# **Plant Kingdom**

# **Plant Classification**

# (1) Artificial Classification :

- (i) Aristotle : Father of biology & father of zoology
  - He classified plants on the basis of morphological characters in three groups
     (i) Trees
     (ii) Shrubs
     (iii) Herbs

# (ii) Theophrastus :

- He is known as father of ancient plant taxonomy and father of botany.
- Both Theophrastus & Aristotle are Greek political philosophers.

# (iii) Carolus Linnaeus :

- On the basis of work in latin language, he changed his name to Carolus Linnaeus.
- He is known as father of taxonomy, father of plant taxonomy and father of animal taxonomy.
- In "Genera plantarum" Linnaeus gave the detailed description of plant kingdom.

# (2) Natural Classification :

# George Bentham (1800 - 1884) and Joseph Dalton Hooker (1817 - 1911) :

- They wrote the book "Genera plantarum" (1862 1883).
- In this book, Bentham and Hooker gave the **biggest** and **natural classification** of spermatophyte. i.e. :- plants with seeds.



# **Types of Taxonomy**

- **Cytotaxonomy:** The use of cytological characters of organism in classification or in solving taxonomic problems is called cytotaxonomy. Cytotaxonomy is based on cytological information like chromosome number, structure and behaviour of chromosome.
- **Chemotaxonomy:** The uses of chemical characters of plants in classification or in solving taxonomic problems is called chemotaxonomy or chemical taxonomy. It is based on the chemical constitution of plants.
- The basic chemical compounds used in chemotaxonomy are alkaloids, carotenoids, tannins, polysaccharide, nucleic acids, fatty acids, amino acids, aromatic compounds etc.

# Adansonian System or Phenetic Classification or Numerical Classification:

In this classification plants are classified on the basis of numbers of similarities and dissimilarities. In this classification number and codes are assigned to all the characters and the data are prepared and then processed.

This data can be processed using calculators and computers. In this classification each character is given equal importance and at the same time hundreds of characters can be considered.

# Kingdom-Plantae

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

# Following Plant Groups are Included in Kingdom-Plantae

(1) ALGAE(2) BRYOPHYTA(3) PTERIDOPHYTA(4) GYMNOSPERM(5) ANGIOSPERM

# Algae (Phycology) THALLOPHYTA

# **General Characteristics:**

- (i) Mainly algae are aquatic in nature. Algae are found in both fresh and marine water.
- (ii) They also occur in other habitat also. Some of them are also occur in association with fungi (lichen) and animals (sloth bear).
- (iii) Algae are surrounded by mucilagenous sheath and below the sheath, cell wall is present which is made up of cellulose and pectin, but galactans, mannans and mineral like calcium carbonate are present in cell wall also.
- (iv) On the basis of structure, algae are thalloid i.e. plant body is not differentiated into root, stem and leaves. **Tissue level organisation** is also absent in algae.
- (v) The size and form of algae are highly variable. The size ranges from microscopic unicellular form (Chlorella, Chlamydomonas) to colonial from (Volvox) and to simple unbranched filamentous form (Ulothirix and Spirogyra). Some marine algae form massive plant body e.g. kelp
- (vi) 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  $\beta$  **carotene** are **universal pigment** of algae.

# **Reproduction:**

(1) Vegetative (2) Asexual (3) Sexual

# (1) Vegetative Reproduction:

(i) Binary Fission: Cell is divided into two parts and nucleus is also divided into two parts by mitosis.

It is found only in unicellular algae

(ii) Fragmentation: Filaments break down into small pieces & form new filaments. All filamentous algae shows fragmentation.

## (2) Asexual Reproduction:

Zoospores and Aplanospores are formed in favourable conditions while hypnospore and akinete etc. are formed in unfavourable conditions.

## (3) 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**. they both are present on same plant.



(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 and show **Haplodiplontic** life cycle.

- (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
- (a) Isogamous: Chlamydomonas Debaryanum, Ulothrix, Ectocarpus, Spirogyra, Cladophora
- (b) Anisogamous: Chlamydomonas Braunii, Eudorina
- (c) Oogamous: Chlamydomonas Coccifera, Sargassum, Volvox, Fucus, Chara
- **Note :** (1) **Chlamydomonas** exhibits complete evolution of sexual reproduction.
  - (2) In **Chlamydomonas Debaryanum** gametes are flagellated and similar in size.
  - (3) In **Chlamydomonas Brunii** gametes are motile and dissimilar in size.



**Zoospores of Chlamydomonas** 

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) Rhodophyta Red Algae

# Chlorophyta

## **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. There are mainly present in freshwater.

## 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 algae.



# Chlamydomonas

• Calvin discovered "Calvin Cycle" by experimenting on Chlorella.

(2) **Colonial:** Some green algae are found in colonies. They form colony of cells. *eg. Volvox* - Motile colony



 (3) Multicellular Filamentous: Mostly the green algae are multicellular and filamentous. Unbranched filamentous : e.g. Ulothrix - Known as pond wool Spirogyra - Known as pond silk Branched filamentous : e.g. Chara, Cladophora

# Note :

Some green algae are heterotrichous i.e. two types of branches prostrate and erect are present

## (4) Multicellular Thalloid or Parenchymatous:

eg. Ulva - Also called as sea lettuce

## Structure of Cell:

Cell wall : Inner cell wall  $\rightarrow$  cellulose

outer cell wall  $\rightarrow$  Pectin

Calcium carbonate is present in cell wall of Chara

Photosynthetic pigment: Photosynthetic pigments are present in true chloroplast

Large variation are present in shape of chloroplast

	Algae	Shape of Chloroplast
(i)	Chlamydomonas	Cup-shaped
(ii)	Ulothrix	Girdle shaped
(iii)	Spirogyra	Ribbon / Spiral shaped



#### **Photosynthetic Pigments :**

Chlorophyll - Chl'a' ar	ıd Chl 'b'
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- Carotene  $\beta$  carotene
- Xanthophyll Lutein and Violaxanthin Yellow coloured

## Notes :

- 1. On the basis of pigments (Chl 'a', Chl 'b', Carotenoids), stored food (starch) & cell wall green algae are considered similar to higher plants.
- 2. Most of the members of green algae have starch as stored food and some have oil droplete also.
- **3.** One or more pyrenoids are also present in chloroplast as storage bodies. Pyrenoids contain protein besides starch.

Reproduction : Vegetative reproduction : (a) Binary Fission (b) Fragmentation

## Asexual Reproduction: Zoospores and *aplanospore* are formed in favourable condition.

In zoospore 2-8 flagella are present Hypnospores and akinetes are formed in unfavourable condition.

#### **Sexual Reproduction :**

Isogamous : Ulothrix, Cladophora, Spriogyra, Chlamydomonas Debrynum Anisogamous : Eudorina Oogamous : Chara, Volvox,

#### Economic Importance :

- (1) Food : Chlorella, Ulva
- (2) Antibiotics :

Chlorellin antibiotic is obtained from Chlorella.

- (3) Used as Food :
   In space, Chlorella is used as a source of food and O<sub>2</sub> by space travellers
- (4) Parasitic Algae : Cephaleuros causes disease 'red rust' of coffee and tea.

## Phaeophyta

## (Brown Algae or Sea Weeds)

- Brown algae are found mainly in cold marine water.
- Brown algae are multicellular filamentous. Ectocarpous is simple branched
- Brown algae are the largest in size (upto 100 meter in length).
- Largest brown algae Macrocystis
- Thallus of brown algae is divided into three parts:-
  - (i) Lamina (Frond): Leafy part or photosynthetic part
  - (ii) **Stipe :** Elongated tubes called **trumpet hyphae** are present for food conduction in stipe. Trumpet hyphae are analogous to sieve tubes of vascular plants.
  - (iii) Hold Fast : Help in attachment.



#### **Cell Structure :**

The vegetative cells have a cellulosic wall usually covered on the outside by a gelatinous coating of algin. In brown algae protoplast contain plastid, centrally located vacuole and nucleus.

Pigments : photosynthetic pigments are present in plastid

Chlorophyll	-	Chl 'a' , Chl 'c'
Carotene	-	$\beta$ carotene

Xanthophylls - Mainly Fucoxanthin

## Note:

The amount of Fucoxanthin is more in brown algae due to which these algae are brown in colour. (Xanthophylls are mostly yellow but fucoxanthin is brown)

## Stored Food:

Laminarin and Mannitol: both are derivatives of carbohydrates.

#### **Phycocolloids:**

- On cell wall of brown algae some colloid substances like Fucinic acid, alginic acid and Fucoidin are present which are known as phycocolloids.
- Phycocolloids protects brown-algae against dessication and shocks. Phycocolloids are used in ice-cream as thickening agent. Alginates, salts of alginic acid used for dentury measurement.

Reproduction :	
Vegetative Reproduction :	Fragmentation :
Asexual Reproduction :	Zoospore are Pear shape and have two disimilar lateral flagella Heterokont flagella).
Sexual Reproduction :	Isogamy, Anisogamy or oogamy Gametes have two lateral unequal flagella and are of pear shape
Life cycle : Haplodiplontic.	In Fucus diplontic

# Rhodophyta

### **Red Algae**

(1) Red algae are most primitive **algae**:

(2) There is **no motile stage** found in life cycle of red algae and BGA i.e. cilia & flagella are absent.

#### Habitat:

Red algae are mainly found in marine water with greater concentration found in the warmer areas. But exceptionally Batrachospermum is found in fresh water (river).

#### Structure :

(i) Red algae are multicellular with complex body organisation but exceptionally Porphyridium is unicellular.



## Structure of Cell:

Cell wall of red algae is complex. It is made up of cellulose & pectin with polysulphate esters. Calcium carbonate is present in cell wall of Corallina

## **Pigments:**

Phycobilins

Chlorophyll	-	Chi 'a' and Chi 'd'
Carotenes	_	β carotene

 $\beta$  carotene

- r-phycoerythrin (red coloured), r-phycocyanin (blue coloured) and r- allophycocynin (Yellow green)
  - (i) Red algae are similar to blue green algae in pigment composition.
  - (ii) Red algae show Gaidukov's effect.
  - (iii) R-phycoerythrin can absorb and use ultraviolet light in photosynthesis. Due to phycoerythrin red algae are present at the maximum depth in water.

# Stored Food: Floridean Starch :

Floridean starch is structurally similar to glycogen and amylopectin

#### **Reproduction :**

- (1) Vegetative : By fragmentation
- (2) Asexual: Non motile spores [By Monospore, Carpospores, Tetraspore]

# (3) Sexual Reproduction:

- (i) Sexual reproduction is oogamous and accompanied by complex post fertilization developments.
- (ii) The female sex organs are called carpogonia.
- (iii) The male sex organs of red algae are known as spermatangia. Non motile spore like gametes are formed in spermatangia which are known as spermatia.

# Life Cycle: Haplodiplontic

#### **Economic Importance:**

- (1) *Harveyella*: It is a colourless parasitic alga. It remains as parasite on other algae.
- (2) *Porphyra*: It is an edible algae.
- (3) *Gelidium and Gracilaria*: Agar Agar is a hydrocolloid (Phycocolloid) obtained from these red algae. It is used to prepare culture medium to grow microbes and in prepartion of ice creams and Jellies.
- (4) **Chondrus Crispus:** It is also called Irish moss. Carrageenan colloid is obtained from this alga. It is used as gelating agent in food industries (i.e. to make the food item viscous)
  - Capsule of medicines is also prepared from Carrageenan.
- (5) Bromine is Obtained From Red Algae.

	Classes of algae and their main characteristics								
Classes	Common name	Major pigments	Stored food	Cell Wall	Flagella number and position of insertions	Habitat			
Chlorophyceae	Green algae	Chlorophyll a, b	Starch	Cellulose and Pectose	2-8, equal, apical	Fresh water brackish water, salt water			
Phaeophyceae	Brown algae	Chlorophyll a, c fucoxanthin	Mannitol, laminarin	Cellulose and algin	2, unequal lateral	Fresh water (rare) brackish water, salt water			
Rhodophyceae	Red algae	Chlorophyll a, d, phycoerythrin	Floridean starch	Cellulose and Pectin with Polysulphate ester	Absent	Fresh water (some), brackish water, salt water (most)			

## **Concept Builder**



**4.** Match the following:

		-	_							
	Column-I	Column-II								
	(i) Isogamous	(a) Volvox, Fucus								
	(ii) Anisogamous	(b) Udorina								
	(iii) Oogamous	(c) Ulothrix								
	(1) (i)-(a), (ii)-(b), (	(iii)–(c)	(2) (i)–(c), (ii)–(b),	(2) (i)-(c), (ii)-(b), (iii)-(a)						
	(3) (i)–(b), (ii)–(a),	(iii)–(c)	(4) (i)-(c), (ii)-(a),	(4) (i)–(c), (ii)–(a), (iii)–(c)						
5.	Algae play importa	ant role in CO <sub>2</sub> fixati	on in the amount of:							
	(1) Half of total ph	otosynthesis	(2) One fourth of	total photosynthesis						
	(3) Two third of to	otal photosynthesis	(4) Two third of to	otal photosynthesis						
6.	How many species	s of marine algae are	used as food?							
	(1) 60	(2) 70	(3) 2	(4) 80						
7.	Agar and Carragee	nan are produced by	/:							
	(1) Brown algae		(2) Green algae							
	(3) Red algae		(4) All of the abov	/e						
8.	Food supplement	of space travellers is	s.							
••	(1) Chlorella	(2) Porphyra	(3) Gellidium	(4) Spirogyra						
~				in a difference.						
9.	(1) Colidium	as preparations of c	(2) Gracillaria	ined from:						
	(1) Genalum (3) Chlorella		(4) (1) and (2) both	(4) (1) and (2) both						
40			( .) ( .) a ( <u>_</u> )							
10.	Pear snaped/pyrifo	orm flagella is found	IN:	(1) Nono						
	(I) BIOWII algae	(2) Green algae	(3) Red algae	(4) None						
11.	Complex Carbohyc	drate is the stored fo	ood material of:							
	(1) Brown algae	(2) Green algae	(3) Red algae	(4) All						
12.	Stipe in brown alg	ae is analogous to:								
	(1) Sieve tube of va	ascular plant	(2) Sieve tube of r	non-vascular plant						
	(3) Sieve tube of c	ryptogams	(4) Sieve tube of t	hallophyta						
13.	Any type of motile	e stage in life cycle is	absent in:							
	(1) Green algae	(2) Brown algae	(3) Red algae	(4) All						
14.	Which of the follow	wing is the deepest a	algae ?							
	(1) Green algae	(2) Brown algae	(3) Red algae	(4) All						
15.	Store food materia	al of red algae is sim	ilar to :							
	(1) Amylopectin & g	glycogen	(2) Cellulose							
	(3) Chitin		(4) Pyrenoid							
16.	Mostly algal genera	a are :								
	(1) Haplontic		(2) Diplontic							
	(3) Haplodiplontic		(4) Diplohaplontic	(4) Diplohaplontic						

17.	Warmer oceanic water is the habitat of	
	(1) Green algae	(2) Brown algae
	(3) Red algae	(4) All
18.	Store food of material of green algae is:	
	(1) Cellulose	(2) Starch
	(3) Starch & pyrenoids	(4) Floridean starch
19.	Complex post fertilisation development is a	accompanied in:
	(1) Polysiphonia, Porphyra, Chlorella	(2) Polysiphonia, Gelidium, Chlorella
	(3) Porphyra, Gelidium, Polysiphonia	(4) Gracilaria, Chlorella, Spirogyra
20.	Which one of the following is used to resol	ve confusions of plant taxonomy?
	(1) Numerical taxonomy	(2) Cytotaxonomy

(3) Chemotaxonomy

- (4) Both (1) & (2)

							Co	ncept	t Buil	der (	Answ	/er K	ey)							
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	4	1	1	2	1	2	3	1	4	1	1	1	3	3	1	1	3	3	3	3

# Bryophyta

## **General Characteristics:**

- Bryophytes are the first land plant.
- Bryophytes are known as Amphibians of the Plant Kingdom, because these plants can live in soil but are dependent on water for fertilization.
- The plant body of bryophytes is more differentiated than that of algae.
- It is thallus-like and may be prostrate or erect. They lack true roots, stems or leaves but possess root-like, leaf-like or stem-like structures.
- The plant body is attached to the substratum by root-like structures called rhizoids. The rhizoids may be unicellular or multicellular.
- The dominant phase or the main plant body is a free-living gametophyte and the sporophyte is • borne on the gametophyte.
- Gametophyte is the haploid stage of a plant that generates gametes by the process of mitosis, hence is called as gametophyte.
- The gametophyte of bryophyte consists of multicellular sex organs. The male sex organ is called antheridium and the female sex organ is flask-shaped called archegonium.
- Antheridium is surrounded by a sterile jacket which encloses mass of sperm mother cells/androcytes which produce two biflagellate antherozoids (motile male gametes).
- Archegonium is flask-shaped with tubular neck and swollen venter. Just like antheridium, female sex organ is also surrounded by a jacket. Venter cavity possesses a sterile venter canal cell and a fertile egg. Neck encloses a few sterile neck canal cells.
- An external layer of water is essential for the swimming of antherozoids to the archegonia.
- In Bryophyta, fertilization is performed by **Zooidogamy** i.e. male gamete swims into water to reach the female gametes and fertilizes it.
- Oogamous types of fertilisation is found in bryophytes.
- Fertilisation produces zygote that is formed inside the archegonia. Zygotes do not undergo reduction division (meiosis) immediately instead they undergo mitotic division to form the embryo which develop further into diploid sporophyte. They are the first embryophytes.

