* Plant Kingdom *

* System of Classification

Artificial system	Natural system	Phylogenetic system
→ Given by Linnaeus	→ Given by Bentham & Hooker	→ used by - Whittaker, Engler and Prantl and Hutchinson
→ Based on morphological characters such as colour, shape, number, size.	→ Based on External and internal like ultrastructure, anatomy embryology and phytochemistry.	→ Based on evolutionary Relationship

* Numerical Taxonomy
→ Based on statistical methods using computer
→ codes are assigned to all characters
* Cytotaxonomy:
→ taxonomy based on cell structure like chromosome number, shape and behaviour
* Chemotaxonamy - Taxonomy based on chemicals.

* ALGAE
→ Thalloid - No roots, Stem and leaves
→ Mostly aquatic (both fresh and marine water)
→ Some of them also occur in animals Ex - sloth bear
→ Lichen = Algae + Fungi
→ Unicellular forms like Chlorella - non motile, Chlamydomonas - motile
→ colonial ex - Volvox (motile)
→ Filamentous ex - Spirogyra, Ulothrix, Chara
→ Kelps (Massive) ex - Sargassum

* Reproduction in algae:

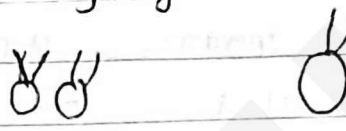
1) Vegetative
→ by Fragmentation

2) Asexual
→ by Spores
common Spores are
zoospores (motile)
→ Aplanospores (non-motile)

3) Sexual Reproduction is of 3 types

1) Isogamy → similar gametes
→ Ex ~~Chlamydomonas~~ Spirogyra Both ♂

2) Anisogamy → dissimilar gametes
Ex - Chlamydomonas



3) Oogamy →
Female (nonmotile) ♂ Male (small & moti

→ Ex - Fucus & Volvox

* Benefits of Algae.
→ Half of the total CO_2 - fixation
→ Food for aquatic animals
→ Porphyra, Lamanaria, Sargassum are among 70 species of Marine algae used as food
→ Hydrocolloids (water holding substance) ex - Algin (brown algae) & carrageen (Red Algae)
→ Agar is a product obtained from Gelidium & Gracilaria which is used in preparation of ice-cream and jellies
→ Chlorella is a protein rich used as Food supplement by Space travellers.

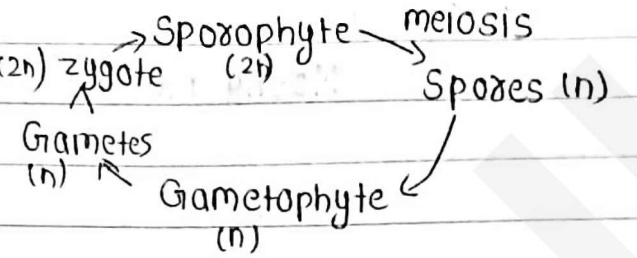
* Basis of Classification.
→ Pigments
→ cell wall structure
→ store food material

→ Chlorophyceae (Green algae)
→ Phaeophyceae (Brown algae)
→ Rhodophyceae (Red algae.

Algae characters	Chlorophyceae	Phaeophyceae	Rhodophyceae
common name	Green Algae	Brown Algae	Red algae
Habitat	Mostly Freshwater	Mostly marine	Mostly marine
Chlorophyll	a, b	a, c	a, d
other Pigments	β-carotene, xanthophyll	β-carotene, Fucoxanthin	β-carotene, γ-phycoerythrin (Red colour)
Stored Food	Starch	Mannitol and Laminarin	Floridean Starch
Cell wall	Cellulose	Cellulose and algin	cellulose, Pectin and Polysulphate esters
Vegetative Repn	Fragmentation	Fragmentation	Fragmentation
Asexual Reproduction	Flagellated zoospores &	Zoospores-Pear shaped Pyriform, 2-unequal laterally attached flagella	Non-motile spores
Sexual repn	Isogamous, Anisogamous Oogamous	Iso, Aniso, Oogamous Gametes are Pyriform	Oogamous, Non-motile gametes
Examples	SUV-C3 S - Spirogyra U - Ulothrix V - Volvox C - Chara C - Chlorella C - Chlamydomonas	SaF-LED Sa - Sargassum F - Fucus L - Laminaria E - Ectocarpus D - Dictyota	P2G2 P - Polysiphonia P - Porphyra G - Gracilaria G - Gelidium

* Bryophytes.

