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Contents

Volume - I

Volume - II

Supplement Book - 1

Unit Test Question Papers
Model Question Papers
Govt. Public Exam Question Paper - March 2020

Supplement Book - 2

Definitions
Differences
Discoveries
Diagrams
Do you know questions
Days of Importance
Abbreviations
Flow charts
Laws and Theories

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2 Plant Kingdom

Book Back Solved Questions - 1 Mark

1. Which of the plant group has gametophyte as a dominant phase?
   a. Pteridophytes
   b. Bryophytes
   c. Gymnosperm
   d. Angiosperm

2. Which of the following represent gametophytic generation in pteridophytes?
   a. Prothallus b. Thallus
   c. Cone d. Rhizophore

3. The haploid number of chromosome for an Angiosperm is 14 , the number of chromosome in its endosperm would be
   a. 7 b. 14
   c. 42 d. 28

4. Endosperm in Gymnosperm is formed
   a. At the time of fertilization
   b. Before fertilization
   c. After fertilization
   d. Along with the development of embryo

Additional Solved Questions - 1 Mark

1. An example of colonial algae is
   a. Chlorella b. Volvox
   c. Ulothrix
   d. Chlamydomonas

2. Double fertilization is exhibited by
   a. Gymnosperms b. Bryophytes
   c. Pteridophytes
   d. Angiosperm

3. Naked seeds occur in
   a. Pteridophytes
   b. Bryophytes
   c. Gymnosperms
   d. Angiosperms

4. Most primitive vascular plants are
   a. Kelps b. Mosses
   c. Cycads d. Ferns

5. Which one of the following group has seedless vascular plants?

---

1. (b) 2. (a) 3. (c) 4. (b) 1. (b) 2. (d) 3. (c) 4. (d) 5. (a)

a. Pteridophyte b. Angiosperm
c. Bryophyte d. Gymnosperms

6. Which of the following plant group is called as amphibians?

a. Thallophyta b. Bryophyta
c. Pteridophyta
d. Tracheophyta

7. Plants reproducing by spores such as mosses and ferns are grouped under the general term

a. Phanerogams
b. Pteridophytes
c. Cryptogams d. Bryophytes

8. Most gymnosperms are

a. Xerophytes b. Hydrophytes
c. Halophytes d. Epiphytes

9. Which of the following is not a cryptogam?

a. Algae b. Bryophyta
c. Pteridophyta
d. Gymnosperms

10. In gymnosperms pollination is by

a. Animals b. Wind
c. Water d. Insects

11. Canada balsam is obtained from

a. Abies balsamea
b. Impatiens balsamina
c. Pinus sp
d. Helianthus annuus

12. Fern's prothallus is normally

a. Haploid b. Diploid
c. Triploid d. Tetraploid

13. Dominant generation in pteridophyte is

a. Prothallus b. Egg
c. Sporophyte d. Gametophyte

14. Which of the following is a fossil pteridophyte?

a. Lycopodium b. Lepidocarpon
c. Psilotum d. Rhynia

15. The aquatic fern which is an excellent biofertilizer is

a. Azolla b. Salvinia
c. Marsilea d. Pteridium

16. Which of the following is used as food?

a. Pteris b. Pteridium
c. Marsilea d. Psilotum

17. Fern prothallus is developed from

a. Spore mother cells
b. Spores
c. Zygote d. Embryo

18. Bryophytes differ from pteridophytes in

a. Swimming antherozoids
b. An independent gametophyte
c. Archegonia
d. Lack of vascular tissue

19. Gametophytic generation is dominant in

a. Bryophyta b. Pteridophyta
c. Gymnosperms
d. Angiosperms

6. (b) 7. (c) 8. (a) 9. (d) 10. (b) 11. (a) 12. (a)
13. (c) 14. (d) 15. (a) 16. (c) 17. (b) 18. (d) 19. (a)

20. Female reproductive organ of bryophytes
a. Sporogonium
b. Archegonium
c. Oogonium d. Antheridium

21. Which plant group dominates land at present?
a. Bryophytes b. Pteridophytes
c. Gymnosperms
d. Angiosperms

22. Triple fusion occurs in
a. Bryophytes b. Angiosperms
c. Pteridophytes
d. Gymnosperms

23. Which of the following is grouped under phanerogam?
a. Gymnosperms
b. Angiosperms
c. Pteridophytes
d. Both (a) and (b)

24. Phycology is the study of
a. Algae b. Fungi
c. Bacteria d. Bryophytes

25. Agar agar is obtained from
a. Chlorella b. Gracilaria
c. Laminaria d. Sargassum

26. Algae which form motile colony is
a. Volvox b. Nostoc
c. Spirogyra
d. Chlamydomonas

27. Pyrenoids are the centre of formation of
a. Enzymes b. Proteins
c. Fats d. Starch.

28. Rhodophyceae is red coloured due to
a. Xanthophyll
b. Carotenoids
c. Phycoerythrin
d. Phycocyanin

29. Brown algae is characterised by the presence of
a. Phycocyanin
b. Phycoerythrin
c. Fucoxanthin d. Chlorophyll

30. Most primitive members of the plant group are
a. Algae b. Bryophytes
c. Pteridophytes
d. Gymnosperms

31. Chloroplast of chlamydomonas is
a. Stellate b. Cup-shaped
c. Collar shaped d. Spiral

32. Match the column I with column II and select the correct option

Column I	**Column II**
A-Algae	- i) Marsilea
B- Bryophyte	- ii) Pinus
C-Pteridophyte	- iii) Oedogonium
D- Gymnosperm	- iv) Riccia

Options
a. A-iii, B-iv,C-i, D-ii
b. A-iv, B-iii, C-ii, D-i
c. A-iii, B-iv, C-ii, D-i
d. A-iii, B-i, C-iv, D-ii

20. (b) 21. (d) 22. (b) 23. (d) 24. (a) 25. (b) 26. (a)
27. (d) 28. (c) 29. (c) 30. (a) 31. (b) 32. (a)

33. The term 'form genera' is used to name the ———

34. The star shaped stele with solid xylem is known as ———

35. —— type of stele is present in monocots

36. In dicots which type of stele is present

a. atactostele b. Siphonostele
c. Eustele d. Plectostele

37. The simplest green plants are

a. Yeast b. Bacteria
c. Algae d. Bryophytes

38. Which of the following is a nitrogen fixer?

a. Ulothrix b. Anabaena
c. Ulva d. Hydrodictyon

39. Which of the following is a flagellated alga?

a. Chlamydomonas
b. Spirogyra
c. Acetabularia d. Chlorella

40. Alginic acid is obtained from

a. Red algae b. Green algae
c. Diatoms d. Brown algae.

41. Non-motile, thick walled spores of algae are called

a. Bulbils b. Akinetes
c. Tubers
d. Hypnospores

42. In oogamy, fertilization involves

a. A large non-motile female gamete and a small non-motile male gamete.
b. A large motile female gamete and a small non-motile male gamete
c. A small non-motile female gamete and a large motile male gamete
d. A large non-motile female gamete and a small motile male gamete

43. Which one of the following is a fossil alga?

a. Hepaticites b. Palaeoporella
c. Calamites d. Medullosa

44. Which one of the following has haplontic life cycle?

a. Funaria b. Fucus
c. Volvox d. Angiosperms

45. In which of the following plants gametophytic phase is dominant?

a. Fern b. Moss
c. Angiosperms d. Cycas

46. Which is not a monocot?

a. Rose b. Palm
c. Orchid d. Banana

47. First vascular plants are

a. Thallophyte b. Bryophyte
c. Spermatophyte
d. Pteridophyte

48. During fertilization in ferns, male gamete reaches the female gamete through the agency of

33. Fossil plants 34. Actinostele 35. Atactostele 36. (c) 37. (c)
38. (b) 39. (a) 40. (d) 41. (b) 42. (d) 43. (b) 44. (c)
45 (b) 46. (a) 47. (d) 48. (b)

a. Wind b. Water
c. Insects d. Chemicals

49. Vessels and companion cells occur in

a. Angiosperms
b. Gymnosperms
c. Pteridophytes d. Bryophytes

50. The most common mode of reproduction in spirogyra is

a. Conjugation
b. Spore formation
c. Fragmentation
d. All the above

Book Back Solved Questions - Descriptive

5. Differentiate haplontic and diplontic life cycle.

Haplontic	Diplontic
1. ***Haploid gametophyte*** (n) is ***dominant***.	1. ***Diploid sporophyte*** (2n) is **dominant**.
2. ***No*** distinct ***sporophytic thallus.***	2. ***Vegetative thallus*** is the ***diploid sporophyte.***
3. The zygote undergoes ***meiotic*** division.	3. The zygote undergoes ***mitotic*** division
4. Gametophyte produces ***gametes*** by ***mitosis.*** Eg. *Volvox, Spirogyra*	4. Sporophyte produces ***gametes*** by ***meiosis.*** Eg. *Fucus, Gymnosperms*

6. What is plectostele? Give example.

1. Xylem plates alternate with phloem plates.

2. It is a type of ***protostele.***

Eg. *Lycopodium clavatum*

7. What do you infer from the term pycnoxylic?

1. The term pycnoxylic refers to ***pycnoxylic wood.***

2. It is ***compact strong wood***.

3. ***Large*** amount of ***xylem tracheids*** or wood is present.

4. ***Small*** amount of ***cortex*** and ***pith*** with little parenchyma.

