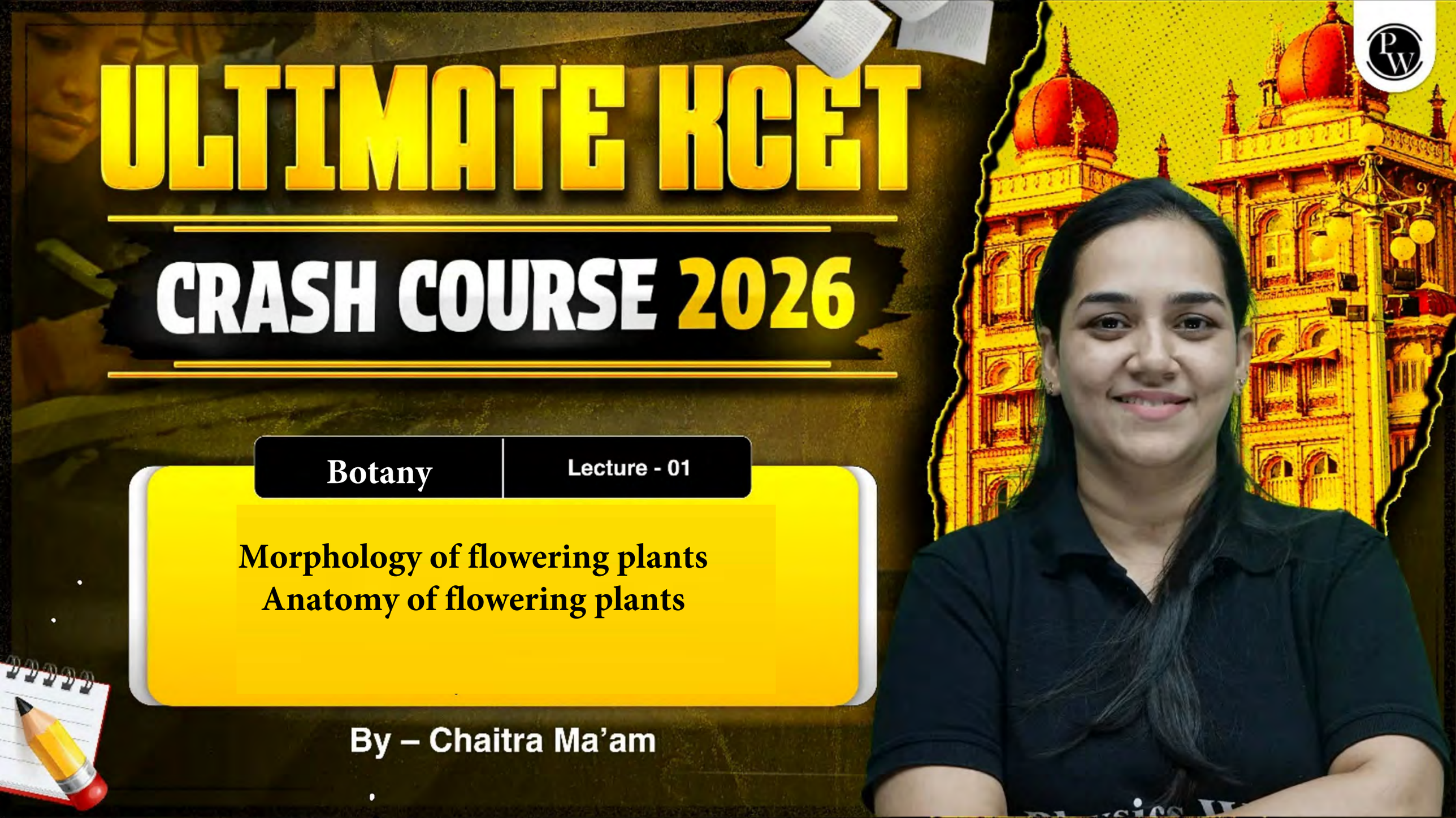
# ULTIMATE KCET

## CRASH COURSE 2026

Botany | Lecture - 01

**Morphology of flowering plants**
**Anatomy of flowering plants**

By – Chaitra Ma'am



# Topics to be covered

1. Anatomy
2.
3.
4.

## ⑥ BRYOPHYTES

- Gametophyte (n) is main plant body and sporophyte (2n) parasite on gametophyte (Photosynthesis)
- Amphibians of plant kingdom, B/C they need water for Sexual Reproduction
- Non-vascular: xylem & phloem ⊗ {B/C they are very thin}
- 1st embryophytes of plant kingdom
- Small, non-woody, occurs in damp, humid & shaded area
- Homosporous
- Lack true Roots, Stems, leaf {But they have: Rhizoid Root like, Stem like, leaf like Structure}
- male sex organ: Antheridium → produce bi-flagellate antherozoids
- Female sex organ: Archegonium (flask shape) → produce single egg
- Types: Liverworts & mosses

Gametophyte
→ free-living
→ Dominent
Sporophyte
→ Non-free living

* zygote do not undergo reduction division immediately
Gametophyte ← spore
zygote ↰ meiosis SMC
↳ Embryo → sporophyte

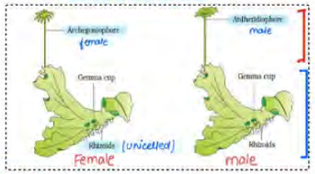
* Sex organs are jacketed and multicelled

### * Importance of Bryophytes:

- Sphagnum (mosses) → provide peat → used as fuel & packing material → B/C of their water Holding capacity {Hygroscopic}
- Mosses with lichens → 1st organism to colonise rock ∴ have great ecological importance
  ↳ Decompose Rock by making suitible for growth of higher plant.

*A: Mosses reduce impact of falling rain & prevent soil erosion
R: B/C Mosses forms dense mats on soil.

### ⓐ Liverworts




Sporophyte (2n) → parasite/dependent
Gametophyte (n) → photosynthetic

### * Reproduction

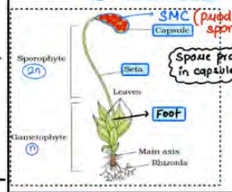
**Asexual**
- Fragmentation of thalli
- Specialised structures formation: Gemmae
  Green ← multi-cellulae ← asexual bud
⇒ Gemmae detach from parent & form new individual

**Sexual**
- by male & female sex organ (on same or diff thalli)
- spore → germinate → Gameto-phyte (free-living) {direct development}

### * imp points:

- plant body → Thalloid [Dorsiventral & closely appressed]
- Rhizoid → unicellular & unbranch
- Leafy members → tiny leaf like appendages in two rows on stem like structure.
- Location → moist shady area → banks of streams, marshy ground, etc
- Example → Riccia, Marchantia

### ⓑ Mosses




* Sporophyte in mosses is more elaborate than liverworts.
* mosses have elaborate mechanism of spore dispersal.

### * Stages

**1st stage / protonema stage** → develop directly from spore
**2nd stage / Leafy stage** → develop from secondary protonema as lateral bud

spore → direct develop → primary protonema → secondary protonema → lateral bud → leafy stage (Sex organ present) {Spirally arrange leaf, Slender, upright axis}

