

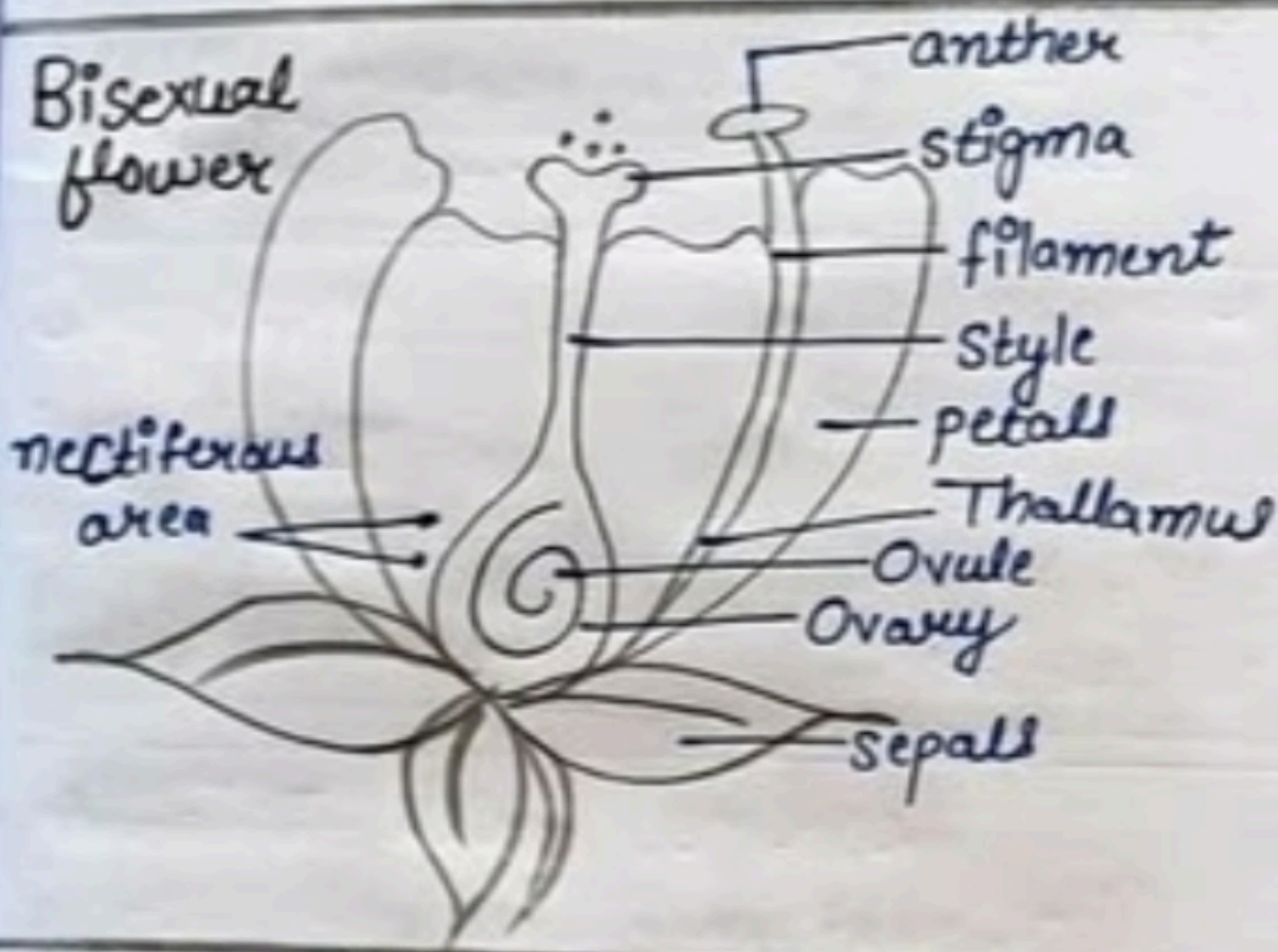
SEXUAL REPRODUCTION IN FLOWERING PLANTS...

Flowers → Objects of aesthetic, ornamental, social, religious and cultural value.

• Symbols for conveying human feelings, Love ♡, affection, happiness...

• Biologist → Flowers are morphological and embryological marvels of sexual rep.?

Floriculture → growing and marketing flowers.



* Male rep. str. → Androecium (whorl of stamens).
* Female rep. str. → Gynoecium.

Stamen, Microsporangium and Pollen grain..

Stamen → Filament (long and slender stalk)
Anther (terminal, bilobed str.)

Proximal end of filament → attached to thallamus/petal of flower.

Anther → Bilobed, Dithecous (2 theca),
4 microsporangia (2 in each lobe)

pollen sac

Dehiscence → Rupturing of anther.

Line of dehiscence → Stomium.

Structure of Microsporangium

Surrounded by 4 walls → **PYQ** ★
out: (1) Epidermis, (2) Endothecium, (3) Middle layer } protection and dehiscence of anther to release pollen.
in: (4) Tapetum → innermost
Growth of developing pollen grain.

Cells of tapetum → dense cytoplasm, and generally have more than one nucleus.

Sporogenous Tissue → group of compactly arranged homogenous cells.

