

③ Plant - Kingdom

Algae (Haploid)

Study → Phycology

Algal component → Phycobiont

characters

- Fresh water, Marine water, terrestrial region
- ¹⁰ Chlorophyllous, Thalloid body (can't differentiate root, stem, leaf)

Autotrophic, Tissue system $\ominus$ nt

- Algae $\longleftrightarrow$ Fungi } Relation → Lichen

- Algae + animal $\Rightarrow$ Sloth bear (symbiotic associⁿ)
सूत

- Form & size (highly variable)

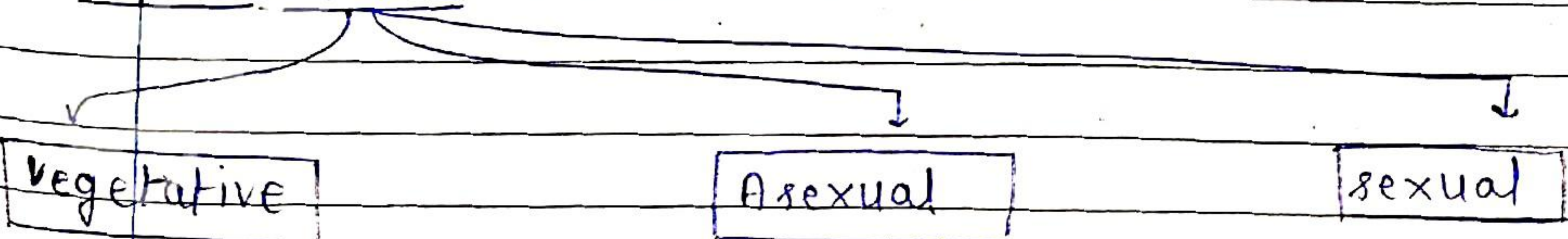
(I) unicellular algae → Chlamydomonas

(II) colonial → Volvox (Flagellated)

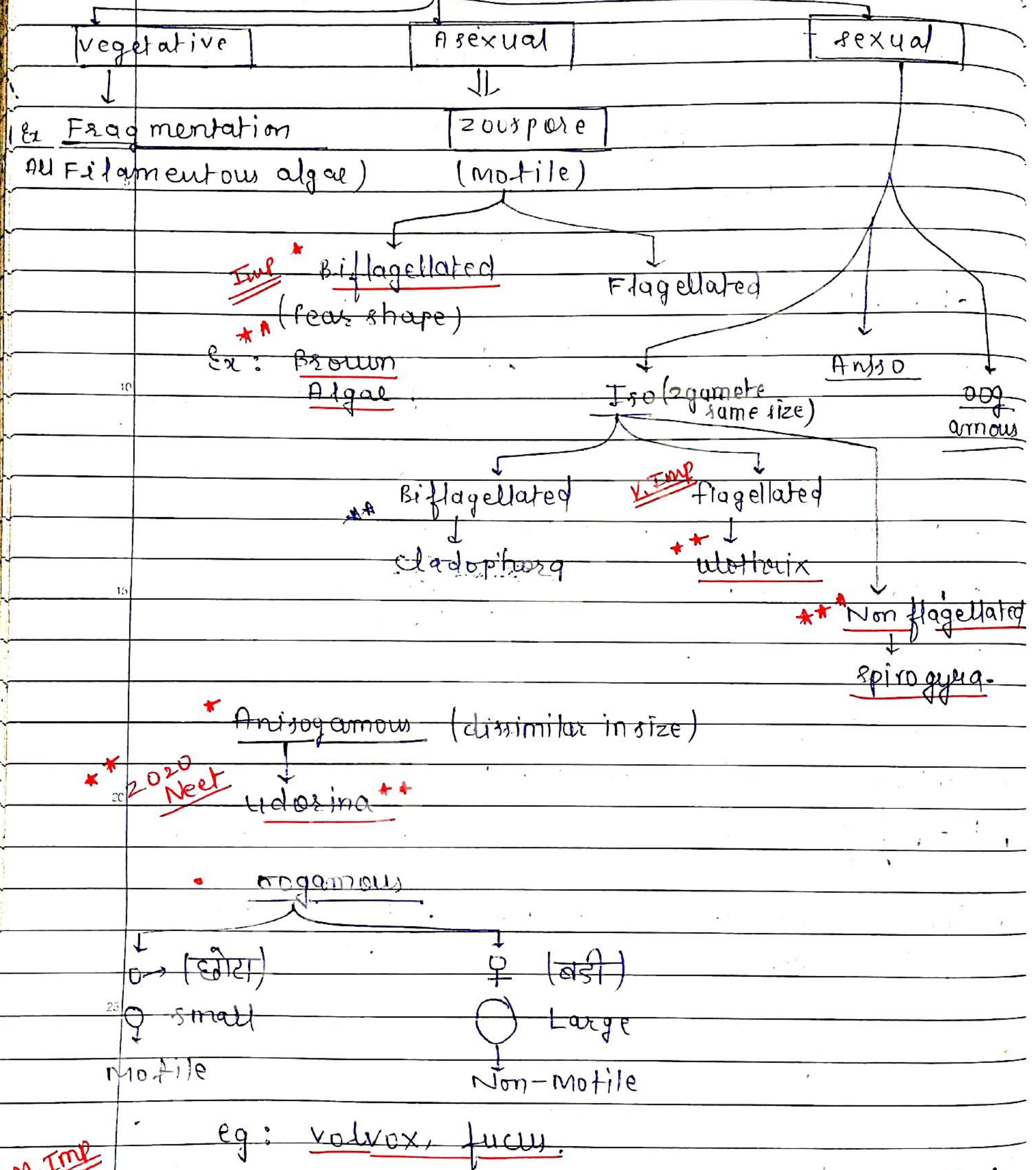
(III) ²⁰ Filamentous → Ulothrix, Spirogyra, Ectocarpus
(USE)

(IV) massive plant bodies → Kelps $\rightarrow$ Brown algae
(बहुल बड़े) $\rightarrow$ 100 m

• Reproduction

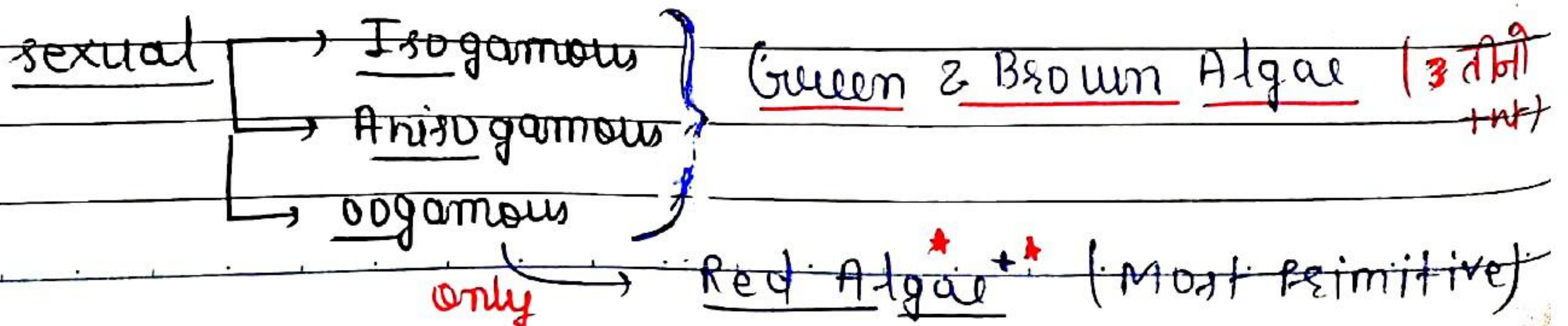


Reproduction

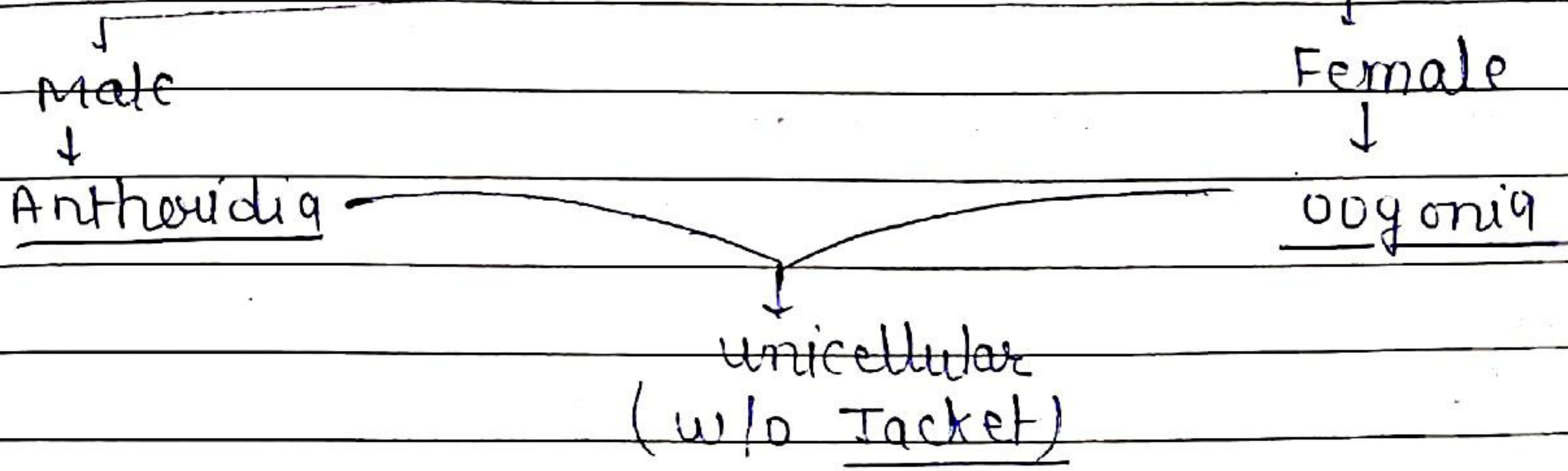


M. Imp

NOTE

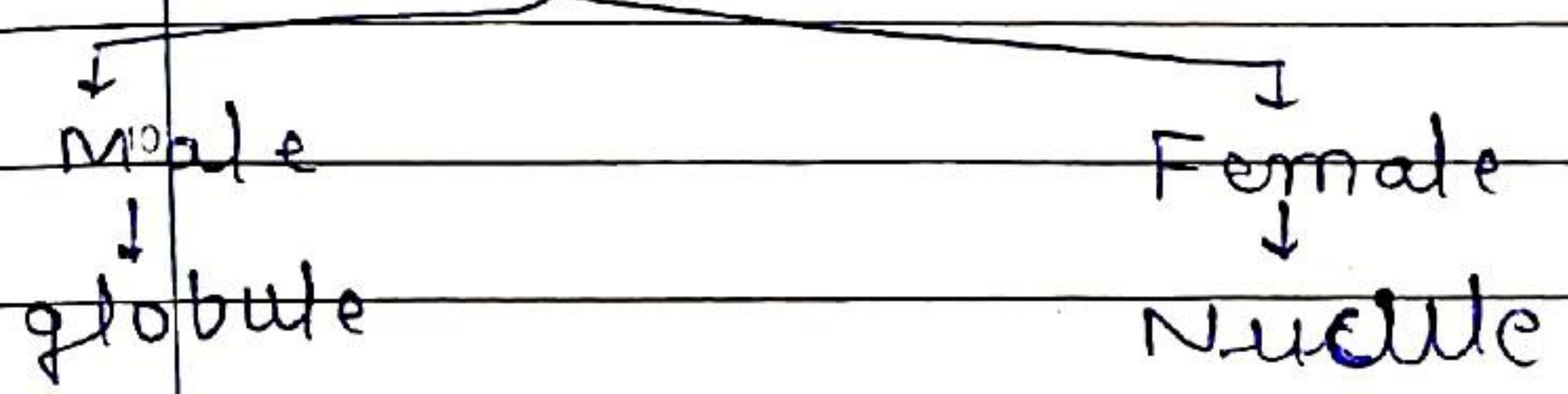


Oogametes



Green Algae

Chara



Algae → Haploid → Haplontic life cycle.

zygotic Meiosis

Exception → Brown Algae (Diploid)

Eg: Ectocarpus (2n) Polysiphonia (n) Kelps (2n)

* Haplodiplontic (Haplontic → dominant stage)

Bryo

(n) dominant haploid

(2n)

Pterido

(2n) dominant diploid

(n)

diplo-haplontic life cycle.