5. Medullary ray layer is narrow.

6. It is ***durable*** and yields timber.

7. It is seen in gymnosperms formed as a result of ***secondary growth.***

Eg. *Pinus*

8. Mention two characters shared by gymnosperms and angiosperms.

1. Presence of ***roots, stem*** and ***leaves.***

2. ***Polyembryony*** (many embryos) is present.

3. The ***sporophytic phase*** is ***dominant*** and ***gametophytic*** phase is ***highly reduced.***

4. Presence of ***cambium.***

49. (a) 50. (c)

9. Do you think shape of chloroplast is unique for algae? Justify your answer?

Yes, shape of chloroplast is unique for algae.

Justification

There is ***variation*** in the shape of the chloroplast in algae. They are:

Algae	Chloroplast shape
1. Chlamydomonas	*- Cup shaped*
2. Chara	*- Discoid*
3. Ulothrix	*- Girdle shaped*
4. Oedogonium	*- Reticulate*
5. Spirogyra	*- Spiral*
6. Zygnema	*- Stellate*
7. Mougeotia	*- Plate-like*

10. Do you agree with the statement 'Bryophytes need water for fertilization'? Justify your answer.

Yes, bryophytes need water for fertilization.

Justification

1. The antheridium produces motile, flagellate ***antherozoids.***

2. Antherozoids reach the archegonium by ***swimming, to fuse with the egg.***

3. So, water is essential for ***fertilization*** in bryophytes.

Additional Solved Questions:
Very Short Answers - 2 Marks

1. How is the Kingdom Plantae classified?

The kingdom plantae is divided into ***two*** subkingdoms

1. *Cryptogamae*
2. *Phanerogamae*

2. How is Cryptogamae classified?

The subkingdom Cryptogamae is divided into ***3*** divisions.

1. *Algae*
2. *Bryophytes*
3. *Pteridophytes*

3. How is subkingdom Phanerogamae classified?

The subkingdom Phanerogamae is divided into ***2*** divisions:

1. *Gymnospermae*
2. *Angiospermae*

4. What are the two divisions of Embryophyta?

The subkingdom Embryophyta is divided into two phyla namely:

1. *Bryophyta*
2. *Tracheophyta*

5. How is phylum Tracheophyta classified?

The phylum Tracheophyta is classified into two subdivisions namely,

1. *Pteridophyta*
2. *Spermatophyta*

6. What are the two divisions of Subkingdom Spermatophyta?

1. *Gymnospermae*
2. *Angiospermae*

7. What do you mean by alternation of generation?

The ***alternation*** of the ***haploid gametophytic phase*** (n) with diploid sporophytic phase (2n) during the life cycle.

8. Who is the Father of Indian Phycology?

M.O.Parthasarathy is the ***father*** of ***Indian Phycology.***

9. Which algae grow in salt pans?

Halophytic algae grow in salt pans.
Eg. *Dunaliella salina*

10. What are cryophytic algae?

♦ Algae growing in ***snow***.
♦ Eg. *Chlamydomonas nivalis*

11. What are epiphytic algae?

♦ Algae growing on the ***surface*** of ***other aquatic plants.***
♦ Eg. *Coleochaete, Rhodymenia*

12. What are pyrenoids?

1. ***Proteinaceous bodies*** found in chromatophores.
2. They assist in the ***synthesis*** and ***storage*** of ***starch***.

13. What is binary fission?

1. The *division* of the parent cell into ***two*** daughter cells.
2. It is a type of ***vegetative reproduction*** in algae.
Eg. *Chlamydomonas*

14. What is budding?

1. The ***lateral outgrowth*** of the parent body.
2. It is a type of ***vegetative reproduction*** in algae. Eg. *Protosiphon*

15. What are bulbils?

1. ***Wedge shaped, modified branches*** which grow into new plants**.**
2. They are produced during ***vegetative reproduction*** in algae.
Eg. *Sphacelaria*

16. What are ***aplanospores?***

1. ***Thin walled, non-motile*** spores.
2. They are produced during ***asexual reproduction*** in algae.
Eg. *Vaucheria*

17. What are autospores?

1. ***Non-motile*** spores which are ***similar to parent cell.***
2. They are produced ***within*** a ***parent cell*** during ***asexual reproduction*** in algae. Eg. *Chlorella*

18. What is a hypnospore?

1. A ***thick walled aplanospore*** which is non-motile.
2. It is produced during ***asexual reproduction*** in algae.
Eg. *Chlamydomonas nivalis*

19. What are zoospores?

1. ***Motile, naked*** spores with two or more ***flagella***.
2. They are formed within the zoosporangium.
3. They are formed during ***asexual*** reproduction in algae.
Eg. *Cladophora*

20. What are tetraspores?

1. A group of four ***haploid*** spores formed as a result of meiosis.
2. They ***occur in group of four,*** two of which produce male plants and two female plants.

Eg. *Polysiphonia*

21. Which algae are cultivated in sea for phycocolloid production?

1. Kappaphycus alvarezii
2. Gracilaria edulis
3. Gelidiella acerosa

22. What are the sources in algae for alginate, agar agar and carrageenan?

1. Algin
2. Polysulphate esters of polysaccharides

23. What are bryophytes?

1. Bryophytes are simplest, first ***land inhabiting cryptogams*** and are restricted to moist, shady habitat.

2. They are most primitive plant groups descended from ***algae-like ancestors.***

3. They are called ***'non-vascular cryptogams'*** and also as ***'amphibians of plant kingdom'.***

24. Why are bryophytes called non-vascular cryptogams?

1. Bryophytes ***lack vascular tissues,*** like ***xylem*** and ***phloem***. So, they are called ***non-vascular.***

2. They do ***not*** produce ***flowers and seeds.*** So, they are called ***cryptogams.***

25. What is heterologous alternation of generation?

The alternation of the ***haploid gametophyte*** phase with the ***diploid sporophyte*** is called heterologous alternation of generation.

26. What is exoscopic embryogeny?

1. Embryogeny in which, the ***first division*** of the zygote is ***transverse*** and the ***apex*** of the embryo develops from the ***outer cell.***

2. It is typical for the Bryophyta.

27. Give the names of two saprophytic bryophytes.

1. Buxbaumia aphylla
2. Cryptothallus mirabilis

28. What are pteridophytes?

1. Pteridophytes are ***vascular cryptogams*** and ***first true land plants.***

29. Why pteridophytes are called vascular cryptogams?

1. Pteridophytes contain vascular tissues such as ***xylem*** and **phloem.** So, they are called ***vascular.***

2. They do ***not*** produce flowers or seeds. Hence, they are called ***cryptogams.***

30. What is apogamy?

1. ***Development*** of an ***embryo*** from the ***diploid cell without fertilization.***

2. In ferns, ***sporophyte*** is formed from ***gametophyte without*** the ***fusion of gametes.***

31. What is apospory?

Development of diploid ***gametophyte*** directly ***from*** the ***sporophyte*** without the formation of spores.

32. What is meant by homosporous?

Production of ***one type of spores.***
Eg. *Lycopodium*

33. What is meant by heterosporous?

Production of ***two different types of spores***. They are:

1. Microspore
2. Megaspore

Eg. *Selaginella.*

34. Define bioremediation.

The ***use*** of ***living organisms,*** mostly micro-organisms and plants to ***remove pollutants*** such as heavy metals ***from the soil.*** Eg. *Pteris vittata*

35. Define stele.

Stele is the ***central*** cylinder of ***vascular tissues.***

It consists of

1. *Xylem*
2. *Phloem*
3. *Pericycle*
4. *Medullary rays*
5. *Pith*

36. What are the two main types of stele?

1. *Protostele*
2. *Siphonostele*

37. What is protostele?

The stele in which ***phloem surrounds xylem without pith*** is the protostele.

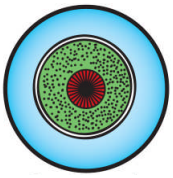


Fig.2.1: Protostele

38. What are the different types of protostele?

1. *Haplostele*
2. *Actinostele*
3. *Plectostele*
4. *Mixed protostele*

39. What is haplostele? Give example.

A type of ***protostele*** in which xylem is ***surrounded*** by ***phloem.***

Eg. *Selaginella*

40. Define actinostele. Give example.

1. Star shaped ***xylem*** core is ***surrounded*** by ***phloem.***
2. It is a type of ***protostele.***

Eg. *Lycopodium serratum*

Fig.2.2: Actinostele.

41. What is mixed protostele? Give example.

1. Xylem groups are uniformly scattered in the phloem.
2. It is a type of ***protostele.***

Eg. *Lycopodium cernuum*

42. What are the three types of solenostele?

1. *Ectophloic solenostele*
2. *Amphiphloic solenostele*
3. *Dictyostele*

43. What is polycyclic stele? Give examples.

1. The vascular tissues are present in the form of two or more ***concentric cylinders.***
2. It is a type of ***siphonostele.***
3. ***Xylem*** is ***surrounded by phloem.***

Eg. *Pteridium*

44. What is amber?

1. A ***transparent*** plant secretion produced by the gymnosperm, *Pinites succinifera.*
2. It is an efficient ***preservative*** that does not get degraded easily.

