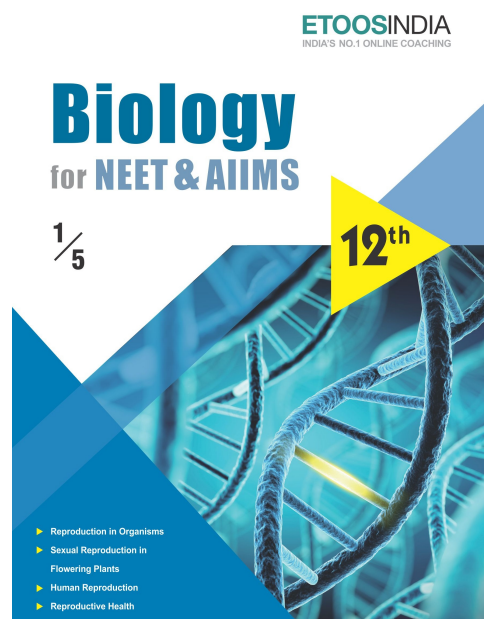
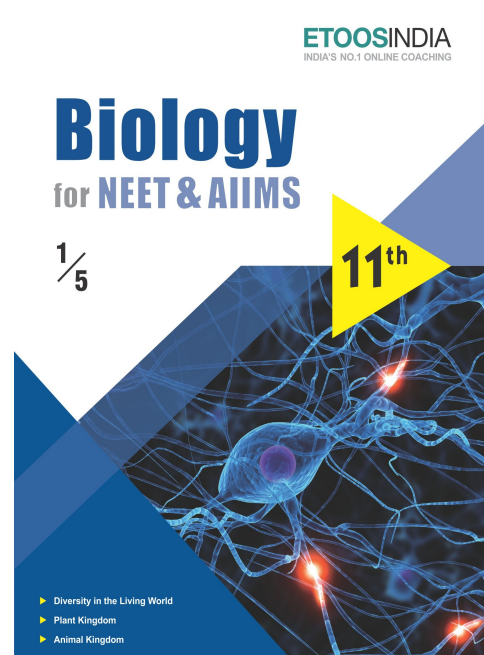
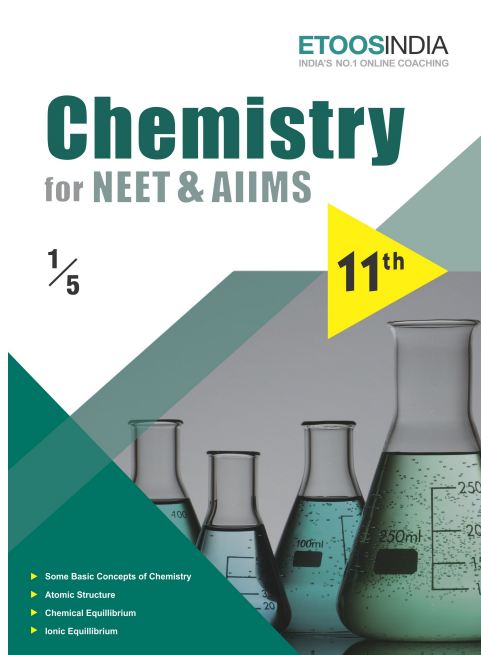
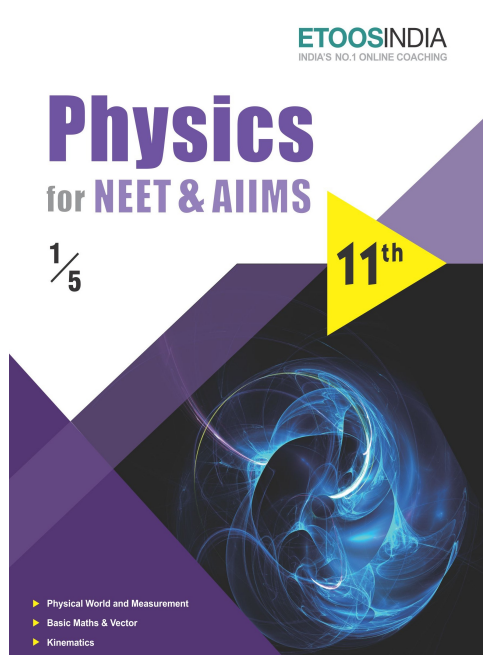


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# PLANT KINGDOM

*“The ‘cure,’ it seemed, had once again been proven to be ‘worse than the disease.’”*

**“R.H. WHITTAKER (1920-1980)”**

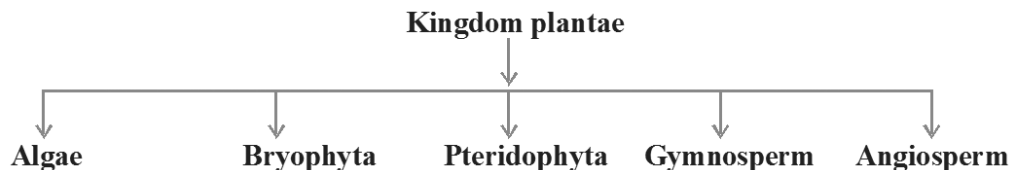
## INTRODUCTION

**I**n this chapter we will discuss about the classification of Plant kingdom. The broad classification of living organisms was given by Whittaker (1969) where in he suggested five kingdom classification i.e. Monera, Protista, Fungi, Animalia and Plantae.

Fungi and members of Monera and Protista having cell walls have now been excluded from Plant though earlier classification placed them in same kingdom. So, the cyanobacteria that are also referred to as blue green algae are not ‘algae’ any more. This chapter will also include Plantae under Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

**PLANT KINGDOM**

All the multicellular eukaryotic plants are placed in Kingdom-Plantae. They are autotrophic i.e. they manufacture their food by photosynthesis.

**ALGAE**

Term "Algae" was given by **Linnaeus**.

Phycology - Study of algae.

Father of Phycology - **Fristch** → Book → "Structure & Reproduction of algae"

Father of Indian phycology - **M.O.P. Iyengar**

**NATURE**

- (1) Algae are found in both fresh and marine water.
- (2) Algae are found in many forms like filamentous, colonial.
- (3) Algae are surrounded by mucilagenous sheath and below the sheath cell wall is present which is made up of cellulose and pectin but mainly made up of cellulose, galactans, mannans and mineral like calcium carbonate.
- (4) On the basis of structure, algae are thalloid i.e. plant body is not differentiated into root, stem and leaves. **Tissue system** is also absent in algae.
- (5) On the basis of nutrition, algae are photoautotrophic. They have chloroplast in which photosynthetic pigments are present. Classification of algae is mainly based on pigments. **Chl-a** and **β carotene** are **universal pigment** of algae.