Haplodiplontic life cycle

Economic importance of Algae

Neet

Page :
Date :

Economic Importance

- ① दुनिया की $1/2$ CO_2 fixation $\rightarrow$ By Photosynthesis
- ② Primary Producer of energy
- ③ Edible $\rightarrow$ P L S को खाते हैं (फ्लेक्स)
प्लस

* * * Porphyra, Laminaria, sargassum } edible.

Neet

- ④ Algin & Carraheen

Brown
Algae

Red
Algae

Trick $\rightarrow$ रस है $\rightarrow$ Red

Water Holding substances } used in transport
(Hydrocolloids)

- ⑤ Agar - Agar $\Rightarrow$ Red Algae $\Rightarrow$ Gelidium & Gracilaria
culture medium (growing microbes)
Ice cream, jelly preparation.

Trick

Agar Agar $\rightarrow$ Gelidium & Gracilaria

- ⑥ space traveller

$\rightarrow$ Chlorella & Spirulina * * } Protein rich

divisions $\rightarrow$ Algae

Chlorophyceae

$\Downarrow$
Green algae

Phaeophyceae

$\Downarrow$
Brown algae

Rhodophyceae

$\Downarrow$
Red algae

Imp

Basis $\rightarrow$ Photosynthetic pigment

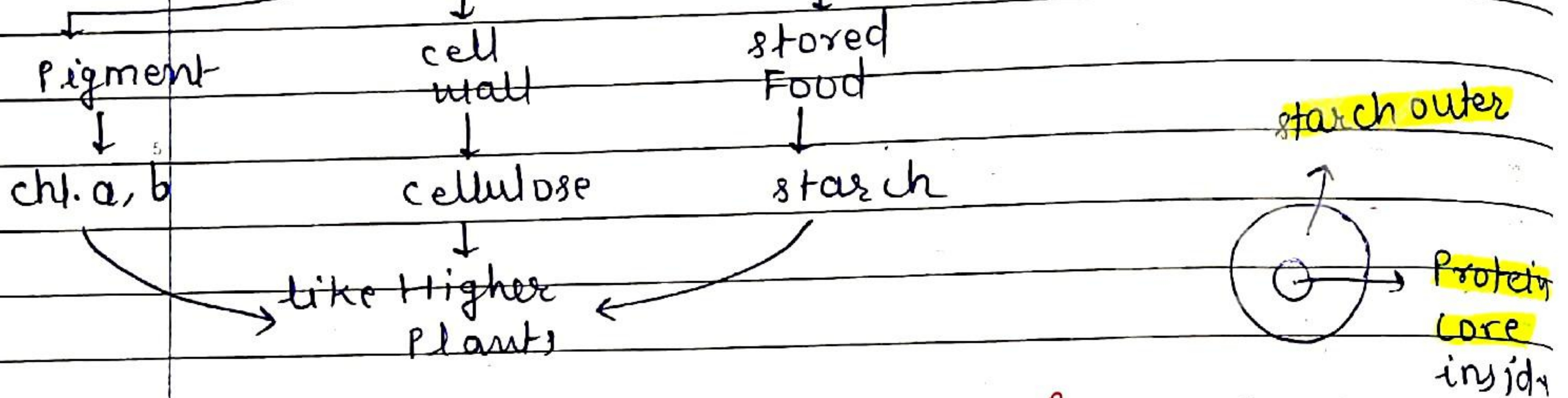
of classification $\rightarrow$ cell wall composition

$\rightarrow$ stored Food

Class	Common Name	Major Pigments	Reserve Food Materials	Cell wall	Flagella
Chlorophyceae	Green Algae	Chl. a + b Pigment $\ominus$ nt	Starch	Pectose + cellulose	2, 8 equal (apical)
Phaeophyceae	Brown Algae	Chl. a + c Pigment $\downarrow$ Fucoxanthin	Mannitol Laminarian Fish Egg $\rightarrow$ Brown Egg	cellulose & algin	2 unequal (lateral)
Rhodophyceae	Red Algae	Chl. a + d Pigment $\downarrow$ Phycocyanin Red colour	Floridian starch	cellulose & pectin with polysulphide ester polysulphate ester	Flagella $\ominus$ nt

① chlorophyceae (Green Algae)

"Most advanced" ★



• stored Food → starch

In chloroplast → Pyrenoid ★★ ★★

starch + Protein / oil droplets

★ ★ ★ chloroplast shape

ex: Volvox → X
Chlamydomonas → cup shaped
Spirogyra → Ribbon / spiral shape
Ulothrix → girdle shape
Chara → discoid shape. } chloroplast shape.

• unicellular → Chlamydomonas, Chlorella, Acetabularia
 green algae

★ ★ Largest unicellular plant

• filamentous → Ulothrix, Spirogyra

M. Imp
 NOTE

Cephaleuros Algae → Parasitic

(Fungus, Algae) → cause Red Rust ★ ★ ★

② Protein content maximum → Spirulina >>> Chlorella

②

Phaeophyceae (Brown Algae)

- Mostly → Marine water
- Multicellular filamentous

longest filament

100 mt

KelpsMacrocystis

Largest Brown Algae

Frond
or
laminastipe
(stalk)

Holdfast

substratum से
जमीन से जुड़ा रहेगा

Algin

Hydrocolloid

Hydrophillic

dryness से बचाती है।

freeze denaturation (मुँह से बचाएगा)

shock absorber

ex:self defense Trick

S → Sargassum

E → Ectocarpus

L → Laminaria

F → Fucus (diplontic)

D → dictyota

Full
NCERT diag:

Part - XIII

③

Rhodophyceae (Red Algae)

③ Rhodophyceae (Red Algae)

- 2nd most ancient algae* (yrtt)

- (First = B.G.A)*

- eg: Polysiphonia

- Mostly found = Marine water = warmer areas

KIM exception → Batrachospermum ⇒ Fresh water
Rosphyridium ⇒ Land (unicellular algae)

M. Imp ***

→ No any motile stage (Flagella ⊖) in lifecycle.

↓

cilia & flagella = B.G.A
⊖

→ cell wall ⇒ cellulose + Pectin

→ xylane
→ galactose
→ polysulphate ester

cell wall ✓

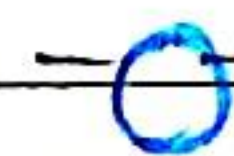
↓
complex

↓
b/c Primitive

NOTE → Cell wall + CaCO_3 → corals
(coelenterata)

- Gaudikov's effect Red algae do colour change acc. to depth

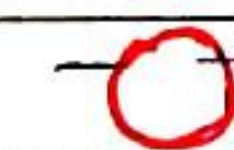
surface 4x
Phycocyanin ↑↑
(Blue colour)



Phycocyanin = UV, violet

↑
colour appearance

Bottom 3x
Phycocyanin
(Red colour)



Red algae colour changes according to depth

Red algal $\rightarrow n$
Brown $\rightarrow 2n$

Page :

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$\rightarrow$ gaudikov's effect $\rightarrow$ also $\oplus$ in B.G.A

• sexual Reproduction

Red algal (n)

only oogamous **

σ (sex organ)

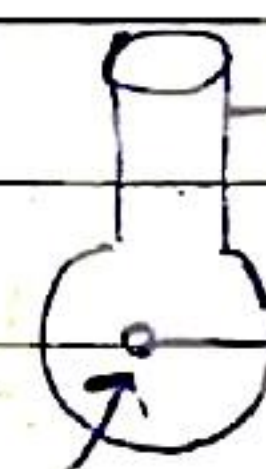
♀ sex organ

Spermatangia

Carpogonia

spermata (male gamete)

(Non-motile)



Trichogyne

egg

zygote

carposporophyte ($2n$)

mitosis

Carpospores

Meiosis

Tetrasporophyte ($2n$)

spore (n)

Red Algal

Imp Note

sexual Repⁿ is oogamous and accompanied by complex Post Fertilisation development

NCERT

Note $\rightarrow$ complex Post Fertilisation development बीजा हैं remaining algal के comparison में।
 σ (male) : ♀ (Female)

Algae

Anthredium

oogonium

Chara

globule

Nucule

Red Algal

spermatogonia

carpogonia

Camlin

Ex: Red Algae

Trick $P^2 + G^2$ } $P \rightarrow$ Polysiphonia
 $P \rightarrow$ Poly Porphyra
 $G \rightarrow$ gelidium
 $G =$ Gracilaria

Examples

Green

Remaining
all

Brown

$S \rightarrow$ Sargassum
 $E \rightarrow$ Ectocarpus
 $L \rightarrow$ Laminaria
 $F \rightarrow$ Fuus
 $D \rightarrow$ dictyota

Red

$P^2 + G^2$

$P \rightarrow$ Polysiphonia
 $P \rightarrow$ Porphyra
 $G \rightarrow$ gelidium
 $G \rightarrow$ gracilaria

#

Bryophyta

(n) Haploid

gametophyte
(dominant)

These are 1st land plant

but unsuccessful.

b/c

Roots

⊖

Vascular

system ⊖

Water

required

For fertilisation

इसलिए Bryophytes

बड़े नहीं होते

(xylem & Phloem ⊖)

→ Bryophytes → Amphibians of Plant Kingdom

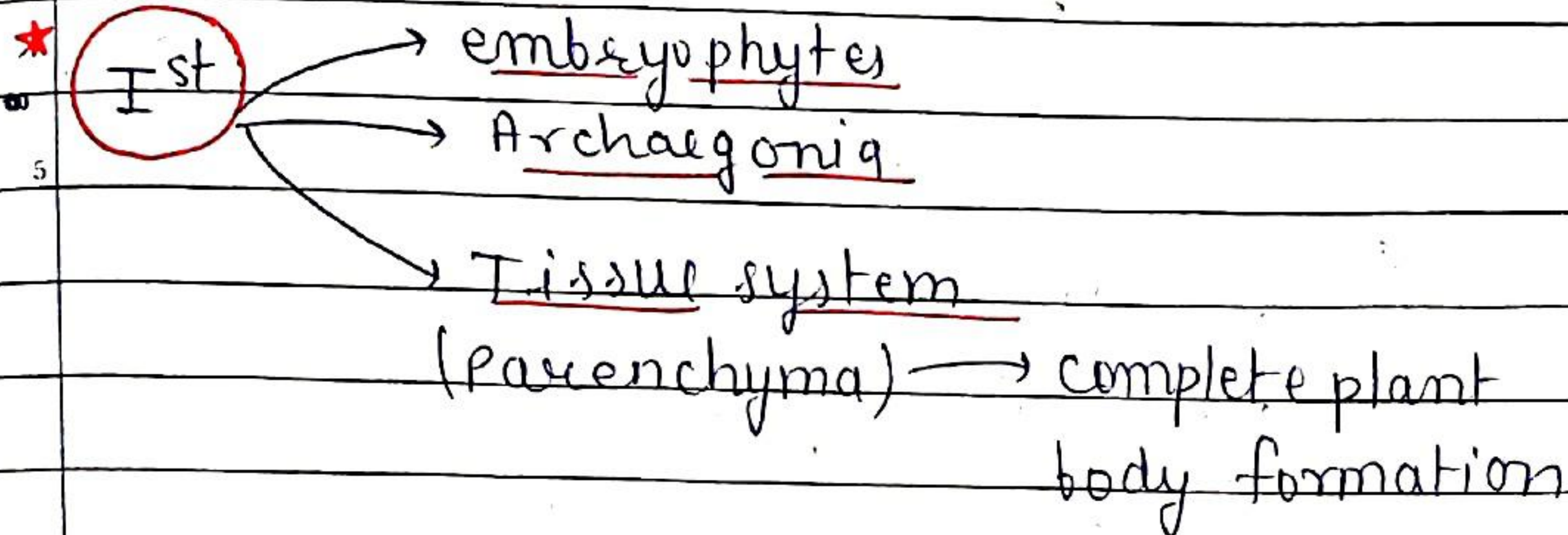
Both } water → fertilisation ✓
 } land → not successful. ✗

