows in forest in forest's humus rich soil. Parasite get their food from the host plant or animal. Parasitic plants are mainly of two types based upon their association with the host plant. They may be complete or partial parasites. The example of these parasites are,

Total stem parasite – Cuscuta reflexa (Dodder or Amarbel) on the host citrus, duranta etc.
Total root parasite- Orobanche, Rafflesia, balanophora (Frown rope) and Strigia.
Partial stem parasite – Viscum (Mistletoe) and Loranthus and Cassytha.
Partial root parasite – Santalum album (Sandlewood).

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Insectivorous plants feed on insects to obtain nitrogen food requirement. They are called partly autotrophs and partly heterotrophs. E.g. Nepenthes khasiana. (Pitcher plant), Drosera (Sundew), Dionea muscipula (Venus fly trap), Aldrovanda (water flea trap) and Utricularia (Bladder wort). Some green plants only prepare their own carbonaceous food as for nitrogenous compounds they capture insects and small animals and feed upon them absorbing only the nitrogenous compounds from their bodies.

Such plants are called carnivores or insectivorous plants, E.g. Sundew, Venus fly trap, Pitcher plant. Etc.
In the pitcher plant the leaf becomes modified into a pitcher and the mouth of the young pitcher is covered by a lid. The inner surface of the pitcher contains various digestive glands, which secrete the digestive agent, which helps in the digestion of proteins only. Hair like structures es is present below the mouth, which pr events the insects from coming out. Pitcher is partially filled with a fluid, and animals and small insects when enters the pitcher they get drowned and after their death digestion starts. Proteins are converted into peptones and peptones to amines. Only amines are absorbed by the pitcher and rest of the material.
The leaves of the sundew plants are covered with hails that secrete sticky fluid at the trips. This sticky fluid glisten in light and hence this plants is called as sundew. An insect when visit this plant gets struck and the enzymes secreted by the heirs digest the insect and the product are absorbed by the leaf surface.

Q3. Explain briefly the special modes of nutrition in plants.

Sol: Special modes of nutrition in plants — There are two modes of nutrition in plants, Autotrophic nutrition and Heterotrophic nutrition.
Autotrophic nutrition — Green plants prepare their own food. They fall into two categories namely chemoautott ophic and photoautotrophic. *Nitrosomonas* and *Nitrosococcus* are chemosynthetic bacteria. All green plants are autotr ophic.
Heterotrophic nutrition — They may be parasitic, sap otr ophic, symbionts and insectivorous plants.
Parasites — They may be obligate parasite and semi parasites. Obligate parasites get their food from their host plants. They may be total root parasites or total stem parasites. *Orobanche* and *Rafflesia* are total root parasites while *Cuscuta reflexa* is a total stem parasite. Partial parasites may be partial stem parasites and partial root parasites. *Loranthus* and *Viscum* are partial stem parasites. Sandal wood tree is partial root parasites.
Saprophytes — E.g. *Monotropa, Neottia.* They grow in soil rich in humus and organic matter. *Monotropa* occurs in pine forests and its underground
ound
part for ms endotropic *Mycorrhizae* to absorb food.
Symbiotic plants — E.g. Lichens. They are an association of algae and fungal partners. Algae provide food to the fungal partner. Fungal partner gives minerals and water to the algae.
Carnivorous plants — These plants trap insects to get nitrogen. Insectivorous plants are *Nepenthes,* Sundew, *Utricularia, Drosera* etc.

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Q4. What are parasites? How are they dependent on other plants for their food?

Sol: Parasites drive their food from the host e.g. fungi and bacteria. They are non-chlorophyllus plants. They live at the expense of others. They show parasitism. They are classified into two types:
Total parasites and
Partial parasites.
Classification of parasites:

Types of parasites	Sub-type	Examples
Total parasites	Total stem parasites	Cuscuta is a pale thin stem parastite on the host plants like Citrus and Zizyphus etc. Haustaria penetrate into host tissue and absorb water and minerals from host.
	Total root parasites	Orobanche grows on the root of potatoes, brinzal, turnip etc. Balanophora grows on forest trees.
Partial parasites	Partial stem parasites	Viscum parasitizes pear, apple and walnut trees. Its shoot remains attached by Haustoria to the host plant and absorbs water and minerals.
	Partial root parasites	Santalum grows on roots of Dalbergia. It has green leaves. It absorbs water and minerals from the host.