⇒ protonema → Green, creeping, branched, filamentous

### * Reproduction

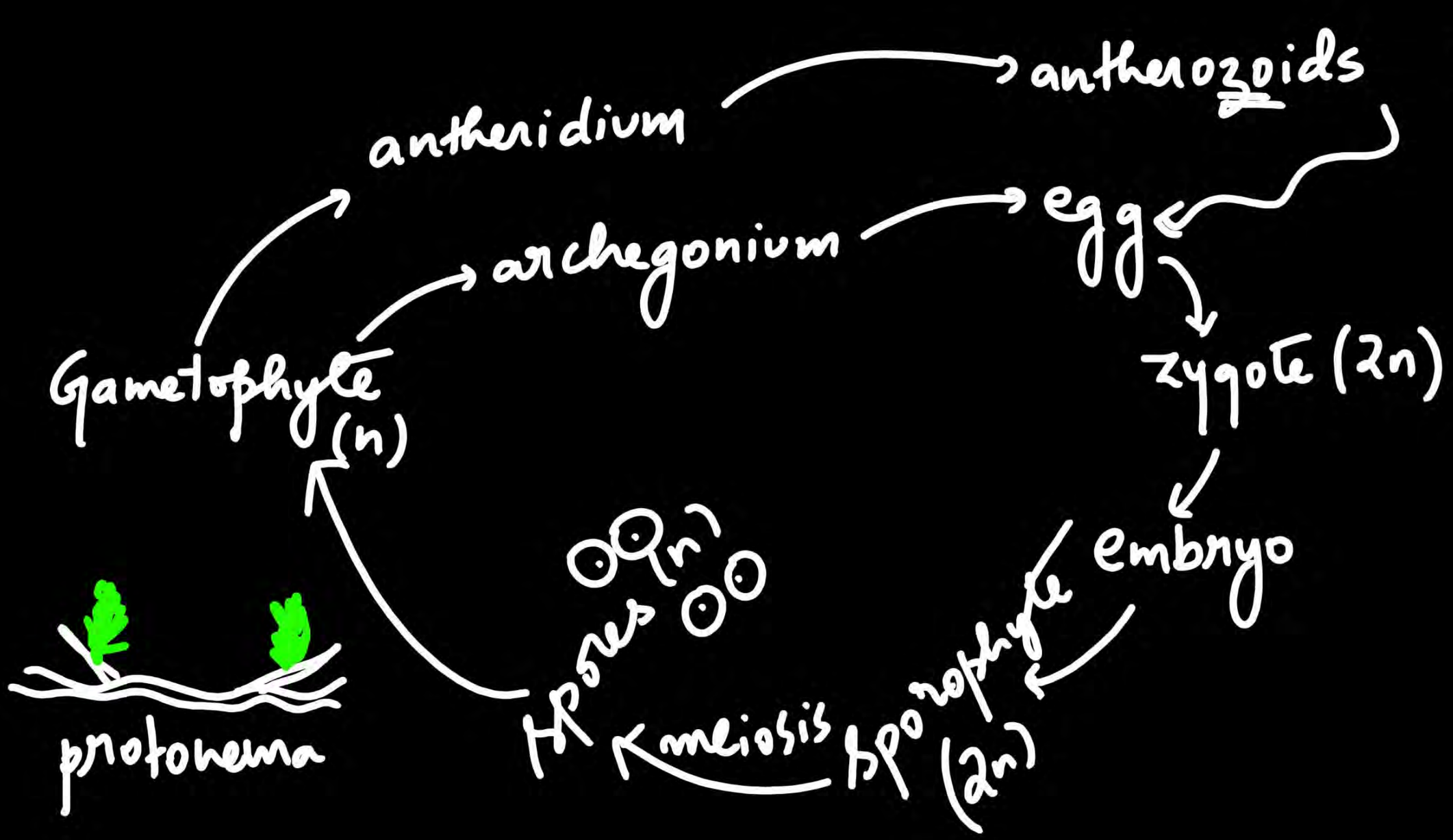
**Asexual**
- Fragmentation
- Budding in sec-protonema

**Sexual**
- Sex organ produced at apex of leafy shoot.

### * Imp points

- plant body → Foliose (erect)
- Rhizoid → Multicellular & branched
- example → Funaria, Polytrichum, Sphagnum

. provide peat
. used as fuel


antheridium
antherozoids
archegonium
egg
Gametophyte (n)
zygote (2n)
embryo
protonema
meiosis
(2n)

## ⑦ PTERIDOPHYTE

Sporophyte : free-living
- Dominant
- Photosynthetic

gametophyte : free-living
- Photosynthetic

- → Sporophyte is main plant body
- → used for medicinal purpose, soil binders & ornamentals
- → Include : Ferns & Horsetails
- → Vascular tissue → xylem & phloem ✓ : but poorly develop ∴ need water for fertilization
- → Location : Cool, damp, shaddy, sandy soil areas
- → True roots, stem, leaf present ✓
- → Limited and Restricted to narrow geographical region
- → Female gametophyte retained on parent sporophyte
- → zygote develop into young embryo take place within female gametophyte → precursor to seed habit.

Evolution → Responsible for

* Spores
- Homospores
  - majority of pteridophyte
- Heterospores (Seed habit)
  - microspore
  - megaspore
  - * selaginella
  - * salvinia

* Example:
- → Psilopsida (P)
- → Lycopsida (L,S)
- → Sphenopsida (E)
- → Pteropsida (PAD)

* Imp points

Sporangia + leaf/phyll
- Small leaf → selaginella (micro-phyll)
- large leaf → Fern (macro-phyll)

→ Sporophylls

Normal arrangment
- Heterospore
- meiosis → spore (n)
- SMC (2n)
- Homospore
- ↓ mitosis
- Gametophyte/Prothallus
  - inconspicuous (poorly develop)
  - Small & multicellular
  - Free-living
  - independent

Compact arrangment of Sporophylls → Strobili/Cones
- selaginella
- Equisetum

• Examples

psilopsida | Lycopsida | sphenopsida | pteropsida (PAD)
- psilopsida: Psilotum
- Lycopsida: Lycopodium, Selaginella (L·S) (Cones)
- sphenopsida: Equisetum (SE)
- pteropsida (PAD): ~~Ptaris~~, ~~Adiantum~~, Dryopteris (PAD)

Selaginella


Equisetum (Cones)