- The sporophyte is not free-living but attached to the photosynthetic gametophyte and derives nourishment from it.
- The sporophyte of bryophytes consists of three parts namely **capsule, seta and foot**. Inside the capsule, the spore mother cells undergoes meiosis to produce haploid spores (Sporic Meiosis).
- Bryophytes are homosporous i.e., they produce only one type of spores.
- The spores get disseminated by wind. Spores have the ability to germinate immediately after falling on the suitable substratum.
- The germination of spores is **Direct** or **Indirect**. In **Liverworts** & **Hornworts** the germination of spore is direct i.e. each spore forms a gametophyte after germination i.e. each spore forms one thallus.
- But the germination of spores in **Mosses** is indirect.
- In **Mosses** a multicellular filament is formed after the germination of spore. This filament is known as **Protonema**. Now **Buds** are formed on protonema. Each bud develops and form a gametophyte plant. Indirect germination is **Best** for survival.
- Mosses are **Gregarious** in nature.

## Note:

Protonema develop from spores is called as primary protonema and the protonema developed from parts other than spores are known as secondary protonema.



## Life Cycle : Haplodiplontic

In Bryophyta the sporophyte is completely or partially depends on gametophyte. This is a unique characters of bryophyta.

## Classification of Bryophyta:

- 1. Hepaticopsida
- 2. Anthocerotopsida
- 3. Bryopsida or Musci

## Hepaticopsida – Liver Worts:

- (i) All the bryophytes included in this class have shape like liver (eg. *Marchantia*) or flat (eg. *Riccia*) so they are known as liverworts.
- (ii) Plant body of this group is thallus like and dorsiventral. Rhizoids and scales are present on thallus. Rhizoids are unicellular and unbranched. Scales are multicellular.

- (iii) The leafy members (eg **Porella**) have tiny leaf like appendages in two rows on the stem like structures.
- (iv) Asexual (vegetative) reproduction in *Liverworts* takes place by fragmentation of thalli, or by the formation of specialised structures called **Gemmae** (sing. gemma).
   Gemmae are green, multicellular, asexual buds, which develop in small receptacles called gemma cups located on the thalli. The gemmae become detached from the parental body and germinate to form new individuals. Eg. *Marchantia*
- (v) During sexual reproduction male and female sex organs are produced either on same (eg. Riccia) or on different thallus (Eg. *Marchantia*)



Marchantia - (A) Female thallus



- (iv) The sporophyte of Liverworts is **completely dependent** on gametophyte i.e. it depends on gametophyte for food, water and habitat.
- (v) The sporophyte of Liverworts (*Marchantia*) is made up of **foot**, **seta** and **capsule**. (In *Riccia*, *sporophyte is made up of* only capsule).
- (vi) **Elaters** are present in sporophyte of some members of liverworts. Elaters are hygroscopic and they help in dispersal of spores.

#### Liverworts :

# Riccia, Marchantia, Cryptothallus, Porella

#### Note :

In Bryophytes, sporophyte of *Riccia* is the simplest.

## Anthocerotopsida – Hornworts: Anthoceros

## Bryopsida or Musci – Mosses:

- (i) All the **Mosses** are included in this class. The predominant stage of the life cycle of a moss 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 protonema as a lateral bud. They consist of upright, slender axes bearing spirally arranged leaves.
  - The Rhizoids present in the plants of this class are multicellular, branched and obliquely septate.
- *Note:* The **presence of leaves** in gametophyte is the unique character of Moss because in plant kingdom any gametophyte do not have leaves.
- (ii) Vegetative reproduction in mosses is by fragmentation and buding in the secondary protonema. During sexual reproduction, sex organs are produced at the apex of the leafy shoots.
- (iii) The sporophyte of moss in bryophyta is highly developed while the sporophyte of liverwort is the simplest. The sporophyte of moss is divided into foot, seta, capsule.

(iv) The sporophyte of mosses is also **Semiparasite** like, that of Hornworts. i.e. it is photosynthetic. The moses have an elaborate mechanism of spore dispersal.



# **Important Mosses**

- Funaria Rope moss or Cord moss
- **Polytrichum –** Hair cap moss
  - **Sphagnum Bog Moss:** It likes to grow on acidic bog.
    - Quaking Dog
    - **Carpet Moss or Turf Moss:** It spreads like a carpet on bog due to which, the swamp cannot be easily seen.
    - **Peat Moss:** Sphagnum grow in oxygen deficient bog. The decomposition of *Sphagnum* is very slow and it get accumulated in bog and from peat which can be used as fuel.
    - Species of *Sphagnum*, Because of their capacity to hold large quantity of water used as packing material for trans-shipment of living material.
    - **Sphagnum** can absorb water in very high amount, therefore it is used in the form of absorbent cotton in Europe.
- **Bryophytes** in general are of little economic importance but some mosses provide food for herbaceous mammals, birds and other animals.
- **Mosses** along with lichens are the first organisms to colonise rocks and hence, are of great ecological importance.
- They decompose rocks making the substrate suitable for the growth of higher plants. Since mosses form dense mats on the soil, they reduce the impact of falling rain and prevent soil erosion.

# Concept Builder

- Sporophytic plant body is partially or completely dependent on gametophytic plant body in:

   Bryophyte
   Pteridophytes
   Algae
   Gymnosperms
- Plants that posses spores and embryo but lack vascular tissues and seeds:

   Rhodophyta
   Bryophyta
   Pteridophyta
   Pteridophyta

(4) Phaeophyta

- 3. Why bryophytes are called "Amphibians of Plant Kingdom"?
  - (1) Grow in soil and water
  - (2) Grow in soil and require water for fertilisation
  - (3) Presence of root and vascular tissue
  - (4) All of the above

4.	Habitat of bryophyte is: (1) Shaded area on hills (3) Swampy area	(2) Marine water (4) Salty area	
5.	Plant body of bryophyte is: (1) Thallus like (3) Well developed vascular plant	(2) Prostrate or erect (4) Both (1) & (2)	
6.	A plant group that has great ecological (1) Pteridophytes (2) Algae	importance but little economic value (3) Bryophytes	is: (4) Angiosperms
7.	Free living gametophytes are produced (1) Gametes (2) Spore	from: (3) Capsule	(4) Zygote
8.	Rhizoides of bryophytes are: (1) Unicellular (3) Multicellular with oblique septa	(2) Multicellular (4) All	
9.	Asexual reproduction in liverworts take (1) Fragmentation of thalli (2) Gemmae	es place by: (3) Both (1) and (2)	(4) Conidia
10.	In thallus of liverworts, a green multice (1) Spore (2) Gemmae	ellular asexual bud is present is called (3) Septa	l: (4) Rhizoides
11.	Liverworts are: (1) Monoecious (3) Monoecious or dioecious	(2) Dioecious (4) Always unisexual	
12.	Among all bryophytes, most developed (1) Liverworts (2) Hornworts	sporophyte is found in: (3) Mosses	(4) Ferns
13.	Protonema is developed from: (1) Haploid structure (3) Diplohaploid structure	(2) Diploid structure (4) Haplodiploid structure	9
14.	Peat moss is: (1) Sphagnum (3) Polytrichum	(2) Funaria (4) Adiantum	
15.	The sporophyte is differentiated into a (1) Liverworts (3) Mosses	foot, Seta & Capsule in: (2) Ferns (4) Both (1) & (3)	
16.	Bryophytes are: (1) Homosporus (3) Spermatophytes	(2) Heterosporus (4) Tracheophytes	
17.	First plant to inhabit l and (1) Angiosperm (3) Gymnosperm	(2) Bryophytes (4) Pteridophytes	
18.	Plants used for trans-shipment of livin (1) Horn Worts (3) Moss	g material are belong to: (2) Liverworts (4) Horse Tail	
19.	Dense mats on soil and succession roc (1) Moss (3) Selaginella	ks along with Lichens is characteristic (2) Pteridophytes (4) <i>Adiantum</i>	cs of:

						C	Conce	ept B	uilde	e <mark>r (A</mark> n	swei	r Key	)						
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Ans.	1	2	2	1	4	3	2	4	3	2	3	3	1	1	4	1	2	3	1

# Pteridophyta

## General Characteristics:

## Pteridophytes are Known as Reptiles of Plant Kingdom.

1. Pteridophytes are also called as **Vascular Cryptogams**. 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.

## Note:

# Secondary growth is absent (Due to Absence of Cambium) in pteridophytes but exceptionally secondary growth is present in stem of *Isoetes* and *Botrychium*.

- **2.** Pteridophytes are used for medicinal purpose and as soil binders. They are also frequently grown as ornamentals.
- **3.** Pteridophytes are called as the **First True Terrestrial Plants** i.e. they are more adapted terrestrial plants as compared to bryophytes. Because -
  - (i) Vascular tissue is present in pteridophytes.
  - (ii) They have roots.
- **4.** Pteridophytes are **Not Completely Successful** terrestrial plants because they need water for fertilization, so pteridophytes grow in shady and moist places.
- 5. In pteridophyta, the plant body is completely differentiated in to **Root**, **Stem** and **Leaves**.
  - The primary root remains alive for short period. After some time it is replaced by **Adventitious** roots.
  - Stem is erect or prostrate. When in 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* 

# Life Cycle of Pteridophytes

- 1. Plant is **Sporophyte** and they produce spore by meiosis.
- **2.** Most of the pteridophytes are **Homosporus** i.e. only one type of spores are formed during reproduction.

## eg. Psilotum, Lycopodium, Equisetum, Pteridium, Dryopteris, Adiantum, Pteris.

**Exception:** Some pteridophytes are **Heterosporus** i.e. two types of spores **Microspores** and **Megaspores**.

eg. Selaginella, Isoetes, Marsilea, Salvinia, Azolla.



- **3.** Formation of spores takes place in **Sporangia**. Sporangia are formed at the abaxial surface of leaves.
- **4.** The leaves on which sporangia are formed are called **Sporophylls** (Reproductive Leaves) and normal photosynthetic leaves are called **Trophophylls** (Vegetative Leaves). Sporangia are present in groups, these groups are called **Sorus** (Plural-Sori). Sori are found on sporophylls.

# Note:

# In Fern, Sporophylls are also Photosynthetic. This is a Unique Character of Fern.

- 5. Spore mother cells are present in sporangia. Spores are formed in these spore mother cells by **Meiosis** and these spores start the gametophytic generation.
- 6. In pteridophyta, the germination of spores is **Exosporic** i.e. germination takes place out side the sporangia (in soil)
- **7.** In soil, a gametophyte is formed by the germination of each spore, which is known as **Prothallus**. The formation of gametophyte takes place in the soil therefore it is free (**Independent**) and mostly photosynthetic.

These gametophyte require cool, damp, shady places to grow. Because of this specific restricted requirement and the need for water for fertilisation, the spread of living pteridophytes is limited and restricted to narrow geographical regions.

8. There is no relation between the main sporophytic plant and prothallus. Prothallus (gametophyte plant) is made up of Thallus and Rhizoids. It is Non-Vascular.
 Note: In Plant Kingdom, Gametophyte is Always Non-Vascular

# In homosporus staridantytas, gamatantyta is manaasiaus but in hatarasparus

**9.** In homosporus pteridophytes, gametophyte is monoecious but in heterosporus pteridophytes the gametophyte is dioecious.

In Heterosporus Pteridophytes -

## Microspores Form - Male Gametophyte

## Megaspores Form - Female Gametophyte

**10.** The formation of sex organs takes place on this gametophyte. Male sex organs are called as antheridium and female sex organs are called as archegonium. The formation of male gametes takes place in Antheridia which are called as antherozoids.

**Antherozoids** are **Spiral** and **Multiflagellate** but exceptionally antherozoid of *Selaginella* are spindle shaped and in *Lycopodium* is curved (comma) and biflagellate. Egg is formed in archegonium.

- **11.** Fertilization takes place by **Zooidogamy** and zygote is formed as a result of fertilization. Zygote develops and forms an **Embryo**. Now this embryo develops and forms a **Sporophytic Plant** with **Root, Stem, Leaf**.
  - Type of sexual reproduction in pteridophyta is **oogamous**.
  - Their life cycle is **diplo-haplontic** type.
  - The unique character of life cycle of Pteridophyte is **Independent alternation of generation i.e.** sporophyte and gametophyte are independent of each other.



#### **Heterospory:**

- In few pteridophytes two types of spores are formed i.e. microspore and megaspores in microsporangium and megasporangium respectively. This phenomenon is known as heterospory or heterosporous condition.
- In heterosporous pteridophytes, microspore produces male gametophyte and megaspore produce female gametophyte hence the gametophytes in these plants are dioecious.
- The development of zygote into young embryo takes place within the female gametophyte and the female gametophyte is retained on the parent sporophyte for variable periods.
- This event is precursor of seed habit considered an important step in evolution.
- The development of male and female gametophytes in these plants takes place inside the microsporangium and megasporangium respectively.

#### **Classification of Pteriodophyta:**

Pteridophyta is Divided in to 4 Classes:

1. Psilopsida 2. Lycopsida

3. Sphenopsida

4. Pteropsida

1. Psilopsida:

The most **ancient vascular plants** are placed in this class. The plants in this class have many primitive characters -

- (i) Their plant body is differentiated in to stem (rhizome), scaly leaves and rhizoids.
  - *Eg. Psilotum*  $\rightarrow$  Living Fossil

## *Rhynia* $\rightarrow$ Fossil Plants

#### 2. Lycopsida:

(i) **Club Mosses** are placed in this class.

Lycopodium	-	Common club moss or Ground pipe
Selaginella	-	Little club moss or spike moss or Resurrection plant.
Selaginella Bryopteris	-	It is known as " <b>Sanjeevani</b> "



# 3. Sphenopsida:

(i) In this class **Horse Tails** are included. *e.g.Equisetum* (Pipe)



# 4. Pteropsida:

- (i) This is the **Largest Group** of pteridophytes.
- (ii) They are commonly called as ferns. Most of the pteridophytes are **Ferns**.





Salvinia

-		
Pteridium	-	They are called "Braken fern" or "Sun fern"
Dryopteris	-	Also called as Brook shield fern'
Adiantum	-	Walking fern
Marsilea	-	Pepper wort fern
Azolla	-	Aquatic fern (Smallest Pteridophyte and Biofertilizer)
Salvinia	-	Heterosporous fern

Concept Builder 1. Which of the followings are microphyllous and macrophyllous respectively? (1) Selaginella, fern (2) Fern, Selaginella (3) Salvinia, Selaginella (4) Salvinia, Pteridium 2. Which of the following pteridophytes posses strobili/cones: (2) Salvinia (1) Selaginella (3) Equisetum (4) Dryopteris 3. What is the name of inconspicuous, small multicellular, photosynthetic, free-living structure in pteridophytes: (1) Prothallus (2) Sporophytes (3) Gametophytes (4) Both (1) & (3) 4. Select the odd one w.r.t. heterosporous pteridophytes: (1) Selaginella (2) Azolla (3) Lycopodium (4) Marsilea **5.** Development of embryo on female gametophyte tend to: (1) Seed habit in Salvinia (2) Seed & fruit habit in Selaginella (3) Seed habit in Selaginella (4) Seed habit in Lycopodium 6. Plants used for soil binders and medicinal, ornamental purpose are belong to (1) Pteridophytes (2) Bryophytes (3) Algae (4) Gymnosperms 7. First terrestrial plants that posses vascular tissues are : (1) Bryophytes (2) Pteridophytes (3) Algae (4) Gymnosperms 8. Habitat of pteridophytes is : (1) Sandy soil (2) Fresh or marine water (3) Cool, damp, shady place (4) (1) and (3) both 9. Which one of the following belongs to class Sphenopsida? (1) Adiantum (2) Psilopsida (3) Equisetum (4) Lycopodium **10.** Female gametophyte retained on sporophyte first of all in plant kingdom seen in: (1) Algae (2) Bryophyte (3) Pteridophyte (4) Gymnosperm 11. What is the reason of limited distribution of pteridophyte? (1) Habitat (2) Water for fertilisation (3) Absence of vascular tissue (4) Habitat and water for fertilisation

Concept Builder (Answer Key)											
Que.	1	2	3	4	5	6	7	8	9	10	11
Ans.	1	3	4	3	3	1	2	4	3	3	4

# Gymnosperm

- 1. The gymnosperms (Gymnos = Naked, Sperma = Seed) and plants in which the ovule are not enclosed by any ovary wall and remain exposed, both before and after fertilization.
- 2. Study of Gymnosperm known as Gymnospermology.
  - They are first completely successful plant on earth because they do not require water for fertilization.
  - Main plant body of Gymnosperm is divided in to Root, Stem and leaves.
  - The roots are generally tap roots.