↓ meiosis
Microspore Tetrad

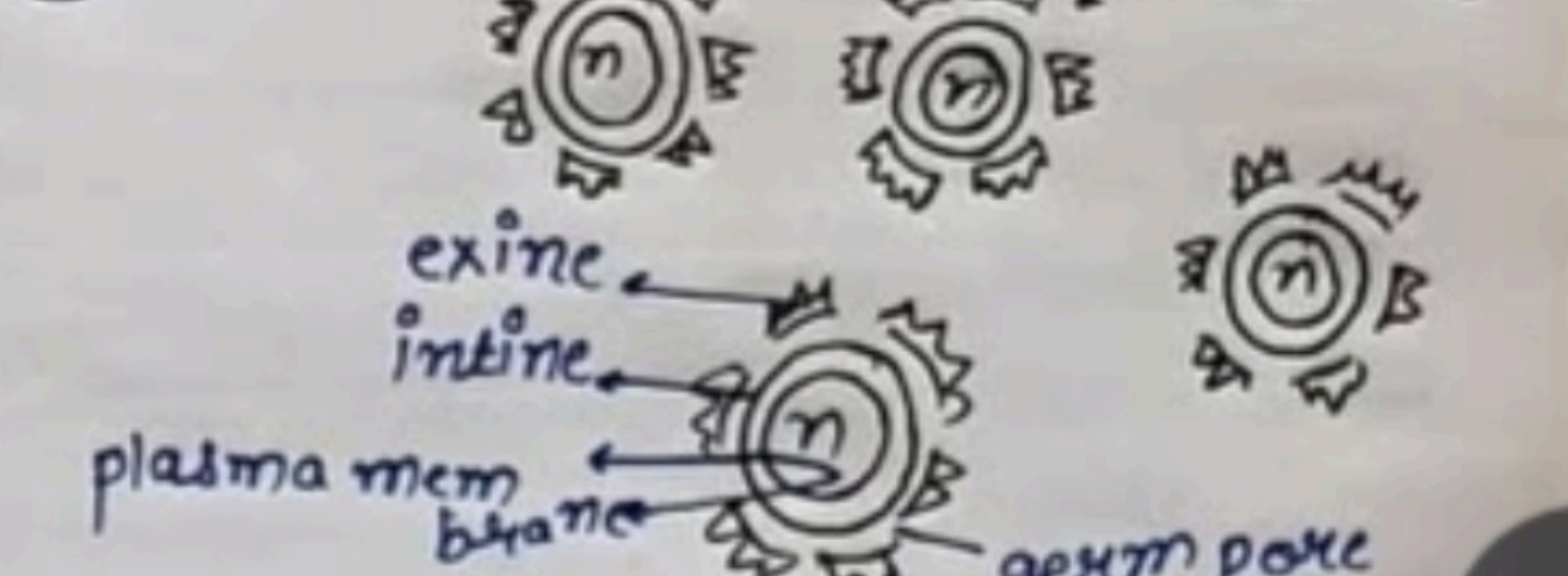
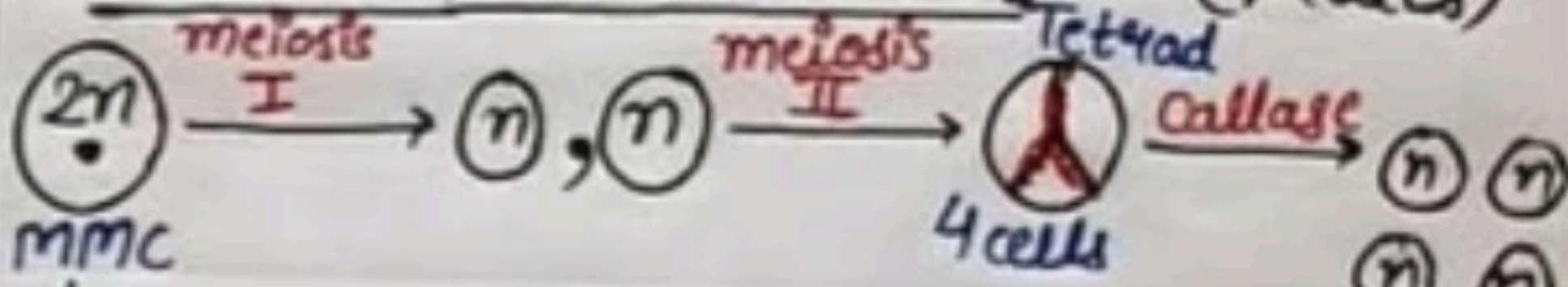
↓ - anther mature, microspore develop into.

pollen grains - released during dehiscence of anther.

* each cell of sporogenous tissue is capable of giving rise to tetrad.

* each one is potential/microspore mother cell.

* MICROSPOROGENESIS :- (Males)



Pollen Grain } male gametophyte
 Generally spherical
 (25-50 μ m diameter)

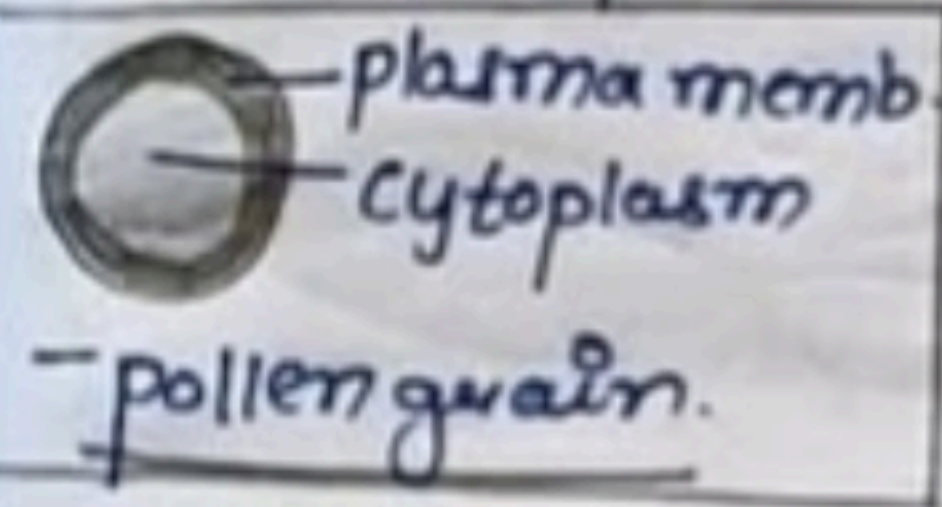
prominent 2 layered wall. **PYQ**

- ① Hard Outer layer **Exine** made of sporopollenin of pollen grain.
- ② Inner wall **Intine** of pollen grain.