Amphibians of
Plant Kingdom

↓
sexual Reproduction ✓
करते हैं।

- Habitat → cool, Damp, (moist), shady Areas (Sciophytes)

Near water bodies ✓



→ Cryptogamous

Habit

↓ Primitive
Bryophyta

↓ Thallus + Rhizoids
↓ dorsiventral
(चपटा)
रोरी की तरह

eg: Liverworts, Hornworts

↓ Advanced
bryophyta

↓ Leaf like (n) + Rhizoids (n)
stem like (n) (root like)

Ex: Mosses (n)

★ Unique character

→ कहीं नहीं मिलेगा

Mosses → हर चीज में
मोसाजी ही अच्छे
हैं

★ Reproduction

① Vegetative / Asexual Repⁿ

(A) Fragmentation

→ Thallus eg: Liverworts
Hornworts

★ ★ ★ ★
→ Marchantia ★ eg: Mosses
(dioceous)

♂

♀

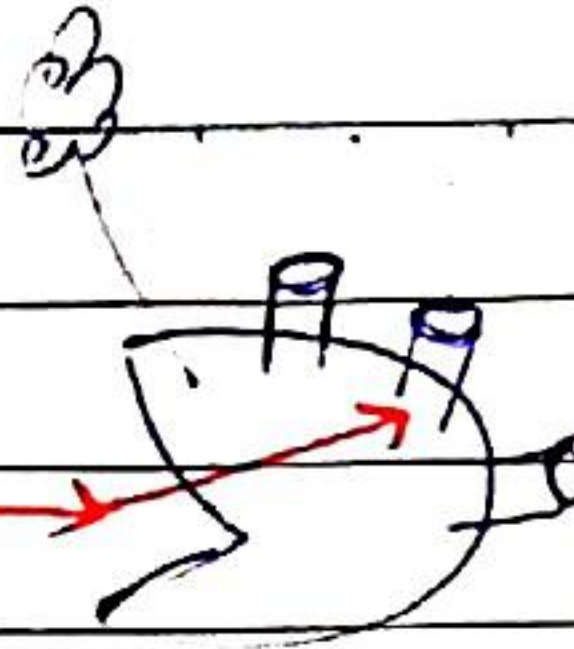
Camlin

(III) Gemma cup

Imp

Gemma

- green ✓
- multicellular
- Asexual bud
- Totipotency → असली काम (एक cell पूरी Body)



200m



Gemmae

New thallus

Life cycle (Sexual Reproduction)

①

Plant body

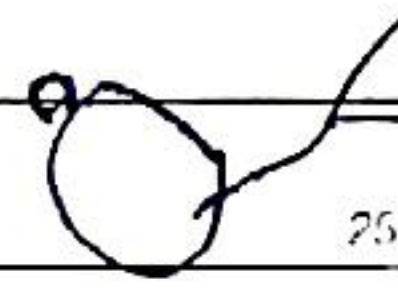
Gametophyte (n)

Monococious (Male, Fem. एक में)

multi cellular (Jacketed) (n)

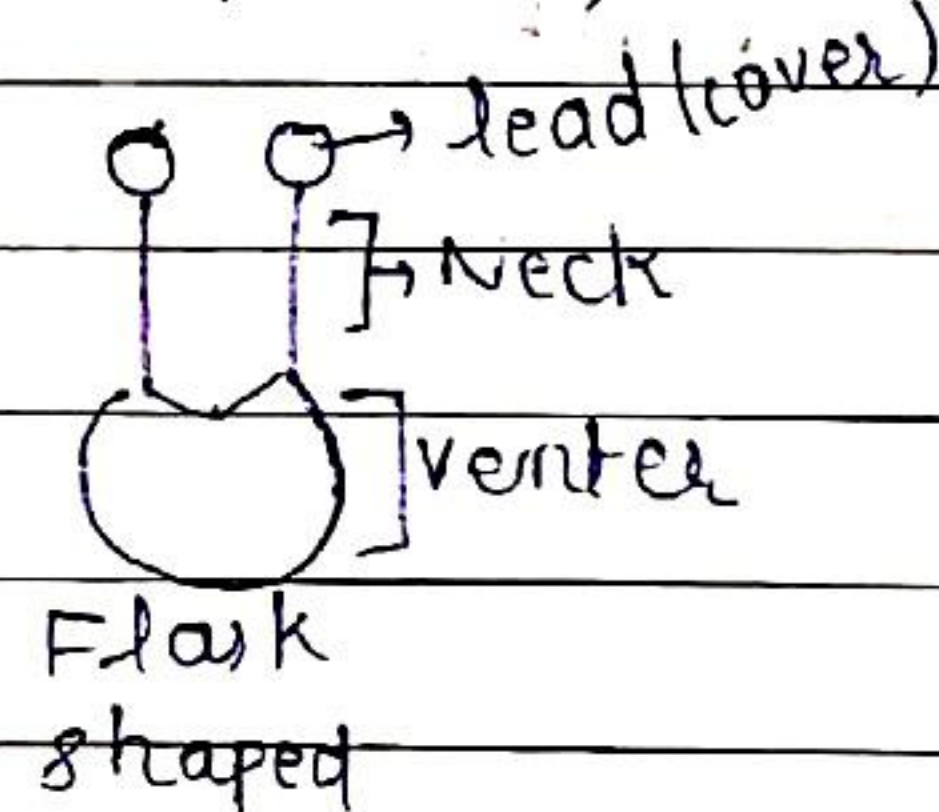
Antheridia

Antherozoids (Biflagellated ♂ gamete)



Archegonia (n)

Egg (♀ gamete)



Antherozoids

eggs

Fertilisation ✓

(zooidiogamy)

पानी में fertilisation

(2n) zygote

mitosis (eqⁿ division)

(2n) Embryo

(2n) sporogenous cell 2 cells

sterile

Nurse cell (2n) (nourishment)

(2n) Fertile

spore mother cell

Meiosis (redⁿ div.)

spore (n)

(2 chance)

direct germin.

Indirect germin.

direct germination

into plant body

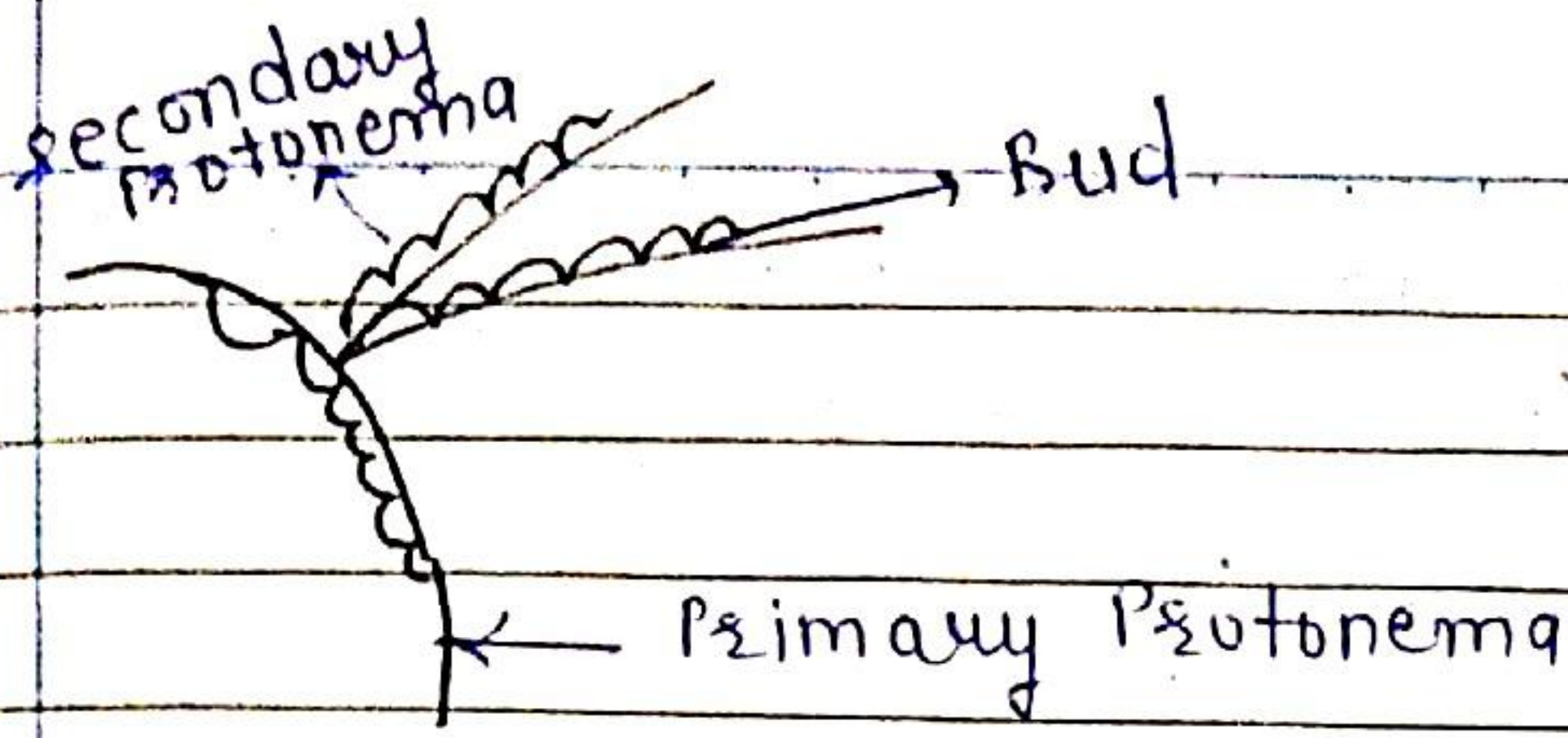
(spore गिरकर New plant)

Paratome

Filament

green branches creeping (रेंगती है)

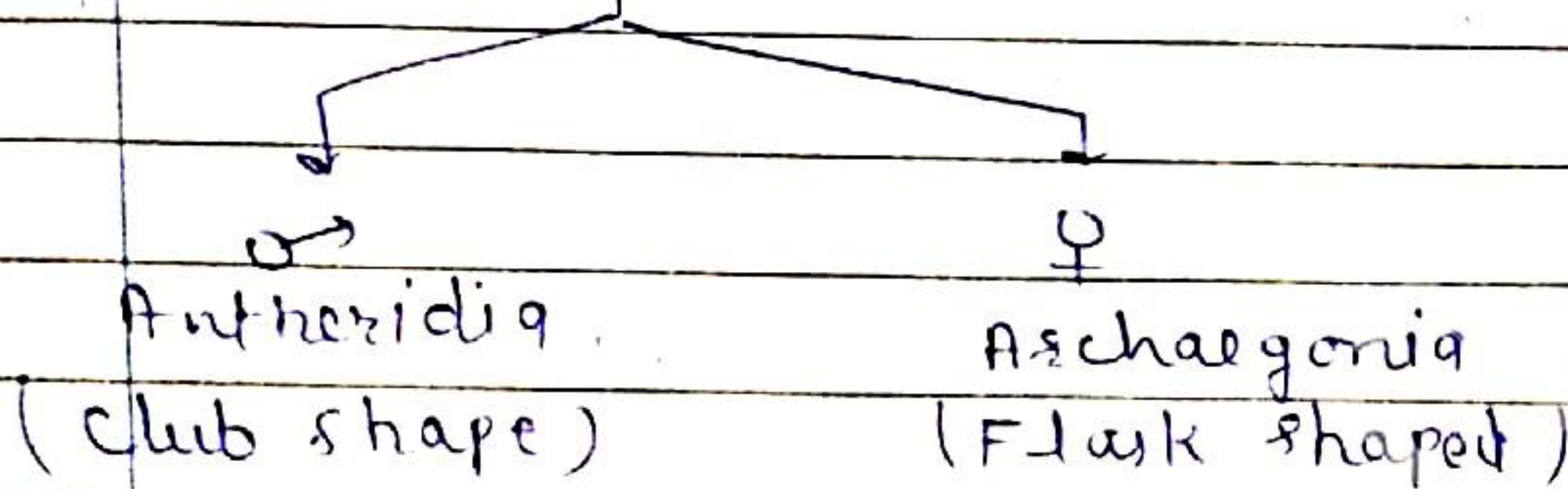
Psotonema



(Indirect germination)

★ zygote do not undergoes ———, Reductional division Immediately.