Roots in some genera have fungal association in the from of mycorrhiza (*Pinus*), while in some others (*Cycas*) small specialised roots called coralloid roots are associated with  $N_2$ -fixing cyanobacteria.

- The stems are unbranched (*Cycas*) or branched (*Pinus*, *Cedrus*).
- The leaves may be simple or compound.
- In Cycas the pinnate leaves persist for a few years.
- The leaves in gymnosperms are well-adapted to extreme condition.
- In conifers the needle like leaves reduce the surface area, their thick cuticle and sunken stomata also help to reduce water loss.
- **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**.
  - Exceptionally in xylem of **Gnetum, Ephedra, Welwitschia** true vessels are present.
  - Secondary growth takes place in gymnosperms stem, so gymnosperms stem is woody.
- 7. Most of the gymnosperms are arborescent but some are present as shrub.

# eg. Ephedra

Some Gymnosperm are liana or woody climbers.

## eg. Gnetum ula

- All gymnosperms are heterosporous plants. They produce two kinds of haploid spores; microspores and megaspores within microsporangium and megasporangium respectively.
- Sporangia are borne on sporophylls which are arranged spirally along an axis to born strobilli or cones.
- The strobili bearing microsporophylls and microsporangia are called microsporangiate cones or male strobilli or male cone.
- Within microsporangium many microspore mother cells are present which undergo meiosis and produce many haploid microspores. Germination of microspore takes place with in microsporangium hence it is called in **situ germination**.

- The microspore develop into a male gametophytic generation which is highly reduced and is made of only a limited number of cells. This reduced male gametophyte is called a pollen grain.
- The development of pollen grains take place within the microsporangium.
- The cones/strobili bearing cluster group of megasporophylls with megasporangia are called megasporangiate cones or female cones.
- When the male and female cones are produced on the same tree, the member is known as monoecious e.g. *Pinus* and when male and female cones or megasporophylls are borne on different trees, the member is called dioecious. In *Cycas* male cones and megasporophylls are borne on different tree, so it is dioecious.
- In gymnosperms the megasporangium is made of a diploid tissue also called nucellus. It is covered with integument. **Megasporangium of gymnosperm equivalent to ovule of angiosperm.**
- One cell of nucellus (2n) is differentiated into megaspore mother cell and undergoes meiosis to form four haploid megaspores. Three of them degenerate and only one megaspore remains functional.
- The functional megaspore germinate inside the megasporangium (Endosporic Germination) and develops into a multicellular female gametophyte also called endosperm(n).
- In gymnosperm, endosperm is formed before fertilization by megaspore so it is haploid but in angiosperm, endosperm is formed after fertilization by triple fusion (sec. nucleus (2n) + male gamete (n). So, endosperm of angiosperm is triploid.
- The female gametophyte (endosperm) produces two or more archegonia or female sex organs in one ovule. This multicellular but less developed male and female gametophyte is retained on sporophyte.

# In bryophytes and pteridophytes, the male and female gametophytes have an independent free living existence.

In gymnosperm and angiosperm they do not have free living existence. They remain within the sporangia retained on the sporophyte.

The pollen grain are released from the microsporangium and are carried in air currents (wind pollination = Anemophily) and come in contact with the opening (micropyle) of ovules on megasporophylls.

- Pollinated pollens are stored in pollen chamber of ovule.
- Pollen chamber in gymnosperm is part of ovule.
- Fertilization in gymnosperm is Zooido-Siphonogamy or Siphonogamy.
- Each pollen grain produces pollen tube carrying two male gametes which grows towards archegonia in ovule and release (discharge) its content (two male gametes) near the mouth of archegonia.
- One male gamete fuses with female gamete The fertilisation is performed which results in zygote and then embryo formation within the ovule.

- Now fertilized ovule having embryo is called seed.
- These seed are not covered with ovary well or fruit wall so they are called naked seeds.
- In gymnosperm seeds are formed but ovary or fruits are not formed, so they are called as naked seeded plants.
- Seeds containing embryo (2n) form new diploid sporophytic plants on germination.

# **Angiosperms:**

- Unlike the gymnosperms where the ovules are naked, in the angiosperms or flowering plants, the pollen grains and ovules are developed in specialised structures called flowers. In angiosperms, the seeds are enclosed in fruits. The angiosperms are an exceptionally large group of plants occurring in wide range of habitats. They range in size from the smallest Wolffia to tall trees of Eucalyptus (over 100 metres).
- They provide us with food, fodder, fuel, medicines and several other commercially important products. They are divided into two classes: the dicotyledons and the monocotyledons.
- The dicotyledons are characterised by seeds having two cotyledons, reticulate venations in leaves, and tetramerous or pentamerous flowers, i.e., having four or five members in each floral whorls.
- The monocotyledons on the other hand are characterised by single cotyledonous seeds, parallel venation in leaves, and trimerous flowers having three members in each floral whorls.
- The male sex organ in a flower is the stamen. Each stamen consists of a slender filament with an anther at the tip. Within the anthers, the pollen mother cell divide by meiosis to produce microspores which matures into pollen grains.
- The female sex organ in a flower is the pistil. Pistil consists of a swollen ovary at its base, a long slender style and stigma. Inside the ovary, ovules are present. Generally each ovule has a megaspore mother cell that undergoes meiosis to form four haploid megaspores. Three of them degenerate and one divide to form the embryo sac. Each embryo-sac has a three-celled egg apparatus one egg cell and two synergids, three antipodal cells and two polar nuclei. The polar nuclei eventually fuse to produce a diploid secondary nucleus.
- Pollen grain, after dispersal from the anthers, are carried by wind or various other agencies to the stigma of a pistil. This is termed as pollination.
- The pollen grains germinate on the stigma and the resulting pollen tubes grow through the tissues of stigma and style and reach the ovule. The pollen tubes enter the embryo-sac where two male gametes are discharged. One of the male gametes fuses with the egg cell (syngamy) to form a zygote. The other male gamete fuses with the diploid secondary nucleus to produce the triploid primary endosperm nucleus (PEN). Because of the occurrence of two fusions i.e., syngamy and triple fusion, this event is termed as double fertilisation, an event unique to angiosperms.
- The zygote develops into an embryo (with one or two cotyledons) and the PEN develops into endosperm which provides nourishment to the developing embryo. The synergids and antipodals degenerate after fertilisation. During these events the ovules develop into seeds and the ovaries develop into fruit.





(a) A dicotyledon





Life Cycle of an Angiosperm

# Life Cycle:

Life cycle of gymnosperm & angiosperm is diplontic because gametophytic generation is short lived. Gametophyte is highly reduced & depends on its sporophyte.



#### Notes:

- (1) **Zooido-Siphonogamy:** This type of fertilization occurs in lower gymnosperms. Male gametes are motile and transfered to female gamate by pollen tube.
- (2) **Siphonogamy:** This type of fertilization occur in higher gymnosperms. Male gametes are non motile transferred to female gamete (egg) by pollen tube.
- **Note:** Different types of polyembryony are found in gymnosperm i.e. occurence of more than one embryos with in seed.
- Seed: Seed in gymnosperm contains three different generations.

# **Classification of Gymnosperm:**

# Gymnosperms are Divided into two Groups

- (1) Cycadophyta (Lower Gymnosperm)
- (2) Coniferophyta (Higher Gymnosperm)

# Cycadophyta:

- (A) The plants of this group are megaphyllous or macrophyllous with circinate vernation.
- (B) Presence of Ramenta.
- (C) Male gamete is motile.
- Cycas
- Fern palm or Sago palm
  - Sago is obtained from its stem.

The diameter of its ovules is 7 cm. Its ovule, male gametes, egg and male cone are largest in plant kingdom. In embryo of cycas two cotyledons are present. In cycas male gametes are top shaped.



In Cycas female cone is absent.

## Coniferophyta:

Four orders are included in this group

## (i) Ginkgoales:

(a) It is the oldest order of coniferophyta. Maximum plants of this group are extinct.
 Ginkgo biloba: living fossil - It is also known as "Maiden hair tree".
 Note: Exceptionally Ginkgo biloba belongs to higher gymnosperm but its male gametes are motile.



Ginkgo

# (ii) Cordaitales : Eg. Cordaites (extinct)

# (iii) Coniferales :

(a) Conifers are included in this group.

## **Coniferales :**

<ul> <li>(a) Pinus (Pines) :-</li> <li>Pinus species</li> <li>Pinus gerardiana</li> <li>Pinus roxburghii</li> </ul>	<ul> <li>A resin "turpentine" is obtained from it. Turpentine is used in varnish.</li> <li>It is known as "chilgoza pine"</li> <li>It is known as "chirpine".</li> </ul>
(b) Ce <i>drus</i> (c) <i>Taxus</i>	<ul> <li>It is known as deodar.</li> <li>It is known as Yew tree. An anticancer medicine "Taxol" is obtained from its bark.</li> </ul>
(f) Araucaria species	– Christmas tree
(g) Sequoia	<ul> <li>It is called Red wood tree or Sherman tree. It is the largest gymnosperm.</li> </ul>
(h) <i>Metasequoia</i>	<ul> <li>It is a living fossil. This plant is present in china valley.</li> </ul>

#### (iv) Gnetales :

- (a) They are the most advanced gymnosperms.
- (b) Exceptionally members of this group have vessels in xylem.
- (c) Archegonia is absent in the members of this group.

#### eg. (1) Gnetum

- (2) Welwitschia
- (3) Ephedra

## – Exceptionally archegonia is present in *Ephedra*.

**Ephedra** – Ephedra is a medicinal plant. *Ephedrine* (Medicine) is obtained from it. It is an effective medicine in asthma.

Co	ncept Builder			
1.	Ovary wall is absent in :			
	(1) Pinus	(2) Mango	(3) Sugar cane	(4) Wheat
2.	Gymnosperms are most	ly		
	(1) Trees	(2) Shrubs	(3) Medium sized trees	(4) All of these
3.	Naked seeded plants ar	e:		
	(1) Gymnosperm	(2) Angiosperm	(3) Pteridophytes	(4) Bryophytes
4.	Tallest øvmnosnerm are			
	(1) Redwood tree	(2) Sequoia	(3) Both (1) and (2)	(4) Cycas
5	N fixing evanobactoria	found in the roots of		
5.	N <sub>2</sub> -IIXINg Cyanobacteria			
	(1) Cycas	(2) Pinus	(3) Cedrus	(4) Sequoia
6.	Dwarf shoot, long shoot	& seeds are clearly visible	e in which of the following	g living fossil ?
	(1) Cycas	(2) Ficus	(3) Fucus	(4) Ginkgo
7	Tap root vascular tics	ue flower absent fruit	absent naked seeded as	athoridium abcont
1.	mostly, dioecious heter	osporous are key features	s of :	inenulum absent,
	(1) Angiosperm	(2) Gymnosperm	(3) Bryophytes	(4) Pteridophytes

8.	Gymnosperm includes :						
	(1) Tall tree, small tree, h	nerb, shrubs	(2) Tree and shrubs				
	(3) All types of plants		(4) Lianas, herb, shrubs				
9.	Gymnosperms contain s (1) Spirally along an axis (3) Laterally along an axi	oorangia on sporophylls a s	re : (2) Radially along an axis (4) Spherical along an axis				
10.	Highly reduced male gan	netophytes of gymnosperr	n is called :				
	(1) Pollen grains	(2) Endosperm	(3) Megasporangium	(4) Archegonia			
11.	Pollination in gymnosper	ms are carried out by :					
	(1) Air	(2) Water	(3) Insects	(4) Human			
12.	Number of archegonia in	female gametophyte of g	ymnosperm is :				
	(1) 0	(2) 1	(3) 2 or > 2	(4) Countless			
13.	Pinus is :						
	(1) Monoecious	(2) Dioecious	(3) Herb	(4) Both (2) & (3)			
14.	Conifers can tolerate ext	reme environment becau	se of :				
	(1) Thick cuticle		(2) Presence of vessels				
	(3) Superficial stomata		(4) Broad leaves				

	Concept Builder (Answer Key)													
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ans.	1	4	1	3	1	4	2	2	1	1	1	3	1	1

# **Plant Life Cycle & Alternation of Generation**

Both haploid & diploid cells can divide by mitosis in plants. The haploid body produces gamete by mitosis. This plant body represents a gametophyte. The zygote forms after gametic fusion that further divides by mitosis & produce a diploid plant body or sporophyte. The life cycle pattern may be of three types:

# 1. Haplontic Life Cycle :

Eg. Many algae like Volvox, Spirogyra, Chlamydomonas Sporophytic generation is represent by onecelled zygote. Meiosis in the zygote results in the formation of haploid spores. Haploid spores divide mitotically and form the gametophyte. Gametophyte is the independent, dominant, photosynthetic.



### 2. Diplontic Life Cycle :

Represented by some algae life *Fucus* sp., gymnosopersm and angiosperms. In this sporophyte is the dominant, photosynthetic and free-living phase of the plant. The gametophytic phase is represented by the single to few celled haploid gametophyte.



### 3. Haplo-Diplontic Life Cycle :

It is represent by Bryophytes, dominant phase is haploid gametophyte which is independent photosynthetic thalloid or erect phase is represented by a haploid gametophyte and it alternates with the short lived multicellular sporophyte totally or partially dependent on the gametophyte for its anchorge and nutrition. *Ectocarpus*, Kelps & *Polysiphonia* show haplo-diplontic life cycle.



In pteridophytes life cycle is **Diplo-haplontic**, In which the diploid sporophyte is represented by dominant, independent photosynthetic vascular plant body. It alternates with multicellular saprophytic / autotrophic independent but short-lived haploid gametophyte. Such a pattern is known as **Diplo-haplontic** life cycle.

# **Concept Builder**

1. Primary endosperm nucleus in angiosperm is : (1) Haploid (2) Triploid (3) Diploid (4) Tetraploid 2. Smallest Angiosperm is : (1) Wolfia (2) Zamia phygmia (3) Bauxbaumia (4) Rafflesia 3. Which pair of plants have unbranched and branched stem in Gymnosperm. (1) Cycas, Cedrus (2) Pinus, Cedrus (3) Ginkgo, Cedrus (4) Pinus, Cycas 4. A plant that has seeds but no flower and fruits (1) Bryophytes (2) Gymnosperms (3) Pteridophytes (4) Angiosperm Pick the **mismatched** pair 5. (1) Cycas – Dioecious (2) Equisetum – Homosporus (3) Salvinia – Heterosporus (4) Pinus – Dioecious

Concept Builder (Answer Key)							
Que.	1	2	3	4	5		
Ans.	2	1	1	2	4		

# Exercise – I

#### **Plant Kingdom**

- Embryophyta includes :
- (1) Angiosperms only
- (2) Algae and fungi

1.

