PTERIDOPHYTA

Term pteridophyta was proposed by Haeckel
The study of pterdophytes is known as pteriodology.
Pteridophytes are known as reptiles of plant kingdom.

1. Pteridophytes are also called as **vascular cryptogames.** Pteridophytes are **vascular plants** i.e. xylem and phloem are present in it. In pteridophytes, vessels in xylem and companion cells in phloem are absent. But exceptionally xylem of ***Pteridium, Selaginella*** and ***Marsilea*** contains false vessels. These false vessels formed by the modification of tracheids, so false vessels are trachieds.
   Type of vascular bundle - Concentric, Amphicribal, mesrch condition and closed.
   Note : Secondary growth is absent (due to absence of cambium) in pteridophytes but exceptionally secondary growth is present in stem of *Isoets.*

2. Pteridophytes are called as the first successful 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.

3. Pteridophytes are **not completely successful** terrestrial plants because they need water for fertilization, so pteridophytes grow in shady and moist places.

4. In pteridophyta, the plant body is completely differentiated in to **root, stem** and **leaves.**

   - The primary root remains alive for short period. After some time it is replaced by **adventitious** roots.
   - Stem is erect or prostrate. In some pteridophytes stem is underground, which is known as **rhizome.**
   - On the basis of leaves, pteridophytes are of two types -

     First in which stem is smaller while leaves are larger. They are known as **macrophyllous** Pteridophytes.

     eg. *Pteridium, Pteris, Marsilea*

     Second, in which stem is larger and leaves are smaller. They are called s **microphyllous** Pteridophytes.

     eg. *Equisetum, Lycopodium, Selaginella*

Note : Differentiation in plant body start from bryophytes.

LIFE CYCLE OF PHERIDOPHYTES

1. Plant is **sporophyte** i.e. diploid.
   Most of the pteriophytes re **homosporus** i.e. only one type of spores are formed during reproduction.
   eg. Lycopodium, Pteridiu, Equisetum, Dryopteris

Exception : Some pteridophytes are **heterosporus** i.e. two types of spores **microspores** and **megaspores**
eg. *Selaginella, Isoetes, Marsilea, Salvinia, Azolla, Stylites.*

2. Formation of spores takes place in **sporangia.** Sporangia is formed at the abaxial surface of leaves.

3. The leaves on which sporangia are formed are called **sporohylls** (reproductive leaves) and normal photosynthetic leaves are called **tropophyllas** (vegetative leaves). Sporngia are present in groups, there groups are called sorus. Many sorus are found on sporophylls. The groups of **sorus** are called **sori.**

Note :

(1) **In pteridophyta, sprophylls are also photosynthetic. This is a unique character of pteridophyta.**

(2) In pteridophytes development of sporangia takes place by two method -
(a) Leptosporangiate - Each sporangium develops from single initial cell.
(b) Eusporangiate - Each sporangium develops from a group of initial cells.

◆ Eusporangiate is advanced character because all higher plants are eusporangiate.