3. So, it can ***preserve*** remains of ***extinct*** life forms.

45. Which gymnosperm yields the resin Canada balsam and what is its use?

1. *Abies balsamea* yields ***Canada balsam.***

2. It is used as ***mounting medium*** in permanent slide preparation.

46. Give an account of the medicinal uses of gymnosperms.

1. *Taxus brevifolia* yields ***taxol*** which is a drug used for ***cancer treatment.***

2. *Ephedra gerardiana* yields ***ephedrine*** which is used for the treatment of ***asthma*** and ***bronchitis.***

47. Which gymnosperms are used to make paper?

1. Pinus roxburghii
2. Picea smithiana

48. Name some gymnosperms used as ornamental plants or for floral decoration.

1. Thuja *2. Cupressus*
3. Araucaria *4. Cryptomeria*

49. Give short notes on the fossil park in Tiruvakkarai.

1. The ***National Wood Fossil Park*** is situated in ***Tiruvakkarai, Villupuram*** district, ***Tamil Nadu.***

2. The park contains petrified wood fossils that are approximately **20** million years old.

50. What do you mean by 'form genera'?

1. Form genera is used to name the ***fossil plants.***

2. The ***whole plant*** is ***not*** recovered as fossils.

3. The ***organs*** or ***parts*** of the ***extinct plants*** are obtained as ***fragments.***

51. Give the names of the new algae reported by Dr. Parthasarathy

1. Fritschiella
2. Ecballocystopsis
3. Charasiphon
4. Cylindrocapsopsis

Additional Solved Questions:
Short Answers - 3 Marks

1. Give names of some eminent algologists.

1. F. E. Fritsch
2. F. E. Round
3. R. E. Lee
4. M. O. Parthasarathy
5. M. S. Randhawa
6. Y. Bharadwaja
7. V. S. Sundaralingam
8. T. V. Desikachary

2. What is fragmentation?

1. The ***fragments*** of parent thallus grow into new individual.

2. It is a type of ***vegetative reproduction*** in algae.

Eg: *Spirogyra*

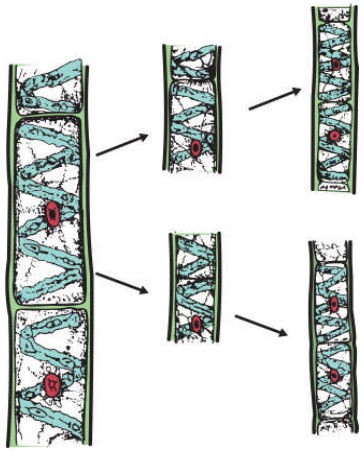


Fig.2.3: Fragmentation-Spirogyra

3. Write about the total number of plant groups in the World and India?

Plant group	Number of known species	
	World	India
Algae	40,000	7,357
Bryophytes	16,236	2,748
Pteridophytes	12,000	1,289
Gymnosperms	1,012	79
Angiosperms	2,68,600	18,386

4. What are akinetes?

1. ***Non-motile, thick walled spores*** of algae.

2. They are produced during ***vegetative reproduction*** in algae.

3. They are produced during unfavourable conditions.

4. They serve as ***perennating*** structures.

Eg. *Pithophora*

5. What are tubers?

1. Tubers are structures found on the ***rhizoids*** and the ***lower nodes.***

2. They ***store food*** materials.

3. They are produced during ***vegetative reproduction*** in algae.

Eg. *Chara*

6. What is isogamy?

1. The ***fusion*** of ***morphologically*** and ***physiologically similar gametes.***

2. It is a type of ***sexual*** reproduction.

Eg. *Ulothrix*

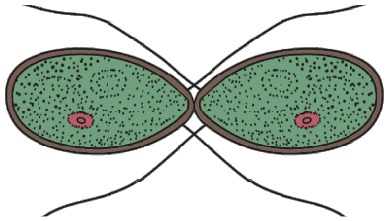


Fig.2.4: Isogamy

7. What is an anisogamy?

1. The ***fusion*** of either ***morphologically*** or ***physiologically dissimilar gametes.***

2. It is a type of ***sexual*** reproduction in algae.

Eg. *Pandorina*

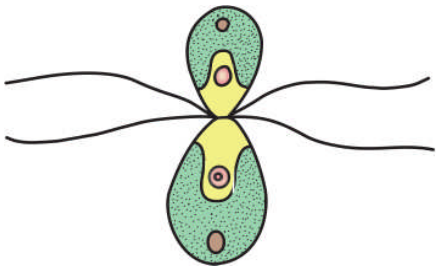


Fig.2.5: Anisogamy

8. What is oogamy?

1. The ***fusion*** of both ***morphologically*** and ***physiologically dissimilar gametes.***

2. It is a type of ***sexual reproduction*** in algae.

Eg. *Sargassum*

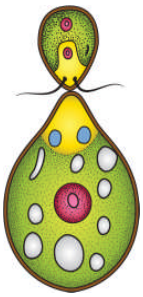


Fig.2.6: Oogamy

9. How is algae useful in healthcare?

1. ***Kelps,*** which are ***large brown algae*** are rich ***sources*** of ***iodine.***

2. *Chlorella* is used as ***single cell protein*** (SCP).

3. *Chlorella* is also used in the production of ***antibiotic, chlorellin.***

4. ***Dunaliella salina*** provides ***β-carotene.***

5. ***Chondrus crispus*** are used as ***blood coagulant.***

10. What are the contributions of M.O.Parthasarathy?

1. M.O.Parthasarathy is the ***father*** of ***Indian Phycology.***

2. He conducted research on following algal characters.

* Structure * Reproduction
* Cytology * Taxonomy

3. He published a ***Monograph on Volvocales.***

4. He reported the following algal forms:

1. *Fritschiella*
2. *Ecballocystopsis*
3. *Charasiphon*
4. *Cylindrocapsopsis*

11. Bryophytes are called amphibians of plant kingdom Why?

1. Amphibians are those organisms which live in ***both, land*** and ***water.***

2. Bryophytes live in soil, but they ***need water*** for ***sexual reproduction.***

3. ***Antherozoids*** are flagellated and ***need water*** to swim to the eggs. So, bryophytes are called ***amphibians of plant kingdom.***

12. Write short notes on rhizoids in Bryophytes

1. Rhizoids are the ***filamentous***, ***root like*** structures seen in Bryophytes.

2. They may be ***unicellular*** or ***multicellular***.

3. Rhizoids are of ***two*** kinds namely,

1. Smooth walled or simple rhizoids
2. Pegged or tuberculated rhizoids

Eg. *Marchantia.*

4. They fix the thallus to the substratum.

13. Describe the plant body in mosses

1. Plant body is the ***thallus.***
2. It is the ***gametophyte.***
3. It is ***haploid.***
4. It is ***erect*** with central axis.
5. It consists of the following parts
   1. Stem 3. Rhizoids
   2. Leaf

14. How did Proskauer classify Bryophytes?

Proskauer classified Bryophytes into **three** classes.

1. Hepaticopsida - Riccia, Marchantia, Porella, Riella

2. *Anthocerotopsida* - *Anthoceros, Dendroceros*
3. *Bryopsida* - *Funaria, Polytrichum and Sphagnum*

15. Give an account of the contribution of Shiv Ram Kashyap.

1. Shiv Ram Kashyap the ***Father*** of ***Indian Bryology.***
2. He published a book '***Liverworts of Western Himalayas and Punjab plains'.***
3. He identified new genera like
   1. *Atchinsoniella*
   2. *Sauchia*
   3. *Sewardiella*
   4. *Stephansoniella*

16. Give a brief account of the classification of Pteridophytes by Reimer

The Pteridophytes are divided into ***five*** subdivisions:

1. *Psilophytopsida*
2. *Psilotopsida*
3. *Lycopsida*
4. *Sphenopsida*
5. *Pteropsida*

There are ***19 orders*** and ***48 families*** in this classification.

17. What is siphonostele? What are the different types of siphonostele?

♦ In siphonostele, ***xylem*** is ***surrounded*** by ***phloem with pith*** at the centre.

♦ The different types are:

1. *Ectophloic siphonostele*
2. *Amphiphloic siphonostele*
3. *Solenostele*
4. *Eustele*
5. *Atactostele*
6. *Polycyclic stele*

18. What is ectophloic siphonostele? Give example.

1. The ***phloem*** is restricted ***only*** on the ***external side*** of the ***xylem.***
2. ***Pith*** is in the ***centre.***
3. It is a type of ***siphonostele.***

Eg. *Osmunda*

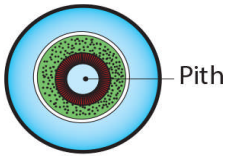


Fig.2.7: Ectophloic siphonostele

19. What is amphiphloic siphonostele? Give example.

1. ***Phloem*** is present on ***both*** the external and internal ***sides*** of ***xylem.***
2. The ***pith*** is seen in the ***centre.***

Eg. *Marsilea*

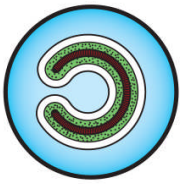


Fig.2.8: Amphiphloic siphonostele

20. What is solenostele? Give example.

1. The stele is ***perforated*** at a place or places corresponding the origin of the leaf trace.
2. It is a type of ***siphonostele.***

Eg. *Adiantum*

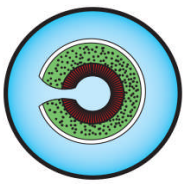


Fig.2.9: Solenostele

21. What is ectophloic solenostele?

1. ***Xylem*** is surrounded by ***phloem*** only on one side.
2. ***Pith*** is in the ***centre.***
3. ***Stele*** is ***perforated*** at the region of the origin of the leaf trace.
4. It is a type of ***solenostele*** of siphonostele.