- One of most resistant organic material
- Withstand high temp., strong acids and alkali.
- No enzyme can degrade.
- pollen grains are preserved as fossils becoz of sporopollenin.

- Thin and
- Continuous layer
- Made of Cellulose and pectin.

Germ pore } prominent apertures
 sporopollenin absent.



* Pollen Grain
 # Vegetative Cell →
 Bigger, abundant food, large irregular shaped nucleus.

Generative Cell →
 Small, floats in cytoplasm of vegetative cell. Spindle shaped. Dense cytoplasm and nucleus.

60% Angiosperms 40% Angiosperms.

pollen grain shed at 2 celled stage. pollen grain shed at 3 celled stage.

pollen Grains → Allergies and Bronchial affilications.
 Chronic respiratory Disorders (asthma, Bronchitis).

* parthenium (Carrot grass) →
 Came to India, contaminated with imported wheat.

- # pollen grains are rich in nutrients.
- pollen tablet/syrup - food supplements.
 - ↑ Use athletes and race horse performance.

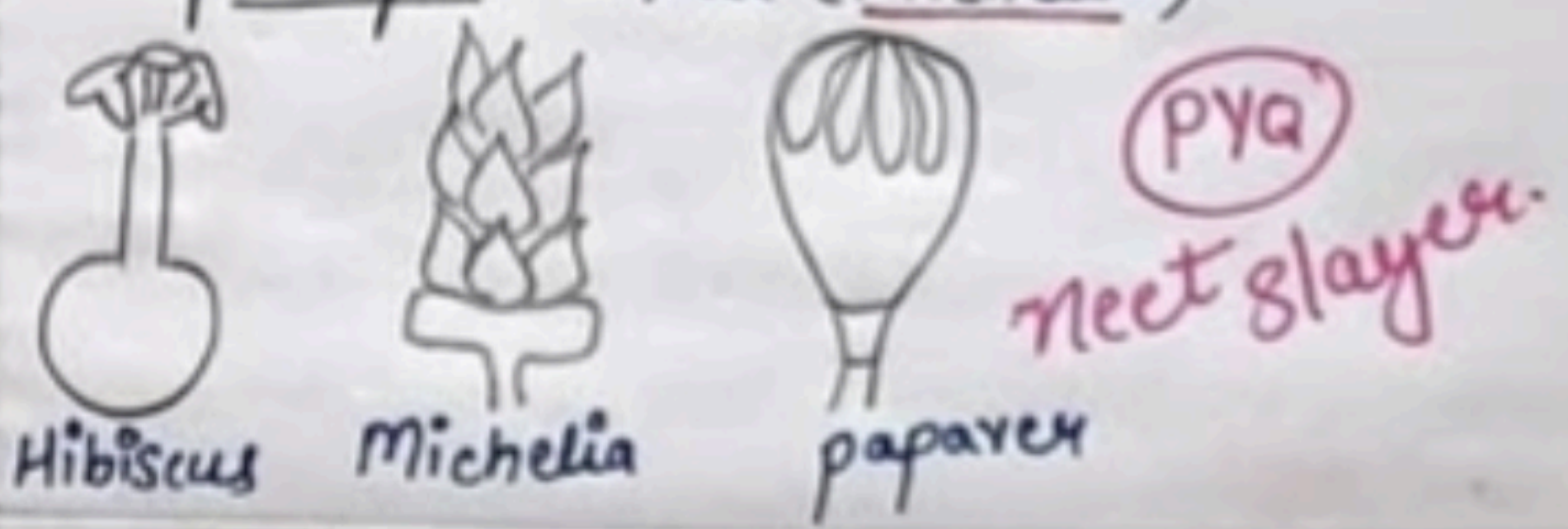
Viability → Highly Variable. (PYQ)
 ↳ depends on temp. and humidity.

- ① Rice and Wheat → 30 min.
- ② Rosaceae, Leguminosae, Solanaceae → Viability for months.

Artificial Insemination | sperm stored.
 → Liquid Nitrogen (-196°C).
 → pollen/seed Banks used in crop breeding.

The Pistil, Microsporangium, and Embryo Sac →

- Gynoecium → Female sep. part.
- ① Monocarpellary → Single pistil (Hibiscus)
 - ② Multicarpellary → More than 1 pistil
 - ↳ Syncarpous → fused together (papaver)
 - ↳ Apocarpous → free (Michelia)