**REPRODUCTION****(1) Vegetative**

**Vegetative reproduction :**

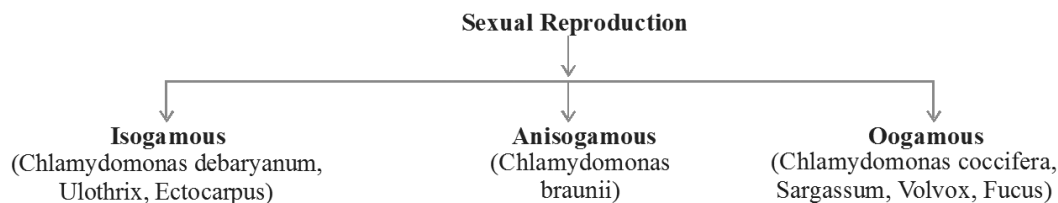
- (i) **Binary fission** - Cell is divided into two parts and nucleus is also divided into two parts by mitosis.  
eg. Found only in unicellular algae
- (ii) **Fragmentation** - Filaments break down into small pieces & form new filaments.  
eg. All filamentous algae

**(2) Asexual****(3) Sexual**

**Asexual reproduction :** It is a method of protection in all unfavourable conditions.

**Sexual reproduction :**

- (i) Male sex organ is called **antheridium** and female is called **oogonium**. The sex organs of algae are **unicellular & jacketless**. But exceptionally sex organs of green algae **Chara** (Chara - green algae - known as stone wort) are multicellular and Jacketed. The male sex organ of **Chara** is known as **globule** and female is known as **nucule**.
- (ii) Plant body of algae is haploid so sexual reproduction take place through **zygotic meiosis**. So their life cycle is **haplontic**. But exceptionally brown algae are diploid so that sexual reproduction takes place through gametic meiosis in them. So their life cycle is **diplo haplontic**.
- (iii) Algae reproduce by **zygotic meiosis** i.e. first division in zygote is meiosis so embryo is not formed. Sexual reproduction is of three types



**Check Point :**

- (1) *Chlamydomonas* exhibits complete evolution of sexual reproduction.
- (2) *Ulothrix* exhibits origin of sexual reproduction

**The classification of algae is mainly based on the photosynthetic pigments. In addition to this, cell wall composition and stored food are also the base of classification.**

Algae is divided into following divisions

- |                 |   |                      |
|-----------------|---|----------------------|
| (1) Chlorophyta | - | Green Algae          |
| (2) Phaeophyta  | - | Brown Algae          |
| (3) Xanthophyta | - | Yellow - Green Algae |
| (4) Rhodophyta  | - | Red Algae            |

**CHOLOROPHYTA GREEN ALGAE**

Green algae are the **most advanced** algae. It is believed that green algae are the ancestors of the higher plants.

**Habitat :** Green algae are cosmopolitan in nature.

**Different forms of Green algae (Structure) :**

Green algae are found in many forms

(1) **Unicellular :-**

- (i) **Chlamydomonas** - Motile unicellular algae. This algae moves with the help of flagella.
- (ii) **Chlorella** - Non motile unicellular alga.  
Calvin discovered "Calvin Cycle" by experimenting on *Chlorella*.
- (iii) **Acetabularia** - Umbrella plant - It is the largest unicellular plant. The diameter of its cell is 10 cm.  
Hammerling experimented on *Acetabularia*.

(2) **Coenocytic** - Some green algae are coenocytic i.e. multinucleated.

eg. *Caulerpa*

**Check Point :** According to five kingdom system the algae described above should be placed in Protista but exceptionally due to their life cycle is similar to green algae. they are placed in Plantae. But now modern scientist place above algae in protista.

(3) **Colonial** - Some green algae are found in colonies. They form colony of cells. The number of cells in a colony is fixed. Colony with fixed number of cells called coenobium.

eg. *Volvox* - Motile colony

*Hydrodictyon* - Non motile colony (called as water net)

(4) **Multicellular filamentous** - Mostly algae are multicellular filamentous.

eg. *Ulothrix* - ( pond wool), *Spirogyra* - (pond silk)

**Check Point :** some green algae are heterotrichous i.e. two types of branches prostrate and erect - *Fritschiella*, *Stigeoclonium*, *Coleochaete* (*Fritschiella tuberosa* has approach to the early land plants).

(5) **Multicellular thalloid or Parenchymatous** - Some algae are multicellular in length & width.

eg. *Ulva* - it is also known as sea lettuce.

## BRYOPHYTA

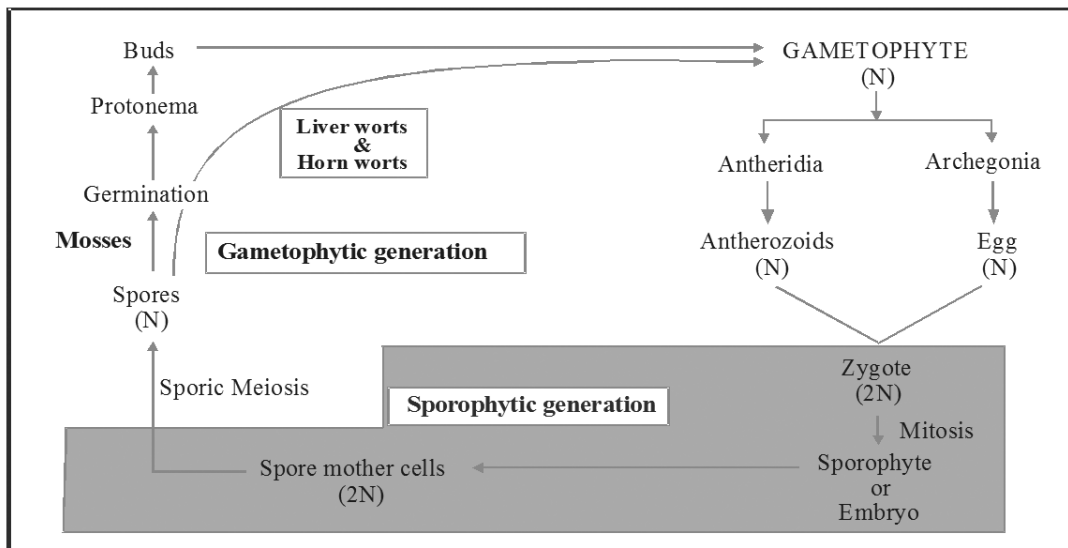
- The term "**Bryophyta**" was proposed by "**Robert Braun**".
- The study of Bryophytes is known as **Bryology**.
- **Hedwig** is considered to be the father of Bryology. But according to some scientist it is believed that **Cavers** is the father of Bryology.
- Father of Indian Bryology is **Prof. Shiv Ram Kashyap**.