Q5. What type of condition is created by leghaemoglobin in the root nodules of legumes?

Sol: Anaerobic condition is created by leghaemoglobin in the loot nodules of legumes.

Q6. Define mineral nutrition.

Sol: The process, which involves absorption and utilization of mineral elements by the plants for their growth and development, is called mineral nutrition.

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Q7. In which process nitrogenase enzyme is useful?

Sol: Nitrogenase enzyme is useful in biological fixation of nitrogen.

Q8. Differentiate between macro-elements and micro-elements.

Sol.

Macro-elements	Micro-elements
(1) They are present in plants in relatively large concentrations.	(i) They are present in plants in very small amounts.
(2) Their concentration per gram of plant dry matter is atleast 1 mg.	(ii) Their concentration is less than 1mg per gram of plant dry matter.
(3) They build up the plant body and different cell constituents.	(iii) They do not have such roles.
(4) Some of the macronutrients contribute to the development of osmotic potential in the cells.	(iv) They have no significant role in the development of osmotic potential in the cells.
(5) They do not become toxic in slight excess.	(v) Microelements are toxic in slight excess.

Q9. Write the symptoms of mineral deficiency in plants.

Sol: The most common type of deficiency symptoms developing in plants are
Chlorosis: Loss or non-development of chlorophyll, resulting in yellowing of leaves.
Necrosis: Localised death of tissues.
Mottling: Appearance of patches of green and non-green areas on the leaves.
Stunted growth: Retardation of growth resulting in rosette appearance of the plant.
Abscission: Premature fall of flowers and fruits.
(vi) Leaf curls: Cur ling of leaves due to unequal growth.

Wilting: Loss of turgor resulting in the drooping of leaves and young shoots.
Heart rot: Softening or rotting of internal tissues. (xi) Die-back: Death of shoot apex.
(x) White bud: Chlorosis of young leaves and buds.

Q10. Define mineral nutrition.

Sol: Plants require a number of miner al nutrients for their growth and development which do not occur in the plant body in free of state. The utilization of these elements by the plant for its growth and development is called mineral nutrition.

Q11. What do you understand by the term hunger signs?

Sol: Specific deficiency symptoms of a particular miner al nutrient are called hunger signs.

Q12. What are fertilizers?

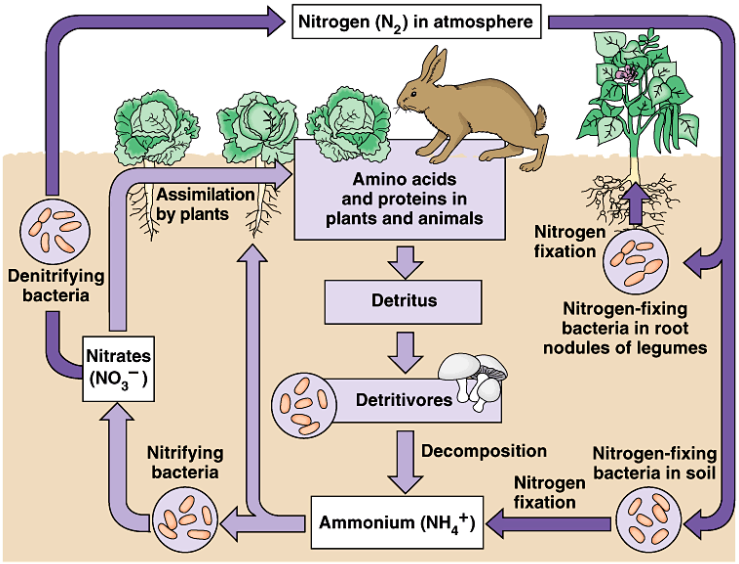
Sol: Fertilizers are the chemicals or mixture of chemicals, which are added to the soil to overcome the deficiency of minerals.

Q13. Name soil bacteria which is capable of converting ammonia to nitrates.

Sol: Nitrosomonas is a soil bacterium, which is capable of converting ammonia to nitrates.

Q14. How does nitrate get assimilated in plants?