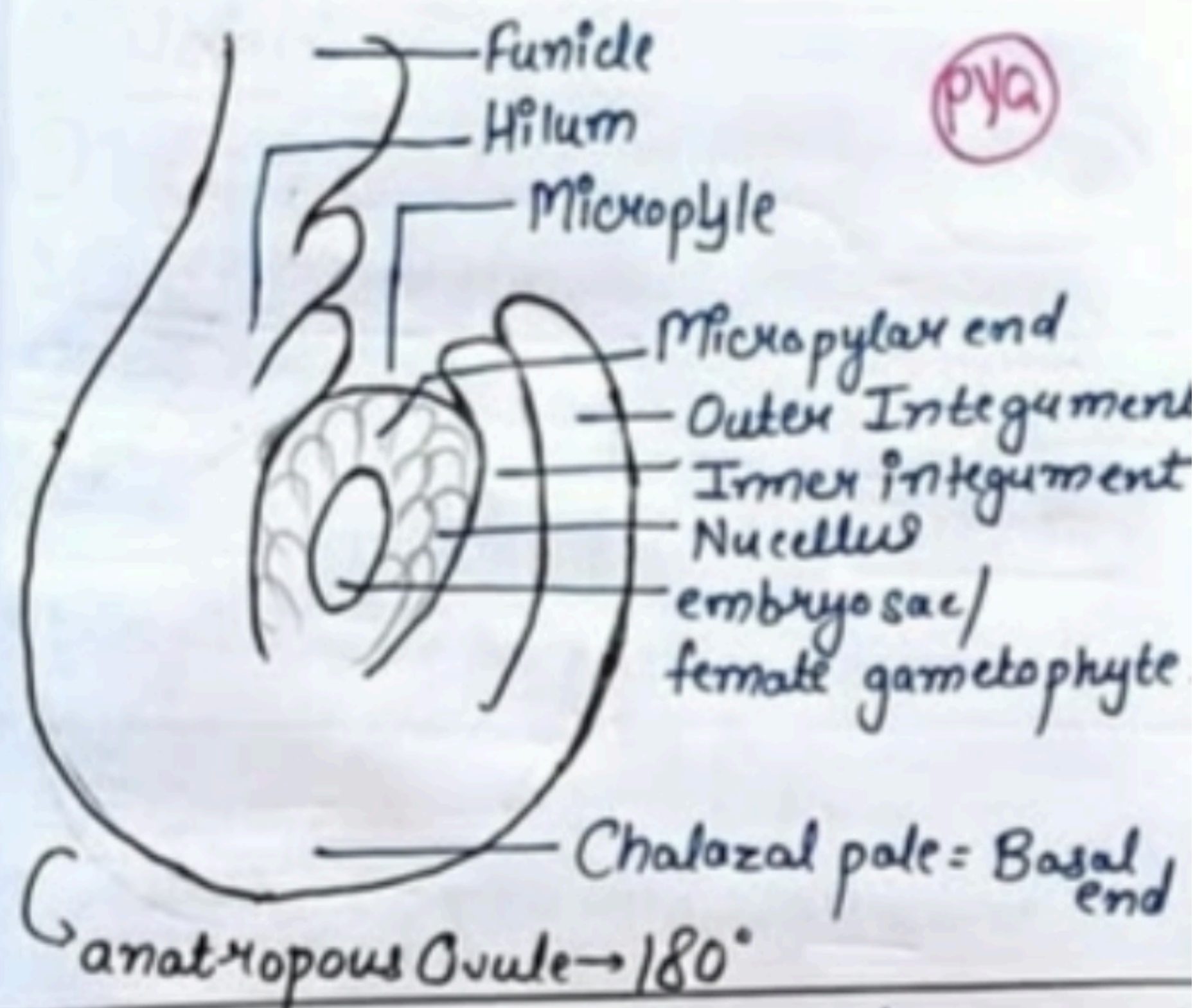


Pistil → 3 parts.

- ① Stigma: landing platform of pollen grain.
- ② Style: elongated slender part.
- ③ Ovary: Basal bulged part.
 - ↳ Ovarian Cavity (locule) → placentas → Ovules.

- 1 Ovule in an Ovary → Wheat, paddy, Mango.
 Many Ovules → papaya, Watermelon, Orchid.

The Megasporangium / Ovule -



Funicle → Small str. attached to placenta by means of stalk.

Hilum → Body of ovule fuses with funicle here / Jun. b/w ovule and funicle.

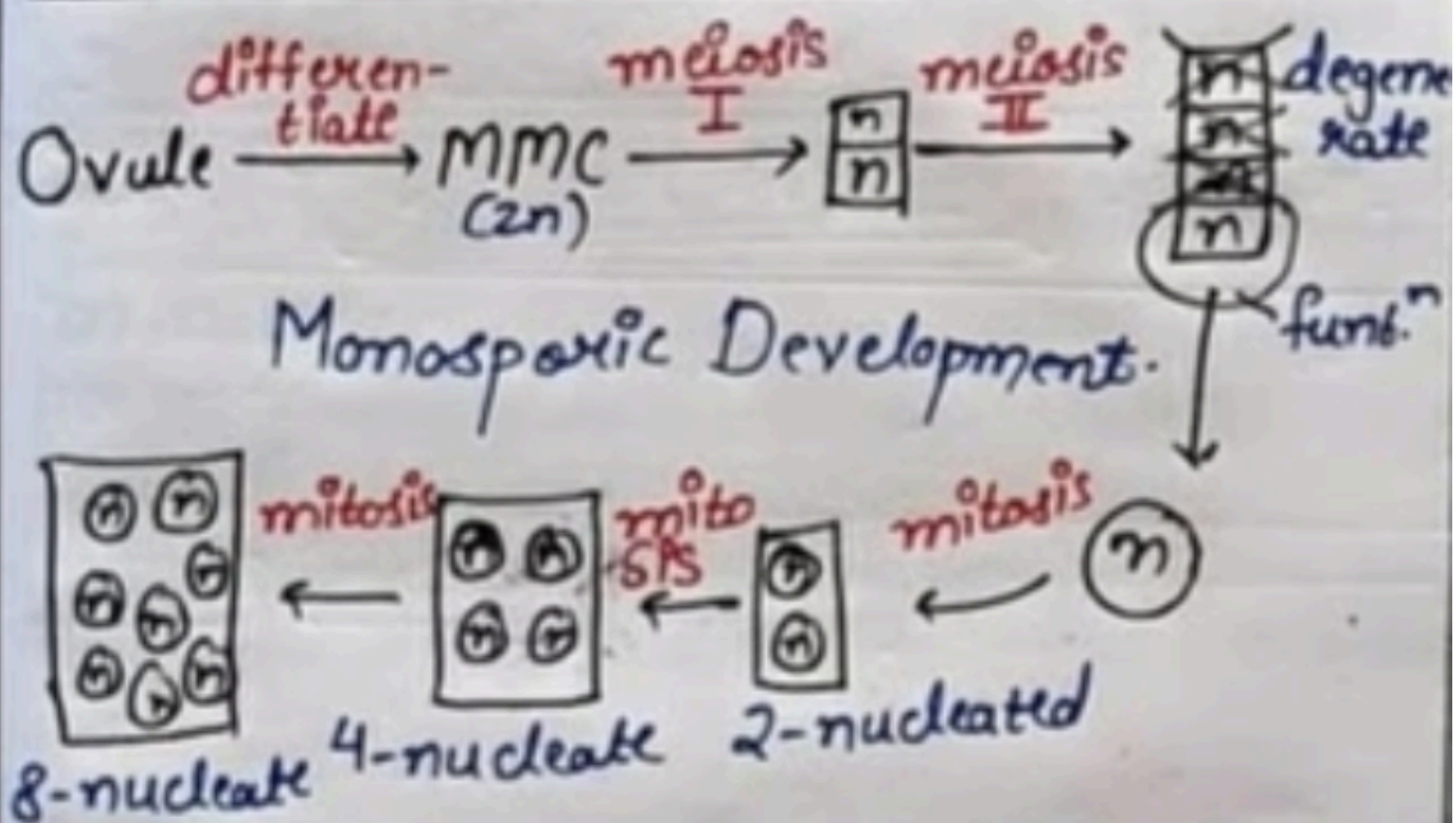
Integuments → protection / coverings.