### GENERAL CHARACTERISTICS :

1. Bryophytes are the first land plant. It is believed that, they **originated from aquatic plant** and they come on land through water. Because some bryophytes have characters similar to aquatic plants (eg. presence of air canal)
2. Bryophytes are not considered as the successful land plants because *vascular tissue* is absent and they need water for fertilization. Due to the absence of vascular tissue bryophytes cannot grow very tall. The process of water conduction in bryophytes takes place with the help of **parenchyma**. Parenchyma is a living tissue.
3. Bryophytes are known as *amphibians* of the plant kingdom, because they need water to complete their life cycle. Mostly bryophytes are found on land.
4. Bryophytes are sciophytes, i.e. bryophytes prefer to grow in moist (wet) and shady places.
5. Roots are absent in bryophytes. Stem and leaves of bryophytes are functionally similar to the stem and leaves of higher plants.

### Life cycle of Bryophytes :

1. The plant in bryophyte is gametophyte. It is haploid.
2. Sex organs are formed on gametophyte. Sex organs are multicellular and jacketed in bryophytes. Male sex organs are called as antheridium and female sex organs are called as archegonium.
3. The male gametes of bryophytes are motile. These motile male gametes are called as *antherozoids*. Antherozoids are comma shaped and biflagellate. Female gamete is called egg.



## PTERIDOPHYTA

**Term pteridophyta was proposed by Haeckel**

**The study of pteridophytes is known as pteridology.**

**Pteridophytes are known as reptiles of plant kingdom.**

1. Pteridophytes are also called as **vascular cryptogames**. Pteridophytes are **vascular plants** i.e. xylem and phloem are present in it. In pteridophytes, vessels in xylem and companion cells in phloem are absent. But exceptionally xylem of **Pteridium**, **Selaginella** and **Marsilea** contains false vessels. These false vessels, are formed by the modification of tracheids, so false vessels are tracheids.  
**Type of vascular bundle** - Concentric, Amphicribal, mesarch condition and closed.  
**Note :- Secondary growth is absent (due to absence of cambium) in pteridophytes but exceptionally secondary growth is present in stem of Isoetes.**
2. Pteridophytes are called as the first successful terrestrial plants i.e. they are more adapted terrestrial plants as compared to bryophytes. It is because vascular tissue is present in pteridophyta and they have roots.
3. Pteridophytes are **not completely successful** terrestrial plants because they need water for fertilization, so pteridophytes grow in shady and moist places.
4. In pteridophyta, the plant body is completely differentiated in to **root, stem and leaves** hence their body is called as cormophyte.
  - The primary root remains alive for short period. After some time it is replaced by *adventitious* roots.
  - Stem is erect or prostrate. In some pteridophytes stem is underground, which is known as *rhizome*.
  - On the basis of leaves, pteridophytes are of two types -  
**First** in which stem is smaller while leaves are larger. They are known as *macrophyllous* Pteridophytes.  
*eg. Pteridium, Pteris, Marsilea*  
**Second**, in which stem is larger and leaves are smaller. They are called as *microphyllous* Pteridophytes.  
*eg. Equisetum, Lycopodium, Selaginella***Note : Differentiation in plant body starts from bryophytes.**

### LIFE CYCLE OF PTERIDOPHYTES

1. Plant is **sporophyte**. i.e. diploid.  
 Most of the pteriophytes are **homosporus** i.e. only one type of spores are formed during reproduction.  
*eg. Lycopodium, Pteridium, Equisetum, Dryopteris*  
**Exception** - Some pteridophytes are **heterosporus** i.e. two types of spores **microspores** and **megaspores**.  
*eg. Selaginella, Isoetes, Marsilea, Salvinia, Azolla, Stylites, Pillularia, Regellidium*

eg. of Ferns :

**Pteridium**

**Pteris**

**Dryopteris**

**Dryopteris**

**Adiantum**

They are called "Braken fern" or "Sun fern"

- Also called as Brook shield fern'

- **Walking fern** or Maiden hair fern

This name is given to them due to rapid vegetative reproduction. Vegetative reproduction in *Adiantum* takes place by means of leaf tip. It spreads very fast.

**Osmunda** - Royal fern or flowering fern

**Ophioglossum** - *Adder's tongue fern*

**Marsilea** - *Pepper wort fern*

**Azolla** - Aquatic fern (Smallest pteridophyte and biofertilizer)

**Onychium** - Golden fern

**Cyathea** - Lofty tree fern

**Alsophila** - Tree fern (Largest pteridophyte)

**Chielanthus** - Silver fern

**Botrychium** - Moon wort fern

### ETOOS KEY POINTS

(1) **Selaginella** – Vivipary is present in it i.e. **partial endosporic** germination. Seed habit was originated in *Selaginella* like pteridophytes.

- Ligulate leaves (tongue shaped) are present in it

**Function** - Ligule is secretory structure, which secretes water and keeps the sporangium and the young leaf moist.

(2) In some pteridophytes sporangia are not formed on lower surface of sporophylls -

- In some pteridophytes sporangia are formed at the axil of leaf.

eg. **Selaginella**

- In some pteridophytes sporangia are formed in spike.

eg. **Ophioglossum**

- In some pteridophytes sporangia are formed in sporocarp.

eg. **Marsilea, Azolla**

**Habitat of some important pteridophytes** - Most of the pteridophytes are found in moist soil and shady places.

(1) **Aquatic** - Some pteridophytes are found in water.

eg. *Marsilea, Salvinia, Azolla, Isoetes*

(2) **Epiphytes** - Some pteridophytes grow on other plants.

eg. *Lycopodium phlegmeria, Ophioglossum pendulum, Pleopeltis*

(3) **Xerophytes** - Some pteridophytes are found in deserts.

eg. *Selaginella rupestris, Selaginella bryopteris*

*Selaginella lepidophylla*

## **GYMNOSPERM**

1. Term Gymnosperm was given by Theophrastus.
2. Study of Gymnosperm known as Gymnospermology.
3. Gymnosperm & Angiosperm are collectively included under spermatophyta i.e. seed bearing plants.
4. Gymnosperms are naked seeded plant i.e. no fruit formation takes place in these plant.  
i.e. in gymnosperm embryo & seed formation takes place but no fruit formation occur.
5. Gymnosperms are very limited in distribution. They are mainly found in cold regions. In India Gymnosperms are found on Himalayan mountains. They occur on slopes of mountain in cold region therefore gymnosperms are **xerophyte**.
6. All gymnosperm are vascular plants. Therefore vascular tissue present i.e. xylem & phloem. Xylem lack **vessels** & phloem lacks **companion cells**.