* Other examples:
- → Ferns
- → Salvinia


Ferns


Salvinia

## ⑧ GYMNOSPERMS → ovules & seed both naked before & after fertilization

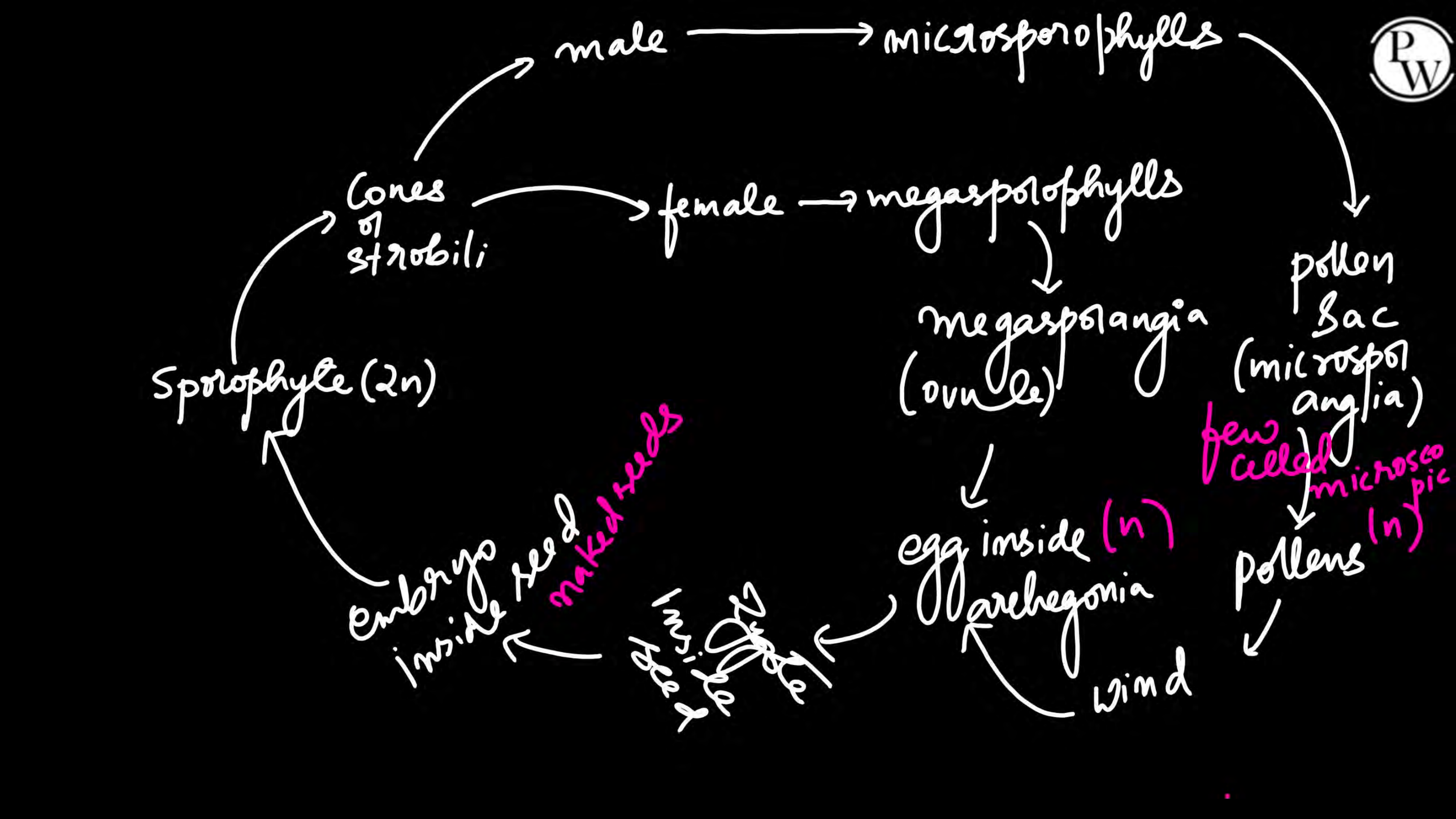
Naked Seed

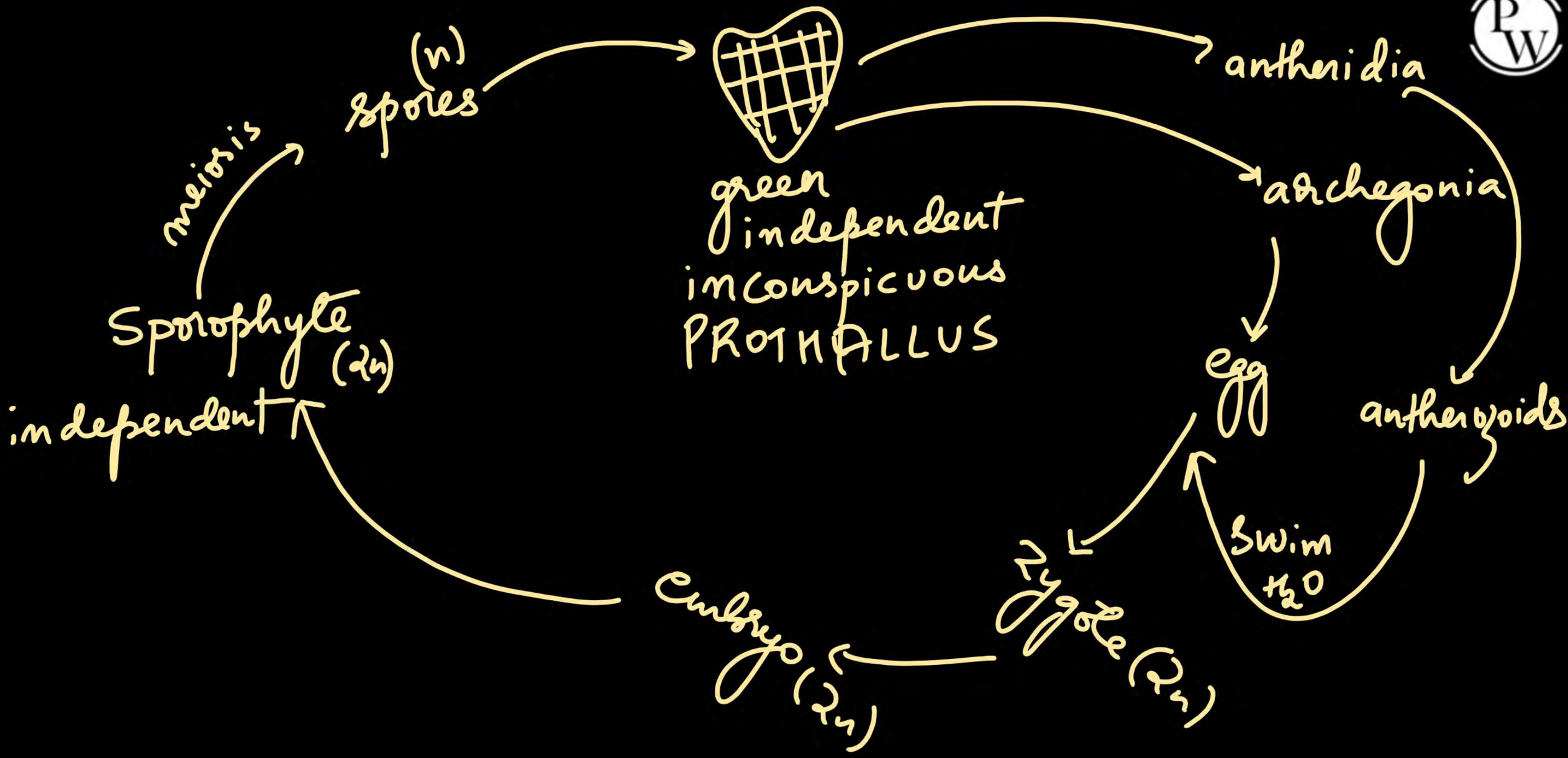
* Sporophyte : free-living
* Gametophyte: Not free-living

- Sporophyte is main plant body & Gametophyte depend on sporophyte
- Include: tree, shrubs
- Tallest tree: sequoia (giant redwood tree)
- Cones/strobili are present
- Pollen grain (male gametophyte) :
  - highly reduced & limited
  - Carried by air current
  - pollen tube discharge gametes near mouth of Archegonia.

eg: Pinus (• Moss • winged pollen grain), Cycas (• Cup), Cedrus (Branch), Sequoia (giant redwood tree), Ginko (living fossil)

Ginko


male
microsporophylls
Cones
of
strobili
female
megasporophylls
Sporophyte (2n)
megasporangia
(ovule)
pollen
sac
(microsporo
angia)
few
celled
microscopic
embryo
inside seed
naked seeds
egg inside (n)
archegonia
pollens (n)
wind
wind


(n)
spores
meiosis
Sporophyte
(2n)
independent
green
independent
inconspicuous
PROTHALLUS
anthenidia
archegonia
egg
antherozoids
Swim
$H_2O$
Zygote (2n)
Embryo (2n)

## (a) Roots (Tap root)

- Mycorrhiza {Roots + fungi} → pinus
- Coralloid root {Root + $N_2$-fixing cyanobacteria} → cycas

## (c) Stem

- unbranch → cycas
- branch → • pinus • cedrus

## (b) Leaf {well adapted to tolerate extreme conditions}

- Simple leaf
- Compound leaf
  - pinnate
  - palmate
  - • cycas (persist for few years)
- Conifers
  - • Needle like : to Reduce surface area
  - • Thick cuticle and : Sunken stomata to Reduce water loss

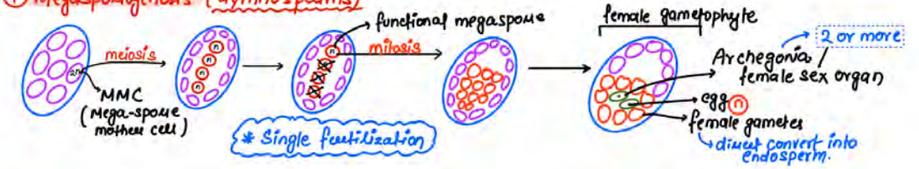
## (d) Strobili/cones (compact arrangement of sporophyll)

| | | | |
|---|---|---|---|
| Male | micro-sporangia | micro-sporophyll | male Strobili / micro-sporangiate |
| Female | Mega sporangia | Mega sporophyll | Female Strobili / mega sporangiate |

## (e) Sexuality

- Monoecious/bisexual {male & female part present on same plant} → pinus
- Dioecious/unisexual {male & female part present on diff plant} → Cycas
  - • male cone
  - • mega sporophyll

## (f) Megasporogenesis (Gymnosperms)




## (g)

| | BRYOPHYTE | PTERIDOPHYTE | GYMNOSPERM |
|---|---|---|---|
| Main plant body: (Dominant) | • Gametophyte | • Sporophyte | • Sporophyte |
| Dependency | • Sporophyte depend on gametophyte | • Sporophyte & gametophyte both are independent | • Gametophyte depend on sporophyte |
| Photosynthetic structure | • Gametophyte | • both sporophyte & Gametophyte | • Sporophyte |
| Vascular tissue | ✗ | ✓ (poorly develop) | ✓ |
| Structure | • Root like str<br>• Stem like str<br>• leaf like str<br>Lack true str | • True Root, stem, leaf present. | • True Root, stem, leaf present. |
| Spores type | • Homospores | • Both Homo & Hetero (S,S) | • Heterospores |
| Gametes | • motile gamete → flagellated | • motile gamete → flagellated | • Non motile gamete (except: cycas & Ginko) |
| Gametophyte | • well developed | • poorly develop | • highly Reduced |
| Imp point | • Liverworts: Gemmae<br>• Mosses: protonemma | • Gametophyte known as → prothallus | • Cone / strobili present |
| Example | • Liverworts → Riccia, Marchantia<br>• Mosses → Funaria, Polytrichum, Sphagnum<br>FPS | • Psilopsida: Psilotum<br>• Lycopsida: Lycopodium, Selaginella<br>• Sphenopsida: Equisetum<br>• Pteropsida: Pteris, Adiantum, Drypteris<br>→ Ferns, Salvinia<br>DP PLEASE | • S: Sequoia<br>• P: Pinus NBB<br>• G: Ginko<br>• C: Cycas, Cedrus<br>CUUP |

# Morphology of flowering plants

External visible structures of any organism. Which can be either vegetative or sexual in case of plants. Angiosperms are characterised by presence of root,stem,leaf,flower,fruit,modification

## The root system

In dicots,direct elongate of radical leads to form primary root which bears lateral roots(sec. & tert.)