Eg. *Osmunda*

22. What is amphiphloic solenostele?

1. ***Phloem*** is present on ***both*** the external and internal sides of the xylem.
2. ***Pith*** is in the ***centre.***
3. ***Stele*** is ***perforated.***
4. It is a type of solenostele of siphonostele. Eg. *Adiantum pedatum*

23. Define dictyostele.

1. The stele is ***separated*** into several ***vascular strands.***
2. Each ***vascular strand*** is called ***meristele.***
3. It is a type of ***solenostele of siphonostele***.

Eg. *Adiantum capillus-veneris*

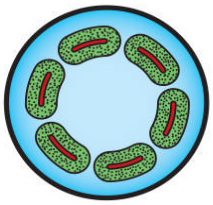


Fig.2.10: Dictyostele

24. What do you mean by atactostele?

1. The stele is ***split*** into ***distinct collateral vascular bundles*** and are ***scattered*** in the ground tissue.
2. It is a type of ***siphonostele.***
3. Xylem and phloem lie in the ***same*** radius.
4. The vascular bundles are ***scattered*** in the ground tissue.

Eg. *Monocot stem*

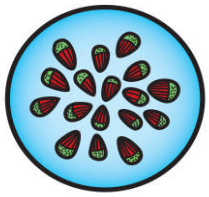


Fig.2.11: Atactostele

25. What do you infer from the term manoxylic?

1. Manoxylic refers to ***manoxylic wood***.
2. It is a ***porous***, ***soft*** wood.
3. ***More parenchyma*** is present. ***Medullary rays*** are ***wide.***
4. Seen in ***Gymnosperms***
5. It has ***secondary growth.***

Eg. Cycas.

26. Name some of the fossil rich sites of India.

1. Tamil Nadu - 1. National wood fossil park, Tiruvakkarai
   2. Ariyalur park
2. Himachal Pradesh - Siwalik fossil park
3. Madhya Pradesh - Mandla fossil park
4. Jharkand - Rajmahal Hills

27. Briefly give an account of the contribution of Prof. Birbal Sahni.

1. ***Prof. Birbal Sahni*** is called the ***Father of Indian Palaeobotany.***
2. He described fossil plants from Rajmahal Hills of Eastern Bihar.

3. The ***form genera*** described by him are,

1. Pentoxylon sahnii

2. Nipanioxylon

4. ***Birbal Sahni Institute of Paleobotany*** is located in ***Lucknow.***

28. Distinguish between manoxylic and pycnoxylic wood.

Manoxylic	Pycnoxylic
1. Non-compact wood, porous, soft.	1. ***Compact*** wood
2. ***Large amount*** of ***parenchyma.***	2. ***Large amount*** of ***xylem.***
3. ***Large pith.***	3. ***Small*** amount of cortex and ***pith.***
4. ***Not durable.*** Eg. *Cycas*	4. ***Durable*** and yields timber. Eg. *Pinus*

29. Justify the reasons for the success and dominance of vascular plants.

1. ***Extensive root system.***

2. Efficient ***conducting tissues*** i.e., xylem and phloem.

3. The presence of ***cuticle*** in the epidermis helps to ***prevent desiccation.***

4. ***Stomata*** help in ***effective gaseous exchange.***

Additional Solved Questions: Long Answers - 5 Marks

1. Define haplontic life cycle. Explain

1. ***Dominant haploid gametophyte alternates*** with the ***diploid sporophyte.***

2. It is ***photosynthetic*** and ***independent.***

3. Sporophytic phase is represented by the zygote which is diploid (2n)

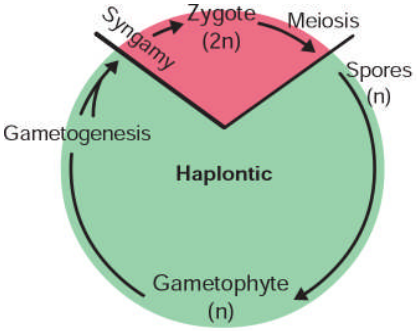


Fig.2.12: Haplontic life cycle

4. Zygote undergoes ***meiosis.***

5. Thus, haploid condition is restored.

Eg. Volvox, Spirogyra

2. Describe diplontic life cycle

1. ***Diploid sporophytic*** phase is ***dominant*** and it ***alternates*** with ***gametophytic phase*** which is represented by the single to few celled gametophyte.

2. It is ***photosynthetic*** and ***independent.***

3. During gamete formation, ***meiosis*** takes place.

4. The ***gametes*** fuse to form ***zygote (2n).***

5. Zygote undergoes ***mitotic*** division and develops into ***sporophyte.***

Eg. *Fucus*, Gymnosperms and Angiosperms.

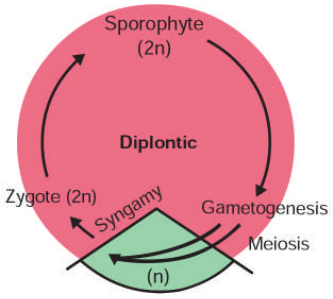


Fig.2.13: Diplontic life cycle.

3. Describe haplodiplontic lifecycle

1. ***Haploid*** phases and ***diploid*** phases are ***dominant*** and they ***alternate*** with each other.

2. ***Diploid*** sporophyte cells (2n) undergo ***meiosis*** to produce haploid (n) spores.

3. Each spore divides ***mitotically*** and develop into a multicellular haploid ***gametophyte*** (n).

Eg. Bryophytes, pteridophytes.

In ***Bryophytes, gametophyte*** (n) is ***dominant,*** sporophyte (2n) is multicellular which is totally or partially dependent on gametophyte.

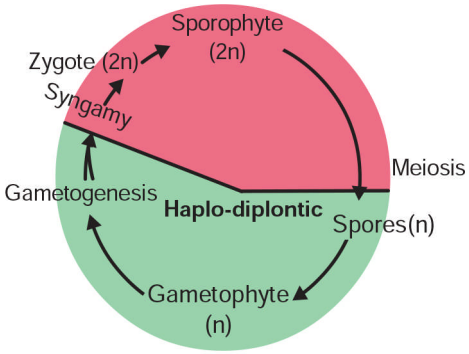


Fig.2.14: Haplodiplontic life cycle.

In ***pteridophytes, sporophyte*** (2n) is ***dominant***. Gametophyte (n) is independent and multicellular.

4. Give an account of the occurrence of algae?

Algae	Habitat
1. *Gracilaria, Sargassum*	- *Marine*
2. *Oedogonium, Ulothrix*	- *Freshwater*
3. *Fritschiella, Vaucheria*	- *Soil*
4. *Chlorella*	- *Live in Hydra and Sponges (endozoic)*
5. *Cladophora crispata*	- *Shells of molluscs*
6. *Dunaliella salina (Halophytic algae)*	- *Salt pans*
7. *Chlamydo-monas nivalis*	- *Snow covered mountains*
8. *Coleochaete, Rhodymenia*	- *Surface of aquatic plants (epiphytic algae)*

5. Write an account of the salient features of algae.

1. Algae are simple ***chlorophyll*** bearing ***thallophytes.***

2. They are ***autotrophs***

3. They grow in a ***wide range*** of ***habitats***

* Marine - *Gracilaria* and *Sargassum*

* Freshwater - *Oedogonium* and *Ulothrix*

* Soil - *Fritschiella* and *Vaucheria*

4. They are ***adapted*** to thrive in ***harsh environment*** too.

5. Algae growing in snow are called ***Cryophytic algae.***

6. Algae grow on the ***surface*** of ***aquatic plants*** and are called ***epiphytic*** algae.

7. Sex organs are either ***unicellular*** or ***multicellular*** and not protected by sterile envelop.

8. Algae are included in the ***kingdom Plantae*** and are ***eukaryotes*** except blue green algae.

9. The plant body ***does not*** show ***differentiation*** into ***tissue system.***

10. The **cell wall** of algae is made up of ***cellulose*** and ***hemicellulose.***

11. In ***diatoms, siliceous walls*** are present.

12. In *Chara,* the ***thallus*** is covered with ***calcium carbonate.***

13. Some algae possess ***algin, polysulphate esters*** of ***polysaccharides.***

14. Membrane bound ***nucleus*** is ***present.***

15. ***Cell organelles*** like chloroplast, mitochondria, endoplasmic reticulum, golgi bodies, etc. are present.