**Note :**

- Exceptionally in xylem of **Gnetum, Ephedra, Welwitschia** true vessels are present.
  - In gymnosperms vascular bundle is **Conjoint-Collateral-Endarch-Open**.
  - In the vascular bundle cambium is present therefore secondary growth takes place in gymnosperms, so that Gymnosperms are woody plants.
7. Most of the gymnosperms are arborescent (woody and tree habit) - but some are present as shrub.  
**eg. Ephedra**  
Some Gymnosperm are liana or woody climbers.  
**eg. Gnetum ula**

**LIFE CYCLE OF GYMNASPERM**

1. In Gymnosperms main plant body is **sporophyte** (diploid). All Gymnosperm are **dioecious**. i.e. male & female plants are separate, but exceptionally Pinus is monoecious.
2. All Gymnosperms are **heterosporus**. At the time of reproduction two types of spores are formed.
  - Microspores form – Male gametophyte
  - Megaspores form – Female gametophyte
3. These two types of spores are formed in different sporangia.
  - Microspores are formed in Microsporangia. Microsporangia are also termed as pollen sac.
  - Megaspores are formed in Megasporangia. Megasporangia are also termed as ovule.
4. Both type of sporangia are formed on different sporophylls.
  - Microsporangia are formed on Microsporophyll. It is known as stamen.
  - Megasporangia are formed on Megasporophylls. It is known as carpel.
5. Both types of sporophylls are found in groups & form male cone (strobilus) & female cone.
  - **Gymnosperm's cone are just like flower or inflorescence of angiosperm.**
  - **Carpels of Angiosperm & Gymnosperm are different to each other.**



- Kingdom plantae includes all eukaryotic chlorophyllous autotrophic organisms. A few members
- The gametes of these algae are pyriform (pear shaped) and bear two laterally attached flagella.
- Common members of phaeophyceae are - Ectocarpus, Dictyota, Laminaria, Sargassum & Fucus.

**1. RHODOPHYCEAE (Red algae)**

- Majority of red algae are found in marine water with greater concentrations in warmer areas.
- The reserve food in red algae is floridean starch which is very similar to amylopectin and glycogen.
- Sexual reproduction in red algae is Oogamous and accompanied by complex post fertilisation developments.
- Examples of red algae are Polysiphonia, Porphyra, Gracillaria, Gelidium.

**2. BRYOPHYTA**

- Bryophytes lack true roots, stem or leaves. They may possess root like, stem like or leaf like structures.
- Main body of bryophytes is made of haploids cells and it produces gametes hence is called as gametophyte.
- Sporophyte in them is not free living, but attached to the photosynthetic gametophyte and derives nourishment from it.
- Sphagnum provides peat that have long been used as fuel and also used as packing material for trans-shipment of living material because of its high water holding capacity.
- Mosses along with lichens are the first organisms to colonise rocks and hence are of great ecological importance.
- Mosses form dense mats on the soil, they reduce the impact of falling rain and prevent soil erosion. LIVER WORTS
- The plant body of liver wort is thalloid and the thallus is dorsiventral and closely appressed to the substratum.
- The leafy members of liverworts have tiny leaf like appendages in two rows on the stem like structures.
- Asexual reproduction in liverworts takes place by fragmentation of thalli or by the formation of specialised structures called gemmae (gemma-singular). Gemmae are green multicellular, asexual buds, which develop in small receptacles called gemma cups.
- The sporophyte is differentiated into a Foot, Seta and Capsule (Marchantia). After meiosis spores are produced within the capsule. "MOSS
- The gametophyte body of moss is made up of two stages.
  - (i) Protonema - first stage produced from spore.
  - (ii) Leafy stage - The second stage produced from buds of protonema.
- Vegetative reproduction in mosses is by fragmentation and budding in the secondary protonema.
- Common example of mosses are Funaria, Polytrichum and Sphagnum.

**3. PTERIDOPHYTA**

- In pteridophytes the main plant body is sporophyte which is differentiated into root, stem & leaves. They have well differentiated vascular tissues.
- The leaves in pteridophyta are small (microphylls) as in Selaginella or large (macrophylls) as in ferns.
- Only few genera of pteridophytes show heterospory; they produce two types of spores, Macrospores (large) and Microspores (small).
- In heterosporous pteridophytes the female gametophytes are retained on the parent sporophyte for variable period. The development of zygote into young embryo takes place within the female gametophytes. This is precursor to the seed habit, considered as an important step in evolution.

**4. GYMNOSPERMS**

- In gymnosperms ovules are not enclosed in ovary walls and remain exposed both before and after fertilisation, so they produce naked seeds.
- Gymnosperms are medium sized trees or tall trees and shrubs .
- The giant redwood tree Sequoia is one of the tallest tree species .
- In gymnosperms the stem may be unbranched (Cycas) or branched (Pinus, Cedrus)
- The leaves may be simple or pinnately compound.
- The leaves in gymnosperms are well adapted to withstand extremes of temperature, humidity and wind. In conifers,

**SOLVED EXAMPLE**

**Ex.1** Fusion of two motile gametes which are dissimilar in size is termed as

- (A) oogamy (B) isogamy  
(C) anisogamy (D) zoogamy.

**Sol.** (C) : Anisogamy is fusion of two motile gametes dissimilar in size. It is observed in some species of Chlamydomonas. Oogamy is also fusion of two dissimilar sized gametes in which female gamete is larger but non-motile.

**Ex.2** Cyanobacteria are classified under

- (A) Protista (B) Plantae  
(C) Monera (D) Algae.