- (3) Bryophyta & Pteridophyta
- (4) All plants except thallophyta
- "Genera Plantarum" was written by :
   (1) Engler and Prantal (2) Hutchinson
   (3) Bentham & Hooker(4) Bessey
- **3.** Chief merit of Bentham and Hooker's classification is that :
  - It is a system mostly based on evolutionary concepts
  - (2) It is a natural systems of classification of all groups of plants
  - (3) The description of the taxa are based on actual observation of the specimen
  - (4) It also considers the phylogenetic aspects
- **4.** The classification of Linnaeus was mainly based on :
  - (1) Sepals (2) Stem
  - (3) Petals (4) Stamens
- 5. System of classification proposed by Linnaeus was :

(1) Artificial	(2) Natural
(3) Sexual	(4) (1) and (3) both

- **6.** Carolus Linnaeus classified plant kingdom on the basis of :
  - (1) Floral morphology
  - (2) Overall morphology of plants
  - (3) Type of sexual reproduction
  - (4) Anatomical character
- Linnaeus described 5900 species of plants in his book \_\_\_\_\_ (1753) and 4326 species of animals in his book \_\_\_\_\_ (1758).
  - (1) Philosophia Botanica, Genera Plantarum
  - (2) Historia Naturalis, Species Plantarum
  - (3) Systema Naturae, Species Plantarum
  - (4) Species Plantarum, Systema Naturae

- 8. First plant classification was given by :
  (1) Linneaus
  (2) John Ray
  - (3) Aristotle
- 9. Division "Tracheophyta" includes :(1) Bryophyta
  - (2) All vascular plants
  - (3) All non-vascular plants
  - (4) All non-vascular and vascular plants

(4) Darwin

- **10.** Which group of plant have embryo but not vascular tissue ?
  - (1) Cyanophyta (2) Tracheophyta
  - (3) Bryophyta (4) Chlorophyta

## Algae

- **11.** Which algal groups have similarity in pigment composition ?
  - (1) Red algae and brown algae
  - (2) Green algae and blue green algae
  - (3) Kelps and diatoms
  - (4) Diatoms and euglenoids
- **12.** Autotrophic thallophytes are called as :
  - (1) Fungi (2) Lichens
    - (3) Algae (4) Microbes
- **13.** Red algae is red due to the presence of :
  - (1) R-Phycocyanin (2) R-Phycoerythrin
    - (3) C-Phycocyanin (4) C-Phycoerythrin
- **14.** Fertile cells are not enclosed by sterile cells in the group:
  - (1) Thallophyta (2) Spermatophyta
  - (3) Pteridophyta (4) Bryophyta
- **15.** "Red rust of tea" is caused by parasitic:
  - (1) Algae (2) Fungi
  - (3) Bacteria (4) Bryophyta
- **16.** No Zoospore formation has been observed in the Algal members belonging to:
  - (1) Chlorophyceae (2) Brown algae
    - (3) Phaeophyceae (4) Cyanophyceae

17.	Which pigment is fou	ind in phaeophyceae?	26.	Irish moss, is a member of:		
	(1) Chl. a, c and fuce	oxanthin		(1) True moss	(2) Lio	
	(2) Chl. a, d and vio	axanthin		(3) Algae	(4) Br	
	(3) $\gamma$ Carotene and $\mu$	phycocyanin	27.	Flagellated cells are	absent	
	(4) None of these			(1) Red algae	(2) Blı	
18.	Food reserve in Rho	dophyta is:		(3) Higher seed plants	s (4) All	
	(1) Floridean starch	(2) Mannitol				
	(3) Leucosin	(4) All of the above	28.	Green algae are con	sidered	
	(-)	())		of higher plants due	to their	
19.	Zygotic meiosis is c	haracteristic of:		with higher plants in	1:	
	(1) Procaryotes	(2) Thallophyta		(1) Pigments	(2) Ce	
	(3) Bryophyta	(4) Spermatophyta		(3) Stored food	(4) Al	
20.	Photosynthetic pigr	nents common to all	29.	Pyrenoids are chara	cteristi	
	algae:			algae. A pyrenoid co	nsists c	
	(1) Chlorophyll 'b' ar	nd carotene		(1) Core of starch su	rrounde	
	(2) Chlorophyll 'a' a	nd 'b'		(2) Core of protein s	urround	
	(3) Chlorophyll 'a' a	nd carotene		(3) Core of fatty acid	ds covei	
	(4) Chlorophyll and	xanthophyll		(4) Nucleic acid and	protein	
	Description in a s					
21.	Deepest algae in se	(0) Drawn Aldaa	30.	In chlorophyta th	e mod	
	(I) Red Algae	(2) Brown Algae		reproduction is:		
	(3) Green Algae	(4) Golden Algae		(1) Isogamy		
22.	Phycobilins are ch	aracteristic pigments		(2) Anisogamy		
	of:			(3) Oogamy		
	(1) Rhodophyta and	phaeophyta		(4) Isogamy, Anisoga	my and	
	(2) Rhodophyta and	Pyrophyta	31.	Unique character of	thallop	
	(3) Pyrophyta and C	yanophyta		(1) Thalloid body	·	
	(4) Rhodophyta and	Cyanophyta		(2) Absence of vascu	ular tiss	
00		ing along gauge have		(3) Zygotic meiosis		
23.	which of the follow	ing plant groups have		(4) All the above		
	(1) Dhe de rebute and					
	(I) Rhodophyta and	phaeophyta	32.	In thallophyta main	plant b	
	(2) Chlorophyta and	pnaeopnyta		(1) Gametophyte		
	(3) Rhodophyta and	cyanopnyta		(2) Sporophyte		
	(4) All			(3) Diploid plant boo	ly	
24.	Polyuronic acid and	l polysulphate esters		(4) Leafy plant body		
	are characteristic ir	cell wall of:	33	The characters of th	allonhy	
	(1) Brown Algae	(2) Red Algae		(1) Plant body thall	ie ie	
	(3) Dinoflagellates	(4) Diatoms		(2) Non vascular pla	nt	
05	(Change 11)			(2) Sev orden are ur	nicellula	
25.	Stone wort' is com	mon name or:		(3) SEX OIGAII ALE UI	ooll	
	(1) Chara	(2) Uniorella		(1) All the choice	0 <del>0</del> 11	
	(3) Laminaria	(4) Polysiphonia	l	(4) All the above		

moss (2) Lichen (4) Bryophyte е ted cells are absent in: (2) Blue green algae algae er seed plants (4) All the above lgae are considered as ancestors er plants due to their resemblance her plants in: ents (2) Cell wall ed food (4) All the above ds are characteristically found in pyrenoid consists of: of starch surrounded by protein of protein surrounded by starch of fatty acids covered by starch eic acid and protein prophyta the mode of sexual ction is:

- my
- ogamy
- amy
- amy, Anisogamy and oogamy
- character of thallophyta is:
  - oid body
  - ence of vascular tissue
  - tic meiosis
  - he above
- phyta main plant body is:
  - etophyte
  - ophyte
  - bid plant body
  - y plant body
- racters of thallophyta is/are :
  - t body thallus
  - vascular plant
  - organ are unicellular and without et of sterile cell
  - he above

34.	Sexual reproduction place by :	in thallophyta takes
	(1) Isogamy	(2) Anisogamy
	(3) Oogamy	(4) Any of the above
35.	Most advanced group	o of algae is :
	(1) Myxophyta	(2) Chlorophyta
	(3) Brown algae	(4) Phaeophyta
36.	"Agar-agar" is obtain	ed from :
	(1) Green Algae	(2) Red Algae
	(3) Brown Algae	(4) Yellow green Algae
37.	Motile stages are no of :	t found in life cycle
	(1) Red Algae & green	algae
	(2) Red Algae & brow	n algae
	(3) Red Algae & blue	green algae
	(4) Green Algae & bro	own algae
38.	Embryo is not forme	d in thallophyta due
	to:	(0) Zugatia mitagia
	<ul><li>(1) Zygotic meiosis</li><li>(3) Sporangial meiosis</li></ul>	(2) Zygotic mitosis (4) Gametic meiosis
39.	Oogonia of thallo	ohyta differs with
	archegonia of bryoph	iyta :
	(1) Being multicellula	r
	(3) Being stalked	
	(4) Being unicellular	and jacket less
40.	Which of the followi	ng hest evolains the
		ing best explains the
	evolution of sexual r	eproduction?
	evolution of sexual ro (1) Chlamydomonas	eproduction? (2) Ulothrix
	evolution of sexual ro (1) Chlamydomonas (3) Puccinia	eproduction? (2) Ulothrix (4) Albugo
41.	evolution of sexual ro (1) <i>Chlamydomonas</i> (3) <i>Puccinia</i> Gametes are non-mo	eproduction? (2) <i>Ulothrix</i> (4) <i>Albugo</i> ptile in:
41.	evolution of sexual re (1) <i>Chlamydomonas</i> (3) <i>Puccinia</i> Gametes are non-mo (1) Blue green Algae	eproduction? (2) <i>Ulothrix</i> (4) <i>Albugo</i> otile in: (2) Red Algae
41.	evolution of sexual re (1) <i>Chlamydomonas</i> (3) <i>Puccinia</i> Gametes are non-mo (1) Blue green Algae (3) Both 1 and 2	eproduction? (2) <i>Ulothrix</i> (4) <i>Albugo</i> otile in: (2) Red Algae (4) Green Algae
41. 42.	evolution of sexual r (1) <i>Chlamydomonas</i> (3) <i>Puccinia</i> Gametes are non-mo (1) Blue green Algae (3) Both 1 and 2 Which of the followi	eproduction? (2) <i>Ulothrix</i> (4) <i>Albugo</i> otile in: (2) Red Algae (4) Green Algae
41. 42.	evolution of sexual re (1) <i>Chlamydomonas</i> (3) <i>Puccinia</i> Gametes are non-mo (1) Blue green Algae (3) Both 1 and 2 Which of the following for algae?	eproduction? (2) <i>Ulothrix</i> (4) <i>Albugo</i> otile in: (2) Red Algae (4) Green Algae ng statement is true
41. 42.	evolution of sexual re (1) <i>Chlamydomonas</i> (3) <i>Puccinia</i> Gametes are non-mo (1) Blue green Algae (3) Both 1 and 2 Which of the followi for algae? (1) Algae have root, s	eproduction? (2) <i>Ulothrix</i> (4) <i>Albugo</i> otile in: (2) Red Algae (4) Green Algae ng statement is true tem and leaves
41. 42.	evolution of sexual re (1) <i>Chlamydomonas</i> (3) <i>Puccinia</i> Gametes are non-mo (1) Blue green Algae (3) Both 1 and 2 Which of the followi for algae? (1) Algae have root, s (2) Algae have true re	eproduction? (2) <i>Ulothrix</i> (4) <i>Albugo</i> otile in: (2) Red Algae (4) Green Algae ng statement is true tem and leaves oots but lack leaves
41. 42.	<ul> <li>evolution of sexual responses of the response of the response</li></ul>	eproduction? (2) <i>Ulothrix</i> (4) <i>Albugo</i> otile in: (2) Red Algae (4) Green Algae ng statement is true tem and leaves bots but lack leaves des and leaves hallus

- **43.** In which plant group reproductive organs are not enclosed in a layer of sterile cells?
  - (1) Pteridophyta (2) Thallophyta
  - (3) Angiosperm (4) Gymnosperm
- **44.** Classification of algae is mainly based up on:
  - (1) Reproductive organs
  - (2) Structure of spores
  - (3) Pigments
  - (4) Stored food
- **45.** "Carrageenin" is obtained from:
  - (1) Chondrus crispus (2) Laminaria
  - (3) Gelidium (4) Macrocystis
- 46. Female sex organ of algae is called:
  (1) Carpel
  (2) Oogonium
  (3) Archegonia
  (4) Oosphere
- 47. Change in colour of algae according to depth in sea is called:(1) Bohr's effect
  - (2) Gaudikov's effect
  - (3) Fogg's effect
  - (4) Pasteur effect
- **48.** Which of the following is not correctly matched?
  - (1) Heterocyst =  $N_2$ -fixation structure of B.G.A.
  - (2) Hormogonia = Reproductive structure of B.G.A
  - (3) Floridean starch = Stored food of brown algae
  - (4) Cyanophycean starch = Stored food of B.G.A.
- **49.** Trumpet hyphae present in:
  - (1) Brown algae (2) Diatoms
  - (3) Dinoflagellates (4) Euglena
- 50. Algae which have food conducting tubes similar to phloem in vascular plants are:
  (1) Red algae
  (2) Brown algae
  - (3) Blue green algae (4) Green algae

- **51.** Chlorophyll 'c', 'd' are characteristic pigments of respectively :
  - (1) Red algae, brown algae and green algae
  - (2) Brown algae, red algae
  - (3) Diatoms, dinoflagellates, *Euglena*
  - (4) High plants, red algae, Diatoms
- 52. Reserve food of algae and fungi are :(1) Starch and soluble floridoside
  - (2) Oil droplets and fats
  - (3) Starch and glycogen
  - (4) Starch and Glycerol
- **53.** About 90 percent of total photosynthesis in the world is caused by :
  - (1) Bryophytes (2) Algae
  - (3) Pteridophytes (4) Angiosperms
- **54.** Which type of algae are helpful in nitrogen economy ?
  - (1) Green algae (2) Blue green algae
  - (3) Red algae (4) Brown algae
- **55.** Sea weeds belong to :
  - (1) Red algae (2) Brown algae
  - (3) Green algae (4) Blue green algae

# 56. Plants of thallophyta are :

- (1) Haploid and gametophyte
- (2) Haploid and sporophyte
- (3) Diploid and gametophyte
- (4) Diploid and sporophyte

# **57.** Which of the following is **true** for algae ?

- At least one half of the total CO<sub>2</sub> fixation on earth is carried out by algae through photosynthesis
- (2) Being photosynthetic they increase the level of dissolved oxygen in their immediate environment
- (3) They are of paramount importance as primary producers which form the basis of food cycles of all aquatic animals
- (4) All of the above

- **58.** What is true for alternation of generation in plants ?
  - (1) Two distinct, diploid sporophytic and haploid gametophytic phases are present
  - (2) The length of haploid and diploid phases and whether these phases are free living or dpendent on others vary among different groups
  - (3) There is no rotation of haploid and diploid phases
  - (4) More than one option is correct
- **59.** Select the correct match w.r.t. algal class and its flagellation :
  - (1) Rhodophyceae Flagella absent
  - (2) Phaeophyceae 2, unequal length, lateral
  - (3) Chlorophyceae 2-8, equal length, apical
  - (4) All are correct
- **60.** Which of the following lack the ability to fix nitrogen ?
  - (1) Spirogyra (2) Anabaena
  - (3) Nostoc (4) Rhizobium

# Bryophyta

- **61.** Gemma :
  - (1) Is an asexual bud, green and multicellular
  - (2) Develops in small receptacles called gemma cup
  - (3) Get detached from the parent body and germinate to form new individuals
  - (4) All are correct
- **62.** The spores of bryophytes germinate to form :
  - (1) Green parasitic gametophytes
  - (2) Non-green independent gametophytes
  - (3) Non-green parasitic gametophytes
  - (4) Green free-living gametophytes

- **63.** The second stage of gametophyte in mosses is the leafy which :
  - Develops from the protonema as the lateral bud
  - (2) Consists of upright slender axis bearing sprially arranged leaves
  - (3) Both (1) and (2)
  - (4) Is brown and non-photosynthetic
- **64.** The similarity between bryophytes and algae is the presence of :
  - (1) Thallus plant body, autotrophic nutrition and presence of vascular tissue
  - (2) Thallus plant body, autotrophic nutrition and lack of vascular bundle
  - (3) Presence of rhizoid, cauloid and phylloid
  - (4) All of the above
- **65.** The spread of living bryophytes and pteridophytes is restricted to moist, damp and shady places as :
  - They require water for fertilization and gametophyte requires cool, damp and shady places
  - (2) They lack motile gametes
  - (3) They are weak plants
  - (4) They lack vascular bundles
- **66.** Embryo is present but true vasculature is absent in phylum :
  - (1) Cyanophyta
  - (2) Tracheophyta
  - (3) Bryophyta
  - (4) Chlorophyta
- **67.** The unique feature of Bryophytes compared to other green plant groups is that :
  - (1) They produce spores
  - (2) They lack vascular tissue
  - (3) They lack root
  - (4) Their sporophyte is attached to gametophyte