16. ***Pyrenoids*** are ***present.***

17. The following characters differ among the algal groups:

- *Pigmentation*
- *Reserve food material*
- *Flagellation*

18. Algae reproduce by ***vegetative, asexual*** and ***sexual*** methods.

19. Vegetative reproduction includes

1. *Fission*
2. *Fragmentation*
3. *Budding*
4. *Bulbils*
5. *Akinetes*
6. *Tubers*

20. Asexual reproduction takes place by the production of

1. Zoospores
2. Aplanospores
3. Autospores
4. Hypnospores
5. Tetraspores

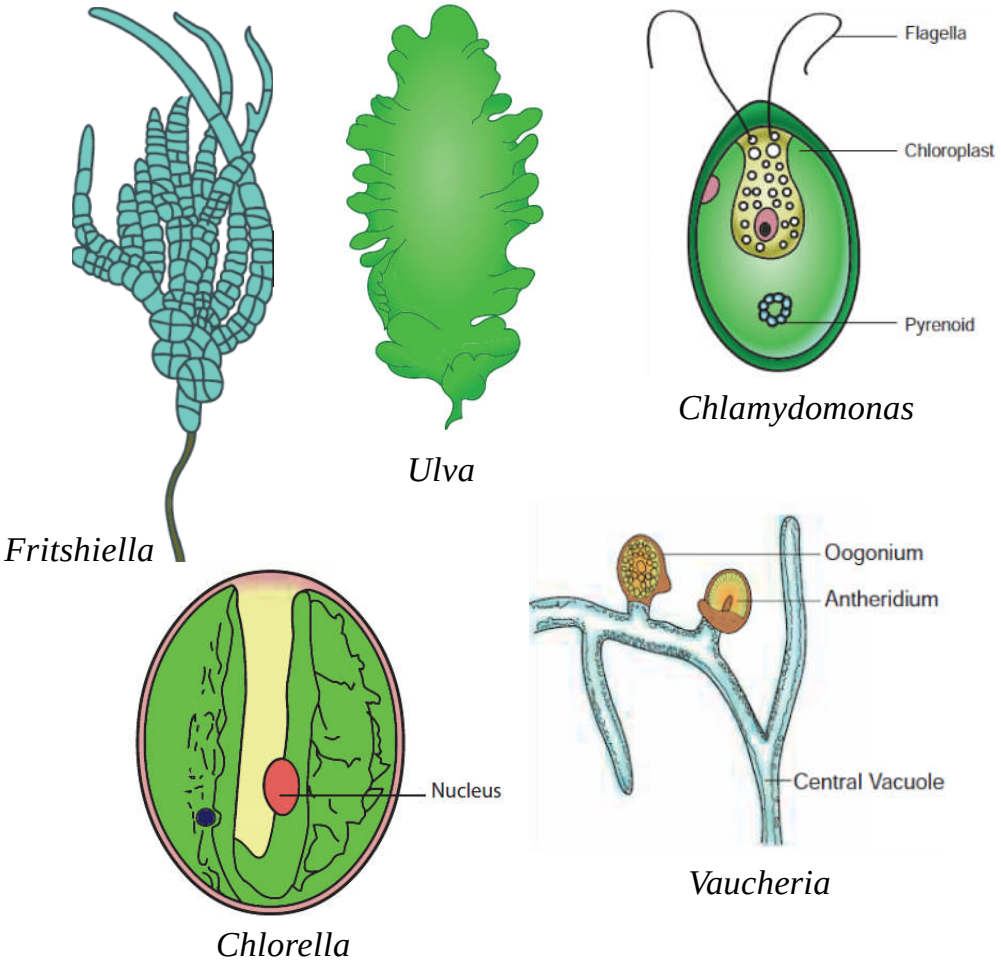
21. Sexual reproduction is of ***three*** types:

1. *Isogamy*
2. *Anisogamy*
3. *Oogamy*

22. Life cycle may be ***haplontic, diplontic*** or ***haplodiplontic.***

6. Describe the thallus organisation in algae.

1. Unicellular motile
   - *Chlamydomonas*
2. Unicellular non-motile
   - *Chlorella*
3. Colonial motile
   - *Volvox*
4. Colonial non-motile
   - *Hydrodictyon*
5. Siphonous
   - *Vaucheria*
6. Unbranched filamentous
   - *Spirogyra*
7. Branched filamentous
   - *Cladophora*



Chlamydomonas

Ulva

Fritshiella

Vaucheria

Chlorella

Fig.2.15: Thallus organization in Algae

8. Discoid
   - *Coleochaete*
9. Heterotrichous
   - *Fritschiella*
10. Foliaceous
   - *Ulva*
11. Giant kelp
   - *Macrocystis, Laminaria*

7. Write short notes on algal classification by Fritsch.

1. ***F. E. Fritsch*** proposed a classification for algae based on the following characteristics:

1. Pigmentation
2. Types of flagella
3. Nature of reserve food materials
4. Thallus structure
5. Reproduction

2. The classification was published in the book, '***The structure and reproduction of the algae'*** in 1935

3. Algae was classified into ***11 classes.*** They are :

1. Chlorophyceae
2. Xanthophyceae

3. Chrysophyceae
4. Bacillariophyceae
5. Cryptophyceae
6. Dinophyceae
7. Chloromonadineae
8. Euglenophyceae
9. Phaeophyceae
10. Rhodophyceae
11. Cyanophyceae

8. Give an account of the salient features of Chlorophyceae.

1. Chlorophyceae is a class of ***green algae*** bearing ***green*** Chlorophyll ***pigment.***

2. The members of this class are commonly called ***green algae.***

3. Most of the species are ***aquatic***, but a ***few*** are ***terrestrial.***

1. Freshwater - Spirogyra
2. Marine - Ulva
3. Terrestrial - Trentepohlia

4. The chloroplasts are seen in different shapes.

1. Cup-shaped - Chlamydomonas
2. Discoid - Chara
3. Girdle-shaped - Ulothrix
4. Reticulate- Oedogonium
5. Spiral - Spirogyra
6. Stellate - Zygnema
7. Plate-like- Mougeotia

5. ***Chlorophyll 'a'*** and ***chlorophyll 'b'*** are the major photosynthetic pigments.

6. ***Storage*** bodies called ***pyrenoids*** are present.

7. Reserve food material is ***starch.***

8. The ***cell wall*** is made up of an ***outer*** layer of ***pectin*** and an ***inner*** layer of ***cellulose.***

9. ***Vegetative reproduction*** takes place by means of ***fragmentation.***

10. ***Asexual reproduction*** is by the production of the following

1. Zoospores
2. Aplanospores
3. Akinetes

11. ***Sexual*** reproduction is ***present.*** It may be

1. Isogamous
2. Anisogamous
3. Oogamous

Eg. ✺ *Chlorella* ✺ *Ulothrix*
✺ *Chlamydomonas* ✺ *Chara*
✺ *Volvox* ✺ *Ulva*
✺ *Spirogyra*

9. Give an account of the salient features of Phaeophyceae.

1. Phaeophyceae is a class of ***brown algae*** bearing ***fucoxanthin*** pigment.

2. They are mostly ***marine.***

3. *Pleurocladia* is a fresh water form.

4. Thallus may be

1. Filamentous - Ectocarpus
2. Frond like - Dictyota
3. Giant kelps - Laminaria, Macrocystis

5. Thallus is differentiated into

1. Frond - Leaf like photo-synthetic part

2. Stipe - Stalk like structure
3. Holdfast - Root like structure which attaches thallus to the substratum

6. The pigments include
1. Chlorophyll- a,c
2. Carotenoids
3. Xanthophylls
4. Fucoxanthin

7. ***Fucoxanthin*** is a ***golden brown*** pigment.

8. It gives shades of colour from ***olive green*** to ***brown.***

9. ***Mannitol*** and ***Laminarin*** are the ***reserve food*** materials.

10. ***Motile reproductive structures*** are present.

11. ***Two*** laterally inserted ***unequal flagella*** are present.
1. Whiplash flagellum
2. Tinsel flagellum

12. Sexual reproduction is mostly ***oogamous***.

13. Life cycle may be of
1. Isomorphic type
2. Heteromorphic type
3. Diplontic type

14. Alternation of generation is present.
Eg. ♦ *Sargassum*
♦ *Laminaria*
♦ *Fucus*
♦ *Dictyota*

10. List out the salient features of Rhodophyceae

1. Rhodophyceae is a class of ***red algae*** containing ***red pigment.***

2. The members of this class are also called ***Red algae.***

3. They are mostly ***marine.***

4. The thallus may be
1. Unicellular - Porphyridium
2. Multicellular - Polysiphonia
3. Filamentous - Goniotrichum
4. Ribbon like - Porphyra

5. They may be ***microscopic*** or ***macroscopic.***

6. Some species are heavily impregnated with lime and form ***coral reefs.***
Eg. ♦ *Corallina*
♦ *Lithothamnion*

7. The photosynthetic pigments include
1. Chlorophylla
2. R - phycoerythrin
3. R - phycocyanin

♦ Asexual reproduction takes place by the production of
1. Monospores
2. Neutral spores
3. Tetraspores

8. The storage product is ***floridean starch.***

9. Sexual reproduction is ***oogamous.***

10. Male sex organ is ***spermatangium.***

11. Female sex organ is ***carpogonium.***

12. The ***spermatium*** fuses with ***egg*** nucleus to form ***zygote.***

13. The zygote develops into ***carpospores.***

14. ***Meiosis*** occurs during ***carpospore formation.***

15. Life cycle may be
   1. *Haplontic*
   2. *Diplontic*

16. ***Alternation of generation*** is ***present.***

Eg. ♦ *Ceramium* ♦ *Cryptonemia* ♦ *Polysiphonia* ♦ *Gigartina* ♦ *Gelidium*

11. Give an account of the economic importance of algae.

Name of the Algae	Economic Importance
Beneficial Activities	
1. *Chlorella, Laminaria, Sargassum, Ulva, Enteromorpha*	1. Food
2. *Gracilaria, Gelidiella, Gigartina*	2. Agar Agar - Cell wall material used for media preparation in the microbiology lab. Packing canned food, cosmetic, textile paper industry.
3. *Chondrus crispus*	3. Carrageenan - Preparation of tooth paste, paint, blood coagulant.
4. *Laminaria, Ascophyllum*	4. Alginate - ice cream, paints, flame proof fabrics.
5. *Laminaria, Sargassum, Ascophyllum, Fucus*	5. Fodder
6. *Diatom (*Siliceous frustules*)*	6. Diatomaceous earth - water filters, insulation material, reinforcing agent in concrete and rubber.
7. *Lithophyllum, Chara, Fucus*	7. Fertilizer
8. *Chlorella*	8. Chlorellin -Antibiotic
9. *Chlorella, Scenedesmus, Chlamydomonas*	9. Sewage treatment, Pollution indicators
Harmful Activity	
1. *Cephaleuros virescens*	1. Red rust of coffee

12. List out the general characteristics of Bryophytes

1. Bryophytes are simplest, first ***land inhabiting cryptogams*** and are restricted to moist, ***shady habitat.***

2. They are most primitive plant groups descendent from algae-like ancestors.

3. They are called ***'non-vascular cryptogams'*** and also as ***'amphibians of plant kingdom'.***

4. They belong to the kingdom, ***Plantae***.

5. Eukaryotic.

6. The plant body is haploid (n) ***gametophyte.***

7. Plant body is called ***thallus.***

8. It is ***not differentiated*** into root, stem and leaves.

9. Most of them are ***primitive land dwellers.***

10. Some bryophytes are ***aquatic.***

Eg. ♦ *Riella*
♦ *Ricciocarpus*

11. ***Thalloid forms*** are ***present*** in

Eg. ♦ *Liverworts*
♦ *Hornworts*

12. In ***Mosses, leaf like, stem like*** structures are ***present.***

13. Thallus grows ***prostate*** on the ground and is attached to the substratum using ***rhizoids.***

14. ***Two*** types of ***rhizoids*** are present.