Bryo sex organs



N.C.C. (Neck canal cell)

V.C.C. (ventral canal cell)

egg

↓
① V.C.C.

Sex organ composition

Algal	B / P
Unicellular	multicellular
Jacketless	jacketed

except: Chara

Part XIV

Bullet Points

Bryophytes

- 1st embryophytes
 - 1st archaegoniate.
- 1st land plant but not successful.

water → req. for fertilisation (zoötiogamy)

1st tissue system

→ Imp. Role in Plant succession on bare rocks / soil
(psim. succession)

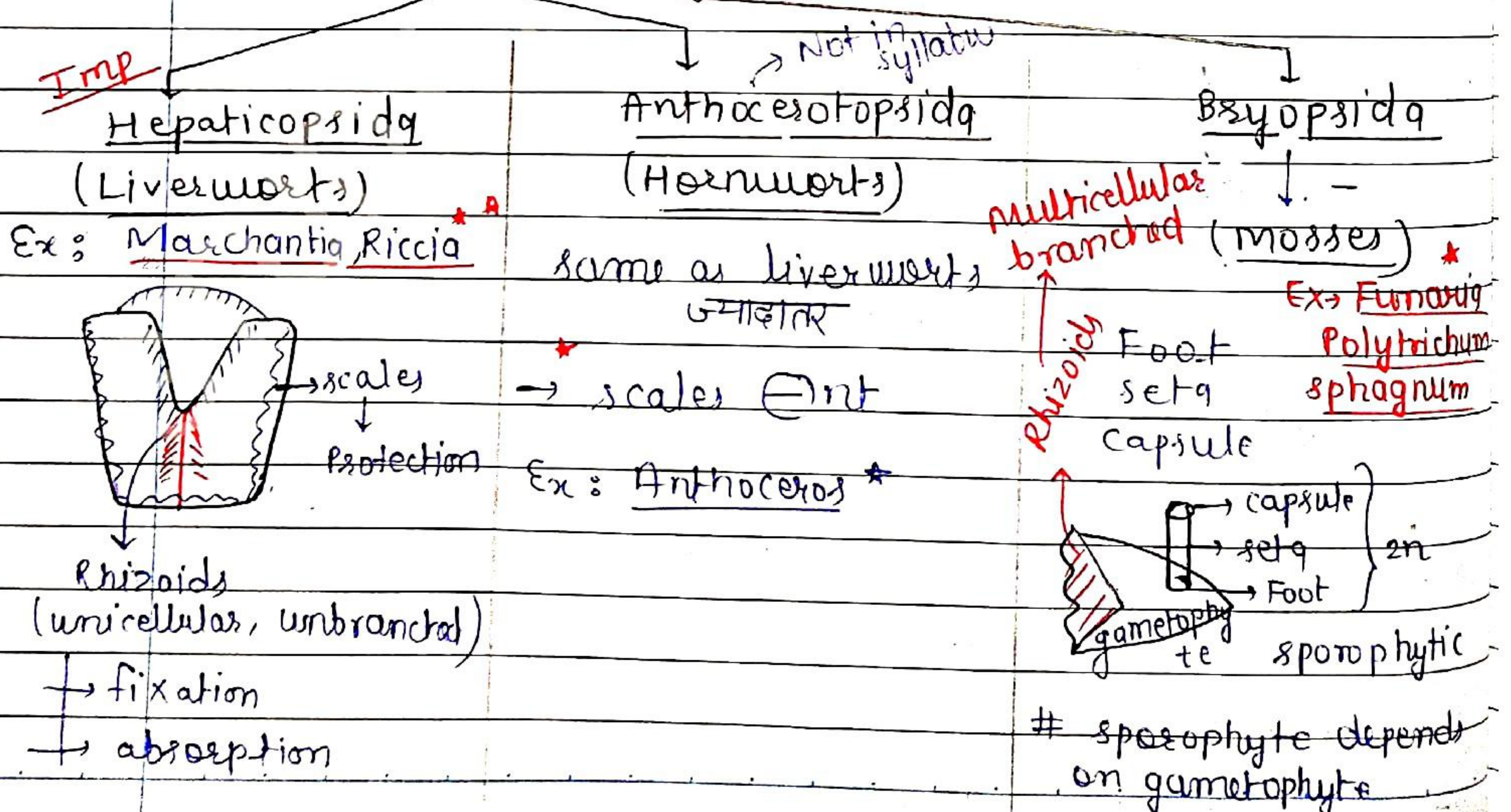
Main plant body → gametophyte.

Economic importance & ecological importance of Bryophytes

→ little economic importance & great ecological importance

<u>economic</u>	<u>ecological</u>
Food, → sphagnum (Packaging / Tsamhipment) ↓ <u>Moss</u>	→ Prevent soil erosion → Reduce impact of Falling rain → 1st organism (Lichen + Bryo) to colonise rocks. → decompose rocks for growth of higher plants.

classification of Bryophytes



sporophytic evolution → Fertile Part reduced

"अच्छा हुआ"

कम आओ अच्छा काम हो

(H)	(A)	(B)
Ex: 1 Riccia → simplest bryophyte	• pseudoeclators	• <u>peristomial teeth</u>
2 <u>Neet</u> Marchantia → dioecious		good than eclators
gemma cup + <u>eclators</u> → dispersal of spores		Best spore dispersal
Modified form of nurse cells.		* मौसमी हमेशा अच्छे ↓ <u>Moss</u>
• Posella ↓ Leafy gametophyte		spore dispersal में sporophyte में Ex. → Funaria * Polytrichum * Sphagnum *

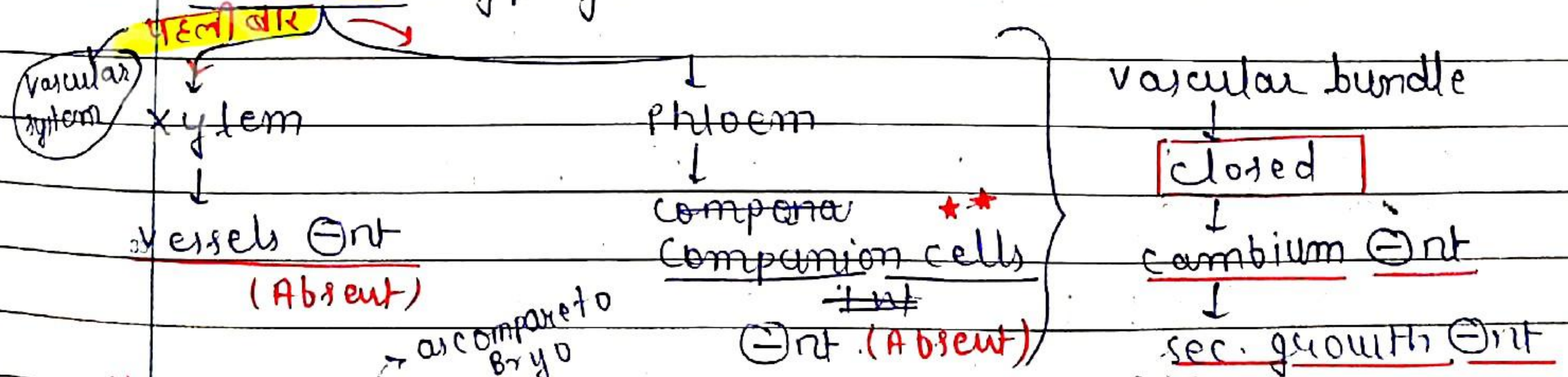
Reptiles of Plant King.
(रिंगकर उड़े हैं पानी पर depend)

Pteridophyta

vascular cryptogames

• Pioneer of secondary succession (Forest Fire में पहली बार यही आया)