General life cycle of plants



→ Amphibians of Plant kingdom because they need water for Sexual Repⁿ
→ They have Rhizoid (instead of roots).
→ Main plant body is Gametophyte (Haploid)
→ Sporophyte is short lived, dependent on Gametophyte
→ Antheridium → produce Antherozoids which is biflagellate (male sex organs)
→ Archegonium (female sex organ) produce egg.
→ An antherozoids fuses with the egg and produce zygote
→ zygote do not undergo reduction division and produce multicellular body called sporophyte.

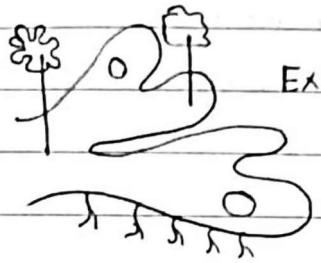
Importance of Bryophytes:

→ Sphagnum → (Peat moss)
Provides Peat and used as fuel
→ water Holding capacity.
→ used as packaging material.
→ Bryophytes help in plant succession

Types of Bryophytes

Liverworts

→ Grow in moist shady habitats such as marshy ground, damp soil, bark of trees etc



Ex - Marchantia, Riccia

→ Dorsiventral, Thalloid

→ Asexual Repn → Fragmentation

→ Gammae → asexual buds

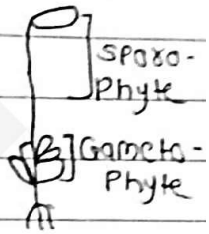
→ Sexual Repn by Antheridia & Archegonia

Mosses

→ First stage - Protonema

→ Second Stage - leafy stage

→ Asexual Repn by fragmentation of Protonema



→ Sexual repn by Antheridia & Archegonia

→ Ex - Funaria, Polytrichum, Sphagnum

* Pteridophytes

→ First vascular plants (Posses xylem and phloem)

→ Main plant body is sporophyte

→ They bear true Root, Stem and leaves

- Small → microphylls → ex - Selaginella
- large → macrophylls → ex - ferns

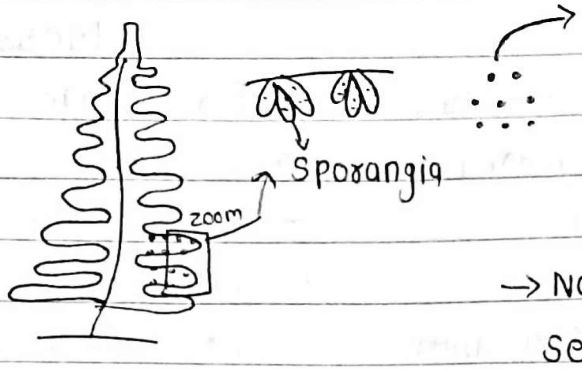
Economic importance

→ Ornamentals

→ Soil binders

→ Medicinal value

* Reproduction: egg ← Archegonium → Antheridium → produce antherozoids ♂



→ Free living, small, mostly photosynthetic sometimes saprophytic
(Prothallus) Gametophyte

→ Need water for Repn

Sexual Reproduction

Sporophyll → leaves with sporangia (spores)

Strobili / cones →

↳ ex · equisetum, Selaginella

* Heterospory - prodn of 2 types of spores

* Homospory - Same type of spores

Megaspore (Large - Female) Microspore (Small - male)

Female gametophyte Male gametophyte

↓ zygote develops inside it

Heterospory is precursor to seed habit.

classes of Pteridophytes

Psilopsida	Lycopsida	Sphenopsida	Pteropsida.
Ex - Psilotum	Lycopdium Selaginella	Equisetum	Dryopteris, Pteris, Adiantum

* Gymnosperms.

→ Gymno – naked Sperms - Seeds (not covered by ovary) no fruit

→ Roots are Tap roots → Main plant body is sporophyte
Mycorrhiza (ex- Pinus) coralloid roots (Ex - cycas) → Endosperm is haploid formed by female gametophyte

→ The leaves are simple or compound
In conifers there are needle like leaves (Reduce surface area)
Thick cuticle and sunken stomata help to reduce water loss.