1. Smooth walled
2. Pegged

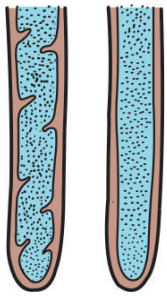


Fig.2.16: Pegged and smooth walled Rhizoids

15. Multicellular ***scales*** are ***present.***

16. ***Xylem*** and ***phloem*** are ***absent.***

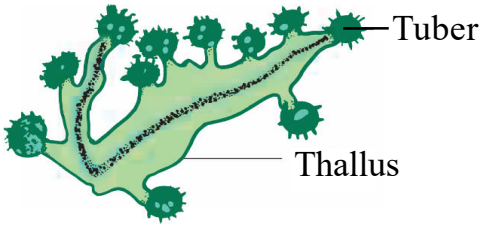


Fig.2.17: Tubers-Anthoceros

17. Vegetative reproduction takes place by the formation of

1. Adventitious buds - *Riccia fluitans*
2. Tubers - *Anthoceros*
3. Small detachable branches or brood bodies - *Bryopteris fruticulosa*
4. Gemmae - Marchantia

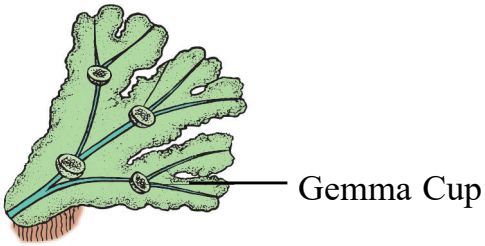


Fig.2.18: Gemmae - Marchantia

5. Fragmentation - *Riccia*

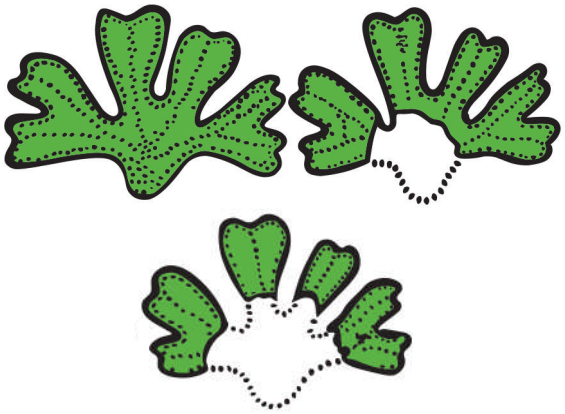


Fig.2.19: Fragmentation-Riccia

18. Sexual reproduction is ***oogamous.***

19. Antheridia and archegonia are ***multicellular.***

20. ***Antheridium*** is the ***male*** reproductive organ.

21. ***Archegonium*** is the ***female*** reproductive organ.

22. ***Archegonium*** contains an egg.

23. ***Antheridia*** produce biflagellate ***antherozoids.***

24. They swim in thin film of water and reach the ***archegonium.***

25. Antherozoid fuses with the egg to form diploid ***zygote (2n).***

26. ***Water*** is ***essential*** for fertilization.

27. The ***zygote*** is the ***first*** cell of the ***sporophyte generation.***

28. The ***sporophyte*** is ***dependent*** on ***gametophyte.***

29.The sporophyte is differentiated into three parts namely:

1. Foot
2. Seta
3. Capsule.

30. The ***haploid gametophytic*** phase alternates with ***diploid sporophyte.***

31. The Bryophytes show ***heterologous*** alternation of generation.

13. Describe the process of sexual reproduction in bryophytes.

1. In Bryophytes, sexual reproduction is of ***oogamous*** type.

2. ***Antheridium*** is the ***male*** reproductive organ.

3. ***Archegonium*** is the ***female*** reproductive organ.

4. Antheridia and archegonia are ***multicellular.***

5. Archegonia contain the ***female gamete*** (***egg***)

6. ***Antheridia*** produce biflagellate ***antherozoids.***

7. Water is essential for fertilization.

8. Antherozoids ***swim*** in thin film of water and ***reach*** the ***archegonium.***

9. Antherozoids fuse with the egg to form diploid ***zygote.***

10. The ***zygote*** is the ***first*** cell of the ***sporophyte.***

11. Zygote undergoes mitotic division to form multicellular, undifferentiated ***embryo.***

12. The ***first*** division of the zygote is ***transverse.***

13. The apex of the embryo develops from the outer cell.

14. The embryo divides and gives rise to sporophyte.

14. Describe the sporophyte in Bryophytes.

1. Sporophyte is the ***spore producing phase*** of Bryophytes.

2. It is ***diploid.***

3. It develops from ***zygote***.

4. The ***sporophyte*** is ***inconspicuous*** and ***short-lived.***

5. It is ***dependent*** on the ***gametophyte.***

6. It is differentiated into three parts:

1. Foot 2. Seta

3. Capsule or sporangium

7. ***Foot*** is the ***basal*** portion of the sporophyte.

8. It is ***embedded*** in the ***gametophyte*** through which water and nutrients are supplied for the sporophyte.

9. ***Seta*** is the ***stalk*** of sporophyte

10. ***Capsule*** contains spore mother cells.

11. Spore mother cell undergoes ***meiotic*** division

12. ***Haploid spores*** are formed.

13. In some sporophytes, ***elaters*** are present.

14. ***Elaters*** help in ***dispersal*** of spores.

Eg. *Marchantia*

15. The spores germinate to produce ***gametophyte.***

16. The ***zygote, embryo*** and the ***sporangium*** constitute ***sporophytic phase.***

15. Describe the life cycle in bryophytes

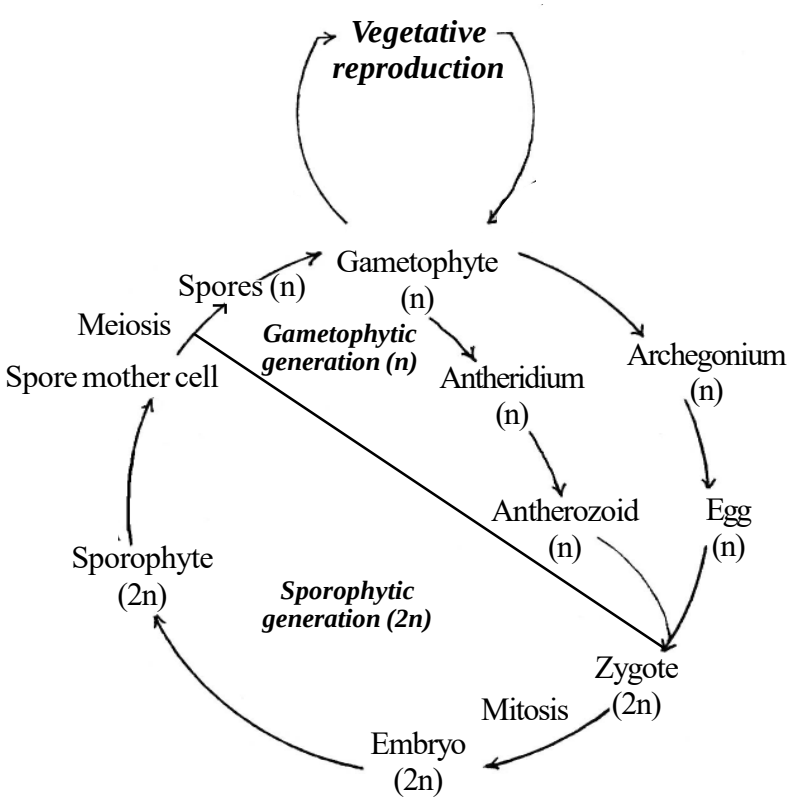


Fig.2.20: Life cycle in Bryophytes.

1. ***Haplodiplontic*** life cycle

2. Dominant phase is haploid ***gametophyte*** (n).

3. Bryophytes reproduce in ***two*** ways:

1. Vegetative reproduction

2. Sexual reproduction

4. Bryophytes reproduce ***vegetatively*** by the following means:

1. Adventitious buds - *Riccia fluitans*
2. Tubers - *Anthoceros*
3. Detachable branches - *Bryopteris fruticulosa*
4. Gemmae - *Marchantia*

5. Sexual reproduction is of ***oogamous type***.

6. Antheridia and archegonia are ***multicellular.***

7. They are produced in a ***protective*** covering.

8. The antheridium produces biflagellate ***antherozoids.***

9. ***Antherozoids swim*** in ***thin film of water*** and reach the archegonia.