Sol: Nitrate is the most important source of nitrogen for plants. Though it can accumulate in the cell sap of sever all plants and take part in producing osmotic potential, it cannot be used as such by the plants in the synthesis of organic compounds. It is first reduced to ammonia before being incorporated into organic compounds. The process of nitrate reduction to ammonia is carried out in two steps, each mediated by a specific enzyme.



(i) Reduction of nitrate to nitrite: First the nitrate is reduced to nitrite by an enzyme called nitrate r eductase. The enzyme contains FAD as prosthetic group, which receives hydrogen from reduced coenzyme for the reduction of the nitrate. The reduced coenzyme selves as hydrogen donor and molybdenum serves as an electron carrier in the process.

(ii) Reduction of nitrite: The nitrite ions are then reduced to ammonia by an enzyme called nitrite reductase. This enzyme does not require molybdenum but requires copper and iron for its activity. The enzyme nitrate r eductase occurs inside the chloi oplasts in the leaf cells and

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leucoplasts of other cells. The reduced coenzyme serves as a hydrogen donor in illuminated cells and NAD + H+ in others for the reduction of nitrites. The process of reduction also requires ferredoxin, which occurs in higher plants mostly in the leaves. Therefore, e, nitlite ions formed in other parts of the plant are transported to leaves for their reduction to ammonia. Ammonia combines with some organic acids to produce amino acids. Amino acids then form various types of nitrogenous compounds.

Q15. What protects nitrogenase?

Sol: Leghaemoglobin protects nitrogenase.

Q16. Mention the criteria to determine the essentiality of an element.

Sol: The criteria are to deter mine the essentiality of an element is as follows:
The element must be absolutely necessary for supporting normal growth and reproduction.
The requirement of the element must be specific and not replaceable by another element.
The element must be directly involved in the nutrition of the plant. For example, magnesium is an essential element because it is the constituent of chlorophyll and is essential for photosynthesis. It cannot be replaced by any other element for the same function. It is also required as a co-factor by many enzymes involved in cellular respiration and other metabolic pathways.

Q17. What are the sources of essential elements for plants?

Sol: All elements, which enter into plants, are ultimately derived from the atmosphere, water and soil. Car bon enters the plants from the atmosphere as car bon dioxide, while hydrogen is obtained mainly from water. Oxygen is supplied from the air or water and often in the form of inorganic ions. Although, free nitrogen is present in abundance in the atmosphere, it is inert and most plants are unable to use it directly. Due to atmospheric activities, free atmospheric nitrogen combines with oxygen and is brought down by rain to the soil. Certain microorganisms called nitrogen fixers, present in the soil, convert nitrogen gas to ammonic form such as nitrate or ammonium. These are absorbed by the plants through the roots and are assimilated as organic nitrogen. The plants in turn provide organic nitrogen to the heterotrophic organisms. All the other elements needed by the plants, are absorbed from the soil, which are ultimately derived from the parent rocks by disintegration and weathering.

Q18. Name the enzyme that can reduce nitrogen to ammonia?

Sol: The enzyme that can reduce nitrogen to ammonia is nitrogenase enzyme.

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Q19. What is hydroponics? Mention their uses.

Sol: The system of growing plants on a large scale in soil less cultures is known as hydroponics. Hydroponics is useful in areas having infertile and dry soils. They grow free of soil pathogens and do not require weeding. They often provide consistently good yield of season vegetables and flowers.

Q20. Which are the two macronutrients that usually play the most important role in limiting plant growth globally?

Sol: Nitrogen and calcium are the two macronutrients that usually play the most important role in limiting plant growth globally.

Q21. A nutritionally wild type organism, which does not require any additional growth supplement, is known as:

A. Holotype
B. Auxotroph
C. Prototroph
D. Phenotype

Sol: (c)

Q22. Which one of the following is not a micronutrient?

A. Magnesium
B. Molybdenum
C. Boron
D. Zinc

Sol: (a)

Q23. The function of leg hemoglobin in the root nodules of legumes is

A. Oxygen removal
B. Inhibition of nitrogenase activity
C. Expression of nif gene
D. Nodule differentiation

Sol: (a)

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Q24. Which of the following is a bacterium involved in denitrification?

A. Azotobacter
B. Nitrosomonas
C. Pseudomonas
D. Nitrobacter

Sol: (c)

Q25. Which one of the following elements in plants is not remobilized?

A. Calcium
B. Phosphorus
C. Sulphur
D. Potassium

Sol; (a)