

GYMNOSPERMS

(SALIENT FEATURES)

BY

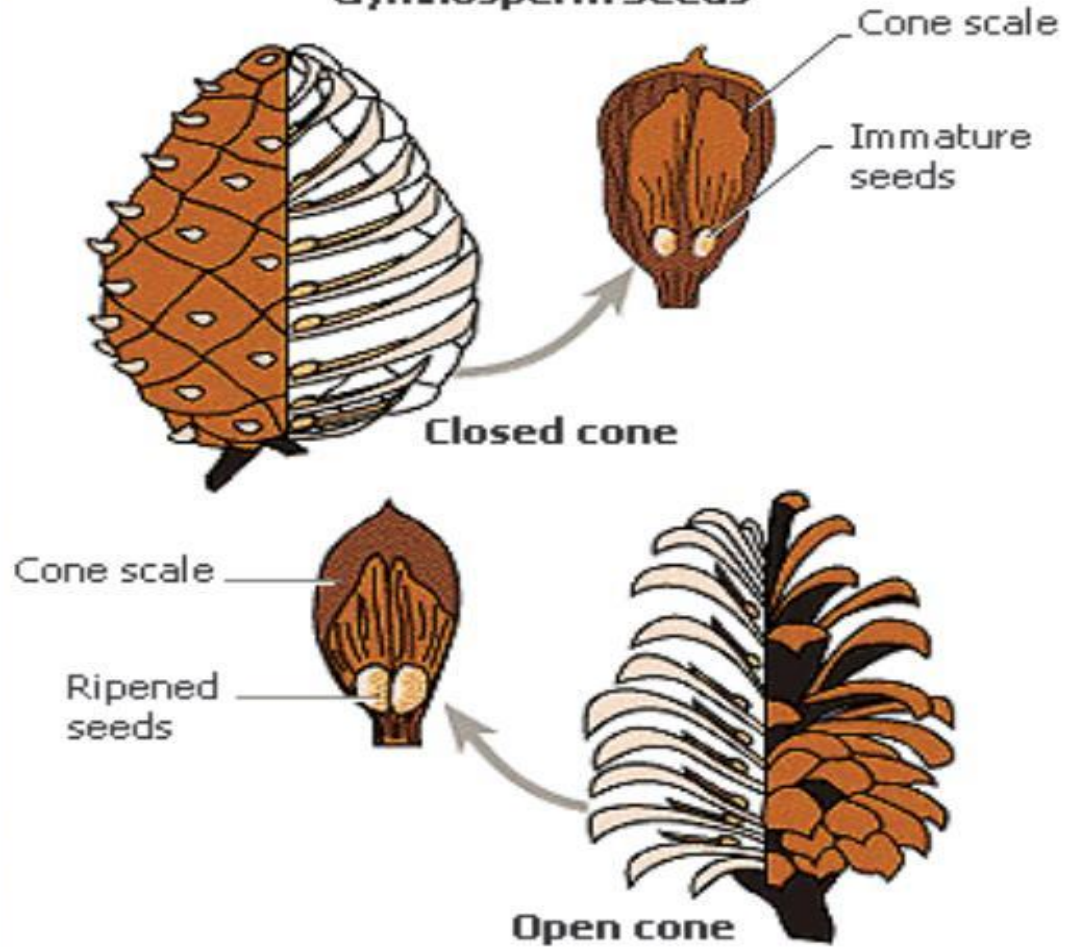
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DEFINATION:

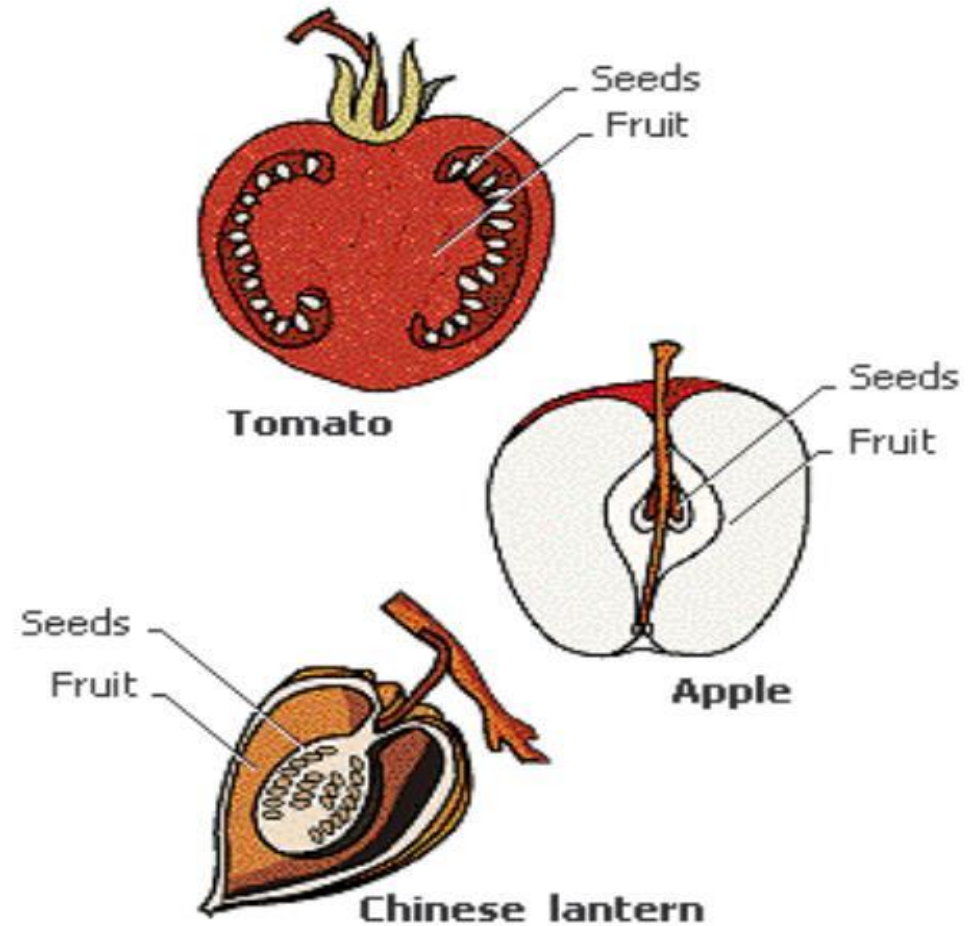
The word “Gymnosperm” comes from the Greek words “gymnos”(naked) and “sperma”(seed), hence known as “Naked seeds” or unprotected seeds. Gymnosperms do not produce flowers and unlike angiosperms, they produce seeds without fruits. After fertilization these plants develop seeds (unprotected) on the surface of scales or leaves called sporophylls and these sporophylls aggregate to form cones or strobilus.

Gymnosperms vs Angiosperms

Gymnosperm Seeds



Angiosperm Seeds and Fruits



- **DISTRIBUTION;**

- Most groups of gymnosperms are totally extinct, other groups include both fossil and living genera, still other groups are mainly living genera.; which are widely distributed in TEMPERATE ,TROPICAL and ARCTIC regions of the world.
- Most gymnosperms show xerophytic characters.
- Predominantly gymnosperms are WOODY PLANTS. [trees and shrubs].
- NONE OF THEM ARE HERBS.
- Plants are usually EVERGREEN.[Bearing leaves throughout the year]

- **EXTERNAL FEATURES**

- The plant body is SPOROPHYTIC and differentiated into ROOT , STEM and LEAVES.
- The gymnosperms include worlds tallest tree SEQUOIA [THE GIANT RED WOOD].;measuring about 125 metres in height and 30 metres in girth.