→ They have vascular tissue – xylem, xylem contain tracheids.
Phloem. phloem contain sei sieve cells

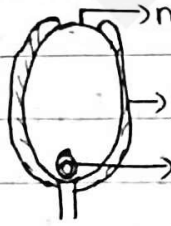
→ Sequoia (Giant Red wood tree) is the tallest Gymnosperm

→ Ginkgo is a living fossil

→ The Gymnosperms are heterosporous they produce two type of spor

Megaspores	Microspores
→ Megaspore produce on megasporangia	→ Microspore produce on microsporangia
→ Megasporangia grow on megasporophyll	→ Microsporangia grow on microsporophyll
→ Large number of megasporophyll produce female cone/ Strobili called as megasporangiate	→ Large number of microsporophyll produce male Strobili called as Microsporangiate.

→



meiosis

4 megaspores (n)

3 degenerate → 1 remains functional
(2-5) Archegonia (female gametophyte)
(n)

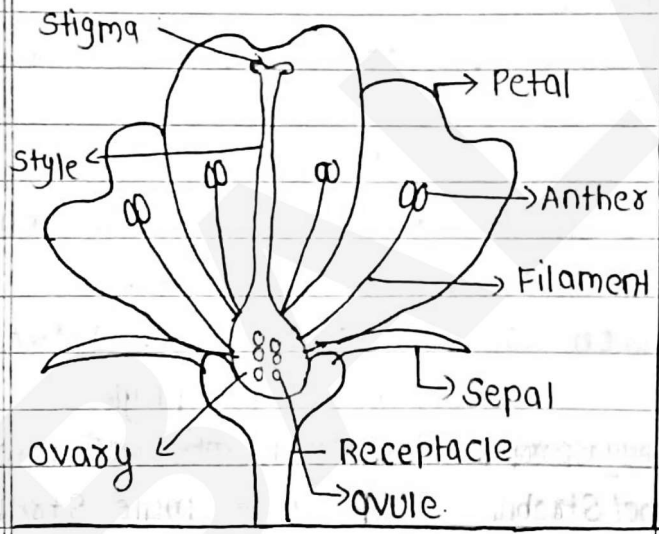
* Angiosperms:

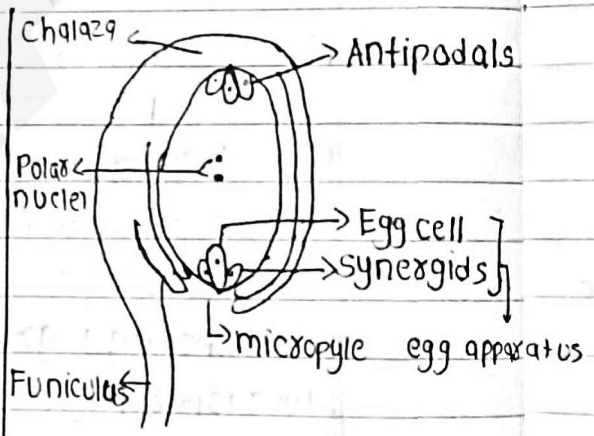
→ Seeds are enclosed in fruit / ovary and they are flowering plan

→ Smallest angiosperm is Wolfia (0·1 cm)

→ Tallest is Eucalyptus (100 metres)

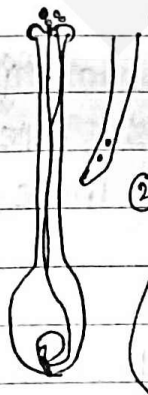
	Monocot	Dicot
Cotyledons →	1	2
Root →	Fibrous	Taproot
Leaves →	Isobilateral	Dorsiventral
	Parallel venation	Reticulate venation
Flowers →	Trimerous	Tetra / Pentamerous





Ovule (Anatropous ovule)

* Double Fertilisation



① 1st male gamete (n) + egg cell (n)

↓

Zygote (2n)

② Secondary nucleus (2n) + 2nd male gamete

↓

PEN

Primary Endosperm Nucleus (3n)