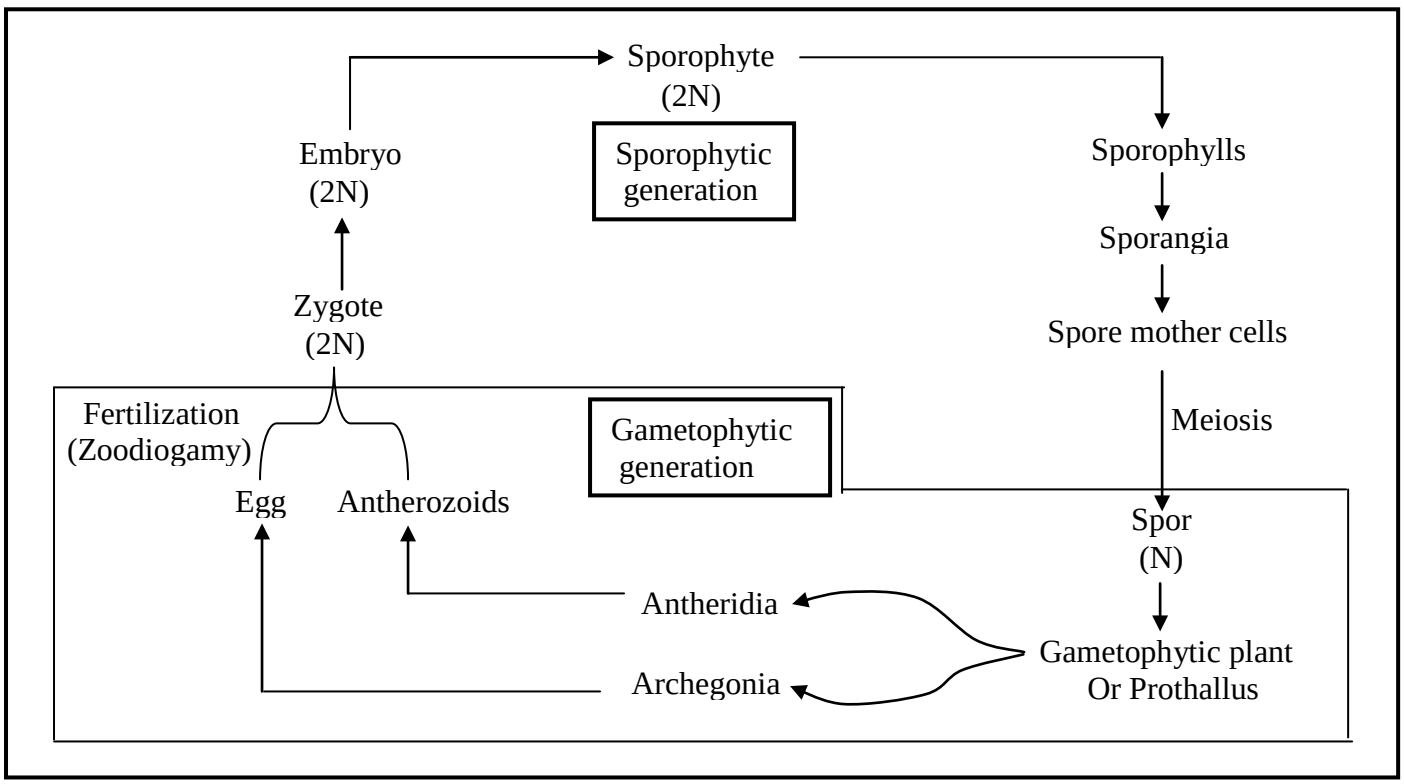
4. Spore mother cells are present in sporangia. Spores are formed in these spore mother cells by **meiosis** and these spores start the gametophytic generation.
5. In pteridophyta, the germination of spores is**exosporic** i.e. germination takes place out side the sporangia (in soil)
6. In soil, a gametophyte is formed by the germination of each spore, which is known **prothallus.** The formation of gametophyte takes place in the soil therefore it is free **(independent)** and **autotrophic.**
7. 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.

8. Prothallus (gametophyte) is monoecious but in heterosporus pteridophytes prothallus is dioecious.

In heterosporus pteridophytes –		
Microspores form	**-**	**Male gametophyte**
megaspores form	**-**	**Female gametophyte**

9. 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.
Antherooids are **spiral** and **mutliflagellate** but exceptionally antherozoied of **Selaginell** are spindle shaped and **Lycopodium** is curved (comma) and biflagellate. Egg is formed is **archegonia.**



10. Fertilization takes place by **zoodiogamy** and zygote is formed as a result of fertilization. Zygote develops and forms and **embryo.** Now this embryo develops and forms a **sprophytic plant** with **root, stem, leaf.**

- Type of sexual repro. in pteridophyta is **oogamous.**
- Their life cycle is **diplo-haplonitc** type.
- The unique character of life cycle of Petridophyte is - **Independent alternation of generation** i.e.
  sporophyte and gametophyte are separate to each other.

Pteridophyta is divided in to 4 classes

1. Psilopsida	2. Lycopsida	3. Sphenopsida	4. Filicinae

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, scaly leaves** and **rhizoids.**

(ii) Rhizoids are present instead roots. In psiolopsia stem is under group i.e. rhizome. This rhizome bears some aerial branches, Sporangia are formed on these branches.

Note : Vascular tissue is present only is stem.

(iii) **Tropophylls** are absent, scaly leaves are known as cataphyllus (Scaly leaves - dry brown coloured and non photosynthetic. They are only for protection of sporangia)

(iv) Their leaves do not have the capacity of phytosynthesis, therefore photosynthesis is done by stem.

(v) Sporangia are formed on stem. Sporophylls are absent.

(vi) Most of the plants in this class are extinct.
Only one living genus is present in this class **- *Psilotum* → A living fossil**
***Rhynia and Horneophyton* - Fossil plants**

2. Lycopsida or Lepidophyta or Microphyllophyta :

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

(ii) The plant body of club mosses in differentiated into root, stem and leaves. Club mosses are microphyllous i.e. small green leaves are present on stem. Leaves of club moss is **uninerved** i.e. only mid rib is present. Roots are adventitious.