Micropyle → Small opening. Integuments encircle nucellus except this tip.

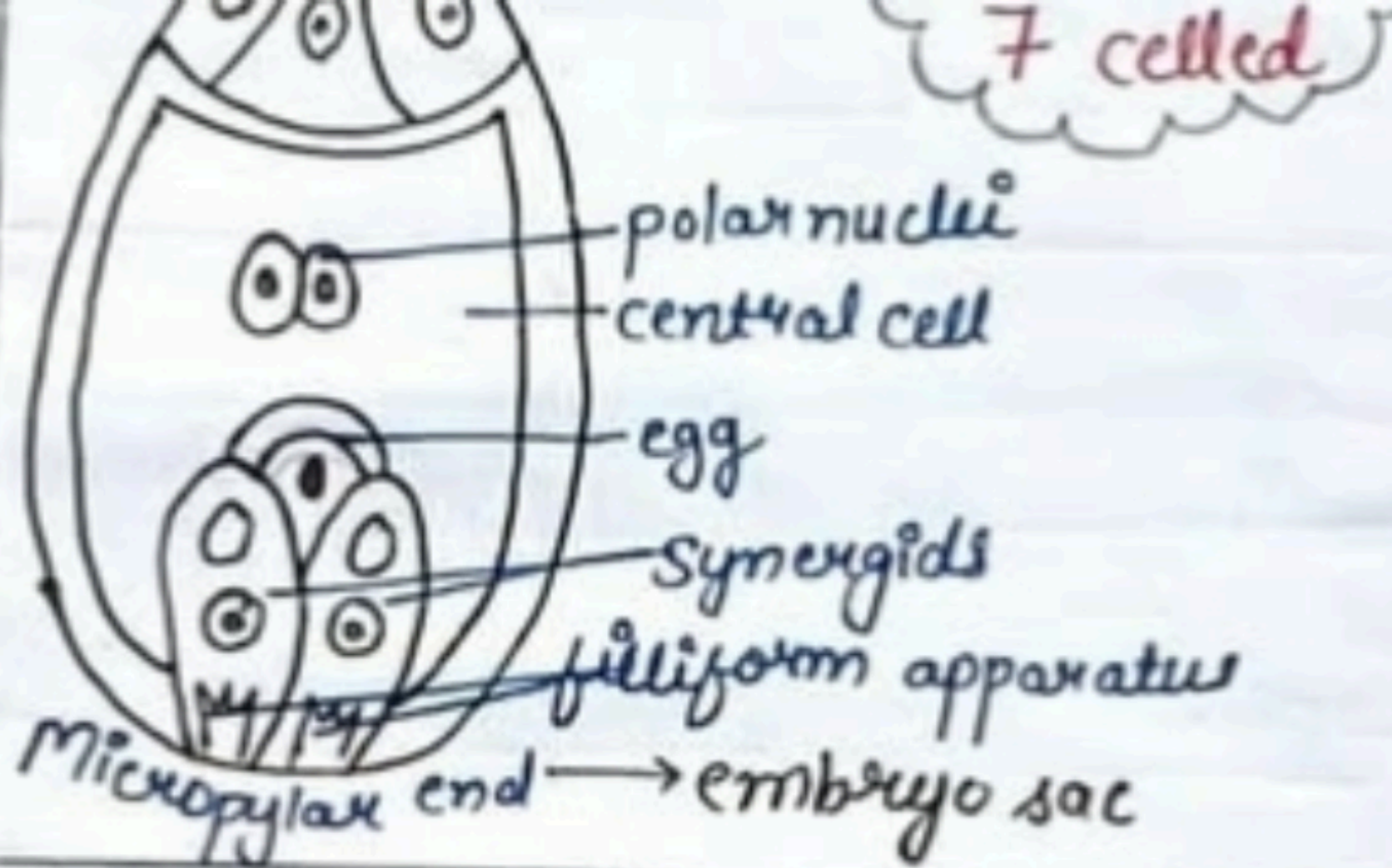
Chalaza → Basal part of ovule.