• Vascular cryptogames



More successful land plant but

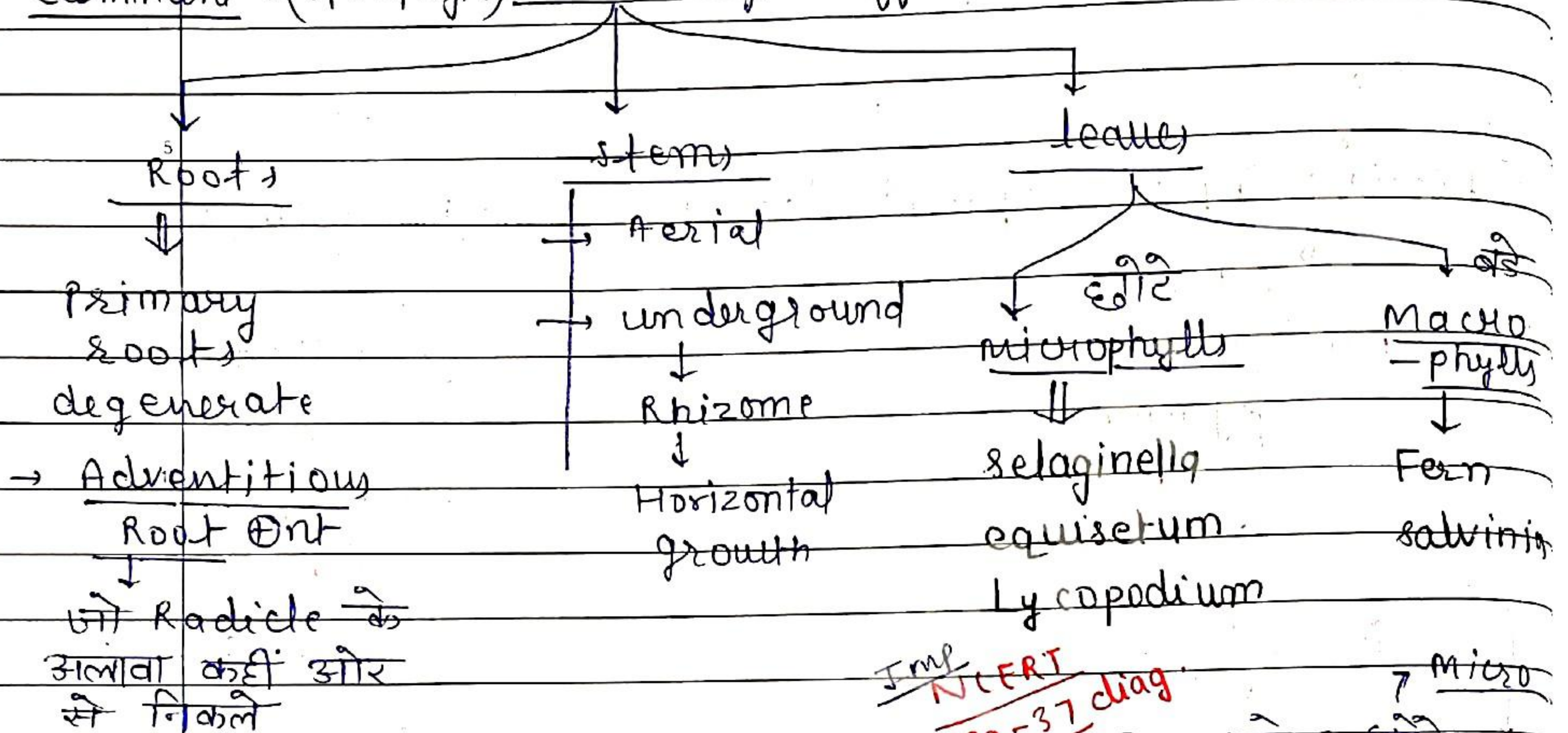
not completely successful →

water required for fertilisation

Camlin

• Plant body → Better differentiation

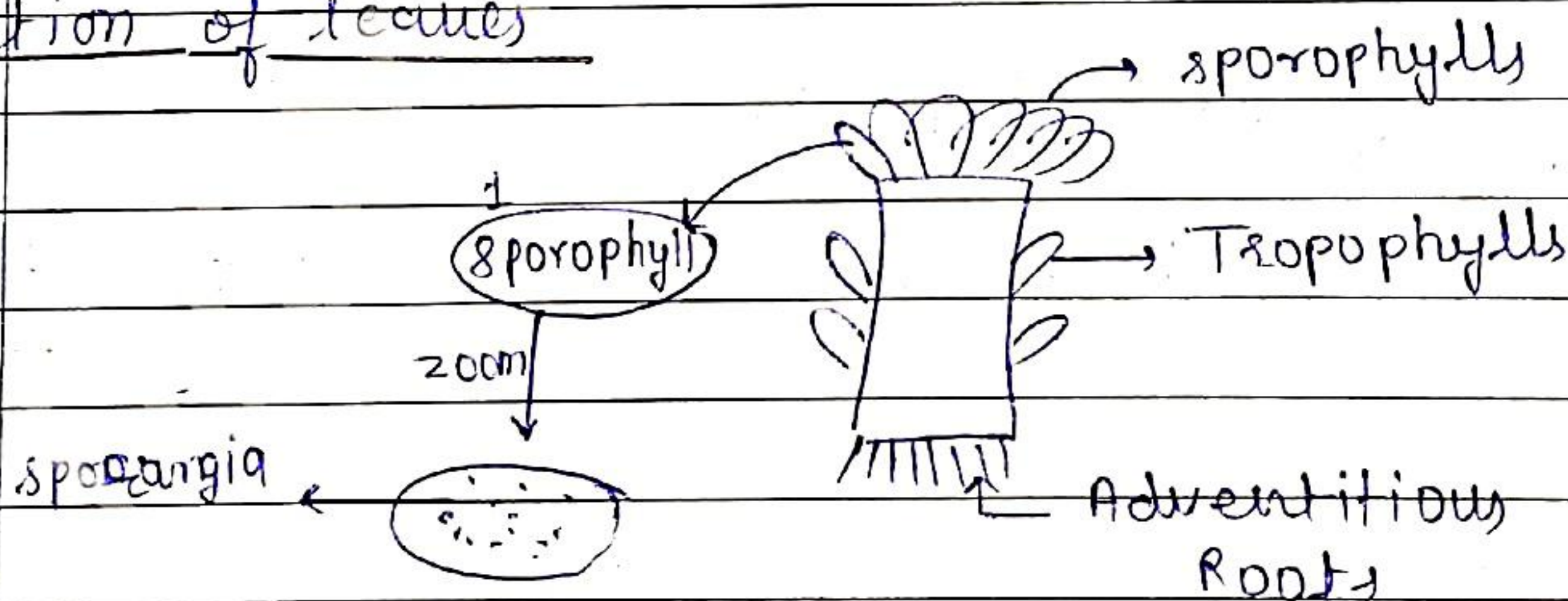
Dominant → (Sporophyte) Plant body (differentiation)



• Selaginella } संजीवनी घृति (Medicinal use)
• Bryopteris }

• Fern plants → decoration.

Imp function of leaves



• strobillus → compact group of sporophyll
• strobilli / cone

Function → Tropophyll = Photosynthesis

sporophylls = (Photosynthesis + sporangia) → unique character

→ Gymno & Angio → दोनों में sporophyll $\oplus$ Ant होते हैं
But Photosynth नहीं करते X

NOTE

→ Pteridophytes include Horsetails
& Ferns.

⇒ Use → medicinal purpose, soil binders, ornamental etc.

⇒ Habitat → cool, damp, shady, sandy soil

#

sporophylls → sporangia → spore mother cell ($2n$)

Meiosis

spore (n)

exosporic
germination

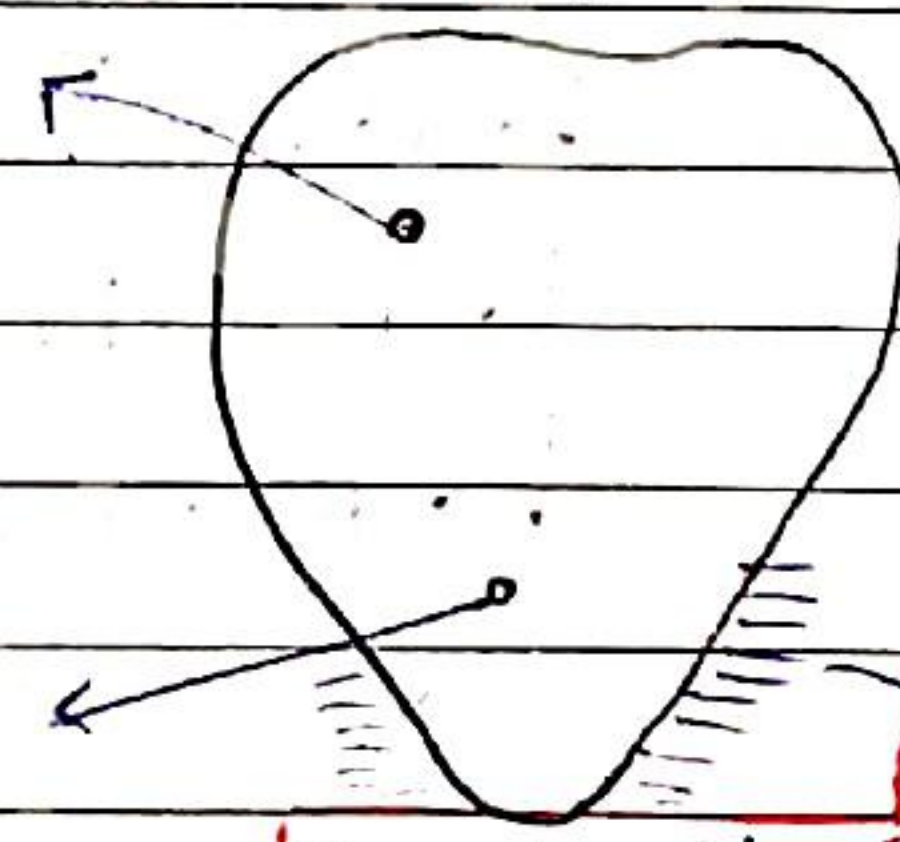
(जो अपने site पर
germinate न करे
बाहर जाकर
germinate करे)

Archegonium

(egg)

Antheridia

Male
gametes



Prothallus

Heart
shaped

Prothallus
Features

Inspicuous (not clear)

Mostly Photosynthetic

multicellular

green colour

small

monocious

Rhizoids

zooidogamy
(Fertilisⁿ with water)

zygote

($2n$)

embryo → New sporophyte

NOTE #

Pteridophytes → Need of water for fertilisation
→ Pioneer of sec. succession

Page :

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NOTE → Pteridophyta में independent of Alternation of generation है।

Pteridophyta → Independent alternation of generation में पहली बार आया

Most of Pteridophytes

Spore Formation

Homospores

spores



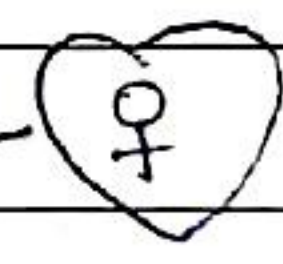
monoecious

Prothallus

Heterospores

microspore
(Male)

megaspore
(Female)



dioecious
Prothallus

अब तक की diversity में ऐसा पहली बार हुआ

Endo-
sporic
germination

NCERT

→ Selaginella ***

→ Salvinia ***

→ Azolla *

→ Marsillia *

→ Isoetes *

AIMSS

Most of Pteridophyte → Homospores

All Gymno, All Angio → Heterospores.
+ कुछ Pterido

Selaginella → Exosporic → Prothallus

→ endosporic → Prothallus X

* अगर seed coat @ wt है तभी वो
True seed है।

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M. Imp
Neet

=> seed Formation → Heterosporus } Requirement
* * Endosporic germination } of seed habit

Requirement / Pre-requisite / Precursor / eligibility
of seed Formation

• Heterosporus
• endosporic germination } Requirement of seed Habit
↓
Female gametophyte

young embryo → soil ^{But} seed अभी तक बने नहीं

M. Imp

Q seed habit starts from → Pteridophytes 2020

M. Imp

Q seed habit established in → gymnosperms. 2020

Heterosporus Plant (2n) का gametophyte
always dioecious ✓

Heterosporus Plant का sporophyte may be monoecious
or dioecious ✓

gymno Angio

कोई भी

* Imp

• selaginella Plant (Heterosporous)
plant } sporophyte → monoecious
gametophyte → dioecious
Always.

Ex

Classes of Pteridophyta (classification)

① Psilotopsida = Psilotum (living fossil)

② Lycopsidea = lycopodium, selaginella Like LS

③ Sphenopsida = equisetum P के बाद 9

④ Pteropsida = dryopteris, Pteris, Adiantum (walking Fern) *

Angio
gymno } spermatophyta

Part - XV

• Maxm. diversity → Fungi
• Maxm. no → Angio
एक ही जगह

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Gymnosperms → seeds

Seed

Naked seeded

Plants

Narrow distribution

Himalya Region
generally

seed is
naked
due to absence
of ovary wall
* fruit wall

Angiosperms

spermatophyta
(seed + nt)