(iii) **Sporangia** are formed on **sporophylls.** These sporophylls are not scattered on stem, instead they are present in groups at the tip of plant. these groups are called as strobilus or cone. The strobilus of club mosses are loose and small.

Note : In Lycopsida tropophylls and sporophylls are separate. Trophophylls are present whole year while sporphylls are formed during reproduction. Sprophylls are present at the tip of plant in group and formed **cone** (cone is photosy. structure)

Lepidodendron	**-**	**Giant club moss -** fossil plant
Lycopodium	**-**	**Common club moss or Ground pine or Trailing evergreen** it is a medicinal plant. It is used as tonic in Homeopathic medicines.
Isoetes	**-**	**Quill wort or Merlyn grass -** Aquatic weed
Selaginella	**-**	**Little club moss or spike moss or Bird's nest moss** **Resurrection plant -** All the species of ***Selaginella*** are known as "Drought Escapers" i.e. do not face drought condition, complete their life cycle in short wet season. In dry season plant dries and rolls in a ball like structures. In this stage, it passes out dry season. When we season returns plant absorbs water and again becomes normal. So, it is also known as "resurrection plant".

***Selaginella bryopteris* -** It is known as **"Sanjeevani"** No medicinal properties.

3. Sphenopsida or Arrhrophyta or Calamophyta :

(i) In this class **Horse tails** are included.

(ii) The plant body horse tails are differentiated into root, stem & leaves.

(iii) Their stem is nodulated i.e. stem distinctly differentiated into node and internode. Scaly leaves are present on these **nodes.**

(iv) **Silica** is present in the epidermis of stem and leaves. Due to silicate surface, leaves become rough. it two horse tail plants collide, then there is a dangerous change of **fire** in the forest.

(v) The formation of sporangia takes place on sporophylls. Sporophylls are arranged in a group and form a tall and condensed cone. This cone is formed at the apical part of aerial stem. The stem on which cone is formed is called as prorangiophore.

eg. Equisetum (Pipe), Sphenophylla, Hyenai

4. Filicinae :

(i) This if the **largest group** of pteridophytes.

(ii) Ferms are included in this class. Most of the pteridophytes are **ferns.**

(iii) Ferns are megaphyllous (macrophyllous) i.e. stem is small and eaves are comparatively larger and these leaves are known as **'Fronds'.** Leavdes are **multinerved.**

(iv) Multicellular hair are present on the young leaf and young stem of ferms which re called as **ramenta.** They are for protection.

(v) There is no difference between tropopphylls and sporophylls in fern i.e. every leaf of ferm forms sporangia at the time of reproduction. Therefore cones are not produced in ferns.

eg. of Ferns :

Pterdium **Pteris** **Dryopteris**	)	They are called "braken fern" or "Sun fern"
Dryopteris	**-**	Also called as Brook shield fern'
Adiantum	**-**	**Walking fern** or Maiden hair fern This name is given to them due to rapid vegetative reproduction. Vegetative reproduction in Adiantum takes place by means of leaf tip. It spreads very fast.
Osmunda	**-**	Royal fern or flowering fern
Ophioglossum	**-**	**Adler's tongue fern**
Marsilea	**-**	**Pepper wort fern**
Azolla	**-**	Aquatic fern (Smallest pteridophyte and biofertilizer)
Onychium	**-**	Golden fern
Cyathea	**-**	Lofty tree fern
Alsophila	**-**	Tree fern (Largest pteridophyte)
Chielanthus	**-**	Silver fern
Botrychium	**-**	Moon wort fern

SOME IMPORTANT POINTS :-

(1) ***Selaginella***

- ☛ Vivipary is present in it i.e. **partial endosporic** germination. Seeds habit originated is *Selaginella* like pteridophytes.
- ☛ Ligulate leaves (tongue shaped) are present in it **Function -** Ligule is secretory structure, which secretes water and keeps the sporanguium and the young leaf moist.

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

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

  eg. Selaginella

- ☛ In some pteridophytes sporangia are formed in spike

  eg. Ophioglossum

- ☛ In some pteridophytes sporangia are formed in sporocarp.

  eg. Marsilea, Azolla

Habitat of some important pteridophytes –

Most of the pteridophytes are found in moist soil and shady place.

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

eg. Marsilea, Salvinia, Azolla, Isoetes

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

eg. Lycopodium phlegmeria, Ophioglossum pendiulu, Pleopeltis

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

eg. Selaginella repestris, Selaginella bryopteris

Selaginella lepidophylla