### Types of root systems

Tap root system-primary root + it's branches Eg-mustard(dicot)

Fibrous root system-in monocots(wheat,rice) primary root is shortlived hence replaced by many several roots(arise from base of stem)

Adventitious root system-in banyan tree,grass,monstera root arises from other than radicle.

### Functions of root

Absorb water&minerals,provides proper anchorage,storing reserve food,synthesis of plant growth regulators(auxin)

### Regions of root

Root cap-protect,root apex(meristematic cells),helps in deep enchoring

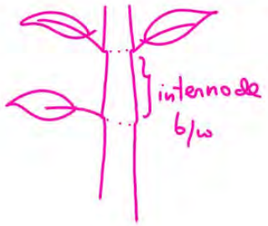
Region for meristematic activity-cells divide without attaining maturity,reponsible for growth of root

Region of elongation-cells enlarge & increase length

Region of maturation-cells differentiate,epidermal cells convert into root hair that absorbs water & minerals

## The stem (shoot system)

Ascending part of plant,bears node & intenode,bears bud(axillary or terminal),green in early stage & tough later



# The leaf

## Introduction

It is lateral,flattened structure which develops exogenously at node & bears a bud in axil(axillary bud) which later develops into branch. Leaves originate from shoot apical meristem & arranged in acropetal order

## Parts of leaf

1)leaf base-leaf is attached to stem by leaf base & it may bear 2 stipules. In monocot leaf base expands into sheathing leaf base(cover stem partially or wholly) while in some legumes it may become swollen pulvinus leaf base.
2)petiole-holds leaf to stem,allow leaf to flutter in wind hence cooling leaf.
3)lamina/leaf blade-expanded green part with veins & veinlets with a midrib. Veins provide rigidity to blade & transport water,minerals & food material.

### VENATION

arrangement of veins & veinlets.
Reticulate venation-veinlets form a network. Eg-dicots
Parallel venation-when the veins runs parallel to each other within a lamina. Eg-banana,monocot

## Types of leaf

SIMPLE LEAF-lamina is entire or when incised,incisions do not touch midrib. Eg-peepal

COMPOUND LEAF-
When incisions reaches midrib breaking it into leaflets. Bud is not found in axil or leaflet

Pinnately compound-leaflets are present at rachis(represents midrib). Eg-neem

Palmately compound-leaflets are attached at common point i.e. tip of petiole. Eg-silk cotton

## Phyllotaxy

Patter of leaves on branch/stem
ALTERNATE-one leaf at one node. Eg-china rose,mustard,sunflower
OPPOSITE-a pair of leaf at one node. Eg-calotropis,guava
WHORLED-more than 2 leaves from one node. Eg-alstonia

# The inflorescence

The arrangement of flowers on the floral axis
A flower is a modified shoot(shoot apical meristem changes to floral meristem, internode do not elongate & the axis get condensed.
The apex produces different kinds of floral appendages laterally at successive nodes instead of leaf. When shoot tip transforms into flower it is always solitary.

## Racemose inflorescence

1) the main axis continues to grow and does not terminate.
2) flowers are arranged in acropetal order.
3) main axis is monopodial.
4) Eg- fabeaceae family

## Cymose inflorescence

1) the main axis terminate in a flower.
2) flowers are arranged in basipetal order.
3) main axis is sympodial.
4) Eg-potato,liliaceae

# The Flower

## Introduction

It is reproductive unit. A typical flower has 4 whorls on swollen end of the stalk/pedicel called thalamus which are calyx,corolla,androecium,gynoecium. Calyx & corolla are accessory while other too are reproductive.
PERIANTH-in lily the calyx & corolla are not distinct or differentiated and are termed as perianth

## Parts of flower

1)calyx-green,protect flower in bud stage,photosynthetic,outermost whorl. Gamosepalous(sepals united),polysepalous(sepals free)
2)corolla-to attract insects,may be tubular,bell shaped,funnel-shaped,wheel shaped. Gamopetalous(fused corolla),polypetalous(free petals)
3)Androecium/stamen(stalk+filament+anther)-anther->bilobed,each lobe having 2 pollen sacs. Sterile stamen is staminode. Stamens attached to petals->epipetalous eg-brinjal. Stamens attached to sepals->epiphyllous eg-lily
Polyandrous-free stamen. Monoadelphous-stamens in 1 bundle(china rose). Diadelphous-in 2 bundles (pea). Polyadelphous-in more than 2 bundles(citrus)
There may be variation in length of filaments

4)gynoecium/carpel/pistil(stigma+style+ ovary)-ovary us enlarged basal part,stigma is receptive surface.each ovary bears one or more ovules attached to flattened cushion like placenta & One ovule have one embryo sac.
Monocarpellary-one carpel in flower. Multicarpellary-more than 1 carpel in a flower. Apocarpous-free carpel(lotus, rose). Syncarpous-fused carpel(mustard, tomato)

dicots

Pentamerous- multiple of 5

thalamus. Eg-guava,cucumber,ray florets of sunflower

bract

## Aestivation

The mode of arrangement of sepals or petals in floral bud with respect to the other members of the same whorl

### Valvate

Sepals/petals in a whorl just touch one another at margin without overlapping. Eg-calotropis

### Twisted

One margin of appendage overlaps that of next one. Eg-china rose,lady finger,cotton

### Imbricate

Margins of appendage overlap one another in any direction. Eg-cassia,gulmohur

### Vexillary

Largest petal(standard) overlaps 2 lateral(wings) which in turn overlaps 2 smallest(keels). Eg-pea,bean. It is also called papilonaecious

posterior

anterior

## Placentation

Arrangement of ovules within ovary

### Marginal

Placenta forms ridge along ventral suture of ovary & ovule are formed on it forming 2 rows Eg-pea

### Axile

Placenta is axial, ovules attached to multilocular ovary Eg-china rose,tomato, lemon

### Parietal

Ovules develop on inner wall of ovary or periphery. Ovary becomes 2 chambered cause of false septum. Eg-Mustard, argemone

### Free central

Ovules are born on central axis & septum are absent. Eg-dianthus,primrose

### Basal

Placenta develops from base of ovary & single ovule is attached. Eg-sunflower,marigold

## Fruit (matured ovary) = pericarp(wall) + seed

After fertilisation ovary—> fruit, ovule—>seed. If pericarp is thick & fleshy it gets differentiated into epi,meso,endo -carps. Mango and coconut are drupe fruits cause developed from monocarpellary superior ovary. In mango mesocarp is edible & in coconut mesocarp is fibrous but in both endocarp is stony

## Seed = seed coat + embryo(radicle+axis+cotyledon)

### Dicot seed

Hilum is a scar on seed coat through which developing seed was attached to fruit. Above hilum there is small pore (micropyle) & cotyledons reserve food and are fleshy.
Endospermic seeds- castor
Non-endospermic seeds-bean,pea,gram, groundnut

### Monocot seed

They are generally endospermous but orchid is not. Seed coat is membranous & fuse with fruit wall. Endosperm is bulky & its outer covering is proteinaceous called aleurone layer. Embryo is found in a groove at one end of endosperm. It's cotyledon is shield shaped & called scutellum. Plumule & radical enclosed in sheaths called coleoptile & coleorrhiza

## Semitechnical descriptions of a typical flowering plant

Br —> bractate
K —> calyx
C —> corolla
P —> perianth
A —> androecium

G —> gynoecium
G —> superior ovary
G —> inferior ovary
♂ —> male
♀ —> female
☿ —> bisexual

Θ —> actinomorphic
% —> zygomorphic

Floral formula shows cohesion & adhesion b/w whorls


$\oplus \varphi \overset{\frown}{K_{2+2}} C \overline{A_{2+4}} \underline{G}_{(2)}$