- **68.** In Bryophytes diploid number of chromosomes occur in :
  - (1) Gametes
  - (2) Spores
  - (3) Spore mother cells
  - (4) Nuclei of gametes
- **69.** The plant used as an alternative of cotton:
  - (1) Sphagnum(2) Funaria(3) Riccia(4) Andria
- 70. The Antherozoids of Bryophytes possess:
  (1) 2 Flagella
  (2) 1 Flagella
  (3) Multiflagella
  (4) No-flagella
- 71. Which of the following is bryophyte?
  (1) Funaria
  (2) Volvox
  (3) Chlorella
  (4) Spirullina
- 72. The group bryophyta includes:(1) Liverworts and ferns(2) Liverworts and club moss
  - (3) Moss and ferns
  - (4) Liverworts and moss
- **73.** A leafy non-vascular plant with parasitic sporophytic generation should properly be classified in :
  - (1) Thallophyta (2) Bryophyta
  - (3) Pteridophyta (4) Spermatophyta
- **74.** A leafy gametophyte plant with multicellular rhizoids and sporophyte differentiated in foot, seta and capsule should belong to :
  - (1) Psilopsida (2) Hepaticopsida
  - (3) Bryopsida (4) Lycopsida
- **75.** Jacketed archegonia occur in :
  - (1) Riccia (2) Funaria
  - (3) Sphagnum (4) All
- **76.** Bryophytes differ from thallophytes in having :
  - (1) Embryo
  - (2) Rhizoids
  - (3) Sterile jacket around sex organs
  - (4) All the above

- 77. Spores do not form protonema but directly grow into flat branching thallus in:
  (1) Liverworts (2) Mosses
  (3) Ferns (4) Gymnosperms
- **78.** In bryophyta, simplest sporophyte occur in:
  - (1) Riccia(2) Marchantia(3) Funaria(4) Anthoceros
- **79.** In which of the following bryophytes there are gammae, the means of vegetative reproduction :
  - (1) Riccia(2) Marchantia(3) Sphagnum(4) Anthoceros
- **80.** Which of the following is example of moss?
  - (1) Funaria(2) Riccia(3) Anthoceros(4) Pellia
- 81. In Bryophytes what is absent :
  - (1) Embryo formation
  - (2) Fertilization
  - (3) Motile gametes
  - (4) True roots and vascular tissue
- **82.** In bryophytes fertilization takes place:
  - (1) At low temp.
  - (2) In dry condition
  - (3) In presence of water
  - (4) In above all situation
- **83.** Which statement is true about bryophytes that?
  - (1) They are non photosynthetic
  - (2) Zygote produces gametophyte on germination
  - (3) Spores form gametophyte plant on germination
  - (4) They have vascular tissues
- **84.** Which bryophyte is of economic importance?
  - (1) Funaria (2) Marchantia
  - (3) Riccia (4) Sphagnum

- **85.** Which type of fertilization is found in bryophytes?
  - (1) Siphonogamous
  - (2) Zoodiogamous
  - (3) Zoodio-siphonogamous
  - (4) Fertilization is not found
- **86.** Mosses are gregarious because they:
  - (1) Have vascular tissue
  - (2) Have indirect germination of spores
  - (3) Have direct germination of spores
  - (4) Have spore mother cells
- **87.** Aquatic ancestry of bryophytes is evidenced by:
  - (1) Their green colour
  - (2) Algae like protonema
  - (3) Many aquatic bryophytes
  - (4) Flagellated male gametes
- **88.** Moss sporophyte is diffentiated in:
  - (1) Stem & leaves
  - (2) Root, stem and leaves
  - (3) Rhizoids, stem & leaves
  - (4) None of these
- **89.** Oblique septa are found in which part of moss:
  - (1) Rhizoids of sporophyte
  - (2) Rhizoids of gametophyte
  - (3) Leaves
  - (4) Stem
- 90. Leaves of Mosses and Ferns are:
  - (1) Analogous and homologous both
  - (2) Analogous but not homologous
  - (3) Homologous but not analogous
  - (4) None of the above
- **91.** Which of the following plants are similar to amphibia animals in requirement of water for fertilisation?
  - (1) Bryophyta(2) Pteridophyta(3) Angiosperm(4) (1) and (2) both
- **92.** In which of the following zygote forms a diploid structure:
  - (1) Thallophyta(2) Bryophyta(3) Algae(4) Fungi

93.	Bryophytes are: (1) First successful land plant (2) Vascular cryptogams (3) Non vascular cryptogams (4) Vascular embryophytes	100. 101.	<ul> <li>Which bryophyte known as Peat moss?</li> <li>(1) <i>Riccia</i></li> <li>(2) <i>Riella</i></li> <li>(3) <i>Sphagnum</i></li> <li>(4) <i>Marchantia</i></li> <li>Leafy gametophyte occur in :</li> <li>(1) Liver worts</li> <li>(2) Horn worts</li> <li>(3) <i>Lorp</i></li> </ul>
94.	Sex organ in bryophytes are: (1) Unicellular and jacketed (2) Unicellular and non-jacketed (3) Multicellular and jacketed (4) Multicellular and non jacketed	102.	<ul> <li>(3) Moss</li> <li>(4) Fern</li> <li>The sporophyte of moss absorbs water</li> <li>from gametophyte with the help of:</li> <li>(1) Capsule</li> <li>(2) Seta</li> <li>(3) Foot</li> <li>(4) Haustoria</li> </ul>
95. 96.	Fossilised fuel obtained from bog is:(1) Tar(2) Peat(3) Bio-gas(4) PetrolWhich structure produces the gamete	103.	<ul> <li>Stem and leaves of bryophyta plants are:</li> <li>(1) Analogous to stem and leaves of higher plants</li> <li>(2) Homologous to stem and leaves of higher plants</li> </ul>
	bearing plant of moss? (1) Spore (2) A Sexual Bud (3) Protonema (4) Zygote		<ul><li>(3) Both analogous and homologus</li><li>(4) None</li></ul>
97.	Bryophyta show an advancement over algae in: (1) Having multi cellular sporophytic	104.	Non vascular embryophyta are: (1) Thallophyta (2) Bryophyta (3) Pteridophyta (4) (1) and (2) both The water conducting tissue in bryophyta
	<ul><li>(2) Having parasitic sporophyte</li><li>(3) Having zygotic meiosis</li><li>(4) None of the above</li></ul>	103.	<ul> <li>is:</li> <li>(1) Parenchyma (2) Sclerenchyma</li> <li>(3) Trachieds (4) Sieve tubes</li> </ul>
98.	<ul><li>Bryophyta like to grow in moist places</li><li>because:</li><li>(1) Of absence of roots, they has to absorb the moisture from water ground</li></ul>	106.	Bryophyta are not tall plants due to: (1) Absence of meristem (2) Absence of vascular tissues (3) Presence of root system (4) All the above
	<ul> <li>(2) Male gametes require water for swimming</li> <li>(3) They do not have water proof coating of cut in on their aerial surface to prevent the loss of water</li> <li>(4) All the above</li> </ul>	107.	The first cell of sporophytic generation in bryophyta is: (1) Spore (2) Spore mother cell (3) Zygote (4) Protonema
99.	Bryophyta are ecologically important plants as they are: (1) Best producer in nature (2) Pioneer in succession on barren lands (3) Decomposers (4) Nitrifying plants	108.	Riccia is a bryophyte due to: (1) Thalloid (2) Rhizoids (3) Alternation of generations (4) Dependent sporophyte

109. In bryophyta, organs are referred to as "Leaf like' and 'Stem like' and not the true leaf and stem because: (1) They lack vasuclar tissues (2) They are non-green (3) Thay do not function as leaf and stem (4) All the above 110. Structures for dispersal of spores in bryophyta are: (1) Elaters (2) Pseudoelaters (3) Peristomeal teeth (4) All the above 111. In which bryophyta germination of spore is indirect: (1) Riccia (2) Rhizopus (3) Puccinia (4) Funaria 112. Seedless non-vascular plants are: (1) Angiosperm (2) Gymnosperm (3) Pteridophyte (4) Bryophytes 113. Sterile jacket cells around reproductive cells is characteristic of: (2) Bryophyta (1) Algae (4) Thallophyta (3) Fungi The vascular tissue is absent in: 114. (1) Algae, fungi and pteridophytes (2) Thallophytes and bryophytes (3) Bryophytes and pteridophytes (4) Angiosperm and gymnosperm 115. The sporophyte of bryophyte is: (1) Parasitic (2) Autotrophic (3) Saprophytic (4) Semiparasitic or parasitic 116. Vascular cryptogams or seed less vascular plants belongs to: (2) Pteridophyta (1) Bryophyta (3) Thallophyta (4) Spermatophyta 117. Seed habit first established in: (1) Pteridophytes (2) Gymnosperms (3) Angiosperms (4) None of the above

- 118. Most conspicuous alternation of generation occurs is:(1) Thallophyta (2) Bryophyta
  - (3) Pteridophyta (4) Spermatophyta
- 119. Which of following is a heterosporous pteridophyte?(1) Lycopodium (2) Selaginella
  - (3) Pteridium (4) Dryopteris
- 120. Which group includes green leaf microphyllous plants?(1) Lycopsida(2) Sphenopsida
  - (3) Psilotopsida (4) Pteropsida
- **121.** Roots first originated in:
  - (1) Algae (2) Fungi
  - (3) Bryophyta (4) Pteridophyta
- **122.** Pteridophyta differs from bryophyta in having:
  - (1) Vascular tissue
  - (2) Archegonia
  - (3) Alternation of generations
  - (4) Motile sperm
- **123.** In pteridophyta, reduction division occurs when:
  - (1) Prothallus is formed
  - (2) Spores are formed
  - (3) Sex organs are formed
  - (4) Gametes are formed
- **124.** The main plant body of pteridophytes is:
  - (1) Sporophyte
  - (2) Gametophyte
  - (3) Haploid

(1) Seedless

- (4) None of the above
- **125.** Cryptogamic plants are:
  - (2) Embryoless
  - (3) Leafless (4) Rootless
- **126.** Cone bearing pteridophyta are:
  - (1) Lycopsida and Psilopsida
  - (2) Filicinae and Lycopsida
  - (3) Filicinae and Sphenopsida
  - (4) Lycopsida and Sphenopsida

127.	<ul> <li>Adiantum is called "walking fern" due to:</li> <li>(1) Power of locomotion</li> <li>(2) Vegetative reproduction</li> <li>(3) Motile antherozoites</li> <li>(4) All the above</li> </ul>	136.	Aquat of blu to inc (1) <i>Sa</i> (3) <i>Isc</i>
128.	Heterospory and ligulate leaves occur in:(1) Selaginella(2) Pteridium(3) Funaria(4) Riccia	137.	Most gener (1) An (3) Gy
129.	The aquatic fern, which is an excellentbiofertilizer is:(1) Salvinia(2) Azolla pinnata(3) Pteridium(4) Marsilea	138.	Prese requir comp chara (1) Th
130.	<ul> <li>Sporangia are found in fruiting structures</li> <li>called sporocarps in aquatic ferns, which</li> <li>of the following is aquatic fern:</li> <li>(1) Azolla</li> <li>(2) Selaginella</li> <li>(3) Pteridium</li> <li>(4) Equisetum</li> </ul>	139.	(3) Pt Evolu (1) Se (2) Ps (3) Gy (4) Mo
131.	The antherozoids of fern are: (1) Uniflagellate (2) Biflagellate (3) Quadriflagellate (4) Multiflagellate	140.	Young prote (1) Ro (3) Ro
132.	In pteridophytes the spore germinate to form:	141.	(1) Ta (3) Tu
133.	<ul> <li>(1) Protonema</li> <li>(2) Prothallus</li> <li>(3) Sporophyte</li> <li>(4) Archegonium</li> <li>Secondary growth occur in which</li> </ul>	142.	Indep found (1) Pte
	pteridophyte: (1) <i>Azolla</i> (2) <i>Salvinia</i> (3) <i>Isoetes</i> (4) <i>Selaginella</i>	143.	Game (1) Sł or
134.	<ul> <li>Sporophylls are photosynthetic in:</li> <li>(1) Gymnosperm</li> <li>(2) Angiosperm</li> <li>(3) Bryophyta</li> <li>(4) Pteridophyta</li> </ul>		<ul> <li>(2) He</li> <li>ar</li> <li>(3) Fi</li> <li>ar</li> </ul>
135.	The botanical name of "Sanjeevani" is: (1) Selaginella utricularia (2) Selaginella bryopteris (3) Selaginella crotalaria (4) Selaginella botardia	144.	(4) Se Stem and ir (1) Psi (3) Sp

6.	Aquatic fern which	ch supports the growth
	of blue green alg	ae, <i>Anabaena</i> , and used
	to increase the yi	eld of paddy crop is:
	(1) Salvinia	(2) Marsilea
	(3) Isoetes	(4) Azolla

- 137. Most distinct type of alternation of generations is demonstrated by:
  (1) Angiosperms (2) Ferns
  (3) Gymnosperms (4) Bryophytes
- 138. Presence of motile stage in life cycle & requirement of water as a medium to complete life cycle is diagnostic characters of:
  (1) Thallophyta (2) Bryophyta
  (3) Pteridophyta (4) Cryptogams
- 139. Evolution of seed habit first started in:
  (1) Selaginella like ancestral pteridophytes
  (2) Psilotum like ancestral pteridophytes
  (3) Gymnosperms
  (4) Mosses
- **140.** Young fern leaves and rhizome are protected by:
  - (1) Root cap (2) Ramenta
    - 3) Roots (4) Leaf bases
- 141.In ferns, the permanent roots are:<br/>(1) Tap root<br/>(2) Adventitious roots<br/>(3) Tuberous roots<br/>(4) Rhizome
- **142.** Independent alternation of generation found in:
  - (1) Pteridophyta (2) Spermatophyta
  - (3) Thallophyta (4) Bryophyta
- **143.** Gametophytes of pteridophytes are:
  - (1) Short lived, Free living and sexual organ bearing
  - (2) Heart shaped, dependent on sporophyte and sex organ bearing
  - (3) Fibre like, dependent on sporophyte and sex organ bearing
  - (4) Semi parasite on sporophyte
- **144.** Stem distinctly differentiated in to node and internode in:
  - (1) Psilopsida (2) Lycopsida
    - ) Sphenopsida (4) Pteropsida

- **145.** Spore producing part of pteridophytes is:
  - (1) Sporangia of gametophytes
  - (2) Capsule of sporophytes
  - (3) Sporangia of sporophytes
  - (4) Capsule of gametophytes
- **146.** In pteridophytes, reduction division takes place in:
  - (1) Zygote
  - (2) Spore mother cells
  - (3) Gametangia
  - (4) Prothallus
- **147.** Cambium is absent in:
  - (1) Pteridophytes
  - (2) Gymnosperms
  - (3) Angiosperms
  - (4) Pteridophytes and gymnosperms

#### Gymnosperm

- 148. Most advanced Gymnosperm belongs to:
  (1) Cycadales
  (2) Coniferales
  (3) Gnetales
  (4) Cycadofillicales
- **149.** Zooideogamy takes place in:
  - (1) Lower gymnosperms
  - (2) Higher gymnosperms
  - (3) Angiosperms
  - (4) All the above
- 150. All Gymnosperms are:
  (1) Heterosporous
  (2) Arborescent
  (3) Seed plants
  (4) All the above
- 151. Gymnosperm plants lack:
  (1) Vessels
  (2) Fruits
  (3) Companion cells
  (4) All the above
- 152. Gymnosperm plants do not produce fruits because they do not have:(1) Ovary(2) Gametes
  - (3) Fertilization (4) None of these
- **153.** Ovule is morphologically equivalent to:
  - (1) Megaspore (2) Megasporangium
  - (3) Microspore (4) Megasporophyll

- **154.** Cones in Gymnosperm plants are:
  - (1) Bisexual
  - (2) Unisexual
  - (3) Sterile
  - (4) Any of the above
- **155.** In which of the following characters, the angiosperms resemble gymnosperms:
  - (1) Presence of ovule
  - (2) Absence of endosperm
  - (3) Presence of vessels
  - (4) Mode of fertilisation by zoodio-sphonogum
- **156.** Ovules are naked in gymnosperm because:
  - (1) Fertilisation is absent
  - (2) True carpels are absent
  - (3) Archegonia are absent
  - (4) Endosperm is absent
- **157.** Gametophyte embeded in sporophyte in:
  - (1) Bryophyta (2) Pteridophyta
  - (3) Cryptogams (4) Spermatophyta
- **158.** Antheridia and archegonia are absent in:<br/>(1) Bryophyta(2) Pteridophyta
  - (3) Gymnosperms (4) Angiosperms
- **159.** Ovules absent in:
  - (1) Pteridophyta (2) Gymnosperm
  - (3) Angiosperm (4) (1) and (2) both
- **160.** Ephedrine is obtained by:
  - (1) Ephedra (2) Gnetum
  - (3) Pinus (4) Cycas
- **161.** In gymnosperms, the pollination is:
  - (1) Anemophilous-micropylar
  - (2) Anemophilous-stigmatic
  - (3) Entomophilous-micropylar
  - (4) Entomophilous-stigmatic
- **162.** Resin turpentine is obtained from:
  - (1) Pinus (2) Adiantum
  - (3) Club mosses (4) Sequoia
- **163.** Which group is largest in gymnosperms?
  - (1) Cycadales (2) Gnetales
  - (3) Coniferales (4) Cordaitales