**Sol.** (C) : Cyanobacteria are classified under Kingdom Monera as they are prokaryotes. They are generally photosynthetic in nature and contain pigments, chlorophyll a, and carotenoids, etc. Nostoc and Oscillatoria are examples of this category.

**Ex.3** If the diploid number of a flowering plant is 36, what would be the chromosome number in its endosperm?

- (A) 36 (B) 18  
(C) 54 (D) 72

**Sol.** (C): Endosperm of flowering plants is a triploid structure. As  $2n = 36$ , then  $n = 18$ , therefore  $3n = 54$ .

**Ex.4** A plant shows thallus level of organisation. It shows rhizoids and is haploid. It needs water to complete its life cycle because the male gametes are motile. It may belong to

- (A) pteridophytes (B) gymnosperms  
(C) monocots (D) bryophytes.

**Sol.** (D) : Bryophytes are non-vascular terrestrial plants of moist habitat in which a multicellular diploid sporophyte lives as a parasite on an independent multicellular haploid gametophyte that develops multi-cellular jacketed sex organs. True roots are absent, instead rhizoids occur, which may be unicellular or multicellular. An external layer of water is essential for the swimming of male gametes to the archegonia.

**Ex.5** Plants of this group are diploid and well adapted to extreme conditions. They grow bearing sporophylls in compact structures called cones. The group in reference is

- (A) monocots (B) dicots  
(C) pteridophytes (D) gymnosperms.

**Sol.** (D) : Gymnosperms are those seed plants in which the seeds remain exposed over the surface of the megasporophylls because the latter are not folded to form pistils. Flowers are absent. Two types of sporophylls, microsporophylls and megasporophylls are usually aggregated to form distinct cones or strobili, pollen cones (male cones) and seed cones (female cones) respectively.

**Ex.6** The embryo sac of an angiosperm is made up of

- (A) 8 cells (B) 7 cells and 8 nuclei  
(C) 8 nuclei (D) 7 cells and 7 nuclei.

**Sol.** (B) : Female gametophyte or embryo sac of angiosperms develops upto 8-nucleate, 7-celled state prior to fertilisation. There is a three celled apparatus (one egg cell or oosphere and two synergids), three antipodal cells and two polar nuclei. The two polar nuclei fuse to form a diploid secondary nucleus.

**Ex.7** Protonema is

- (A) haploid and is found in mosses  
(B) diploid and is found in liverworts  
(C) diploid and is found in pteridophytes  
(D) haploid and is found in pteridophytes.

**Sol.** (A): The predominant stage in the life cycle of a moss (bryophyte) is the gametophyte which consists of two stages. The first stage is the protonema stage, which develops directly from a spore. It is a creeping, green, branched and frequently filamentous stage. The second stage is the leafy stage, which develops from the secondary protonema as a lateral bud. It consists of upright, slender axes bearing spirally arranged leaves attached to the soil through multicellular and branched rhizoids. This stage bears the sex organs.

**Ex.8** Holdfast, stipe and frond constitute the plant body in case of

- (A) Rhodophyceae (B) Chlorophyceae  
(C) Phaeophyceae (D) all of these.

**Exercise # 1**

**SINGLE OBJECTIVE**

**NEET LEVEL**

1. Which algal groups have similarity in pigment composition :-  
 (A) Red algae and brown algae  
 (B) Green algae and blue green algae  
 (C) Kelps and diatoms  
 (D) Diatoms and euglenoids
2. Autotrophic thallophytes are called as :-  
 (A) Fungi (B) Lichens  
 (C) Algae (D) Microbes
3. Which of the following is parasitic algae :-  
 (A) Cephaleuros (B) Harveyella  
 (C) Both (A) and (B) (D) None of the above
4. Red algae is red due to the presence of :-  
 (A) R-Phycocyanin (B) R-Phycoerythrin  
 (C) C-Phycocyanin (D) C-Phycoerythrin
5. Sea lettuce is the name given to :-  
 (A) Laminaria (B) Fucus  
 (C) Sargassum (D) Ulva
6. Fertile cells are not enclosed by sterile cells in the group :-  
 (A) Thallophyta (B) Spermatophyta  
 (C) Pteridophyta (D) Bryophyta
7. "Red rust of tea" is caused by parasitic:-  
 (A) Algae (B) Fungi  
 (C) Bacteria (D) Bryophyta
8. No Zoospore formation has been observed in the Algal members belonging to:-  
 (A) Chlorophyceae (B) Xanthophyceae  
 (C) Phaeophyceae (D) Cyanophyceae
9. Which pigment is found in phaeophyceae :-  
 (A) Chl. a, c and fucoxanthin  
 (B) Chl. a, d and violaxanthin  
 (C)  $\gamma$  Carotene and phycocyanin  
 (D) None of these
10. Food reserve in Rhodophyta is :-  
 (A) Floridean starch (B) Mannitol  
 (C) Leucosin (D) All of the above
11. Zygotic meiosis is characteristic of :-  
 (A) Procaryotes (B) Thallophyta  
 (C) Bryophyta (D) Spermatophyta
12. Photosynthetic pigments common to all algae :-  
 (A) Chlorophyll 'b' and carotene  
 (B) Chlorophyll 'a' and 'b'  
 (C) Chlorophyll 'a' and carotene  
 (D) Chlorophyll and xanthophyll
13. *Acetabularia*, a largest unicellular plant, belongs to  
 (A) Chlorophyta (B) Rhodophyta  
 (C) Pyrrophyta (D) Phaeophyta
14. Deepest algae in sea are :-  
 (A) Red Algae (B) Brown Algae  
 (C) Green Algae (D) Golden Algae
15. Phycobilins are characteristic pigments of :-  
 (A) Rhodophyta and Xanthophyta  
 (B) Rhodophyta and Pyrophyta  
 (C) Pyrophyta and Cyanophyta  
 (D) Rhodophyta and Cyanophyta
16. Which of the following plant groups have similar pigment composition :-  
 (A) Rhodophyta and phaeophyta  
 (B) Chlorophyta and phaeophyta  
 (C) Rhodophyta and cyanophyta  
 (D) Xanthophyta and euglenophyta
17. Polyuronic acid and polysulphate esters are characteristic in cell wall of :-  
 (A) Brown Algae (B) Red Algae  
 (C) Dinoflagellates (D) Diatoms
18. Stone wort is common name of :-  
 (A) *Chara* (B) *Chlorella*  
 (C) *Laminaria* (D) *Polysiphonia*