## Description of some important families

### SOLANACEAE

Also called potato family,distributed in tropics,subtropics,& event temperate zones.
Vegetative characters-mostly herbs,shrubs,rarely small trees. STEM-herbaceous,rarely woody,aerial;erect,cylindrical branched,solid/hollow,hairy or glabrous,underground in solanum tuberosum. LEAVES-alternate,simple,rarely pinnately comp.,exstipulate,reticulate.
Floral characters- INFLORESCENCE-solitary,axillary,cymose in solanum. FLOWER-actinomorphic,bisexual. CALYX-5(united sepals),valvate,persistant. COROLLA-5(united & valvate). ANDROECIUM-5(epipetalous). GYNOECIUM-bicarpellary,obliquely placed,syncarpus,superior,bilocular,placenta swollen with many ovules,axile placentation. FRUIT-berry,capsule. SEEDS-many,endospermous
Economic importance-food(tomato,brinjal,potato),spice(chilli), medicine(belladona,ashwagandha);fumigatory(tobacco);ornamentals(petunia)



$\oplus \varphi \overset{\frown}{K_{(5)}} \overline{C_{(5)}} A_5 \underline{G}_{(2)}$

# ANATOMY OF FLOWERING PLANTS

## TISSUES

- Meristematic tissues
  - Based on origin
    - primary
    - secondary
      - Lateral meristem
  - Based on position
    - Apical
    - axillary
    - Intercalary
- Permanent tissues
  - Simple
    - Parenchyma
    - Collenchyma
    - Sclerenchyma
  - Complex.
    - xylem
      - protoxylem
      - Metaxylem
        - endarch
        - exarch
    - phloem
      - protophloem
      - metaphloem

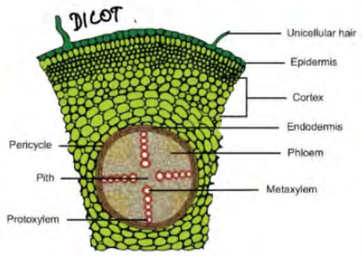
## TISSUE SYSTEM

- Epidermal → Root epidermis - Root hair (epiblema)
  - → Stem epidermis - Stem hair (dicots)
  - → Leaf epidermis - Stomata
- Ground → All tissues except epidermis and vascular bundles
- Vascular → open and closed vascular bundles
  - open → dicot stem
  - closed → Root & leaf
  - Radial → Root
  - Conjoint, Collateral → stem, leaf

P — Cambium — X

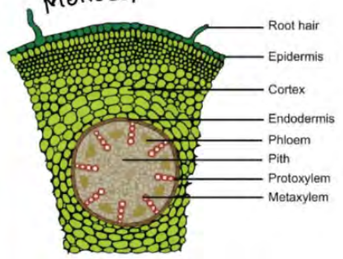
## ANATOMY OF ROOT

DICOT

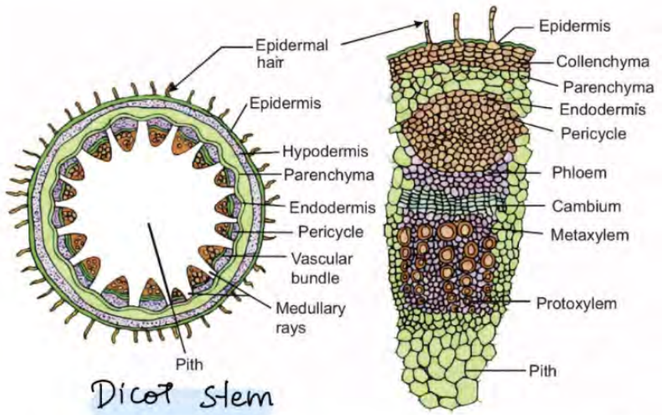



- No cuticle; Root hair present
- Cortex - parenchyma
- Endodermis - Casparian strips
- Radial vascular tissues
- Dicot root - Tetrarch, No pith - exarch
- Monocot root - polyarch, exarch, phloem parenchyma absent

MONOCOT

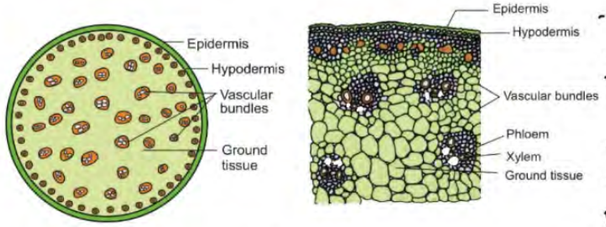


# ANATOMY OF STEM




Dicot stem

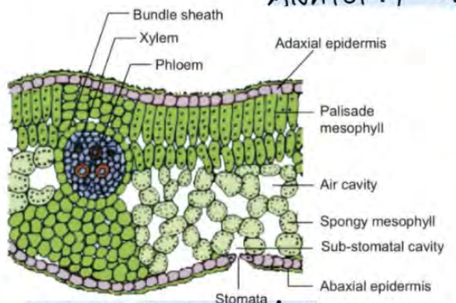
- Eustele condition
- Stem hair
- Hypodermis - Collenchyma
- open vascular bundle
- pith enlarged.
- endarch xylem.
- Conjoint, collateral vascular bundle.
- medullary rays - tissue between vascular bundles




Monocot stem

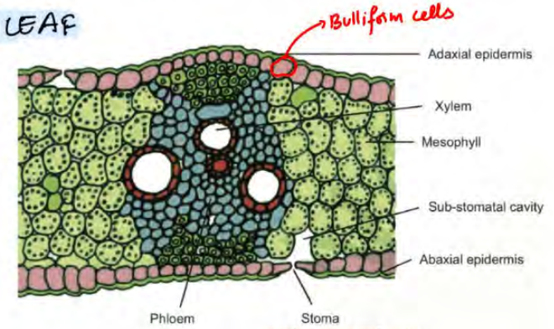
- Atactostele condition
- large vascular bundles at centre.
- Endodermis, pericycle, pith absent
- Hypodermis - sclerenchyma
- Conjoint, collateral, closed vascular bundle.
- Lysiginous cavity present.

# ANATOMY OF LEAF




DICOT LEAF (Dorsiventral leaf)

- Hypostomatic leaf
- palisade & spongy parenchyma
- Bundle sheath around vascular bundle
- closed, conjoint, collateral vascular bundle




MONOCOT LEAF (Isobilateral leaf)

- Amphistomatic
- adaxial epidermis has bulliform cells
- closed, conjoint, collateral vascular bundles.
- Mesophyll undifferentiated

Question No. - 01

Cyanobacteria are classified under

A Protista

B Plantae

C Monera

D Algae

Question No. - 02

Fusion of two motile gametes which are dissimilar in size is termed as

A Oogamy

B Isogamy

C Anisogamy

D Zoogamy

Question No. - 03

Holdfast, stipe and frond constitutes the plant body in case of

A Rhodophyceae

B Chlorophyceae

C Phaeophyceae

D All of the above

Question No. - 04

A plant shows thallus level of organization. It shows rhizoids and is haploid. It needs water to complete its life cycle because the male gametes are motile. Identify the group to which it belongs to

A Pteridophytes

B Gymnosperms

C Monocots

D Bryophytes

Question No. - 05

A Prothallus is

A. A structure in pteridophytes formed before the thallus develops

B. A sporophytic free living structure formed in pteridophytes

C. A gametophyte free living structure formed in pteridophytes

D. A primitive structure formed after fertilization in pteridophytes

Question No. - 06

Plants of this group are diploid and well adapted to extreme conditions. They grow bearing sporophylls in compact structures called cones. The group in reference is

A Monocots

B Dicots

C Pteridophytes

D Gymnosperms

Question No. - 07

The embryo sac of an Angiosperm is made up of

A 8 cells

B 7 cells and 8 nuclei

C 8 nuclei

D 7 cells and 7 nuclei

Question No. - 08

If the diploid number of a flowering plant is 36. What would be the chromosome number in its endosperm