164.	Spore bearing trache	ophytes:
	(1) Pteridophyta	(2) Gymnosperms
	(3) Angiosperms	(4) All the above
165.	Which of the follow orders resembles wit (1) Cycadales	ving Gymnospermic h angiosperms? (2) Coniferales
	(3) Gnetales	(4) Ginkcoales
166.	Living fossil: (1) Cycas (3) Psilotum	(2) <i>Ginkgo</i> (4) All the above
		( ),
167.	"Heterosporous–Arch name for:	negoniatae" is a
	(1) Ferns	(2) Gymnosperms
	(3) Angiosperms	(4) (1) and (2) both
168.	Sequoia belongs to:	
	(1) Cycadofillicales	(2) Gnetales
	(3) Coniferales	(4) Dicots
169.	Which of the follow group gymnosperm?	wing are absent in
	(1) Trees	(2) Shrubs
	(3) Liana	(4) Herbs
170.	Which plant grou perennial?	up is exclusively
	(1) Dicots	(2) Ferns
	(3) Gymnosperms	(4) Monocots
171.	In Ginkgoales the ma	le gametes are:
	(1) Motile	(2) Non-motile
	(3) Amoeboid	(4) Absent
172.	Male gamete of Cyca kingdom, is:	is is largest in plant
	(1) Non motile	(2) Biflagellate
	(3) Multiciliate	(4) Uniflagellate
173.	Which of the f unchanged for last m (1) <i>Pinus</i>	ollowing remained any million years? (2) Rice
	(3) Acacia	(4) Ginkao
		(.)
174.	Life cycle of gymnos	perm is:
	(1) Haplontic	(2) Haplodiplontic
	(3) Diplontic	(4) Diplohaplontic

175.	Which of the follo	owing is commonly
	known as "Chilgoza	pine"?
	(1) Pinus roxburghii	(2) P. strobus
	(3) P. gerardiana	(4) P. sylvestris
176.	If the haploid no.	of chromosomes in
	dumanaanarma ia 10 uu	hat will be the ne of

- gymnosperm is 12, what will be the no. of chromosomes in its root and endosperm: (1) 12, 12 (2) 12, 24 (3) 24, 12 (4) 24, 36
- **177.** Fruits are not formed in gymnosperm because:
  - (1) Fertilization is absent
  - (2) Pollination is absent
  - (3) Seeds are not formed
  - (4) Ovary is absent
- **178.** Gymnosperms differ from pteridophytes in having:
  - (1) Presence of tracheids
  - (2) Presence of embryo
  - (3) Presence of ovule
  - (4) Companian cell
- **179.** Most gymnosperms have:
  - (1) Both archegonia and antheridia
  - (2) Antheridia but no archegonia
  - (3) Archegonia but no antheridia
  - (4) No antheridia or archegonia

**180.** The "endosperm" of a gymnosperm represent:

- (1) Gametophytic tissue
- (2) Sporophytic tissue
- (3) Tissue formed by double fertilization
- (4) Polyploid tissue

181. Which of the following is not heterosporous?(1) Selaginella (2) Pinus

(3) Dryopteris (4) Cycas

**182.** Which of the following plant form seed and have pollen tube?

- (1) Angiosperm (2) Pteridophytes
- (3) Gymnosperm (4) (1) and (3) Both

- **183.** Seeds of gymnosperms have three generations, that is:
  - (1) Two sporophytic and one gametophytic generation
  - (2) Two gametophytic and one sporophytic
  - (3) All the three sporophytic generations
  - (4) All the three gametophytic generations
- **184.** Cycas and ferns resemble each other in possessing:
  - (1) Seeds
  - (2) Ovules
  - (3) Pollen tube
  - (4) Circinate ptyxis and ramenta
- **185.** Which of the following plants produces seeds but not flowers?
  - (1) Maize (2) Mint
  - (3) Peepal (4) Pinus
- **186.** Success and dominance of vascular plants on earth is due to:
  - (1) Development of roots
  - (2) Development of water proofing materials like cutin on surface
  - (3) Development of conducting tissues
  - (4) All the above

- **187.** Which major change occured in germination of spores during evolution of seed?
  - (1) Endosporic to exosporic
  - (2) Exosporic to endosporic
  - (3) Direct to indirect
  - (4) No change
- **188.** The pollen grains of gymnosperms:
  - Are carried in air current and come in contact with the opening of the ovules borne on megasporophylls
  - (2) The pollen tube carrying the male gametes grow towards archegonia in the ovules and discharge their contents near the mouth of the archegonia
  - (3) Represent male gametophyte
  - (4) More than one option is correct

	ANSWER KEY																								
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	4	3	3	4	4	1	4	3	2	3	3	3	2	1	1	4	1	1	2	3	1	4	3	2	1
Que.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	3	4	4	2	4	4	1	4	4	2	2	3	1	4	1	3	4	2	3	1	2	2	3	1	2
Que.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	2	3	2	2	2	1	4	4	4	1	4	4	3	2	1	3	4	3	1	1	1	4	2	3	4
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans.	4	1	1	2	1	4	3	3	4	2	2	4	4	2	2	4	2	3	3	2	2	1	2	2	3
Que.	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
Ans.	3	3	3	2	1	2	3	4	1	4	4	4	2	2	4	2	2	3	2	1	4	1	2	1	1
Que.	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Ans.	4	2	1	2	1	4	2	3	4	2	4	2	4	1	2	2	1	1	3	3	2	1	3	1	4
Que.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
Ans.	4	1	2	2	1	2	4	4	1	1	1	1	3	1	3	4	2	3	4	3	1	3	4	3	3
Que.	176	177	178	179	180	181	182	183	184	185	186	187	188												
Ans.	3	4	3	3	1	3	4	1	4	4	4	2	4												

		Exer	cise -	- 11			
1. 2.	Algae reproduce by (1) Asexual (3) Vegetative Stored food in Pha (1) Laminarin or mar (3) Cellulose	/: (2) Sexual (4) All the above eophyceae is: nitol(2) Starch (4) Algin	8.	Match the <b>Colum</b> A. Chlamy B. Volvox C. Fucus D. Spirogy	column: <b>n-I</b> domonas ra	<b>Column-II</b> (i) Isogamo (ii) Anisoga (iii) Oogam	ous imous ous ::::)
3.	Asexual reproduct Algae is by: (1) Biflagellated zo (2) Single flagellate (3) Aplanospore (4) None of these	on in maximum Brown ospore ed zoospore	9.	(1) $A = (1)$ , (2) $A = (1, i)$ (3) $A = (iii)$ (4) $A = (1, i)$ Read the f (i) Agar-a and in	i), B = (ii), C = i), B = (iii), C , B = (i, ii), C ii, iii), B = (iii following sta gar is used the prepar	(iii), D = (ii, D = (i), D = (i), D = (iii), D = (iii), D = (iii), C = (iii), I = (iiii), I = (iiii), I = (iii), I = (iii), I = (iii), I = (iii), I = (i	(i, iii) (i) D = (i) microbes
4.	Major Pigments in (1) Chlorophyll a (3) Fucoxanthin	Phaeophycae: (2) Chlorophyll c (4) All the above		and jel (ii) Chlore algae,	llies lla and Spir rich in fat a	ulina are u nd are used	nicellular d as food
5.	Generally red Alga (1) Zoospore (3) Non-motile game	e do not form: (2) Non-motile spore ete (4) None of these		supple (iii) <i>Porph</i> y are po (iv) Algae a	ements by s <i>ira, Lamina</i> isonous are photosy	pace travel <i>ria</i> and Sc nthetic	lers argassum
6.	The artificial sys gives equal weight sexual characters. as: (1) Sexual charac affected by t	tem of classification cage to vegetative and This is not acceptable ters are more easily he environment than	10.	<ul> <li>(v) Spirog</li> <li>How many</li> <li>incorrect?</li> <li>(1) Five</li> <li>Identify X</li> <li>below:</li> </ul>	yra is a filar y of the ab (2) Three , Y and Z	mentous fu ove statem (3) Four in the tak	ngi nents are (4) Two ble given
	(2) Vegetative cha affected by t	racters are more easily he environment than		Classes	Major pigments	Stored food	Flagella
	sexual charact (3) Both vegetative a equally affecte	ers and sexual characters are d by the environment	(1)	Chlorophyceae	Chlorophyll a and b	Y	2-8, equal, apical
	(4) Neither vege characters ar environment	4) Neither vegetative nor sexual characters are affected by the (2) environment			х	Mannitol laminarin	2, unequal lateral
7.	According to phy classification:	logenetic system of	(3)	Rhodophyceae	Chlorophyll a and b	Fluoridean starch	Z
	<ul> <li>(1) Organisms bel have different</li> <li>(2) Morphology is organism class</li> <li>(3) Organisms belo have same and</li> <li>(4) Organisms be have a commo</li> </ul>	onging to same taxa ancestors the main basis for ification onging to different taxa estors longing to same taxa n ancestor		<ul> <li>(1) X = Fu flagella</li> <li>(2) X = P Flagell</li> <li>(3) X = Ch 2-flage</li> <li>(4) X = Ch = Flage</li> </ul>	icoxanthin, a hycobilins, a absent ilorophyll-e ella lorophyll-a ella absent	Y = Starch Y = Mann , Y = Lamir and c, Y =	, Z = 2-8 itol, Z = narin, Z = Starch, Z

- 11. The main plant body of bryophyte is:
  (1) Haploid
  (2) Diploid
  (3) Haplo-diploid
  (4) Diplo-haploid
- **12.** The plant body of liverworts is:
  - (1) Sporophyte (2) Thalloid
  - (3) With roots (4) Xerophytic
- 13. Vegetative reproduction in mosses is by:
  (1) Fragementation (2) Budding
  (3) Both (1) & (2) (4) By spore
- Marchantia is the example of:
  (1) Mosses
  (2) Liver worts
  (3) Sphenopsida
  (4) Lycopsida
- **15.** In Mosses creeping, green, branched and frequently filamentous stage is called:
  - (1) Protonema (2) Rhizome
  - (3) Rhizophore (4) All of these
- **16.** Identify the diagram below and mention the class to which this plant belongs:



- (1) Equisetum, Sphenopsida
- (2) Funaria, Bryopsida
- (3) Funaria, Hepaticopsida
- (4) Dryopteris, Filicopsida
- **17.** Which of the following is **incorrect** w.r.t. bryophytes?
  - (1) They play an important role in plant succession on bare rocks/soil
  - (2) They usually occur in shaded, dry and xeric areas
  - (3) They lack gamete formation
  - (4) 2 and 3 both

- **18.** Read the following statement w.r.t. bryophytes:
  - (i) Sporophyte is multicellular
  - (ii) Sporophyte is free living
  - (iii) The spores germinate to produce sporophyte
  - (iv) Some cells of sporophyte undergo reduction division to produce haploid spores
  - (v) Gametophyte is non-photosynthetic structure

Which of the above statements are correct?

- (1) (i), (ii) and (v) (2) (i) and (iv)
- (3) (ii), (iii) and (v) (4) (i), (iii) and (iv)
- **19.** Read the following statements:
  - **A.** Bryophytes live in soil but depend on water for sexual reproduction
  - B. The male gamete (sperm) of bryophytes is biflagellatedChoose the correct option
  - (1) Both the staements A and B are incorrect
  - (2) Both the statements A and B are correct
  - (3) The statement A is correct but B is incorrect
  - (4) The statement A is incorrect but B is correct

**20.** Which of the following is correct for pteridophytes showing the events which is precursor to the seed habit?

- (1) These are heterosporous
- (2) The female gametophyte in these plants is are retained on the parent sporophytes for same periods
- (3) The development of zygotes into young embryos take place within the male gametophytes
- (4) All are correct
- **21.** The leaves of Pteridophyta are:
  - (1) Microphylls (2) Macrophylls
  - (3) Both (1) & (2) (4) None of these

- **22.** In majority of the Pteridophytes all the spores are of similar kind such plants are called:
  - (1) Homosporous
  - (2) Heterosporous
  - (3) Prothallus
  - (4) Protanema
- **23.** Which is the dominant phase of Pteridophytes?
  - (1) Gametophyte (2) Sporophyte
  - (3) Spores (4) Gametes
- 24. In Pteridophytes, sporophylls may form distinct compact structure, called:(1) Strobili or cones (2) Microphyll
  - (3) Macrophyll (4) Tropophyll
- **25.** Pteridophytes are classified in to:
  - (1) Three classes (2) Two classes
  - (3) Four classes (4) Five classes
- 26. Gymnospermic plants are:
  - (1) Homosporous
  - (2) Heterosporous
  - (3) Both
  - (4) With out spores
- 27. The nucellus is protected by envelopes and the composite structure is called:(1) Megaspore (2) Microspore
  - (3) Ovule (4) Cone
- **28.** In cycas specialised roots are associated with N<sub>2</sub> fixing cyanobacteria, called:
  - (1) Tap root
  - (2) Coralloid root
  - (3) Adventitious root
  - (4) All the above
- 29. Gymnosperms include:(1) Medium sized trees (2) Tall tree
  - (3) Shrubs (4) All the above
- **30.** In Gymnosperm which is not found:
  - (1) Antheridia (2) Archegonia
  - (3) Both (4) None of these

- **31.** Read the following statement w.r.t. gymnosperms:
  - (i) The cones bearing megasporophylls with ovules or megasporangia are called megasporangiate or female strobili
  - (ii) The male or female cones or strobili may be borne on the same tree (e.g., Pinus)
  - (iii) In Cycas, male cones and female cone are borne on different trees
  - (iv) One of the cells of nucellus differentiates into megaspore mother cell
  - (v) Ovule is a specialised megasporangium which is integumented, dehiscent and permanently stores the megaspores

How many of the above statements are correct?