10. Antherozoids fuse with egg to form ***diploid zygote (2n).***

11. The diploid zygote undergoes ***mitosis*** to form multicellular undifferentiated ***embryo.***

12. Embryo divides and gives rise to ***sporophyte.***

13. Sporophyte is differentiated into the following:

1. Foot *3. Capsule*
2. Seta

14. Diploid spore mother cells present in the capsule undergo ***meiosis*** to give rise to ***haploid spores*** (n).

15. The ***spores germinate*** to produce ***gametophyte (n).***

16. Describe the economic importance of Bryophytes.

1. The accumulated, compressed, hardened ***dead thallus*** of *Sphagnum* is called ***peat.***

2. Peat is used as ***fuel*** in commercial scale.

3. Following are derived from the peat:

1. Nitrates
2. Brown dye
3. Tanning materials

4. It is also used as ***packing material*** in horticulture because of their water holding capacity.

5. ***Pulmonary tuberculosis*** can be cured using *Marchantia polymorpha.*

6. Bryophytes can be used as food.

Eg.
- *Sphagnum*
- *Bryum*
- *Polytrichum*

7. They play a major role in ***soil formation*** through ***succession.***

8. They help in ***soil conservation.***

17. What are the salient features of pteridophytes?

1. ***Flowerless, seedless,*** spore bearing ***vascular cryptogams.***

2. ***Small herbaceous*** plants.

3. Grow well in ***moist, cool*** and ***shady places*** where water is available.

4. The ***plant body*** is diploid ***sporophyte*** (2n) and it is the **dominant** phase.

5. It is differentiated into the following:

1. Root 2. Stem
3. Leaves

6. ***Roots*** are ***adventitious.***

7. Stem shows ***two*** types of ***branching.***

1. Monopodial branching
- *Selaginella*

2. Dichotomous branching
- *Adiantum*

8. Leaves are of ***two*** types:

1. Microphyllous - Selaginella
2. Megaphyllous - Pteris

9. Stele is ***protostele,*** but siphonostele is present in *Marsilea.*

10. The major water conducting elements are the ***tracheids.***

11. In *Selaginella,* ***vessels*** are found.

12. ***Sporophylls*** are special leaves as they bear ***sporangia.***

13. ***Sporangia*** are spore bearing bag like structures.

14. Sporophylls organize to form ***cone*** or ***strobilus.***

Eg. *Selaginella, Equisetum*

15. Pteridophytes may be

1. Homosporous- produce one type of spores. Eg- Lycopodium

2. Heterosporous- produce two types of spores. Eg - Selaginella

16. ***Heterospory*** is the origin for seed habit.

17. Development of sporangia may be

1. Eusporangiate - development of sporangium from group of initials Eg. Selaginella

2.Leptosporangiate-development of sporangium from single initial. Eg. Adiantum

18. Spore mother cells undergo ***meiosis*** and produce ***spores*** (n).

19. Spore germinates to produce a haploid ***gametophyte*** called ***prothallus.***

20. The prothallus has the following characters:

- Multicellular
- Green coloured
- Cordate shaped
- Independent

21. Vegetative reproduction takes place through

1. Fragmentation
2. Resting buds
3. Root tubers
4. Adventitious buds

22. Sexual reproduction is ***oogamous.***

23. ***Sex organs*** are produced on the ***prothallus.***

24. ***Water*** is essential for ***fertilization.***

25. A diploid ***zygote*** is formed as a result of fertilization.

26. Zygote undergoes ***mitosis*** to form ***embryo.***

27. Pteridophytes show

1. Apogamy
2. Apospory

18. Describe sexual reproduction in pteridophytes.

1. In pteridophytes, sexual reproduction is ***oogamous.***

2. Sexual reproduction takes place in gametophytes.

3. ***Antheridium*** is the ***male*** sex organ.

4. ***Archegonium*** is the ***female*** sex organ.

5. Antheridium and archegonium are produced on the ***prothallus.***

6. ***Antheridium*** produces ***spirally coiled*** and ***multiflagellate antherozoids.***

7. ***Archegonium*** is ***flask shaped.***

8. ***Archegonium*** has

1. Broad venter

2. Elongated narrow neck

9. The ***venter*** possesses ***egg*** or ***ovum.***

10. Neck contains ***neck canal cells.***

11. ***Water*** is essential for ***fertilization.***

12. Antherozoid fuses with egg to form diploid ***zygote.***

13. ***Zygote*** undergoes ***mitosis*** to form ***embryo.***

19. Give an account of the economic importance of Pteridophytes.

Pteridophyte	Uses
1. *Rumohra adiantiformis* (leather leaf fern)	1. Cut flower arrangements
2. *Marsilea*	2. Food
3. *Azolla*	3. Biofertilizer
4. *Dryopteris filix–mas*	4. Treatment for tapeworm.
5. *Pteris vittata*	5. Removal of heavy metals from soils - Bioremediation
6. *Pteridium* sp.	6. Leaves yield green dye
7. *Equisetum* sp.	7. Stems for scouring
8. *Psilotum, Lycopodium, Selaginella, Angiopteris, Marattia*	8. Ornamental plants

20. Describe the life cycle in pteridophytes

1. Life cycle of pteridophytes have both ***sporophytic phase*** and ***gametophytic phase***.

2. It is of ***haplodiplontic*** type.

3. Hence, the life cycle of pteridophytes involves the ***alternation of generation.***

4. Dominant phase is the ***diploid sporophyte*** (2n).

5. Sporophytes reproduce by the following two methods:

1. Vegetative reproduction
2. Asexual reproduction.

6. Vegetative reproduction takes place by

- *Fragmentation*

- *Formation of resting buds*
- *Formation of root tubers*
- *Formation of adventitious buds*

7. Asexual reproduction takes place by ***spores.***

8. Pteridophytes may be ***homosporous*** or ***heterosporous.***

9. Sporophytes produce ***sporangia***.

10. Sporangia are spore bearing structures borne on special leaves called ***sporophylls***.

11. Spore mother cells are present in the ***sporangia.***

12. Spore mother cells (2n) undergo meiosis and produce ***spores (n)***.

13. Spore germinates to produce haploid ***prothallus***.

14. The prothallus is

- Independent
- Multicellular
- Cordate shaped
- Green coloured gametophytes.

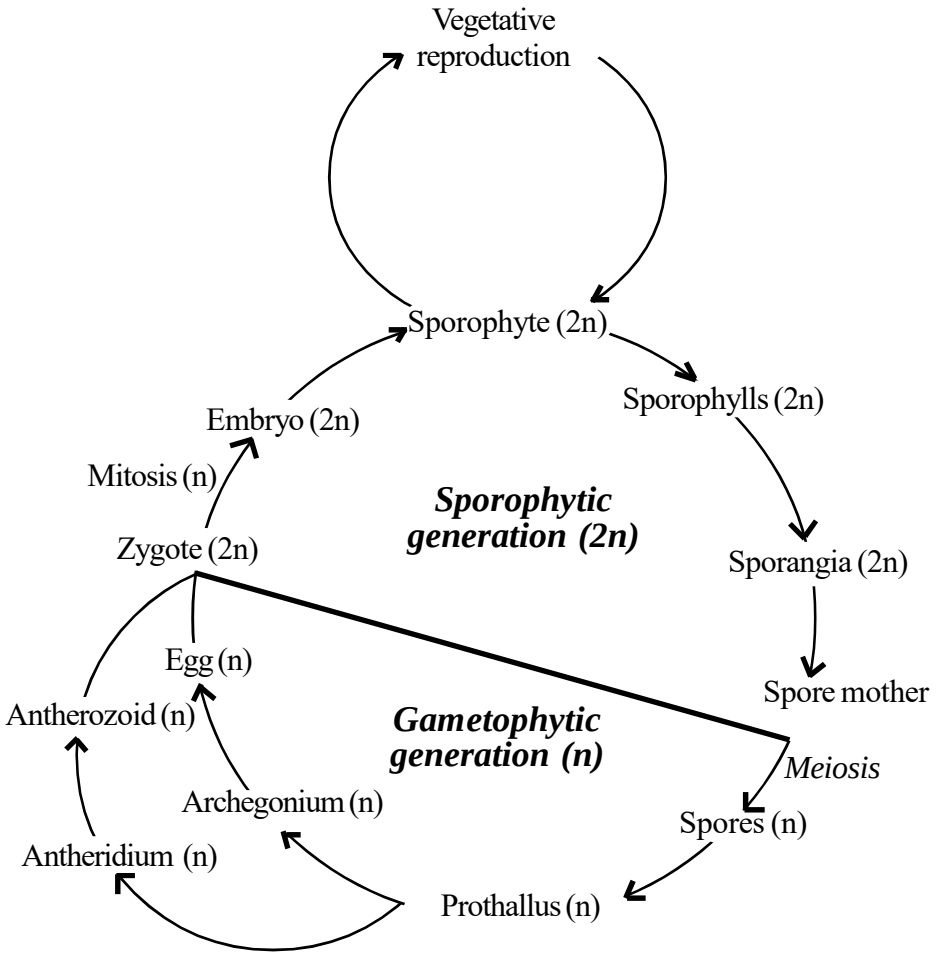


Fig.2.21: Life cycle in Pteridophytes

15. Gametophyte reproduces sexually.

16. Sexual reproduction is ***Oogamous.***

17. Sex organs, namely ***antheridium*** and ***archegonium*** are produced on the prothallus.

18. Antheridium produces spirally coiled and multiflagellate ***antherozoids***.

19. Archegonium produces ***egg*** or ovum.

20. Antherozoids ***swim*** in water and reach the ***egg*** and ***fuse*** with it to form ***zygote.***

21. Zygote is ***diploid*** (2n)

22. It undergoes ***mitosis*** and forms ***embryo.***

23. Embryo develops into ***sporophyte (2n).***

24. The independent ***sporophyte alternates*** with the multicellular ***gametophyte.***

25. So, the life cycle is ***haplodiplontic***.

21. Define eustele

1. The stele is split into ***distinct collateral vascular bundles*** around the pith.

2. It is a type of ***siphonostele*** with ***pith*** in the center.

3. Xylem and phloem lie in the ***same radius.***

4. ***Phloem*** is seen towards the ***periphery*** of the stem.