A 36

B 18

C 54

D 72

Question No. - 09

Protonema is

A Haploid and is found in mosses

B Diploid and is found in liverworts

C Diploid and is found in pteridophytes

D Haploid and is found in pteridophytes

Question No. - 10

The giant Redwood tree (Sequoia sempervirens) is a/an

A Angiosperm

B Free fern

C Pteridophyte

D Gymnosperm

Question No. - 11

Isogamy with nonflagellated gametes is found in

A *Chlamydomonas*

B *Ulothrix*

C *Spirogyra*

D Volvox

Question No. - 12

Most algae are characterized by

A Presence of embryo

B Presence of multicellular jacketed sex organs *Spirogyra*

C Possessing thalloid plant body

D Presence of photosynthetic independent sporophyte

Question No. - 13

Agar-agar commonly used in culture medium is obtained from

A *Gelidium*

B *Chara*

C *Sargassum* Presence of photosynthetic independent sporophyte

D *Polysiphonia*

Question No. - 14

Fucoxanthin is found in plants belonging to group

A *Gelidium*

B Rhodophyceae

C Pheophyceae

D Chlorophyceae

Question No. - 15

Pyrenoids contain

A Protein

B Starch

C Pheophyceae

D Chlorophyceae

Question No. - 16

Chlorophyll a, d and phycoerythrin as major pigments occur in

A Green algae

B Brown algae

C Red algae

D Blue green algae

Question No. - 17

Red algae differ from the green algae as they lack

A Chlorophyll a

B Specialised sex organs

C Cellulose in their cell wall

D Flagella throughout the life

Question No. - 18

A class of algae, characterised by pyriforrn zoospores with two laterally inserted flagella, is exemplified by

A *Volvox*

B *Fucus*

C *Eudorina*

D *Poiphyra*

Question No. - 19

Select the incorrect statement w.r.t. bryophytes

A Commonly growing in moist and shaded areas

B Dependent on water for sexual reproduction

C Lack true roots, stem and leaves

D Zygote undergoes reduction division immediately to form spore

Question No. - 20

Sporophyte of bryophytes is

A Free living sporophyte

B Free living gametophyte

C More differentiated than that of ferns

D Non green structure dependent on sporophyte

Question No. - 21

The main plant body of bryophytes is

Gametophyte

A Free living

B Unicellular

C Divided into foot, seta and capsule - sporophyte

D Is more developed than gymnosperms

Question No. - 22

Since _____ form dense mats over the soil they reduce the impact of falling rain and prevent soil erosion.

A Mosses

B Algae

C Seed plants

D Ferns

Question No. - 23

Statement A : Protonema is formed in mosses and liverworts.

Statement B : Protonema represents sporophytic stage of bryophyte.

(A) Only (A) is correct

(B) Only (B) is correct

(C) Both (A) and (B) are incorrect

(D) Both (A) and (B) are correct

Question No. - 24

In which of the following features bryophytes do not resemble green algae?

(A) Thalloid plant body - both

(B) Absence of vascular tissues - both

(C) Need of water for sexual reproduction - both

(D) Presence of embryo ✓ - Bryo only

Question No. - 25

Heterospory is not found in

A Liverworts and mosses — homo homo

B Selaginella and Salvinia — hetero

C Dicots and monocots — hetero

D Cycas and Cedrus — hetero

Question No. - 27

In heterosporous species, the female gametophyte remains on the parent sporophytes for variable periods and development of zygote into young embryo within the female gametophyte is precursor to the

A Heterospory

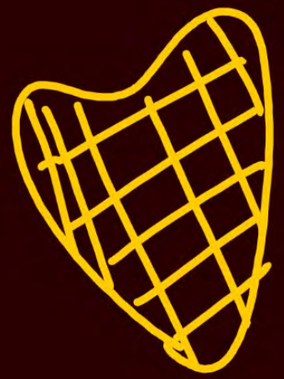
B Seed habit

C Development of prothallus

D Fruit formation

Question No. - 28

In some pteridophytes, the spore germinate to form prothallus, which is



A Inconspicuous and unicellular

B Multicellular and green in colour

C Thalloid and photosynthetic

D Both (B) and (C)

Question No. - 29

Vascular archegoniates include

(A) All embryophytes - Bryo - - -> Angi

(B) All spermatophytes → Gymno. Angio (no archegonia)

(C) Pteridophytes and gymnosperms

(D) Gymnosperms and angiosperm (no archegonia)

Question No. - 30

The giant red wood tree is

A Sequoia, a gymnosperm

B Ficus, an angiosperm

C Wolfia, an angiosperm

D Selaginella, a pteridophyte

Question No. - 31

In gymnosperms the male gametophyte is highly reduced, known as

A Endosperm

B Embryo sac

C Nucellus

D Pollen grain

Question No. - 32

Pteridophytes differ from gymnosperms as the former

A Have embryo

B Contains vessels in their xylem

C Do not form seeds

D Produce non-motile male gametes

Question No. - 33

The event of pollination is seen in which of the given plant groups?

A Algae

B Gymnosperm

C Bryophytes

D Pteridophytes

Question No. - 36

Select the incorrect match

A. First embryophytes — Bryophytes

B. First tracheophytes — Pteridophytes

C. Archegoniate spermatophytes — Gymnosperms

D. Seed plants without ovary—Angiosperms

Question No. - 38

Which of the given is bryophyte?

A Laminaria

B Marchantia

C Lycopodium

D Ginkgo

## Question

Given below are two statements: One is labelled as Assertion A and the other islabeled as Reason R: [2023]

Assertion (A): A flower is defined as modified shoot wherein the shoot apical meristem changes to floral meristem.

Reason (R): Internode of the shoot gets condensed to produce different floral appendages laterally at successive nodes instead of leaves.

In the light of the above statements, choose the correct answer from the options given below:

A. A is false but R is true.

B. Both A and R are true and R is the correct explanation of A.

C. Both A and R are true but R is NOT the correct explanation of A.

D. A is true but R is false.

## Question

Axile placentation is observed in [2023]

A China rose, Petunia and Lemon

B Mustard, Cucumber and Primrose

C China rose, Beans and Lupin

D Tomato, Dianthus and Pea

## Question

In Calotropis, aestivation is: [2023-Manipur]

A Valvate

B Vexillary

C Imbricate

D Twisted

## Question

In a pea flower, five petals are arranged in a specialized manner with one posterior, two lateral and two anterior. These are named as ....., ..... and ..... respectively.
[2023-Manipur]

A. Keel, Wings and Standard

B. Vexillum, Keel and Standard

C. Keel, Standard and Carina

D. Standard, Wings and Keel

## Question

Match the following [2023-Manipur]

| Type of flower | Example |
|---|---|
| (A) Zygomorphic | (I) Mustard |
| (B) Hypogynous | (II) Plum |
| (C) Perigynous | (III) Cassia |
| (D) Epigynous | (IV) Cucumber |

Select the correct option:

A. A-I, B-II, C-IV, D-III

B. A-I, B-II, C-III, D-IV

C. A-IV, B-I, C-III, D-II

D. A-III, B-I, C-II, D-IV

## Question

Match List-I with List-II: (2022 Re)

| List-I | List-II |
|---|---|
| (A) Imbricate | (I) Calotropis |
| (B) Valvate | (II) Cassia |
| (C) Vexillary | (III) Cotton |
| (D) Twisted | (IV) Bean |

Choose the correct answer from the options given below

(A) A-I, B-III, C-IV, D-II

(B) A-II, B-I, C-III, D-IV

(C) A-II, B-I, C-IV, D-III

(D) A-II, B-IV, C-III, D-I

## Question

Which one of the following plants shows vexillary aestivation and diadelphous stamens? [2022]

A *Solanum nigrum*

B *Colchicum autumnale*

C *Pisum sativum*

D *Allium cepa*

## Question

The flowers are Zygomorphic in: [2022]

A. Mustard B. Gulmohar

C. Cassia D. Datura

E. Chili

Choose the correct answer from the options given below.