**Exercise # 2**

**SINGLE OBJECTIVE**

**AIIMS LEVEL**

1. Blue - green Algae resembles more closely to:-  
 (A) Green Algae  
 (B) Brown Algae  
 (C) Red Algae and bacteria  
 (D) Slime molds
2. Which of the following statement is true for algae :-  
 (A) Algae have root, stem and leaves  
 (B) Algae have true roots but lack leaves  
 (C) Algae have rhizoides and leaves  
 (D) Body of algae is thallus
3. In which plant group reproductive organs are not enclosed in a layer of sterile cells:-  
 (A) Pteridophyta (B) Thallophyta  
 (C) Angiosperm (D) Gymnosperm
4. Classification of algae is mainly based up on :-  
 (A) Reproductive organs  
 (B) Structure of spores  
 (C) Pigments  
 (D) Stored food
5. "Carrageenin" is obtained from :-  
 (A) *Chondrus crispus* (B) *Laminaria*  
 (C) *Gelidium* (D) *Macrocystis*
6. Female sex organ of algae is called :-  
 (A) Carpel (B) Oogonium  
 (C) Archegonia (D) Oosphere
7. Change in colour of algae according to depth in sea is called :-  
 (A) Bohr's effect (B) Gaudikov's effect  
 (C) Fogg's effect (D) Pasteur effect
8. In some algae two entire individual fuse with each other. Such a type of sexual reproduction is called—  
 (A) Isogamy  
 (B) Anisogamy  
 (C) Hologamy  
 (D) Gametangial contact
9. Which of the following is not correctly matched :  
 (A) Heterocyst = N<sub>2</sub>-fixation structure of B.G.A.  
 (B) Hormogonia = Reproductive structure of B.G.A.  
 (C) Floridean starch = Stored food of brown algae  
 (D) Cyanophycean starch = Stored food of B.G.A.
10. Cilia & flagella are absent in life cycle of:—  
 (A) Red algae (B) Brown algae  
 (C) Green algae (D) Red algae & B.G.A.
11. Which algae best explains the evolution of sexual reproduction :-  
 (A) Green algae (B) Red algae  
 (C) Brown algae (D) B. G. Algae
12. Spermatia are male gametes of:—  
 (A) Red algae (B) Diatoms  
 (C) Spermatophyta (D) Euglena
13. Cap cells occur in :-  
 (A) *Oedogonium* (B) Diatoms  
 (C) Dinoflagellates (D) *Euglena*
14. Algae which have food conducting tubes similar to phloem in vascular plants are :-  
 (A) Red algae (B) Brown algae  
 (C) Blue green algae (D) Green algae
15. Chlorophyll 'c', 'd' and 'e' are characteristic pigments of respectively :-  
 (A) Red algae, brown algae and yellow green algae  
 (B) Brown algae, Red algae and yellow green algae  
 (C) Diatoms, Dinoflagellates, Euglena  
 (D) High plants, Red algae, Diatoms
16. Which of the following algae produces synzoospores :-  
 (A) *Chlamydomonas* (B) *Polysiphonia*  
 (C) *Chlorella* (D) *Vaucheria*
17. Reserve food of algae and fungi are :-  
 (A) Starch and soluble floridoside  
 (B) Oil droplets and fats  
 (C) Starch and glycogen  
 (D) Starch and Glycerol

**Exercise # 3**

**PART - 1**

**MATRIX MATCH COLUMN**

- Select the correct match from the options given in all algae
 

(A) Phaeophyceae	-	Mannitol	
(B) Rhodophyceae	-	Dictyota	
(C) Chlorophyceae	-	Non- motile gametes	
(D) Rhodophyceae	-	r-Phycoerythrin	
(A) A, B and C	(B) B, C and D	(C) A and C	(D) C and D
(E) A and D			
- Observe the diagram A, B, C, and D. In which one of the four options all the items are correct
 

A	B	C	D
(A) Chlamydomonas	Chara	Laminaria	Volvox
(B) Laminaria	Volvox	Chlamydomonas	Chara
(C) Chara	Laminaria	Volvox	Chlamydomonas
(D) Volvox	Chlamydomonas	Laminaria	Chara
- Which of these is mismatched
 

(A) Phaneros	- Visible
(B) Kryptos	- Concealed
(C) Gymmo	- Naked
(D) Bryon	- Liverworths
(E) Trachea	- Windpipe
- Choose the wrong pair.
 

(A) Hepaticopsida	- Marchantia
(B) Lycopsida	- Selaginella
(C) Bryopsida	- Anthoceros
(D) Pteropsida	- Dryopteris
(E) Sphenopsida	- Equisetum
- Observe the diagrams (A-D) given below and select the right option in which all the four items A - D are correctly identified.
 

A	B	C	D
(A) Antheridia	Archegonia	Gemma cup	Sphagnum
(B) Archegonia	Antheridia	Gemma cup	Sphagnum
(C) Archegoniophore	Gemma cup	Gametophyte	Sphagnum
(D) Gemma cup	Archegoniophore	Sporophyte	Sphagnum
- Match the following with correct combination
 

Column - I	Column - II
A. Anthoceros	i. Walking fern
B. Adiantum	ii. Alga
C. Sargassum	iii. Inferae
D. Asterales	iv. Gametophyte
	v. Hornwort
	vi. Liverwort

(A) A - vi, B - v, C - i, D - iii	(B) A - v, B - iv, C - iii, D - ii
(C) A - v, B - i, C - ii, D - iv	(D) A - iii, B - ii, C - i, D - v
(E) A - i, B - iv, C - iii, D - v	