Nucellus → These cells have abundant food reserve.

MEGASPOROGENESIS :- (females)



mitosis → free nucleus, Not immediate followed by cell wall format.



Pollination → Transfer of pollen grains from anther to stigma.

Kind of pollination →

① Autogamy → Blw same flower's anther and stigma.
requires synchrony in pollen release and stigma

Anther, Stigma → Very close for self pollinat.
eg → Viola (Common pansy), Oxalis, Commelina

* Chasmogamous flower → exposed anther and stigma.

* Cleistogamous flower → Do not open
→ pollinat.ⁿ by anther dehiscence at all.
→ pollen agent not required. *
→ Invariably autogamous dia. imp

② Geitonogamy → Blw another flower of same plant.
functionally → Cross pollination. *
genetically → Autogamy.

Outbreeding Devices

Hermaphrodite flowers → Continuous Self pollinaⁿ → Inbreeding depression.
 ↓ To overcome

Dichogamy Outbreeding Devices.

① pollen, stigma receptivity unsynchronised. eg → China rose, lady finger, Jasmine, Custard apple.

Hexchogamy → anther, stigma placed at different position. pollen can't reach stigma of same flower.

Self Sterility / Incompatibility → pollen of flower have no fertilizing effect on stigma of same flower. eg - passiflora, potato.

Unisexuality → Monoicous plants with unisexual flowers (Maize, cucurbit, Castor) avoids autogamy.

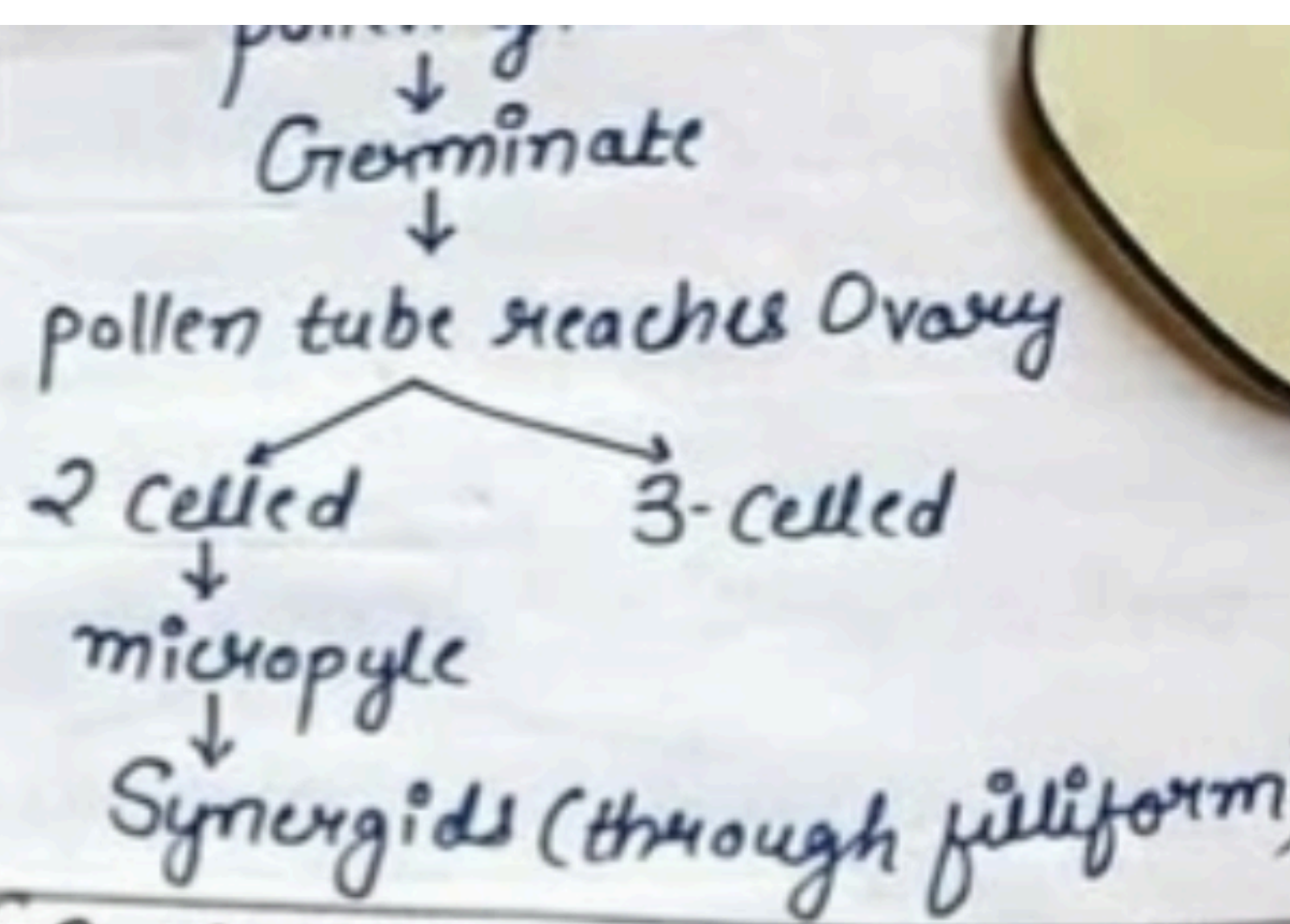
Diocious plants (papaya, mulberry) results in Xenogamy.