A C, D and E only

B A, B and C only

C B and C only

D D and E only

## Question

Diadelphous stamens are found in: [2021]

A Citrus

B Pea

C China rose and citrus

D China rose

## Question

Ray florets have: [2020]

A. Superior ovary

B. Hypogynous ovary

C. Half inferior ovary

D. Inferior ovary

## Question

The ovary is half inferior in: [2020]

A Mustard

B Sunflower

C Plum

D Brinjal

## Question

Correct position of floral parts over thalamus in mustard plant is- [2020-Covid]

A. Margin of the thalamus grows upward, enclosing the ovary completely, and other parts arise below the ovary

B. Gynoecium is present in the centre and other parts cover it partially

C. Gynoecium is situated in the centre, and other parts of the flower are located at the rim of the thalamus, at the same level

D. Gynoecium occupies the highest position, while the other parts are situated below it

## Question

Placentation in which ovules develop on the inner wall of the ovary or in peripheral part, is [2019]

A Basal

B Axile

C Parietal

D Free central

## Question

Free-central placentation is found in: [2016 – II]

A *Brassica*

B *Citrus*

C *Dianthus*

D *Argemone*

## Question

Radial symmetry is found in the flowers of: [2016 – II]

A *Pisum*

B *Cassia*

C *Brassica*

D *Trifolium*

## Question

The term ‘Polyadelphous’ is related to: [2016 – II]

A Corolla

B Calyx

C Gynoecium

D Androecium

## Question

The standard petal of a papilionaceous corolla is also called: [2016 – I]

A. Carina

B. Pappus

C. Vexillum

D. Corona

## Question

Perigynous flowers are found in: [2015]

A China rose

B Rose

C Guava

D Cucumber

## Question

Ovary is inferior in: [2015]

A Guava

B Rose

C China rose

D Peach

## Question

Axile placentation is present in: [2015 Re]

A Lemon

B Pea

C *Argemone*

D *Dianthus*

## Question

Among China rose, mustard, brinjal, potato, onion and tulip, how many plants have superior ovary? [2015 Re]

A Six

B Three

C Four

D Five

## Question

When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as: [2014]

A. Valvate

B. Vexillary

C. Imbricate

D. Twisted

## Question

Among bitter gourd, mustard, brinjal, pumpkin, china rose, Lupin, cucumber, sun hemp, gram, guava, bean, chili, plum, Petunia, tomato, rose, Withania somnifera, potato, onion, Aloe and tulip how many plants have hypogynous flower? [2013]

A Eighteen

B Six

C Ten

D Fifteen

## Question

In China rose the flowers are: [2013]

A. Zygomorphic, epigynous with twisted aestivation

B. Actinomorphic, hypogynous with twisted aestivation

C. Actinomorphic, epigynous with valvate aestivation

D. Zygomorphic, hypogynous with imbricate aestivation

## Question

Identify the correct features of Mango and Coconut fruits.

(i) In both fruit is a drupe

(ii) Endocarp is edible in both

(iii) Mesocarp in Coconut is fibrous, and in Mango it is fleshy

(iv) In both, fruit develops from monocarpellary ovary

Select the correct option from below: [2020-Covid]

A (i), (ii) and (iii) only

B (i) and (iv) only

C (i) and (ii) only

D (i), (iii) and (iv) only

## Question

Coconut fruit is a: [2017-Delhi]

A Drupe

B Berry

C Nut

D Capsule

## Question

The morphological nature of the edible part of coconut is: [2017-Delhi]

A. Perisperm

B. Cotyledon

C. Endosperm

D. Pericarp

## Question

An aggregate fruit is one which develops from: [2014]

A. Multicarpellary superior ovary

B. Multicarpellary syncarpous gynoecium

C. Multicarpellary apocarpous gynoecium

D. Complete inflorescence

## Question

Placenta and pericarp are both edible portions in: [2014]

A. Potato

B. Apple

C. Banana

D. Tomato

## Question

Which one of the following statements is correct? [2014]

A. A sterile pistil is called a staminode

B. The seed in grasses is not endospermic

C. Mango is a parthenocarpic fruit

D. A proteinaceous aleurone layer is present in maize grain

## Question

Seed coat is not thin, membranous in: [2013]

A. Gram

B. Maize

C. Coconut

D. Groundnut

## Question

Family Fabaceae differs from Solanaceae and Liliaceae. With respect to the stamens, pick out the characteristics specific to family Fabaceae but not found in Solanaceae or Liliaceae. [2023]

A. Epiphyllous and Dithecous anthers

B. Diadelphous and Dithecous anthers

C. Polyadelphous and Epipetalous stamens

D. Monoadelphous and Monothecous anthers

## Question

The Floral Diagram represents which one of the following families [2022 Re]

A Liliaceae

B Fabaceae

C Brassicaceae

D Solanaceae

## Question

Keel is the characteristic feature of flower of: [2015]

A *Aloe*

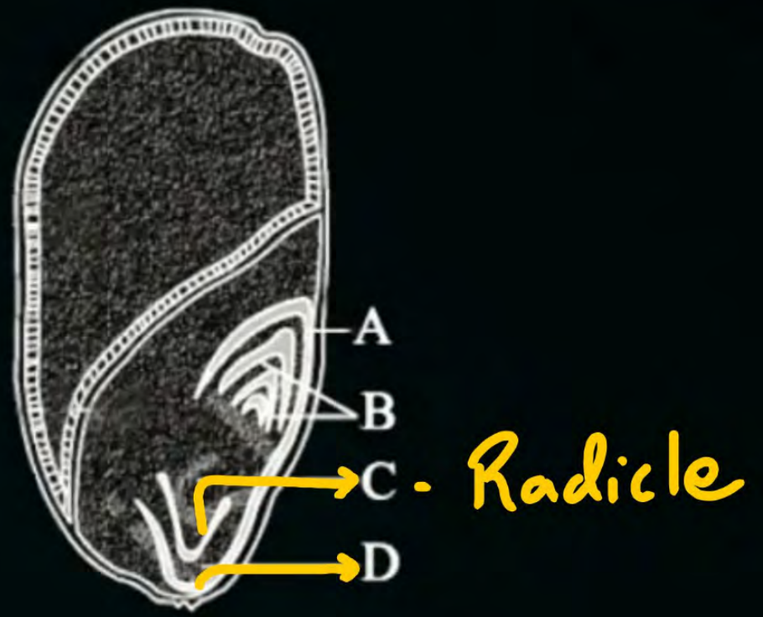
B Tomato

C Tulip

D *Indigofera*

## Question

Identify the part of the seed from the given figure which is destined to form root when the seed germinates. [2024]




(A) C

(B) D

(C) A

(D) B

## Question

Identify the type of flowers based on the position of calyx, corolla and androecium with respect to the ovary from the given figures (A) and (B). [2024]

A. (A) Perigynous; (B) Epigynous

B. (A) Perigynous; (B) Perigynous

C. (A) Epigynous; (B) Hypogynous

D. (A) Hypogynous; (B) Epigynous

(A) (B)

## Question

Which of the following is an example of actinomorphic flower? [2024]

A *Pisum*

B *Sesbania*

C *Datura*

D *Cassia*

## Question

Match List-I with List-II. [2024]

| List-I | List-II |
|---|---|
| (A) Rose | (I) Twisted aestivation |
| (B) Pea | (II) Perigynous flower |
| (C) Cotton | (III) Drupe |
| (D) Mango | (IV) Marginal placentation |

Choose the correct answer from the options given below:

**A** A-(IV), B-(III), C-(II), D-(I)

**B** A-(II), B-(III), C-(IV), D-(I)

**C** A-(II), B-(IV), C-(I), D-(III)

**D** A-(I), B-(II), C-(III), D-(IV)

## Question

Match List-I with List-II. (2024)

| List-I (Types of stamen) | List-II (Example) |
|---|---|
| (A) Monoadelphous | (I) Citrus |
| (B) Diadelphous | (II) Pea |
| (C) Polyadelphous | (III) Lily |
| (D) Epiphyllous | (IV) China-rose |

Choose the correct answer from the option below:

A. A-(I), B-(II), C-(IV), B-(III)

B. A-(III), B-(I), C-(IV), D-(II)

C. A-(IV), B-(II), C-(I), D-(III)

D. A-(IV), B-(I), C-(II), D-(III)

Question No. - 01

Shape of guard cells in gramineae family

A Kidney shaped

B Oval shaped

C Round shaped

D Dumbel shaped

## Question No. - 02

Ring arrangement of vascular bundles is the characteristic of

A Dicot root

B Dicot stem

C Monocot root

D Monocot stem

## Question No. - 03

Type of vascular bundles in dicot root

A Radial and exarch xylem

B Radial and endarch xylem

C Conjoint open

D Conjoint closed

## Question No. - 04

Find the correct match

polyarch

A Monocot root-Tetrarch xylem bundles ✗

large

B Monocot root- Pith is small or inconspicuous ✗

tetrarch

C Dicot root-Polyarch xylem bundles ✗

D Dicot root-pericycle involves in vascular cambium formation ✓

## Question No. - 05

Dorsiventral leaf and isobilateral leaf are similar in

Dicot monocot

(A) Type of vascular bundles

(B) Having large, empty and colourless cells on adaxial surface

upper

(C) Distribution of stomata -

(D) Differentiation of mesophyll tissue -

Question No. - 06

Roots hairs are formed due to elongation of the ..... cells of root

A Cortical

B Endodermal

C Epidermal

D Hypodermal

Question No. - 07

Hypostomatic leaf, with stomata distributed more on the lower surface is an example of

more stomata on abaxial epidermis.