**Exercise # 4****PART - 1****PREVIOUS YEAR (NEET/AIPMT)**

1. The largest ovules, largest male and female gametes and largest plants are found among [CBSE AIPMT-2000]  
(A) angiosperms  
(B) tree ferns and some monocots  
(C) gymnosperms  
(D) dicotyledonous plants
2. In ferns meiosis occurs when [CBSE AIPMT-2000]  
(A) spore germinates  
(B) gametes are formed  
(C) spores are formed  
(D) antheridia and archegonia are formed
3. A research student collected certain alga and found that its cells contained both chlorophyll-*a, b, c*, and chlorophyll-*d* as well as phycoerythrin. The alga belongs to [CBSE AIPMT-2000]  
(A) Rhodophyceae (B) Bacillariophyceae  
(C) Chlorophyceae (D) Phaeophyceae
4. *Cycas* has two cotyledons but not included in angiosperms because of [CBSE AIPMT-2001]  
(A) naked ovules (B) seems like monocot  
(C) circinate ptyxis (D) compound leaves
5. Which of the following plants produces seeds but not flowers? [CBSE AIPMT-2002]  
(A) Maize (B) Mint  
(C) Peepal (D) Pinus
6. Which of the following is without exception in angiosperms? [CBSE AIPMT-2002]  
(A) Presence of vessels  
(B) Double fertilisation  
(C) Secondary growth  
(D) Autotrophic nutrition
7. Sexual reproduction in *Spirogyra* is an advanced feature because it shows [CBSE AIPMT-2003]  
(A) physiologically differentiated sex organs  
(B) different size of motile sex organs  
(C) same size of motile sex organs  
(D) morphologically different sex organs
8. Which one pair of examples will correctly represent the grouping spermatophyta according to one of the schemes of classifying plants? [CBSE AIPMT-2003]  
(A) *Rhizopus, Triticum* (B) *Ginkgo, Pisum*  
(C) *Acacia, sugarcane* (D) *Pinus, Cycas*
9. Which one the following pairs of plants are not seed producers? [CBSE AIPMT-2003]  
(A) *Ficus* and *Chlamydomonas*  
(B) *Punica* and *Pinus*  
(C) *Fern* and *Funaria*  
(D) *Funaria* and *Ficus*
10. Angiosperms have dominated the land flora primarily because of their [CBSE AIPMT-2004]  
(A) power of adaptability in diverse habitat  
(B) Property of producing large number of seeds  
(C) nature of some pollination  
(D) domestication by man
11. A free living nitrogen fixing cyanobacterium which can also form symbiotic association with the water fern *Azolla* is - [CBSE AIPMT-2004]  
(A) *Tolypothrix* (B) *Chlorella*  
(C) *Nostoc* (D) *Anabaena*
12. Which one of the following is a living fossil? [CBSE AIPMT-2003]  
(A) *Tolypothrix* (B) *Chlorella*  
(C) *Nostoc* (D) *Anabaena*
13. Which of the following propagates through leaf-tip? [CBSE AIPMT-2004]  
(A) Walking fern (B) Sproux - leaf plant  
(C) *Marchantia* (D) Moss

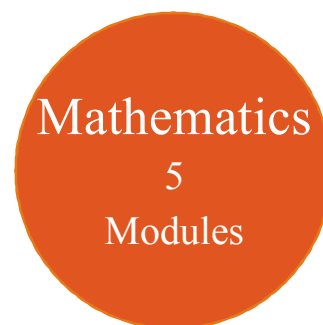
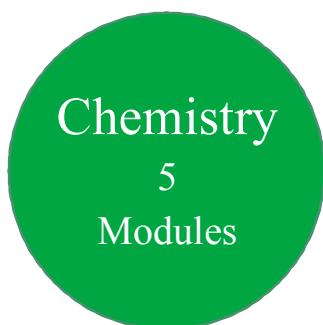
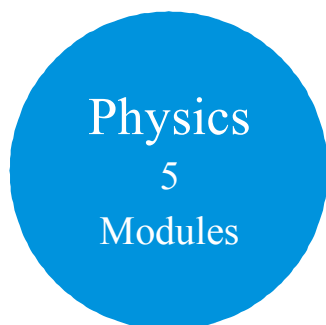
## MOCK TEST

- Which one of the following statements is wrong?
  - Algae increase the level of dissolved oxygen in the immediate environment.
  - Algin is obtained from the red algae, and carrageenan from brown algae.
  - Agar-agar is obtained from *Gelidium* and *Gracilaria*.
  - Laminaria* and *Sargassum* are used as food.
- Find out the wrong statements.
  - Ulothrix* and *Spirogyra* are filamentous forms.
  - Porphyra* and *Laminaria* are fresh water algae.
  - Stored food is in the form of mannitol in Rhodophyceae members.
  - Chlorella* and *Spirulina* are unicellular algae.

(A) A and B                      (B) B and C                      (C) A and C                      (D) A and D  
(E) b and D
- Which of the following groups of algae produces algin?
  - Phaeophyceae and Chlorophyceae
  - Rhodophyceae and Phaeophyceae
  - Chlorophyceae and Rhodophyceae
  - Phaeophyceae only
- Which out of the following is a mismatched pair?
  - Rhodophyceae – Floridean starch, phycoerythrin
  - Chlorophyceae – Laminarin, Mannitol
  - Rhodophyceae – Non-flagellated gametes
  - Phaeophyceae – Chlorophyll a and c, fucoxanthin
- Which one of the following shows isogamy with non-flagellated gametes?
  - Sargassum*
  - Ectocarpus*
  - Ulothrix*
  - Spirogyra*
- Which of the following groups of algae belongs to Class Rhodophyceae?
  - Laminaria*, *Fucus*, *Porphyra*, *Volvox*
  - Gelidium*, *Porphyra*, *Dictyota*, *Fucus*
  - Gracilaria*, *Gelidium*, *Porphyra*, *Polysiphonia*
  - Volvox*, *Spirogyra*, *Ulothrix*, *Sargassum*
  - Sargassum*, *Laminaria*, *Fucus*, *Dictyota*
- Match the following and choose the correct combination from the option given.
 

Column I	Column II
(Alga type)	(Example)
A. Green alga	i. <i>Dictyota</i>
B. Brown alga	ii. <i>Porphyra</i>
C. Red alga	iii. <i>Spirogyra</i>
(A) A-iii, B-ii, C-i	(B) A-iii, B-i, C-ii
(C) A-ii, B-iii, C-i	(D) A-(i), B-ii, C-iii
(E) A-i, B-iii, C-ii	