Pollen Pistil Interaction

pistil have ability to recognize compatible and incompatible pollen
 ↓ accepts ✓ ↓ rejects X

- Continuous dialogue b/w pollen grain and pistil.
- Chemical components of pollen interacting with pistil.

pollen - pistil interaction



Artificial Hybridisation

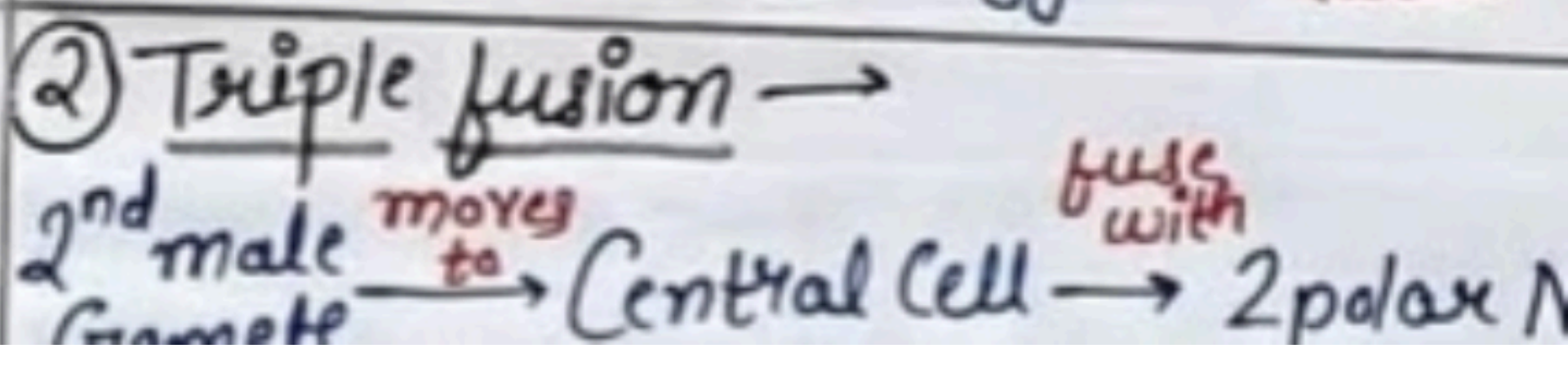
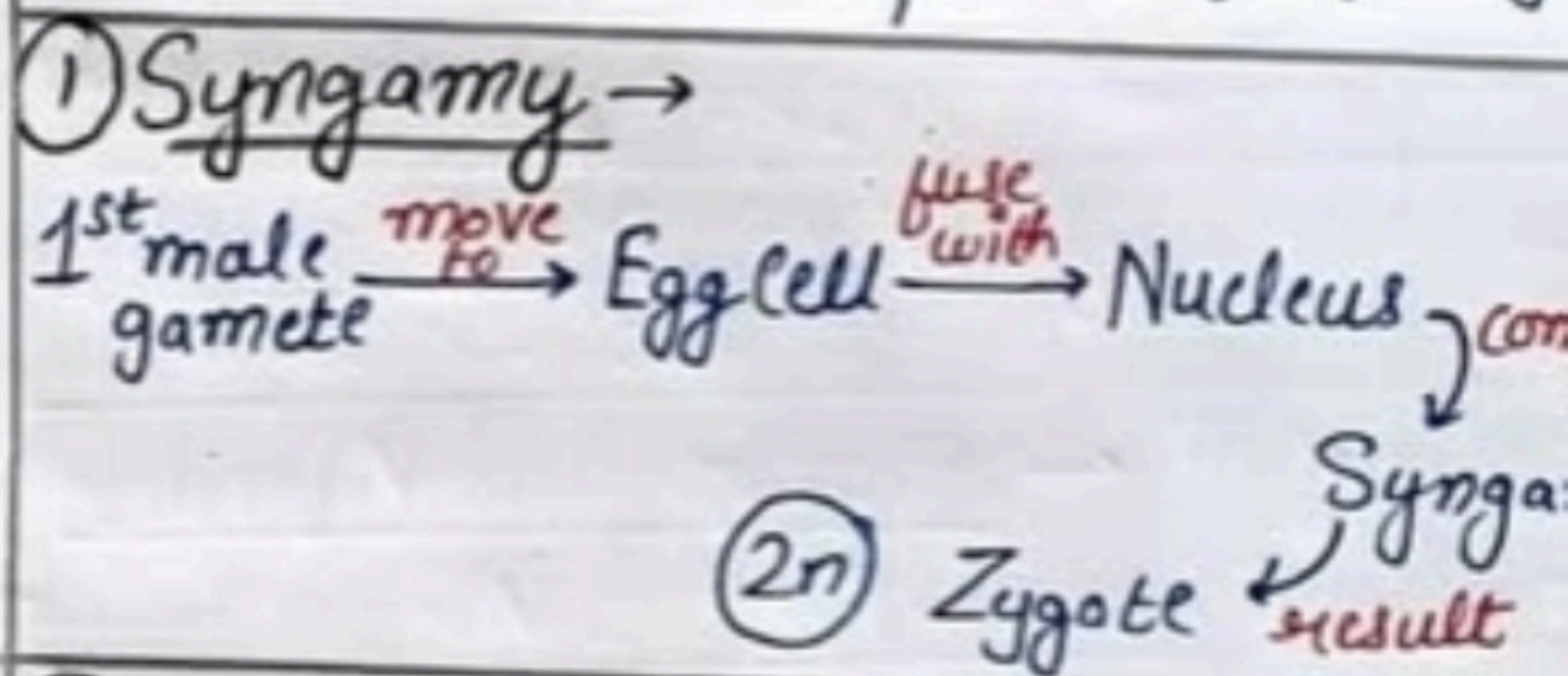
- Superior Varieties.
- Crop improvement.
- Desired pollens used.
- Stigma protected from contamination.