seed + Fruit

widely
distributed
Plants

→ 1st seeded plant in Nature

→ smallest group of Plant diversity

→ Medium size, tall trees, shrubs

sequid → Red wood Tree } Tall & giant
100 meter

Leaves

→ बदलते environment के
साथ adapt कर सकते
हैं।

→ Needle like leaf

→ Thick cuticle

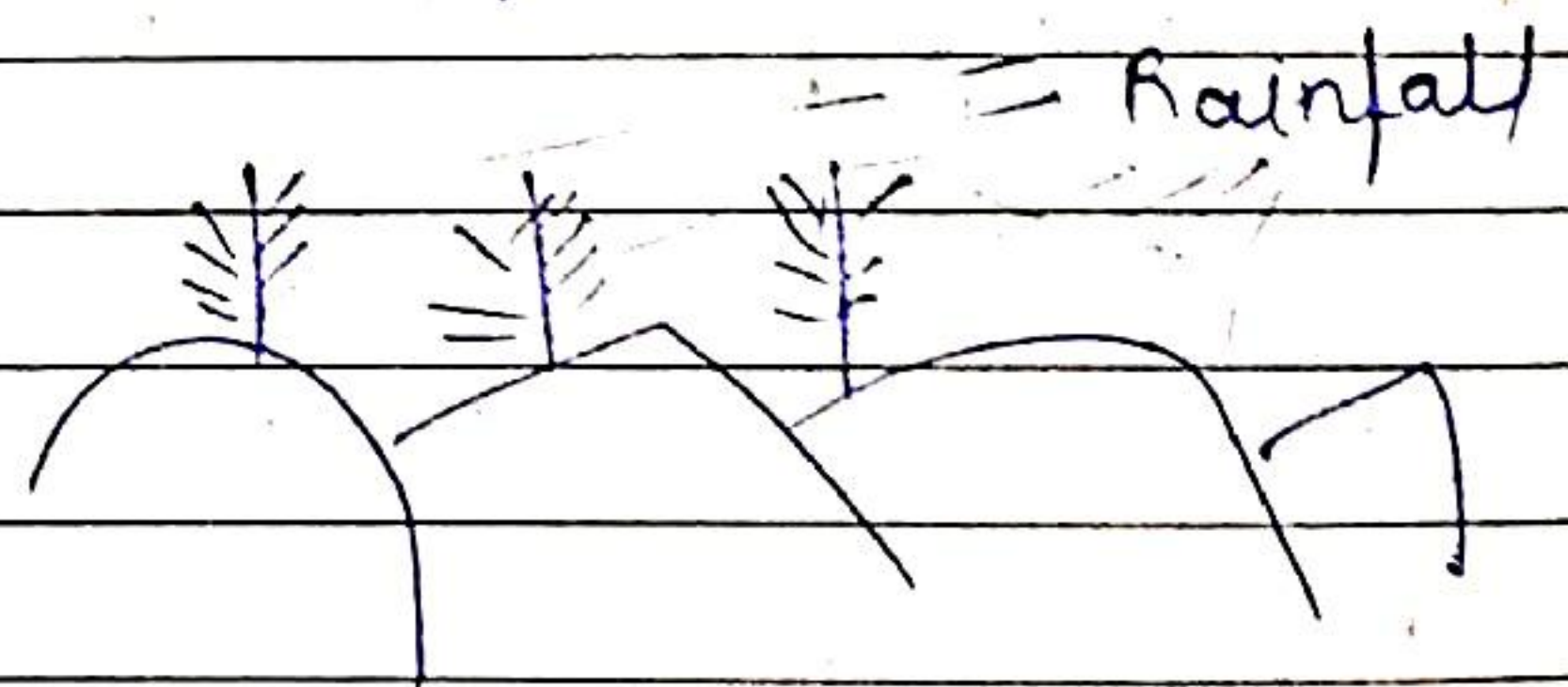
→ sunken stomata
(deep)

Xerophytes

→ Physically dry

→ Physiological dry
(internal)

Both



vascular system

vascular system

xylem

vessels

⊖ nt

Phloem

companion cells

⊖ nt

vascular bundle

open

cambium ⊕ nt

sec. growth

⊕ nt ✓

Tree habit

woody

Habit ✓

gymno <<< Angio

Tree species

maximum **

gymno में

Maximum Trees

मिलते हैं

(Tree habit)

Angio

gymno

Ex :

70 / 100

100 में 70 Tree

47 / 50

50 में 47

Trees मिलेंगे

main plant body → sporophyte (2n)

Root

Tap Root system

stem

unbranched

cycas **

Leaf

Photosynthesis

scales + w

Protection

Branched

Pinus

Cidrus

PC Branching

Tsick

PM

CD

cycas dioecious

Pinus monocious

Camlin

→ cycas Tap Roots ✓

coralloid Roots + B.G.A

(N₂)

Neel

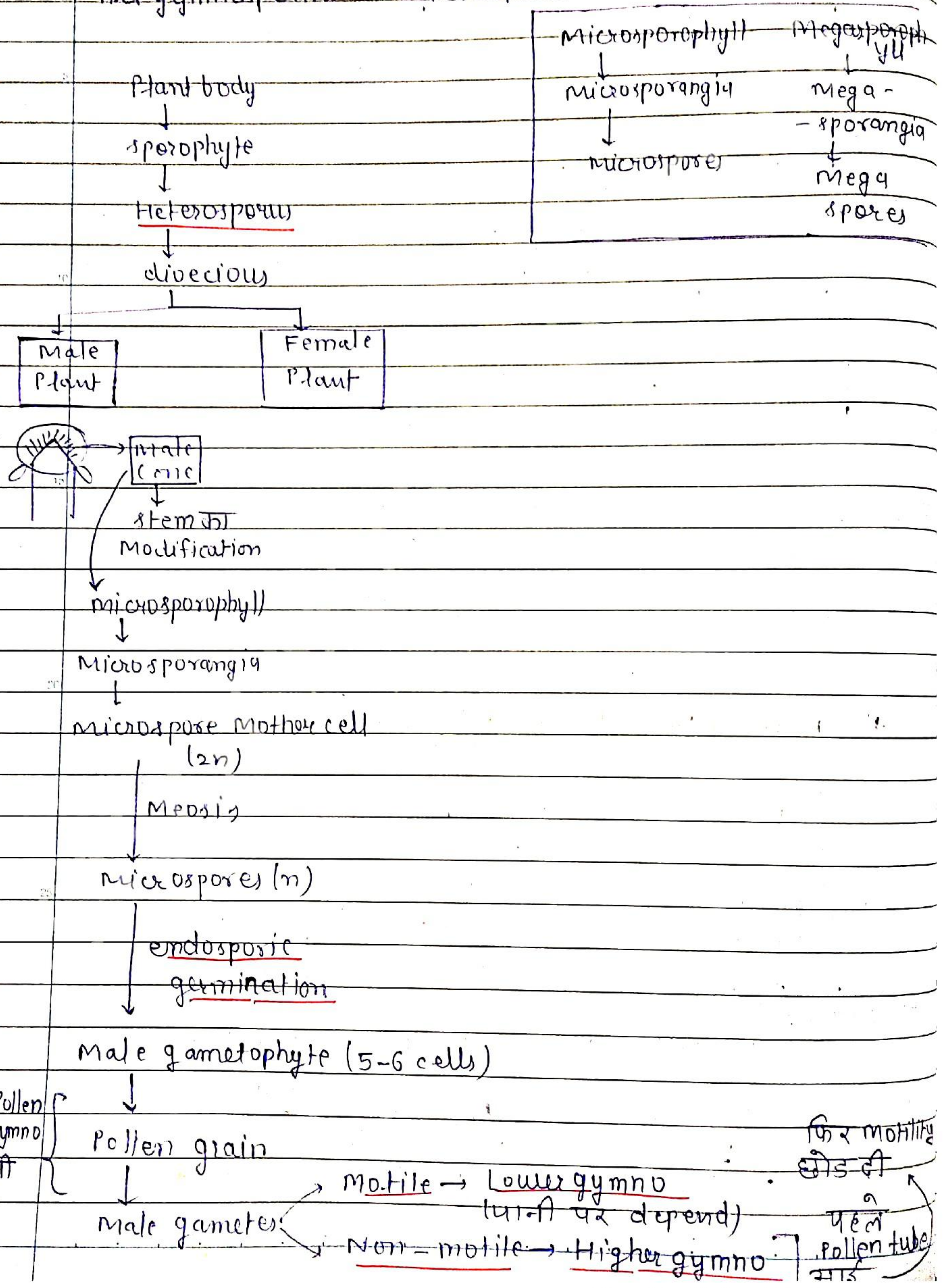
→ Pinus = Root + Fungi (Amenita)

Mycorrhiza

Basidio

⇒ Life cycle of gymnosperms

→ All gymnosperms = heterosporous ✓



Neet

• Cycas → 3-5 Male gametes



Top shaped, multiciliated
(चट्टा)

• Female Plant (cone shaped) *

↓
Megasporophyll

↓
Megasporangia

↓
Megaspores

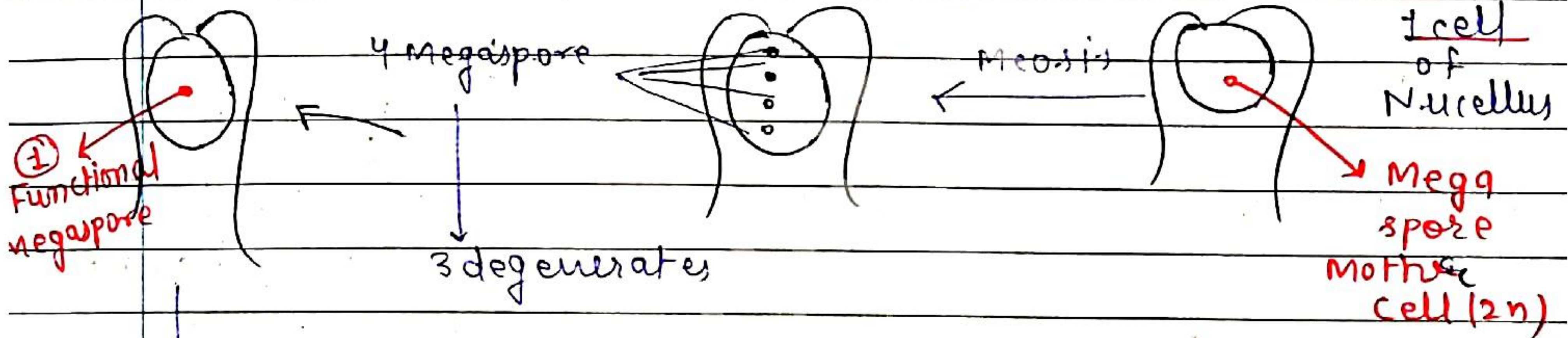
integuments

zoom

ovule

(2n) *
Nucellus

Integuments
(2n)



⇒ Pollination

↓
Anemophily (हवा से)

through water.

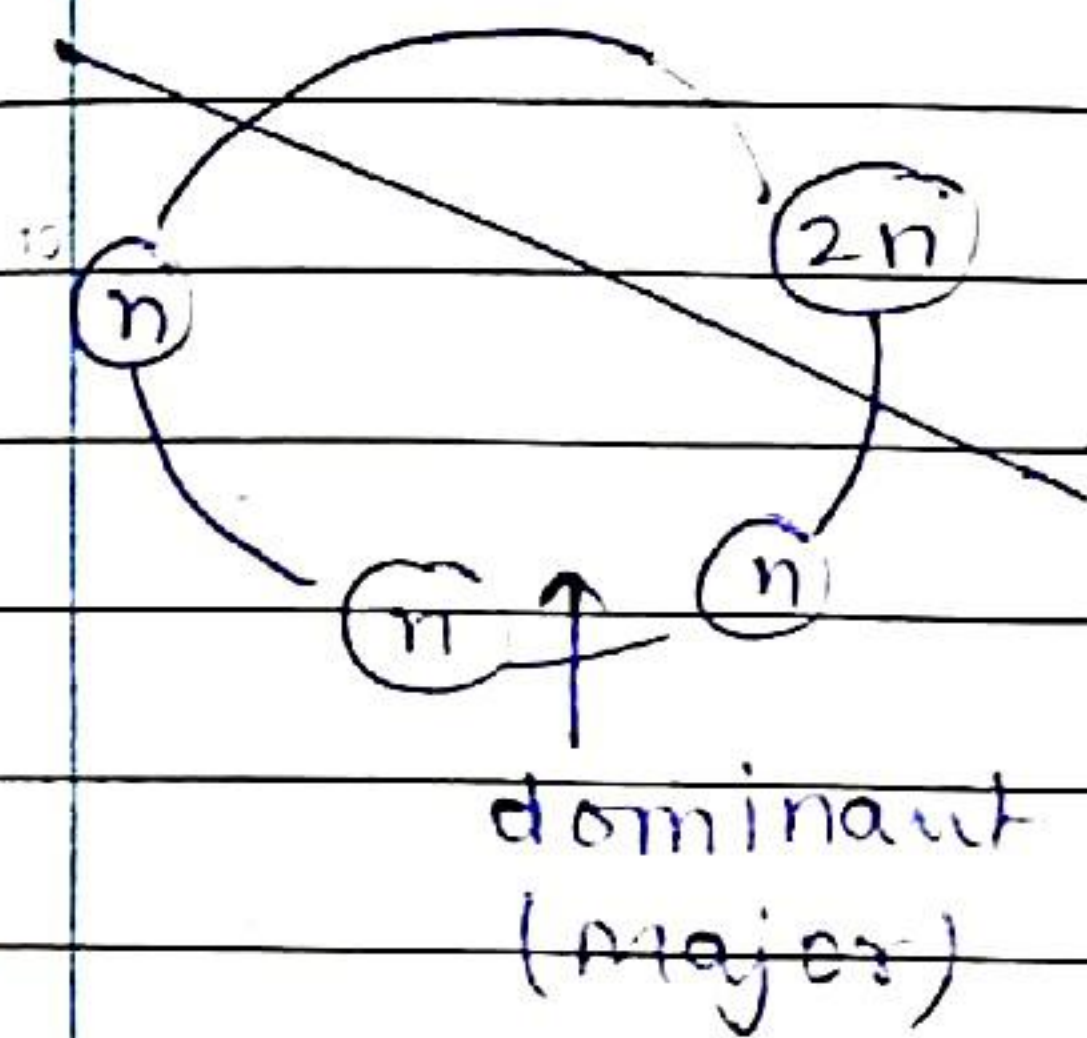
⇒ Fertilisation (I) zooidisiphonogamy → Lower gymno

(II) siphonogamy → Higher gymno.