# 11<sup>th</sup> Class Modules Chapter Details



PHYSICS	CHEMISTRY	BIOLOGY
<p><b>Module-1</b></p> <ol style="list-style-type: none"> <li>1. Physical World &amp; Measurements</li> <li>2. Basic Maths &amp; Vector</li> <li>3. Kinematics</li> </ol> <p><b>Module-2</b></p> <ol style="list-style-type: none"> <li>1. Law of Motion &amp; Friction</li> <li>2. Work, Energy &amp; Power</li> </ol> <p><b>Module-3</b></p> <ol style="list-style-type: none"> <li>1. Motion of system of particles &amp; Rigid Body</li> <li>2. Gravitation</li> </ol> <p><b>Module-4</b></p> <ol style="list-style-type: none"> <li>1. Mechanical Properties of Matter</li> <li>2. Thermal Properties of Matter</li> </ol> <p><b>Module-5</b></p> <ol style="list-style-type: none"> <li>1. Oscillations</li> <li>2. Waves</li> </ol>	<p><b>Module-1(PC)</b></p> <ol style="list-style-type: none"> <li>1. Some Basic Concepts of Chemistry</li> <li>2. Atomic Structure</li> <li>3. Chemical Equilibrium</li> <li>4. Ionic Equilibrium</li> </ol> <p><b>Module-2(PC)</b></p> <ol style="list-style-type: none"> <li>1. Thermodynamics &amp; Thermochemistry</li> <li>2. Redox Reaction</li> <li>3. States Of Matter (Gaseous &amp; Liquid)</li> </ol> <p><b>Module-3(IC)</b></p> <ol style="list-style-type: none"> <li>1. Periodic Table</li> <li>2. Chemical Bonding</li> <li>3. Hydrogen &amp; Its Compounds</li> <li>4. S-Block</li> </ol> <p><b>Module-4(OC)</b></p> <ol style="list-style-type: none"> <li>1. Nomenclature of Organic Compounds</li> <li>2. Isomerism</li> <li>3. General Organic Chemistry</li> </ol> <p><b>Module-5(OC)</b></p> <ol style="list-style-type: none"> <li>1. Reaction Mechanism</li> <li>2. Hydrocarbon</li> <li>3. Aromatic Hydrocarbon</li> <li>4. Environmental Chemistry &amp; Analysis Of Organic Compounds</li> </ol>	<p><b>Module-1</b></p> <ol style="list-style-type: none"> <li>1. Diversity in the Living World</li> <li>2. Plant Kingdom</li> <li>3. Animal Kingdom</li> </ol> <p><b>Module-2</b></p> <ol style="list-style-type: none"> <li>1. Morphology in Flowering Plants</li> <li>2. Anatomy of Flowering Plants</li> <li>3. Structural Organization in Animals</li> </ol> <p><b>Module-3</b></p> <ol style="list-style-type: none"> <li>1. Cell: The Unit of Life</li> <li>2. Biomolecules</li> <li>3. Cell Cycle &amp; Cell Division</li> <li>4. Transport in Plants</li> <li>5. Mineral Nutrition</li> </ol> <p><b>Module-4</b></p> <ol style="list-style-type: none"> <li>1. Photosynthesis in Higher Plants</li> <li>2. Respiration in Plants</li> <li>3. Plant Growth and Development</li> <li>4. Digestion &amp; Absorption</li> <li>5. Breathing &amp; Exchange of Gases</li> </ol> <p><b>Module-5</b></p> <ol style="list-style-type: none"> <li>1. Body Fluids &amp; Its Circulation</li> <li>2. Excretory Products &amp; Their Elimination</li> <li>3. Locomotion &amp; Its Movement</li> <li>4. Neural Control &amp; Coordination</li> <li>5. Chemical Coordination and Integration</li> </ol>

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# 12<sup>th</sup> Class Modules Chapter Details

Physics  
5  
Modules

Chemistry  
5  
Modules

Mathematics  
5  
Modules

PHYSICS	CHEMISTRY	BIOLOGY
<p><b>Module-1</b></p> <ol style="list-style-type: none"> <li>1. Electrostatics</li> <li>2. Capacitance</li> </ol> <p><b>Module-2</b></p> <ol style="list-style-type: none"> <li>1. Current Electricity</li> <li>2. Magnetic Effect of Current and Magnetism</li> </ol> <p><b>Module-3</b></p> <ol style="list-style-type: none"> <li>1. Electromagnetic Induction</li> <li>2. Alternating Current</li> </ol> <p><b>Module-4</b></p> <ol style="list-style-type: none"> <li>1. Geometrical Optics</li> <li>2. Wave Optics</li> </ol> <p><b>Module-5</b></p> <ol style="list-style-type: none"> <li>1. Modern Physics</li> <li>2. Nuclear Physics</li> <li>3. Solids &amp; Semiconductor Devices</li> <li>4. Electromagnetic Waves</li> </ol>	<p><b>Module-1(PC)</b></p> <ol style="list-style-type: none"> <li>1. Solid State</li> <li>2. Chemical Kinetics</li> <li>3. Solutions and Colligative Properties</li> </ol> <p><b>Module-2(PC)</b></p> <ol style="list-style-type: none"> <li>1. Electrochemistry</li> <li>2. Surface Chemistry</li> </ol> <p><b>Module-3(IC)</b></p> <ol style="list-style-type: none"> <li>1. P-Block Elements</li> <li>2. Transition Elements (d &amp; f block)</li> <li>3. Co-ordination Compound</li> <li>4. Metallurgy</li> </ol> <p><b>Module-4(OC)</b></p> <ol style="list-style-type: none"> <li>1. HaloAlkanes &amp; HaloArenes</li> <li>2. Alcohol, Phenol &amp; Ether</li> <li>3. Aldehyde, Ketone &amp; Carboxylic Acid</li> </ol> <p><b>Module-5(OC)</b></p> <ol style="list-style-type: none"> <li>1. Nitrogen &amp; Its Derivatives</li> <li>2. Biomolecules &amp; Polymers</li> <li>3. Chemistry in Everyday Life</li> </ol>	<p><b>Module-1</b></p> <ol style="list-style-type: none"> <li>1. Reproduction in Organisms</li> <li>2. Sexual Reproduction in Flowering Plants</li> <li>3. Human Reproduction</li> <li>4. Reproductive Health</li> </ol> <p><b>Module-2</b></p> <ol style="list-style-type: none"> <li>1. Principles of Inheritance and Variation</li> <li>2. Molecular Basis of Inheritance</li> <li>3. Evolution</li> </ol> <p><b>Module-3</b></p> <ol style="list-style-type: none"> <li>1. Human Health and Disease</li> <li>2. Strategies for Enhancement in Food Production</li> <li>3. Microbes in Human Welfare</li> </ol> <p><b>Module-4</b></p> <ol style="list-style-type: none"> <li>1. Biotechnology: Principles and Processes</li> <li>2. Biotechnology and Its Applications</li> <li>3. Organisms and Populations</li> </ol> <p><b>Module-5</b></p> <ol style="list-style-type: none"> <li>1. Ecosystem</li> <li>2. Biodiversity and Conservation</li> <li>3. Environmental Issues</li> </ol>

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