A Isobilateral leaf

B Dorsiventral leaf ✓

C Equifacial leaf

D Epistomatic leaf

## Question No. - 08

Bulliform cells are found in

A The epidermis of monocot stem

B The adaxial epidermis of grass leaf

C Abaxial epidermis of dicot leaf

D The adaxial epidermis of dorsiventral leaf

Question No. - 09

In plants, the guard cells differ from other epidermis cells in having

A Cytoskeleton

B Mitochondria

C Endoplasmic Reticulum

D Chloroplast

## Question No. - 10

Ground tissue includes :-

A All tissues external to endodermis

B All tissues except epidermis and vascular bundles

C Epidermis and cortex

D All tissues internal to endodermis

## Question No. - 11

A major characteristic of the monocot root is the presence of :

A Scattered vascular bundles

B Vascular tissue without cambium

C Cambium sandwiched between phloem and xylem along the radius

D Open vascular bundles

## Question No. - 12

Casparian strips occur in

A Epidermis

B Cortex

C Pericycle

D Endodermis

## Question No. - 13

Radial vascular bundles characteristically occur in

Root

A Monocot and dicot stems

B Monocot and dicot leaves

C Monocot and dicot roots ✓

D All of these

Question No. - 14

Casparian strips/bands are thickening present on radial and tangential walls of

A Cortical cells

B Endodermal cells of monocot root

C Endodermal cells of dicot root

D Both (B) & (C) correct

Question No. - 15

Which plant part possesses polyarch condition of vascular bundles with a well developed pith?

A Dicot root

B Dicot stem

C Monocot root

D Monocot stem

Question No. - 16

Hypodermis is..... in sunflower stem and .....in maize stem.

(A) Parenchymatous, Collenchymatous

(B) Collenchymatous, Sclerenchymatous

(C) Sclerenchymatous, Collenchymatous

(D) Sclerenchymatous, Sclerenchymatou

## Question No. - 17

A transverse section of stem is stained first with safranin and then with fast green following the usual schedule of double staining for the preparation of a permanent slide. What would be the colour of the stained xylem and phloem?

A. Red and green

B. Green and red

C. Orange and yellow

D. Purple and orange

## Question No. - 18

Match the followings and choose the correct option from below

| Column - I | | Column – II | |
|---|---|---|---|
| A. | Meristem | i. | Photosynthesis, storage |
| B. | Parenchyma | ii. | Mechanical Support |
| C. | Collenchyma | iii. | Actively dividing cells |
| D. | Selerenchyma | iv. | Stomata |
| E. | Epidermal tissue | v. | Sclereids |

(A) A-i, B-iii, C-v, D-ii, E-iv

(B) A-iii, B-I, C-ii, D-v, E-iv

(C) A-ii, B-iv, C-v, D-I, E-iii

(D) A-v, B-iv, C-iii, D-ii, E-i

## Question No. - 19

Match the followings and choose the correct option from below

| Column - I | | Column – II | |
|---|---|---|---|
| A. | Cuticle | i. | Guard cells |
| B. | Bulli from cells | ii. | Single layer |
| C. | Stomata | iii. | Waxy layer |
| D. | Epidermis | iv. | Empty colourless cell |

(A) A-iii, B-iv, C-i, D-ii

(B) A-i, B-ii, C-iii, D-iv

(C) A-iii, B-ii, C-iv, D-i

(D) A-iii, B-ii, C-I, D-iv

Question No. - 20

Identify the simple tissue system from the following

A Parenchyma

B xylem

C Epidermis

D Phloem

## Question No. - 21

Cells of this tissue are living and show angular wall thickening. They also provide mechanical support. The tissue is

A Xylem

B Sclerenchyma

C Collenchyma

D Epidermis

## Question No. - 22

Epiblema of roots is equivalent to

A Pericycle

B Endodermis

C Epidermis

D Stele

Question No. - 23

A conjoint and open vascular bundle will be observed in the transverse section of

A Monocot root

B Monocot stem

C Dicot root

D Dicot stem

Question No. - 24

Interfascicular cambium and cork cambium are formed due to

A Cell division

B Cell differentiation

C Cell dedifferentiation

D Redifferentiation

Question No. - 25

In which of the following pairs of parts of a flowering plant is epidermis absent?

A Root tip and shoot tip

B Shoot bud and floral bud

C Ovule and seed

D Petiole and pedicel

## Question No. - 26

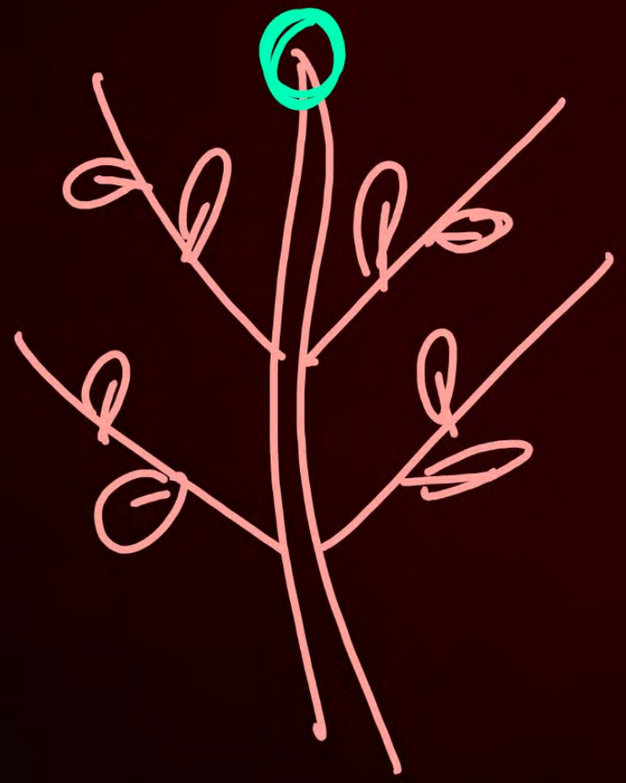
How many shoot apical meristems are likely to be present in a twig of a plant possessing 4 branches and 26 leaves

A 26

B 5

C 30

D 4



## Question No. - 32

Match the followings and choose the correct option from below

| Column – I | Column – II |
|---|---|
| A. Meristem | i. Photosynthesis, storage |
| B. Parenchyma | ii. mechanical support |
| C. Collenchyma | iii. Actively dividing cells |
| D. Sclerenchyma | iv. stomata |
| E. Epidermal tissue | v. sclereids |

A. A-i, B-iii, C-v, D-ii, E-iv

B. A-iii, B-i, C-ii, D-v, E-iv

C. A-ii, B-iv, C-v, D-i, E-iii

D. A-v, B-iv, C-iii, D-ii, E-i

## Question No. - 33

Match the following and choose the correct option from below

| Column – I | Column – II |
|---|---|
| A. Cuticle | i. guard cells |
| B. Bulli form cells | ii. single layer |
| C. Stomata | iii. waxy layer |
| D. Epidermis | iv. empty colourless cell |

(A) A-iii, B-iv, C-i, D-ii

(B) A-i, B-ii, C-iii, D-iv

(C) A-iii, B-ii, C-iv, D-i

(D) A-iii, B-ii, C-i, D-iv

Question No. - 34

Identify the simple tissue system from the following

A Parenchyma

B Xylem

C Epidermis

D Phloem

## Question No. - 35

Cells of this tissue are living and show angular wall thickening. They also provide mechanical support. The tissue is

A Xylem

B Sclerenchyma

C Collenchyma

D Epidermis

Question No. - 36

Epiblema of roots is equivalent to

A Pericycle

B Endodermis

C Epidermis

D Stele

Question No. - 37

A conjoint and open vascular bundle will be observed in the transverse section of

A Monocot root

B Monocot stem

C Dicot root

D Dicot stem

Question No. - 38

Interfascicular cambium and cork cambium are formed due to

A Cell division

B Cell differentiation

C Cell dedifferentiation

D Redifferentiation

## Question No. - 41

How many shoot apical meristems are likely to be present in a twig of a plant possessing 4 branches and 26 leaves

A 26

B 1

C 5

D 30

E 4

# Thank You