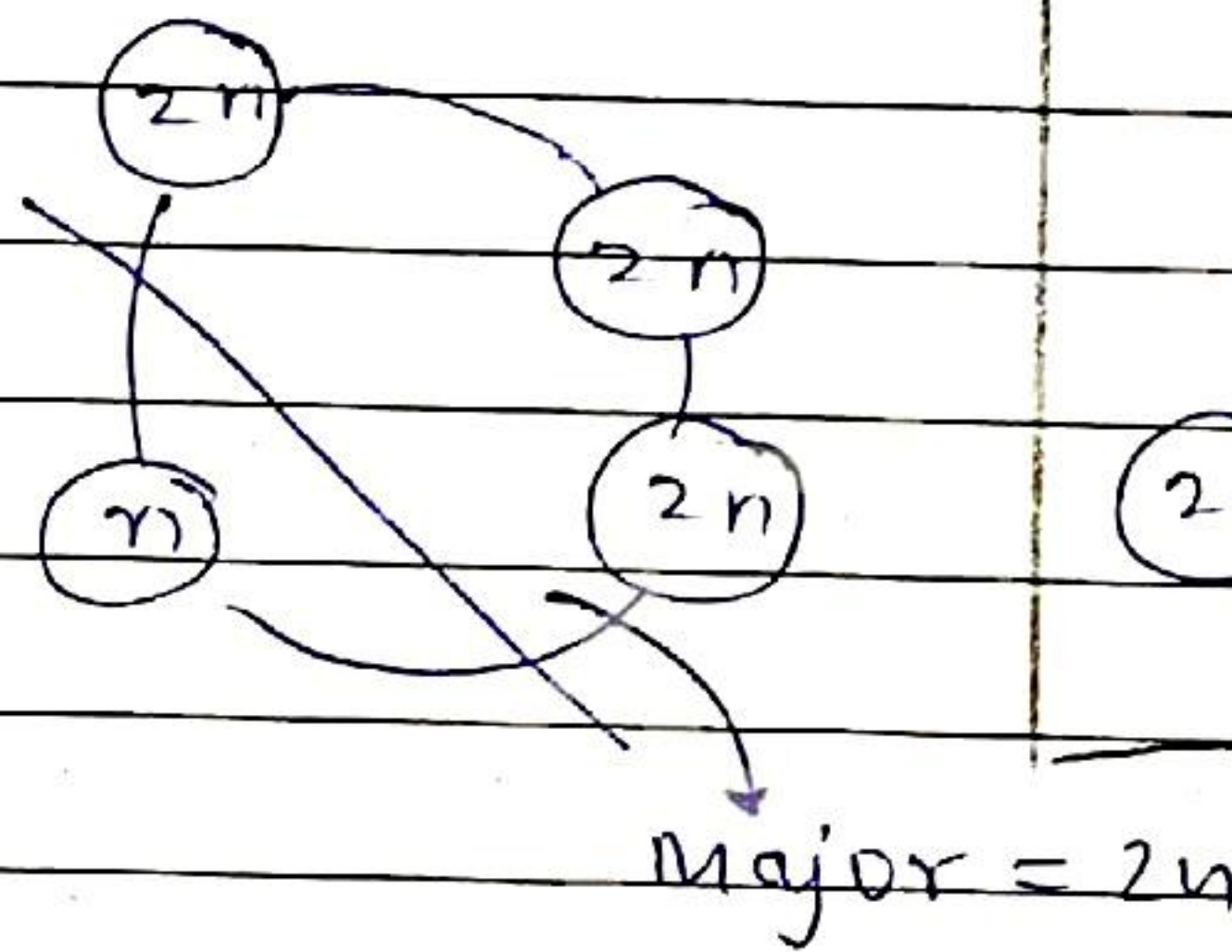
⑧ gymno & Angio → ♂ & ♀ gametophyte

Neet
↓
dependent ✓
(do not have free living existence)
or
Q. (Not independent)

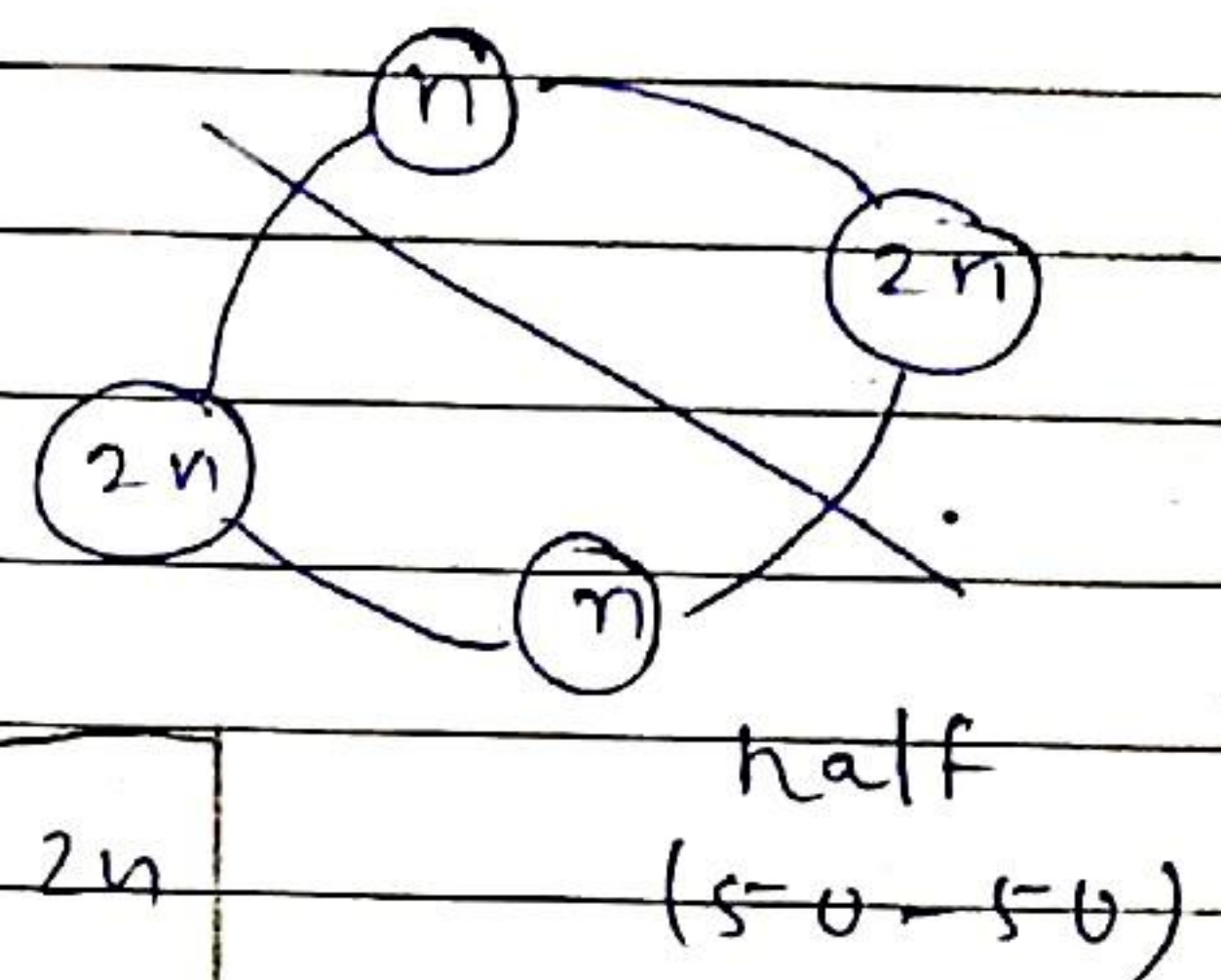
Haplontic



diplontic



Haplodiplontic



⇒ chart

Character	Bryophytes	Phenidophytes	Gymnosperms (Higher gymno)	Angiosperms
Nature of Spores	Homospores	Hetero spermatophytes	Heterospores	Hetero
Vascular Tissues	(n)	(n)	(n)	(n)
Tissue Root Tissue stem Tissue leaf	No	Yes	Yes	Yes
dominant Phase.	gametophyte (n)	spermatophyte	spermatophyte	spermatophyte
Fertilisation (water needed)	Yes	Yes	No (Higher gymno)	No
seeds (covering)	No	No	seed (Naked) without covering	seed (covering)
Flowers/ Cones	X	X	X cones (n)	X
Ploidy	(n)	(n)	(2n)	(2n)
Motile/ Non-motile gamete.	Motile	Motile	Non-motile	Non-motile

sanjeevni → selaginella
bryopteris

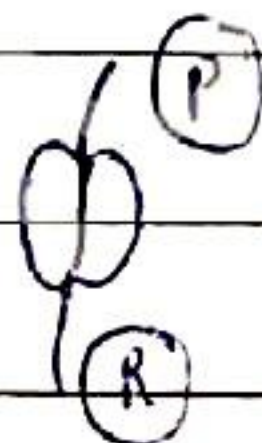
Angiosperms

- Flowering Plants
- ovules are developed in flowers
- ovules = seeds
- ovary = Fruit (Ripened ovary)
- wide range habitat (हर जगह) ~ 2.5 lac spp.
- Microscopic Plants = Wolffia (बहुत छोटा)
- 100 m tall = Eucalyptus (बहुत बड़ा)

- Fodder
 - Food
 - Fuel
 - Medicine
- } Production.

* Angiosperm → 2 classes dicot
monocot

dicotyledon

- seeds = 2 cotyledon 

- Reticulate venation



eg: mustard, sunflower,
Rose etc.

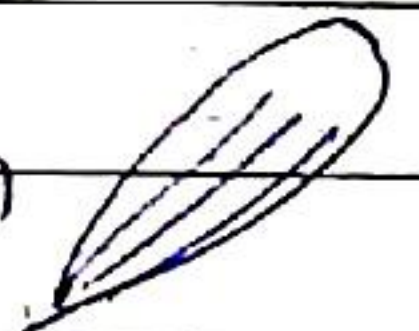
- Pentamerous / Tetramerous
(sepal, petal)

Primary root long lived

Monocotyledon

- 1 cotyledon

- Parallel venation



ex: grass, bamboo,
banana etc.