Triple fusion

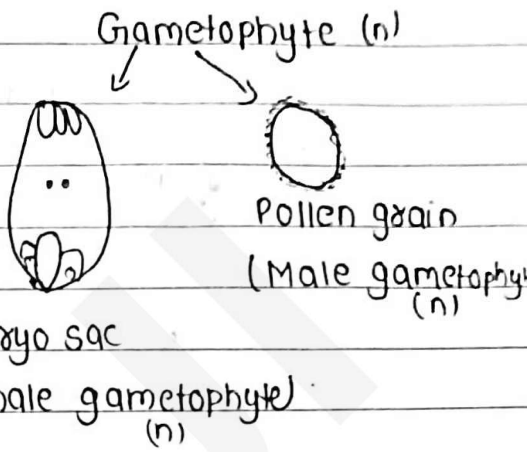
After Fertilisation

Ovule → Seed

Ovary → Fruit

→ Main plant Body is Sporophyte (2n)

→ Short lived → Gametophyte (n) dependent on sporophyte



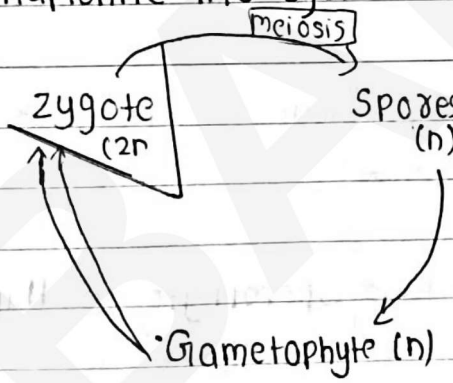
* Plant life Cycles and Alternation of generation.

→ All Diploid Structure is a part of sporophytic generation

→ All Haploid Structure is a part of Gametophytic generation

→ Sporophytic generation alternates with Gametophytic generation is called alternation of generation.

* Haplontic life cycle.



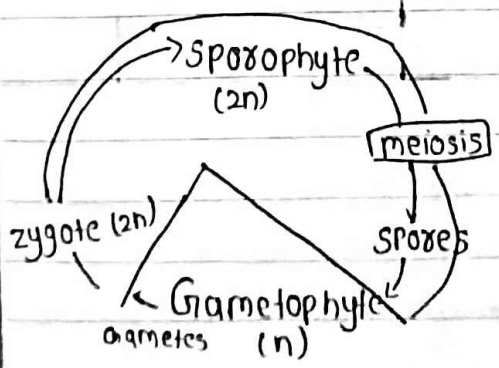
→ Sporophytic generation has one-celled zygote

→ Gametophyte → Dominant, mostly multicellular

→ Meiosis → zygotic meiosis forms haploid Spores

→ Ex- Mostly Algae, Volvox, Spirogyra Chlamydomonas

* Diplontic life cycle.

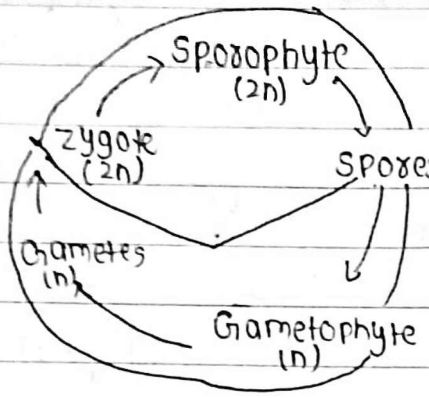


→ Sporophyte is dominating, multicellular and independent

→ Gametophyte is dependent on sporophyte

Ex. Gymnosperm, Angiosperm
Fucus (Alga)

* Haplo-diplontic lifecycle



→ Both Sporophyte and Gametophyte and multicellular

→ In Bryophyte - Gametophyte is dominating and Sporophyte dependent on Gametophyte and it is short lived

→ In Pteridophyte → Sporophyte is dominating and Gametophyte is Independent.

Ex- some algae- kelps, Ectocarpus, Polysiphon

	Structure	Dominating plant part	Life cycle.
Algae	Thalloid	Gametophyte	Haplontic.
Bryophytes	Thalloid / leafy (Liverworts, Mosses)	Gametophyte	Haplo-diplontic
Pteridophytes	Root, stem, leaves	Sporophyte (Gametophyte- free living)	Haplo-diplontic
Gymnosperm & Angiosperm	Root, stem, leaves	Sporophyte	Diplontic