5. ***Xylem*** is seen towards the ***center.***

Eg. *Dicot stem*

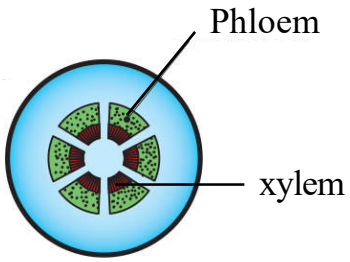


Fig.2.22: Eustele.

22. Write short notes on the general characteristic features of Gymnosperms.

1. Gymnosperms are phanerogams with ***naked seeds.***

Gymnos = naked
Sperma = seed

2. They are included in the ***kingdom plantae***

3. ***Eukaryotic***

4. They may be

1. Evergreen woody trees - Pinus
2. Shrubs - Ephedra
3. Lianas - Gnetum

5. They are distributed throughout the ***temperate*** and ***tropical regions*** of the world.

6. The plant body is ***sporophyte.*** It is differentiated into the following:

** Root * Leaves*
** Stem*

7. A well developed ***tap root system*** is present.

8. In coralloid roots of *Cycas, Nostoc,* a ***blue green alga*** is seen.

9. ***Mycorrhiza*** is present in *Pinus.*

10. The stem is

1. Aerial
2. Erect
3. a) Branched - Pinus
b) Unbranched - Cycas
4. With leaf scars

11. ***Two*** types of ***branches*** are seen in ***conifers.*** They are

1. Dwarf shoot - branches of limited growth

2. Long shoot - branches of unlimited growth

12. ***Leaves*** are of ***two*** types. They are

1. Foliage leaves
2. Scale leaves

13. Foliage leaves are ***green, photosynthetic*** and are borne on branches of limited growth.

14. Scale leaves are ***dark, brown, thin*** and ***small*** and are borne on both, ***long*** and ***dwarf shoots.***

15. ***Xylem*** consists of ***tracheids.***

16. In *Gnetum* and *Ephedra,* vessels are present.

17. Secondary growth is present.

18. ***Wood*** is of ***two*** types.

1. Manoxylic - Cycas
2. Pycnoxylic - Pinus

19. They are ***heterosporous*** i.e., they produce ***two*** types of spores.

20. The plant may be

1. Monoecious - Pinus
2. Dioecious - Cycas

21. ***Microsporophyll*** or ***male cone*** produces the ***microsporangia.***

22. ***Megasporophyll*** or ***female cone*** produces the ***megasporangia.***

23. ***Anemophilous pollination*** is present.

24. Fertilization is ***siphonogamous.***

25. ***Pollen tube*** helps in the ***transfer*** of ***male nuclei.***

26. ***Polyembryony*** is present.

27. The ***naked ovule*** develops into ***seed.***

28. The ***endosperm*** is ***haploid*** and develops ***before fertilisation***.

29. The life cycle shows ***alternation of generation.***

30. The sporophytic phase is ***dominant.***

31. The gametophytic phase is highly ***reduced.***

23. Give the similarities between Gymnosperms and Angiosperms.

1. The plant body is ***well organized***.

2. It is differentiated into ***roots, stem*** and ***leaves***.

3. ***Polyembryony*** is present. i.e., presence of many embryos.

4. The naked ovule develops into ***seed.***

5. The life cycle shows ***alternation of generation.***

6. The ***sporophytic*** phase is ***dominant*** and ***gametophytic*** phase is highly ***reduced.***

7. ***Cambium*** is ***present*** in gymnosperms as in dicotyledons.

8. ***Zygote*** represents the ***first cell*** of ***sporophyte.***

9. The male flower of angiosperm resembles the flowers in *Gnetum.*

10. An ***integument*** is ***present*** around the ovule.

11. In both, ***pollen tube*** helps in the transfer of ***male nucleus***.

12. Eustele is present i.e, the stele is divided into ***distinct collateral vascular bundles*** around the pith.

24. Differentiate Gymnosperms from Angiosperms.

Gymnosperms	Angiosperms
1. ***Vessels*** are ***absent*** [except Gnetales].	1. Vessels are ***present.***
2. ***Phloem*** lacks ***companion cells***.	2. Companion cells are ***present.***
3. ***Ovules*** are ***naked.***	3. Ovules are ***enclosed*** within the ***ovary.***
4. ***Wind pollination*** only.	4. ***Insects, wind, water, animals*** etc., act as pollinating agents.
5. ***Double fertilization*** is ***absent.***	5. Double fertilization is ***present.***
6. ***Endosperm*** is ***haploid.***	6. Endosperm is ***triploid.***
7. ***Fruit formation*** is ***absent.***	7. Fruit formation is ***present.***
8. ***Flowers absent.***	8. Flowers ***present.***

25. Give the names of the fossil representatives of different plant groups.

1. Fossil algae
   - *1. Palaeoporella*
   - *2. Dimorphosiphon*
2. Fossil bryophytes
   - *1. Naiadita*
   - *2. Hepaticites*
   - *3. Muscites*
3. Fossil pteridophytes
   - *1. Cooksonia*
   - *2. Rhynia*
   - *3. Baragwanthia*
   - *4. Calamites*
4. Fossil gymnosperms
   - *1. Medullosa*
   - *2. Lepidocarpon*
   - *3. Williamsonia*
   - *4. Lepidodendron*
5. Fossil angiosperms
   - *1. Archaeanthus*
   - *2. Furcula*

26. Give an account of the salient features of Angiosperms.

1. Angiosperms are ***phanerogams*** with ***closed seeds.***

Angio - Vessel
Sperms - Seed

2. It is included in the ***kingdom Plantae***.

3. ***Eukaryotic***

4. ***Flowering*** plants.

5. ***Fruit producing*** plants.

6. Major group of ***land plants.***

7. The ***sporophyte*** is the ***dominant*** phase and ***gametophyte*** is highly ***reduced.***

8. ***Vascular tissue*** i.e, ***xylem*** and ***phloem*** is well developed.

9. ***Flowers*** are produced instead of cone.

10. ***Ovule*** is ***enclosed*** in the ovary.

11. ***Pollen tube*** helps in ***fertilization;*** so water is not essential for fertilization.

12. ***Double fertilization*** occurs.

13. ***Endosperm*** is formed after fertilization and is ***triploid.***

14. Based on the number of cotyledons in the seed, angiosperms are classified into

1. Dicotyledons- two cotyledons

2. Monocotyledons- one cotyledon

27. Write a note on the salient features of Dicotyledons

1. Dicotyledons are ***flowering plants*** with ***two cotyledons*** in the **seed.**

2. ***Reticulate venation*** in the ***leaves.***

3. Roots develop from the ***radicle.***

4. ***Tap root system.***

5. ***Flowers*** are ***tetramerous*** or ***pentamerous.***

6. ***Tricolpate*** pollen - 3 furrows.

7. The ***vascular bundles*** are arranged in the form of a ***ring.***

8. ***Cambium*** is ***present*** and so vascular bundles are ***open.***

9. ***Secondary growth*** occurs**.**

28. Write an account on the salient features of Monocotyledons.

1. Monocotyledons are ***flowering plants*** with a ***single cotyledon*** in the seed.

2. ***Parallel venation*** in the ***leaves.***

3. ***Radicle*** does not persist.

4. ***Fibrous root***

5. Flowers are ***trimerous***

6. ***Monocolpate pollen - 1 furrow.***

7. ***Vascular bundles*** are ***scattered*** in the stem.

8. ***Cambium*** is ***absent*** and so vascular bundles are ***closed.***

9. ***Secondary growth*** does not occur

29. Distinguish between dicotyledons and monocotyledons.

Dicotyledons	Monocotyledons
1. ***Two cotyledons.***	***One cotyledon.***
2. ***Radicle persists***.	***Radicle doesn't persist.***
3. ***Tap root***	***Fibrous root***
4. ***Reticulate venation***	***Parallel venation.***
5. ***Tetramerous*** or ***pentamerous*** flowers**.**	***Trimerous*** flowers**.**
6. ***Ring*** like ***vascular bundles***	***Scattered vascular bundles***
7. ***Cambium*** is ***present.***	Cambium is ***absent.***
8. ***Open vascular bundles***	***Closed vascular bundles***
9. ***Tricolpate pollen.***	***Monocolpate pollen***.
10. ***Secondary growth occurs*** eg. Grasses	***Secondary growth does not occur*** eg. Hibiscus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