- Trimerous (3x)

Tepal

→ can't diff.
blw sepal &
petal

liliaceal
Family

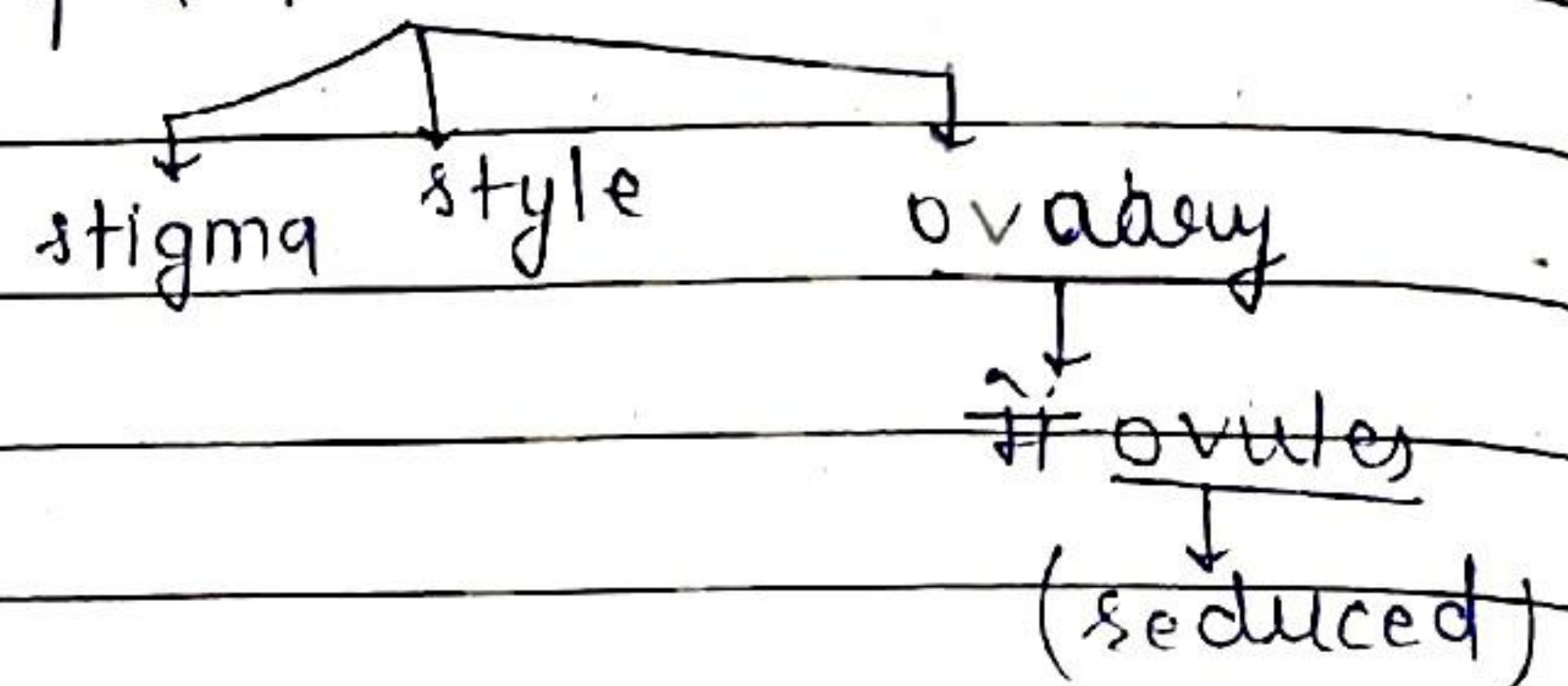
- Primary root short lived.

• development of flower & fruit

→ Male sex organ = stamen (Anther & filament)

→ meiosis in Anther produce Pollen grains

→ Female sex organ = carpel / Pistil



• Life cycle of Angiosperms

→ Each "embryo sac" (n)^{*} (Female gametophyte = highly Reduced)
contains

- ① Antipodal cells (3)
- ② Synergids (2)
- ③ egg cell (1)
- ④ central cell (1) = 2 Polar nuclei

Neet
NOTE

→ 7 celled - 8 Nucleated condition Embryo sac.

• Angio → dominant = sporophyte ($2n$) (well develop)

↓
gametophyte Reduced (less develop)
(n)

m. Imp
Neet

• Double Fertilisation → Unique event to angiosperms

*** → Triploid fusion + syngamy

Plant body
sporophyte

Flower (2n)

2n

(Female)
carpel (♀)

(Male)
stamen (♂)

(2n)

(2n)

ovary (2n)

Anther (2n)

ovules (2n)

microsporangium (2n)

(Megasporangium)

microsporogenous

Nucellus (2n)

Tissue

MMC (2n)

MMC (2n)

Microspore
mother cell

Megaspore mother cell

Meiosis

Meiosis

megaspore (n)

microspore
(Pollen grain) (n)

Mitosis

Mitosis

Female gametophyte
(Embryo sac) (n)

male gametophyte
(n)

2 Polar Nuclei

Egg

2 male gametes

(n+n)

(n)

2n

male gamete

male gamete

(n)

(n)

syngamy

zygote (2n)

Triple Fusion

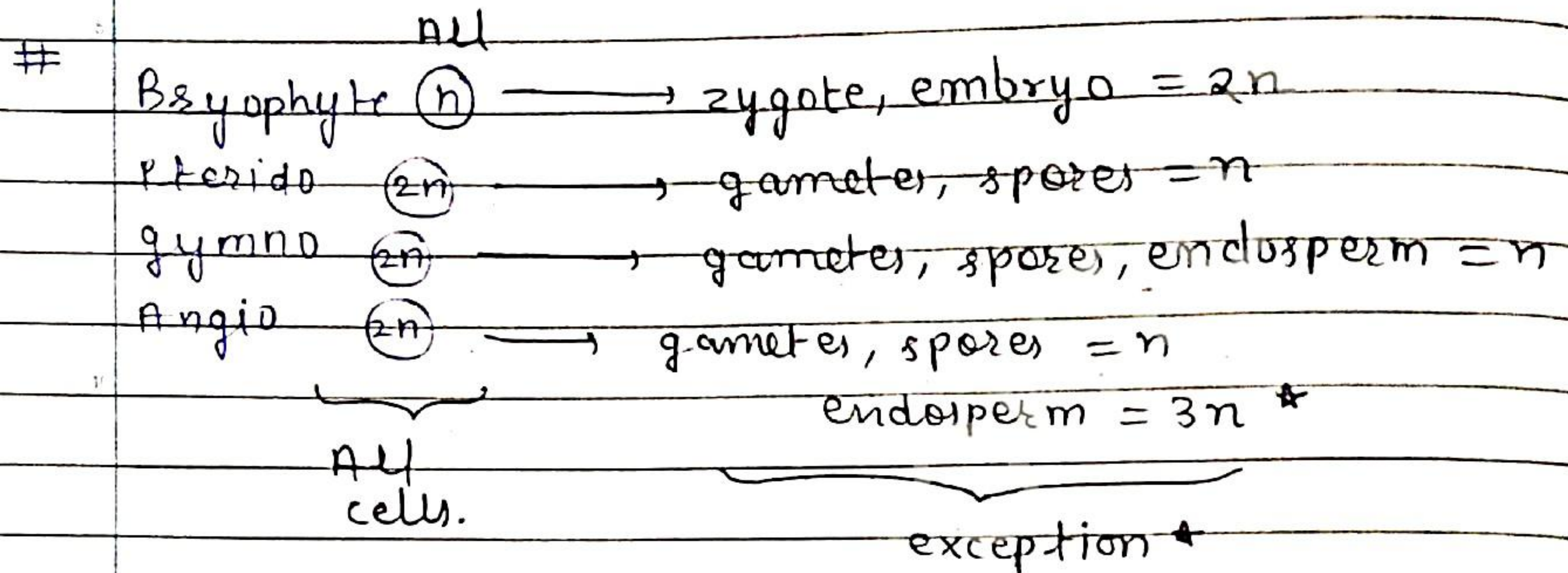
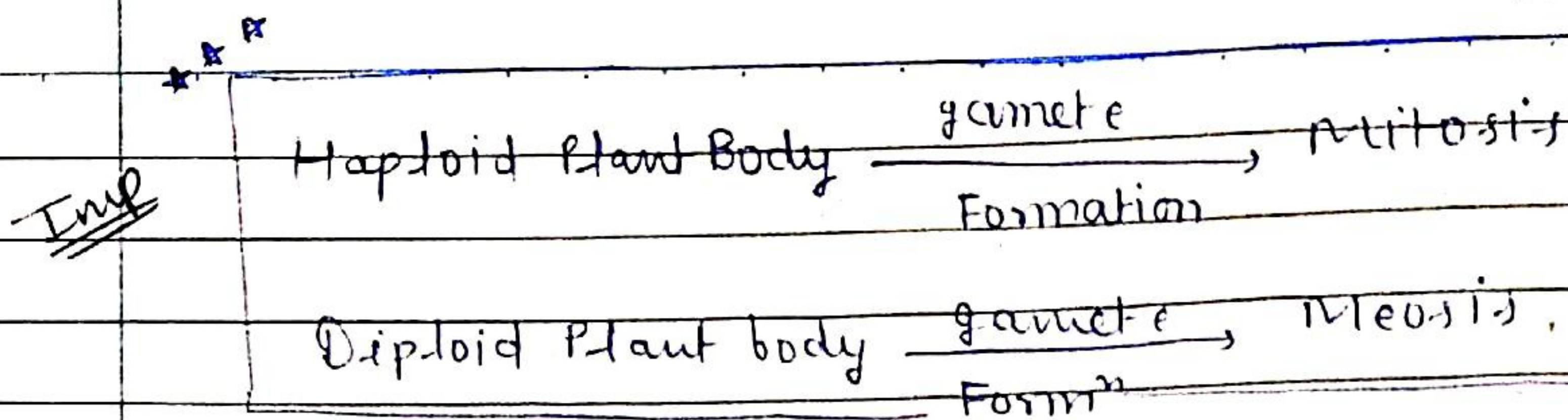
Embryo (2n)

Primary Endosperm
Nucleus (3n)

sporophyte (2n)

Endosperm (Food)

Camlin



Alternation of generations

(A) Haplontic life cycle • gametophyte (n)

↓
dominant (main plant phase body)

* Neet Example

Ex: Many Algae (Volvox, spirogyra, some species of Chlamydomonas)
↓
majority. **

(B) Diplontic Life cycle → sporophyte (2n) → dominant phase

Imp 2018 **
Ex: Fucus, gymnosperms, Angiosperms (main plant body)

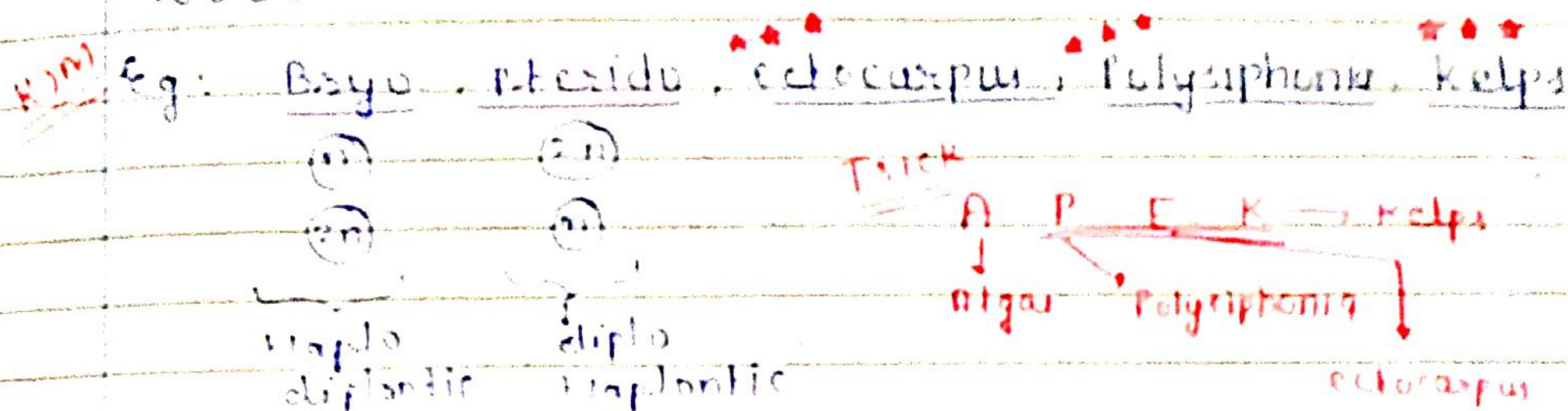
Brown Algae but → diplontic

Tsick → Fd **

Also
sargassum → diplontic

© Haplo-diplontic life cycle (50-50)

Intermediate condition (triplontic-diplontic life cycle)



• green alga green alga = triplontic