- Steps: →
- ① Emasculation → Bisexual flowers se anther cut karo before ma
 - ② Bagging → Emasculated flowers ko butter paper se cover karo.
 - ③ Required pollens dusted on stigma.
 - ④ Rebagging, and fruits allow to deve

Unisexual flowers → no need emascul

Double Fertilization

after entering } pollen tube releases 2
 1 synergid } male gamete into
 cytoplasm of synergid



Agents of Pollination →

① Abiobic Agents → (uncertain)

i) Wind Pollination (Anemophily)

- pollens → light and non-sticky.
- Well exposed stamens.
- Large feathery stigma (to easily trap air borne pollens).
- Single Ovule in each ovary.
- Numerous flowers in inflorescence
eg - **Corn cob**
- Tassels → Stigma and style wave in wind to trap pollen.
- **Quite common in grasses.**

ii) Water Pollination (Hydrophily)

- quite rare (limited to 30 genera, mostly monocots).
- algae, bryophytes, pteridophytes.
- eg - **Vallisneria and Hydrilla** (fresh water)
- eg → **Zostera** (marine sea grasses)
- pollen grains → protected from water by mucilaginous covering.

Vallisneria → female flower → long stalk.
pollen grains → surface of water
→ They are carried passively by water currents.

Sea Grasses → female flower submerge in water.
pollen grains → long ribbon, carried passively inside water.

Not all aquatic plants do water pollination.
Water Hyacinth and Water lily pollinated by insects or wind.

Wind and water pollinated flowers
↳ **No Colour, No nectar**

② Biotic Agents → Majority

1) By animals → Bees, Butterfly, beetles, wasps, ants, moth, bird, bats...
Among insects → Bees dominant.

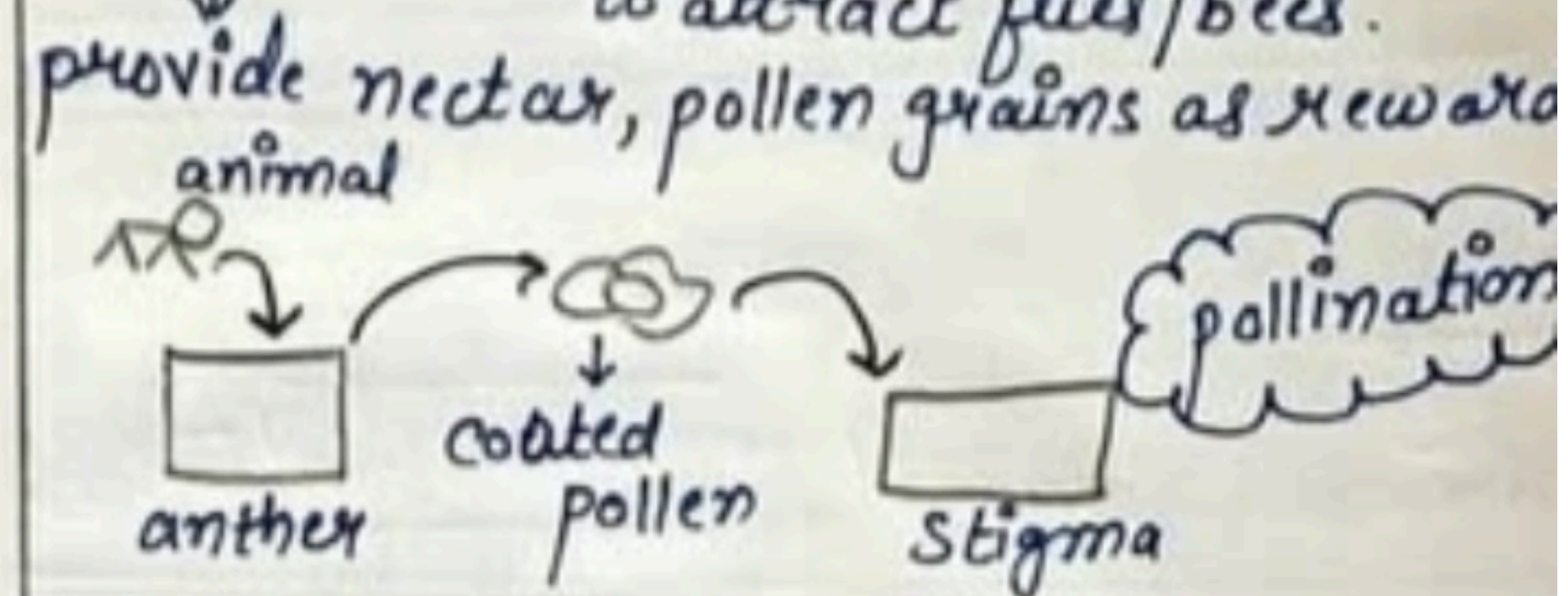
2) Large Animals → primates, lemur, arboreal, rodents, Reptiles (gecko lizard, garden lizards).

3) Insect pollinated flowers → Large, Coloured, fragrant, rich nectar.

4) Small flowers → Cluster into inflorescence → Conspicuous.

5) Animals attract by → Colour, fragrant nectar.

6) Flowers → Secrete foul odours to attract flies/bees.



* Safe Places (Rewards) → to lay eggs
Tallest flower → Amorphophallus (6 feet)

Moth and Yucca plant → can't complete life cycle without each other.

Moth ^{eggs} → locule of ovary → gets pollinated as seeds start developing, larvae of moth comes out.

Pollen/Nectar Robbers → They consume pollen or Nectar, and in turn do not pollinate flower.

① Entomophily - by insects

② Ornithophily - by birds

③ Chiroptophily - by bats

④ Malacophily - by snails, slugs