(1) Three (2) Five (3) Four (4) Two

- **32.** Unlike bryophytes and pteridophytes, in gymnosperms the:
  - Male and female gametophytes do not have an independent free-living existence
  - (2) Male gametophytes have an independent existence but female gametophytes do not
  - (3) Male gametophytes do not have an independent existence but female gametophytes have
  - (4) Male and female gametophytes have an independent free living existence
- **33.** Select the correct incorporation sequence of one structure within the other in a gymnosperm:
  - Spores → Sporophylls → Strobilus → Sporangia
  - (2) Sporangia  $\rightarrow$  Spores  $\rightarrow$  Sporophylls  $\rightarrow$  Strobilus
  - (3) Sporangia  $\rightarrow$  Strobilus  $\rightarrow$  Sporophylls  $\rightarrow$  Spores
  - (4) Spores → Sporangia → Sporophylls → Strobilus

- **34.** Which statement is **wrong** for *Cycas*?
  - (1) Xylem have vessels
  - (2) Male cones are well developed
  - (3) It has coralloid roots
  - (4) Circinate ptyaxis
- **35.** Which of the following statement is true for bryophyta?
  - (1) Along with water absorption roots also provide anchoragement to plants
  - (2) Sporophyte is dominant
  - (3) Gametophyte is dominant and sporophyte is mostly parasitic
  - (4) Gametophyte is parasitic
- **36.** Vessels are found in:
  - (1) All angiosperms and some gymnosperm
  - (2) Most of the angiosperms and few gymnosperm
  - (3) All angiosperms, all gymnosperms and some pteridophyta
  - (4) All pteridophyta
- **37.** Which one pair of examples will correctly represent the grouping Spermatophyta according to one of the schemes of classifying plants?
  - (1) Acacia, Sugarcane
  - (2) Pinus, Cycas
  - (3) Rhizopus, Triticum
  - (4) Ginkgo, Pisum
- **38.** Plants reproducing by spores such as mosses and ferns are grouped under the general term:
  - (1) Cryptogams (2) Bryophytes
  - (3) Sporophytes (4) Thallophytes
- **39.** Which one of the following pairs of plants are not seed producers?
  - (1) Fern and Funaria
  - (2) Funaria and Ficus
  - (3) Ficus and Chlamydomonas
  - (4) Punica and Pinus

- **40.** Classification system are changing every now and then because an attempt has been made to evolve such a system ultimately which is able to explain evolutionary relations in organisms. What was the correct sequence of these types of classification systems with respect to their evolution:
  - (1) Practical  $\rightarrow$  Artificial  $\rightarrow$  Natural  $\rightarrow$  Phylogenetic  $\rightarrow$  Numerical
  - (2) Artificial  $\rightarrow$  Practical  $\rightarrow$  Numerical  $\rightarrow$  Phylogenetic
  - (3) Practical  $\rightarrow$  Artificial  $\rightarrow$  Natural  $\rightarrow$ Numerical  $\rightarrow$  phylogenetic
  - (4) Numerical  $\rightarrow$  Artificial  $\rightarrow$  Natural  $\rightarrow$  Practical  $\rightarrow$  phylogenetic
- **41.** The **correct** sequence of evolution is:
  - (1) Bryophyta  $\rightarrow$  Pteridophyta  $\rightarrow$ Gymnosperms  $\rightarrow$  Dicots  $\rightarrow$  Monocots
  - (2) Pteridophyta  $\rightarrow$  Gymnosperms  $\rightarrow$ Dicots  $\rightarrow$  Monocots  $\rightarrow$  Bryophyta
  - (3) Bryophyta  $\rightarrow$  Gymnosperms  $\rightarrow$ Dicots  $\rightarrow$  Monocots  $\rightarrow$  Angiosperms
  - (4) Bryophyta  $\rightarrow$  Pteridophyta  $\rightarrow$ Gymnosperms  $\rightarrow$  Monocots  $\rightarrow$  Dicots
- **42.** Which of the following is not a character related to Red Algae?
  - (1) Sexual reproduction is oogamous.
  - (2) They occur in both well lighted areas and great depths of oceans.
  - (3) The food stored in them is cyanophycean starch, very similar to amylopectin and glycogen.
  - (4) They reproduce asexually by non motile spores.
- **43.** Find the incorrect from the following:
  - Sporophyte of moss is more elaborate than that in liver worts
  - (2) Gemmae are asexual buds formed in moss only
  - (3) Funaria, Polytrichum & Sphagnum are moss plants
  - (4) After meiosis spores are produced within the capsule of bryophytes

- **44.** Oogamous type of sexual reproduction is found in:
  - (1) Chlamydomonas & Spirogyra
  - (2) Chlamydomonas & Ulothrix
  - (3) Spirogyra & Ulothrix
  - (4) Volvox & Fucus
- **45.** A plant shows sporophyte as a main generation. Its gametophyte shows rhizoids and is haploid. It needs water to complete its life cycle because the male gametes are motile. Identify the group to which it belongs to:

(1) Pteridophytes(2) Gymnosperms(3) Monocots(4) Bryophytes

- **46.** A protonema is?
  - A structure in pteridophytes formed before the thallus develops
  - (2) A sporophytic free living structure formed in pteridophytes
  - (3) A creeping, green, filamentous and gametophytic structure produced in bryophytes
  - (4) A primitive structure formed after fertilization in pteridophytes
- **47.** Read the following statements & select the correct option:
  - (A) Gymnosperms do not show xerophytic characters.
  - (B) In *Cycas* coralloid roots are associated with mycorrhiza
  - (C) In conifers needle like leaves reduce the surface area
  - (D) All gymnosperms are heterosporous How many *above* statements are correct & incorrect?
  - (1) 2 correct, 2 incorrect
  - (2) 3 correct, 1 incorrect
  - (3) 1 correct, 3 incorrect
  - (4) 0 correct, 4 incorrect

- **48.** Diplontic life cycle is found in:
  - (1) Thallophyta & Bryophyta
  - (2) Gymnosperms & Angiosperms
  - (3) Bryophyta & Pteridophyta
  - (4) Both (2) & (3)
- **49.** The life cycle pattern shown is seen in which group of plants:



- (1) In algae only
- (2) In bryophytes and pteridophytes
- (3) In gymnosperms only
- (4) In algae and gymnosperms

#### **50.** Identify the life cycle pattern:



- (1) Diplontic
- (2) Haplontic
- (3) Diplo-haplontic
- (4) Haplo-diplontic

	ANSWER KEY																								
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	4	1	1	4	1	2	4	4	2	4	1	2	3	2	1	2	4	2	2	1	3	1	2	1	3
Que.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	2	3	2	4	1	1	1	4	1	3	2	2	1	1	3	1	3	2	4	1	3	1	2	2	1

	Exercise – III (Previ	ous Yea	r Questions)
1.	<ul> <li>[AIPMT- 2006]</li> <li>Conifers differ from grasses in the:</li> <li>(1) Absence of pollen tubes</li> <li>(2) Formation of endosperm before fertilization</li> <li>(3) Production of seeds from ovules</li> <li>(4) Lack of xylem tracheids</li> </ul>	6.	<ul> <li>Flagellated male gametes are present in all the three of which one of the following sets:</li> <li>(1) Riccia, Dryopteris and Cycas</li> <li>(2) Anthoceros, Funaria and Spirogyra</li> <li>(3) Zygnema, Saprolegnia and Hydrilla</li> <li>(4) Fucus, Marsilea and Calotropis</li> </ul>
2.	Moss peat is used as a packing material for sending flowers and live plants to distant places because: (1) It reduces transpiration (2) It serves as a disinfectant (3) It is easily available (4) It is hygroscopic	7.	<ul> <li>In gymnosperms, the pollen chamber represents:</li> <li>(1) The microsporangium in which pollen grains develop</li> <li>(2) A cell in the pollen grain in which the sperms are formed</li> <li>(3) A cavity in the ovule in which pollen</li> </ul>
3.	<ul> <li>In a moss the sporophyte:</li> <li>(1) Arises from a spore produced from the gametophyte</li> <li>(2) Manufactures food for itself, as well as for the gametophyte</li> <li>(3) Is partially parasitic on the gametophyte</li> <li>(4) Produces gametes that give rise to the gametophyte</li> </ul>	8.	<ul> <li>grains are stored after pollination</li> <li>(4) An opening in the megagametophyte through which the pollen tube approaches the egg</li> <li>Spore dissemination in some liverworts is aided by : <ul> <li>(1) Peristome teeth</li> <li>(2) Elaters</li> <li>(3) Indusium</li> <li>(4) Calyptra</li> </ul> </li> </ul>
	[AIPMT-2007]		[AIPMT-2008]
4.	<ul> <li>In the prothallus of a vascular cryptogam, the antherozoids and eggs mature at different times. As a result:</li> <li>(1) Self fertilization is prevented</li> <li>(2) There is no change in success rate of fertilization</li> <li>(3) There is high degree of sterility</li> <li>(4) One can conclude that the plant is apomictic</li> <li>If you are asked to classify the various</li> </ul>	9.	<ul> <li>Select one of the following pairs of important features distinguishing Gnetum from Cycαs and Pinus and showing affinities with angiosperms:</li> <li>(1) Perianth and two integuments</li> <li>(2) Embryo development and apical meristem</li> <li>(3) Absence of resin duct and leaf venation</li> <li>(4) Presence of vessel elements and absence of archegonia</li> </ul>
	algae into distinct groups, which of the following characters you should choose? (1) Chemical composition of the cell wall	10.	In which one of the following, male and female gametophytes do not have free

- (1) Chemical composition of the cell wall
- (2) Types of pigments present in the cell
- (3) Nature of stored food materials in the cell
- (4) Structural organization of thallus
- (1) Polytrichum (2) Cedrus

living independent existence?

(3) Pteris (4) Funaria

- 11. Which one of the following is heterosporous?
  (1) Adiantum
  (2) Equisetum
  (3) Dryopteris
  (4) Salvinia
- **12.** Cellulose is the major component of cell walls of:
  - (1) Pseudomonas
  - (2) Saccharomyces
  - (3) Pythium
  - (4) Xanthomonas

# [AIPMT-2009]

- **13.** Which one of the following has haplontic life cycle?
  - (1) Wheat (2) Funaria
  - (3) Polytrichum (4) Ustilago
- **14.** Which one of the following is a vascular cryptogamous?
  - (1) Cedrus(2) Equisetum(3) Ginkgo(4) Marchantia
- **15.** Phylogenetic system of classification is based on:
  - (1) Floral characters
  - (2) Evolutionary relationships
  - (3) Morphological features
  - (4) Chemical constituents
- **16.** Which one of the following is considered important in the development of seed habit?
  - (1) Free-living gametophyte
  - (2) Dependent sporophyte
  - (3) Heterospory
  - (4) Haplontic life cycle
- **17.** Which one of the following plants is monoecious?

(1) Papaya	(2) Marchantia
(3) Pinus	(4) Cycas

**18.** Which of the following is a symbiotic nitrogen fixer?

(1) Azolla	(2) Glomus

(3) Azotobacter (4) Frankia

# [AIPMT-2010]

- 19. Male and female gametophytes are independent and free-living in:(1) Sphagnum (2) Mustard
  - (3) Castor (4) Salvinia
- **20.** Algae have cell wall made up of:
  - (1) Cellulose, hemicellulose and pectins
  - (2) Cellulose, galactans and mannans
  - (3) Hemicellulose, pectins and proteins
  - (4) Pectins, cellulose and proteins
- **21.** The chief water conducting elements of xylem in gymnosperms are:
  - (1) Tracheids
  - (2) Vessels
  - (3) Fibres
  - (4) Transfusion tissue
- **22.** Examine the figure A, B, C and D. In which one of the four options all the items A, B, C and D are correct?







# **Options:**

	А	В	С	D
(1)	Equisetum	Ginkgo	Selaginella	Lycopodium
(2)	Selaginella	Equisetum	Salvinia	Ginkgo
(3)	Funaria	Adiantum	Salvinia	Riccia
(4)	Chara	Marchantia	Fucus	Pinus

- 23. Which one of the following is monoecious?
  (1) Cycas
  (2) Pinus
  (3) Date plam
  (4) Marchantia
- 24. Examine the figures (A-D) given below and select the right option out of 1–4, in which all the four structures A, B, C and D are identified correctly:









	Α	В	С	D
(1)	Runner	Archegoniophore	Synergid	Antheridium
(2)	Offset	Antheridiophore	Antipodals	Oogonium
(3)	Sucker	Seta	Megaspore mother cell	Gemma cup
(4)	Rhizome	Sporangiophore	Polar cell	Globule

# [AIIMS-2010]

- **25.** Among the following plant group which has independent gametophyte and sporophyte?
  - (1) Bryophyta
  - (2) Pteridophyta
  - (3) Gymnosperms
  - \*(4) Angiosperms

# [AIPMT-2011]

**26.** A prokaryotic autotrophic nitrogen fixing symbiont is found in:

(1) Alnus	(2) Cycas
(3) Cicer	(4) Pisum

- **27.** Archegoniophore is present in:
  - (1) Marchantia (2) Chara
  - (3) Adiantum (4) Funaria

- **28.** Compared with the gametophytes of the bryophytes, the gametophytes of vascular plants tend to be:
  - (1) Smaller but to have larger sex organs
  - (2) Larger but to have smaller sex organs
  - (3) Larger and to have larger sex organs
  - (4) Smaller and to have smaller sex organs
- **29.** The gametophyte is not an independent, free living generation in:
  - (1) Polytrichum (2) Adiantum
  - (3) Marchantia (4) Pinus
- 30. Examine the figure given below and select the right option giving all the four parts (a, b, c, d) correctly identified.



	(a)	(b)	(c)	(d)
(1)	Antheridio	Male	Clabula	Deete
()	phore	thallus	Globule	ROOLS
(2)	Archegoni	Female	Commo oun	Phizoida
(2)	ophore	thallus	Gemma cup	RHIZOIUS
(2)	Archegoni	Female	Dud	Faat
(3)	ophore	thallus	виа	ΓΟΟΙ
(4)	Seta	Sporophyte	Protonema	Rhizoids

- **31.** Selaginella and Salvinia are considered to represent a significant step toward evolution of seed habit because:
  - (1) Embryo develops in female gametophyte which is retained on parent sporophyte
  - (2) Female gametophyte is free and gets dispersed like seeds.
  - (3) Female gametophyte lacks archegonia
  - (4) Megaspores possess endosperm and embryo surrounded by seed coat.

- **32.** Consider the following four statements whether they are correct or wrong:
  - (a) The sporophyte in liverworts is more elaborate than that is mosses.
  - (b) Salvinia is heterosporous
  - (c) The life-cycle in all seed-bearing plants is diplontic.
  - (d) In Pinus male and female cones are borne on different trees.

The two wrong statements together are:

- (1) Statements (a) and (b)
- (2) Statements (a) and (c)
- (3) Statements (a) and (d)
- (4) Statements (b) and (c)

## [AIIMS-2011]

- **33.** Which statement is correct about mosses?
  - They have dominant and independent sporophyte
  - (2) Their antherozoids require water for fertilization
  - (3) Their archegonia produce many eggs
  - (4) Their antherozoids are multiflagellated

# [AIPMT-2012]

- **34.** *Cycas* and *Adiantum* resemble each other in having:
  - (1) Cambium
  - (2) Vessels
  - (3) Seeds
  - (4) Motile sperms
- **35.** Which one of the following is a correct statement?
  - Antheridiophores and archegoniophores are present in pteridophytes
  - (2) Origin of seed habit can be traced in pteridophytes
  - (3) Pteridophyte gametophyte has a protonemal and leafy stage
  - (4) In gymnosperms female gametophyte is free living

- **36.** Read the following five statements (A–E) and answer as asked next to them:
  - (A) In *Equisetum* the female gametophyte is retained on the parent sporophyte
  - (B) In *Ginkgo* male gametophyte is not independent
  - (C) The sporophyte in *Riccia* is more developed than that in *Polytrichum*
  - (D) Sexual reproduction in Volvox is isogamous
  - (E) The spores of slime molds lack cell walls

How many of the above statements are correct?

(1) Four (2) One (3) Two (4) Three

- **37.** Which one of the following pairs is wrongly matched?
  - (1) Viroids RNA
  - (2) Mustard Synergids
  - (3) Ginkgo Archegonia
  - (4) Salvinia Prothallus

# [NEET-UG-2013]

- **38.** Megasporangium is equivalent to:
  - (1) Ovule (2) Embryo sac
  - (3) Fruit (4) Nucellus
- **39.** Isogamous condition with non-flagellated gametes is found in:
  - (1) Fucus (2) hlamydomonas
  - (3) Spirogyra (4) Volvox
- **40.** Monoecious plant of *Chara* shows occurrence of:
  - (1) Upper oogonium and lower antheridium on the same plant
  - (2) Antheridiophore and archegoniophore on the same plant
  - (3) Stamen and carpel on the same plant
  - (4) Upper antheridium and lower oogonium on the same plant
- **41.** Besides paddy fields, cyanobacteria are also found inside vegetative part of:
  - (1) Psilotum (2) Pinus
  - (3) Cycas (4) Equisetutn

- **42.** Which of the following represents maximum number of species among global diversity?
  - (1) Mosses and fern
  - (2) Algae
  - (3) Lichens
  - (4) Fungi

**43.** Read the following statements (A - E) and answer the question which follows them.

- (a) In liverworts, mosses and ferns gametophytes are free living
- (b) Gymnosperms and some ferns are heterosporous
- (c) Sexual reproduction in *Fucus, Volvox* and *Allbugo* is oogamous
- (d) The sporophyte in liverworts is more elaborate than that in mosses
- (e) Both *Pinus* and *Marchantia* are dioccious

How many of the above statements are correct?

(1) Four (2) Or	ne
-----------------	----

(3) Two (4) Three

## [AIIMS-2013]

- **44.** In which organisms external fertilization occurs:
  - (1) Echinodermata/ Moss
  - (2) Hemichordata/ Fern
  - (3) Reptilia/ Gymnosperm
  - (4) Amphibia/ Algae
- **45.** Match the column-I with column-II:

## Column-I Column-Il

- (i) Chlorophyceae (a) Ectocarpus
- (ii) Lycopsida (b) *Chara*
- (iii) Phaeophyceae (c) Selaginella
- (iv) Liverwort (d) Marchantia
- (1) i-b. ii-c. iii-a. iv-d
- (2) i-b, ii-d. iii-a. iv-c
- (3) i-a. ii-d. iii-c. iv-b
- (4) i-c. ii-a. iii-b. iv-d

## [AIPMT-2014]

- 46. Which one of the following shows isogamy with non-flagellated gametes?
  (1) Sargassum
  (2) Ectocarpus
  (3) Ulothrix
  (4) Spirogyra
- **47.** Which of the following is responsible for peat formation?

(1) Marchantia	(2) Riccia
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- (3) Funaria (4) Sphagnum
- **48.** Male gametophyte with least number of cell is present in:
  - (1) Pteris(2) Funaria(3) Lilium(4) Pinus
- **49.** An Alga which can be employed as food for human being is :
  - (1) Ulothrix (2) Chlorella
    - (3) Spirogyra (4) Polysiphonia

# [AIIMS-2014]

50. Which of the following is homosporous?(1) Selaginella

- (2) Pinus
- (3) Cycas
- (4) Lycopodium
- **51.** Which of the following is not monoecious plant?
  - (1) Cycas
  - (2) Pinus
  - (3) Wheat
  - (4) Mustard
- **52.** Algae, used in preparation of ice-creams and jellies are:
  - (1) Gelidium and Chlorella
  - (2) Gelidium and Gracilaria
  - (3) Choara and Spirulina
  - (4) Chlorella and Spiruline

## [AIPMT-2015]

- 53. In which of the following gametophyte is not independent free living:
  - (1) Marchantia (2) Pteris
  - (3) Pinus (4) Funaria

- **54.** Read the following five statements (A to E) and select the option with **all correct** statements:
  - (A) Mosses and Lichens are the first organisms to colonise a bare rock.
  - (B) Selaginella is a homosporous pteridophyte
  - (C) Coralloid roots in *Cycas* have VAM
  - (D) Main plant body in bryophytes is gametophytic. whereas in pteridophytes it is sporophytic
  - (E) In gymnosperms male and female gametophytes are present within sporangia located on sporophyte
  - (1) (B), (C) and (D) (2) (A), (D) and (E)
  - (3) (B), (C) and (E) (4) (A),(C) and (D)

# **55.** Male gemetes are flagellated in:

- (1) Anabaena (2) Ectocarpus
- (3) Spirogyra (4) Polysiphonia
- **56.** Which one of the following statements is **wrong**?
  - (1) Agar agar is obtained from *Gelidium* and *Gracilaria*
  - (2) Chlorella and Spirulina are used as space food
  - (3) Mannitol is stored food in Rhodophyceae
  - (4) Algin and carragenin are products of algae

## [RE-AIPMT-2015]

- **57.** Which one is a **wrong** statement?
  - (1) Brown algae have chlorophyll a, c and fucoxanthin
  - (2) Archegonia are found in Bryophyta Pteridophyta and Gymnosperms
  - (3) Mucor has biflagellate zoospores
  - (4) Haploid endosperm is typical feature of gymnosperms
- **58.** Algin can be obtained from:
  - (1) Rhodophyceace & chlorophyceae
  - (2) Phaeophyceae & rhodophyceae
  - (3) Rhodophyceae only
  - (4) Phaeophyccae only

- **59.** In *Pinus*, endosperm cells have 30 chromosomes then how many chromosomes are present in sieve cells:
  - (1) 30 (2) 60
  - (3) 10 (4) 15

# [NEET-I - 2016]

- **60.** Select the correct statement:
  - Gymonsperms are both homosporous and heterosporous
  - (2) *Salvinia*, *Ginkgo* and *Pinus* all are gymnosperms
  - (3) Sequoia is one of the tallest trees
  - (4) The leaves of gymnosperms are not well adapted to extrems of climate
- **61.** In bryophytes and pteriodophytes, transport of male gaemetes requires:
  - (1) Wind (2) Insects
  - (3) Birds (4) Water

# [NEET-II - 2016]

- **62.** The ovule of an angiosperm is techincally equivalent to:
  - (1) Megasporophyll
  - (2) Megaspore mother cell
  - (3) Megaspore
  - (4) Megasporangium
- **63.** Conifers are adapted to tolerate extreme environmetal conditions because of:
  - (1) Superficial stomata
  - (2) Thick cuticle
  - (3) Presence of vessels
  - (4) Broad hardy leaves
- **64.** Which one of the following statements is **wrong**?
  - Algin is obtained from red algae, and carrageenan from brown algae
  - (2) Agar-agar is obtained from Gelidium and Gracilaria
  - (3) Laminaria and Sargassum are used as food
  - (4) Algae increase the level of dissolved oxygen in the immediate environment

# [NEET – 2017]

- **65.** Zygotic meiosis is characteristic of: (1) *Marchantia* 
  - (1) Marchan (2) Fucus
  - (2) T ucus
  - (3) Funaria
  - (4) Chlamydomonas
- 66. An example of colonial alga is:
  - (1) Chlorella (2) Volvox
  - (3) Ulothrix (4) Spirogyra
- **67.** Select the mismatch:
  - (1) Pinus Dioecious
  - (2) Cycas Dioecious
  - (3) Salvinia Heterosporous
  - (4) Equisetum Homosporous
- **68.** Life cycle of *Ectocarpus* and *Fucus* respectively are:
  - (1) Haplontic, Diplontic
  - (2) Diplontic, Haplodiplontic
  - (3) Haplodiplontic, Diplontic
  - (4) Haplodiplontic, Haplontic

# [NEET - 2018]

- **69.** Which of the following statements is **correct**?
  - Ovules are not enclosed by ovary wall in gymnosperms.
  - (2) *Selaginella* is heterosporous, while *Salvinia* is homosporous.
  - (3) Horsetails are gymnosperms.
  - (4) Stems are usually unbranched in both *Cycos* and *Cedrus*.
- **70.** Plants having little or no secondary growth are:
  - (1) Grasses
  - (2) Deciduous angiosperms
  - (3) Conifers
  - (4) Cycads
- **71.** Which one is **wrongly** matched?
  - (1) Uniflagellate gametes Polysiphonia
  - (2) Biflagellate zoospores Brown algae
  - (3) Gemma cups Marchantia
  - (4) Unicellular organism Chlorella

- **72.** Winged pollen grains are present in :
  - (1) Mustard (2) *Cycas* 
    - (3) Mango (4) *Pinus*

# [NEET - 2019]

- **73.** Pinus seed cannot germinate and establish without fungal association. This is because.
  - (1) it has very hard seed coat.
  - (2) its seeds contain inhibitors that prevent germination.
  - (3) its embryo is immature.
  - (4) it has obligate association with mycorrhaizae.

# [NEET – 2019 (Odisha)]

**74.** Match the organisms in column-I with habitats in column-II

	Column-I		Column-II
(a)	Halophiles	(i)	Hot springs
(b)	Thermoacidophiles	(ii)	Aquatic
			environment
(c)	Methanogens	(iii)	Guts of
			ruminants
(d)	Cyanobacteria	(iv)	Salty area

Select the correct answer from the options given below:

- (1) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
- (2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (3) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
- (4) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
- **75.** Mad cow disease in cattle is caused by an organism which has:
  - (1) inert crystalline structure
  - (2) abnormally folded protein
  - (3) free RNA without protein coat
  - (4) free DNA without protein coat
- **76.** Which of the following statements is correct?
  - (1) Lichens do not grow in polluted areas.
  - (2) Algal component of lichens is called mycobiont.
  - (3) Fungal component of lichens is called phycobiont
  - (4) Lichens are not good pollution indicators.

- **77.** Which of the following bacteria reduce nitrate in soil into nitrogen?
  - (1) Nitrobacter (2) Nitrococcus
  - (3) Thiobacillus (4) Nitrosomonas
- **78.** Among the following pairs of microbes, which pair has both the microbes that can be used as biofertilizers?
  - (1) Aspergillus and Rhizopus
  - (2) Rhizobium and Rhizopus
  - (3) Cyanobacteria and Rhizobium
  - (4) Aspergillus and Cyanobacteria
- **79.** Which of the following statements about methanogens is not correct?
  - (1) They can be used to produce biogas.
  - (2) They are found in the rumen of cattle and their excreta
  - (3) They grow aerobically and breakdown cellulose-rich food.
  - (4) They produce methane gas.
- **80.** Which of the following is against the rules of ICBN?
  - (1) Hand written scientific names should be underlined.
  - (2) Every species should have a generic name and a specific epithet.
  - (3) Scientific names are in Latin and should be italicized.
  - (4) Generic and specific names should be written starting with small letters.
- **81.** The contrasting characteristics generally in a pair used for identification of animals in taxonomic key are referred to as :
  - (1) Lead (3) Doublet
  - (2) Couplet (4) Alternate

# [NEET(UG) - 2020]

- 82. Floridean starch has structure similar to:
  - (1) Laminarin and cellulose
  - (2) Starch and cellulose
  - (3) Amylopectin and glycogen
  - (4) Mannitol and align

**83.** Match the following columns and select the correct option.

	Colum	nn-l		Column-II
(a)	Clostr	idium	(i)	Cyclosporin – A
	butyli	cum		
(b)	Tricho	derma	(ii)	Butyric Acid
	polysp	orum		
(c)	Mona	scus	(iii)	Citric Acid
	purpu	reus		
(d)	Asper	gillus	(iv)	Blood cholesterol
	niger			lowering agent
	(a)	(b)	(c)	(d)
(1)	(iv)	(iii)	(ii)	(i)
(2)	(iii)	(iv)	(ii)	(i)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(i)	(iii)	(iv)	(iii)

- **84.** Which of the following is correct about viroids?
  - (1) They have free DNA without protein coat.
  - (2) They have RNA with protein coat.
  - (3) They have free RNA without protein coat.
  - (4) They have DNA with protein coat.
- **85.** Which of the following pairs is of unicellular algae?
  - (1) Chlorella and Spirulina
  - (2) Laminaria and Sargassum
  - (3) Gelidium and Gracilaria
  - (4) Anabaena and Volvox
- **86.** Strobili or cones are found in:
  - (1) Equisetum (3) Pteris
  - (2) Salvinia (4) Marchantia
- **87.** Which of the following statements about inclusion bodies is incorrect?
  - (1) These represent reserve material in cytoplasm.
  - (2) They are not bound by any membrane.
  - (3) These are involved in ingestion of food particles.
  - (4) They lie free in the cytoplasm.

# [NEET(UG) 2020 (COVID-19)]

- **88.** Phycoerythrin is the major pigment in:
  - (1) Red algae (2) Blue green algae
  - (3) Green algae (4) Brown algae
- **89.** Which of the following statements is incorrect about gymnosperms?
  - (1) They are heterosporous
  - (2) Male and female gametophytes are free living
  - (3) Most of them have narrow leaves with thick cuticle
  - (4) Their seeds are not covered
- **90.** Inclusion bodies of blue-green, purple and green photosynthetic bacteria are:
  - (1) Contractile vacuoles
  - (2) Gas vacuoles
  - (3) Centrioles
  - (4) Microtubules
- **91.** Which of the following is incorrect about Cynobacteria?
  - (1) They are photoautotrophs
  - (2) They lack heterocysts
  - (3) They often form blooms in polluted water bodies
  - (4) They have chlorophyll a similar to green plants
- **92.** Male and female gametophytes do not have an independent free living existence in:-
  - (1) Pteriodophytes (2) Algae
  - (3) Angiosperms (4) Bryophytes
- **93.** For the commercial and industrial production of Citric Acid, which of the following microbes is used?
  - (1) Aspergillus niger
  - (2) Lactobacillus sp
  - (3) Angiosperms
  - (4) Clostridium butylicum
- 94. Cyclosporin A, used as immune suppression agent, is produced from:(1) Monascus purpureus
  - (2) Satcharomyces cerevisiae
  - (3) Penicillium notatum
  - (4) Trichoderma polysporum

#### [NEET(UG) - 2021]

- **95.** Gemmae are present in:
  - (1) Mosses
  - (2) Pteridophytes
  - (3) Some Gymnosperms
  - (4) Some Liverworts
- **96.** Genera like Selaginella and Salvinia produce two kinds of spores. Such plants are known as:
  - (1) Homosorus (2) Heterosorus
  - (3) Homosporous (4) Heterosporous
- **97.** Which of the following plants is monoecious?
  - (1) Carica papaya
  - (2) Chara
  - (3) Marchantia polymorpha
  - (4) Cycas circinalis
- **98.** Which of the following algae contains mannitol as reserve food material?
  - (1) Ectocarpus(2) Gracilaria(3) Volvox(4) Ulothrix
- **99.** Which of the following algae produce Carrageen?
  - (1) Green algae (2) Brown algae
  - (3) Red algae (4) Blue-green algae
- **100.** Which of the following statements is
  - correct?
    - (1) Fusion of two cells is called Karyogamy.
    - (2) Fusion of protoplasms between two motile on non-motile gametes is called plasmogamy.
    - (3) Organisms that depend on living plants are called saprophytes.
    - (4) Some of the organisms can fix atmospheric nitrogen in specialized cells called sheath cells.
- **101.** Which one of the following belong to the family Muscidae?
  - (1) Fire fly
  - (2) Grasshopper
  - (3) Cockroach
  - (4) House fly

102.	Ma	tch List	-I with L	ist-I	l <b>.</b>							
			List-l			Li	st-ll					
	(a)	Asperg	gillus nig	er	(i)	Aceti	c Acid					
	(b)	Acetok	pacter ac	eti	(ii)	Lacti	c Acid					
	(c)	Clostri	idium		(iii)	Citric	: Acid					
		butylic	cum									
	(d)	Lactob	bacillus		(iv)	(iv) Butyric Acid						
	Ch	oose th	ne corre	ect a	answe	er from	m the					
	opt	ions giv	ven belov	٧.								
		(a)	(b)	(c)		(d)						
	(1)	(iii)	(i)	(iv)		(ii)						
	(2)	(i)	(ii)	(111)		(iv)						
	(3)	(11)	(111)	(1)		(IV)						
	(4)	(1V)	(11)	(1)		(111)						
		[N	IEET(UG)	202	2]							
103.	Wh	ich of	the fo	llowi	ng is	inco	rrectly					
	matched?											
	(1)	Ectocar	pus – Fu	icoxa	anthir	1						
	(2)	Ulothri	x – Manr	itol								
	(3)	Porphy	ra – Flor	idian	Star	ch						
	(4)	Volvox	– Starch	I								
104.	Hvo	drocollo	oid carrag	geen	is ob <sup>.</sup>	tained	from:					
	(1)	Chlorop	hyceae a	and F	haeo	phyce	ae					
	(2)	Phaeop	hyceae a	and F	Rhodo	phyca	е					
	(3) Rhodophyceae and Khodophycae (3) Rhodophyceae only											
	(4)	Phaeop	hyceae d	only								
105	W/b	ich of	the fo	llowi	na ia		orrect					
105.	sta	tement	? ?	110001	116 15		Unect					
	(1)	Cvanoł	nacteria	are	s a	grou	in of					
	(.)	autotro	ophic (	orgar	nisms	cla	ssified					
		under l	Kingdom	Mon	iera.							
	(2)	Bacteri	ia are exe	clusi	vely h	eterot	rophic					
	. /	organis	sms.		5							
	(3)	Slime n	noulds ar	e sap	rophy	tic org	anisms					
	. ,	classifie	ed under	King	dom N	Nonera						
	(4)	Mycopl	<i>asma</i> ha	ve D	NA, R	iboson	ne and					
		cell wa	ıll									

- 106. Identify the asexual reproductive structure associated with *Penicillium*:
  (1) Zoospores (2) Conidia
  - (1) Zoospores(2) Conidia(3) Gemmules(4) Buds

) Geriffides (4) Buds

**107.** Match the plant with the kind of life cycle if exhibits:

	List-I		List-II							
(a)	Spirogyra	(i)	Dominant diploid							
			sporophyte vascular							
			plant. With highly							
			reduced male or							
			female gametophyte							
(b)	Fern	(ii)	Dominant haploid							
			free-living							
			gametophyte							
(c)	Funaria	(iii)	Dominant diploid							
			sporophyte alternating							
			with reduced							
			gametophyte called							
			prothallus							
(d)	Cycas	(iv)	Dominant haploid leafy							
			gametophyte							
			alternating with							
			partially dependent							

multicellular

sporophyte

Choose the correct answer from the options given below:

- (1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)
- (2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (3) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
- (4) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

	Answer Key																								
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Ans.	2	4	3	1	2	1	3	2	4	2	4	3	4	2	2	3	2	4	4	2	1	2	2	2	2
Que.	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Ans.	2	1	4	4	2	1	3	2	4	2	2	4	1	3	1	3	4	4	4	1	4	4	3	2	4
Que.	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	1	2	3	2	2	3	3	4	2	3	4	4	2	1	4	2	1	3	1	1	1	4	4	1	2
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans.	1	3	3	3	4	2	3	3	3	1	1	3	1	2	2	2	3	1	4	4	4	2	1	3	2
Que.	101	102	103	104	105	106	107																		
Ans.	4	1	2	3	1	2	2																		