15 AMAZING THINGS TO DO IN
SEQUOIA & KINGS CANYON
NATIONAL PARKS





CYCAS



PINUS

GINKGO





EPHEDRA

Ephedra sinica



Zamia pygmaea

The smallest gymnosperm is
ZAMIA PYGMIA.

- Zamia is having underground tuberous stem.

- Plants have **TAP ROOT** .In some cases roots show **SYMBIOSIS** or they are symbiotically associated with **ALGAE [CYCAS][coralloid roots]** or with **FUNGUS [PINUS]**.
- The stem is usually **ERECT** or **BRANCHED**. [unbranched in case of **CYCAS**].
- The superficial surface of **STEM** shows characteristic **LEAF SCARS**.
- **LEAVES** may be **MONOMORPHIC** [one kind] or **DIMORPHIC** [two kinds].
- When **DIMORPHIC** , there are **FOLIAGE LEAVES** and **SCALE LEAVES**.
- **FOLIAGE LEAVES** are green , simple or compound,photosynthetic.
- **SCALES LEAVES** are minute ,brown and protective in nature.
- **INTERNAL FEATURES ;**
- The **Roots** have **DIARCH** or **POLYARCH** xylem in Vascular cylinder.[**RADIAL ARRANGEMENT**] .The secondary growth occurs in roots.
- In **STEM** ,the vascular bundles are **CONJOINT** ,**COLLATERAL** and **OPEN**. Vascular Bundles are arranged in a **RING**.The **VESSELS** and **WOOD FIBRES** are absent in the **XYLEM**, and **COMPANION CELLS** are absent in **PHLOEM**.



CORALLOID ROOT IN CYCAS

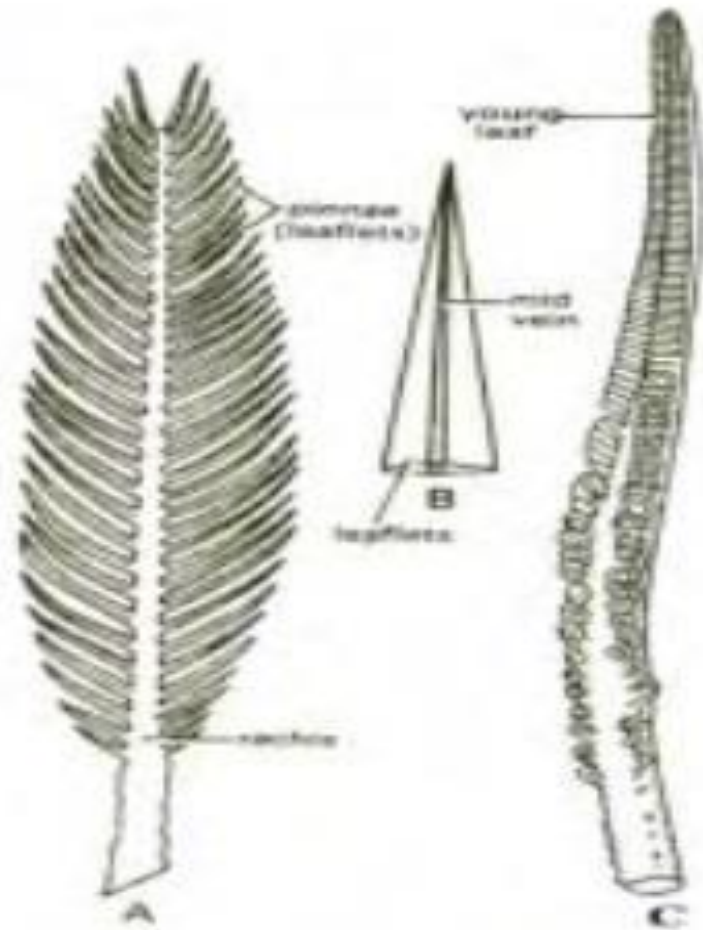


Fig. Cycas Leaf-let

A, Compound leaf. B. Upper portion of a leaf-let
C. Young leaf showing circinate vernation of leaf-lets

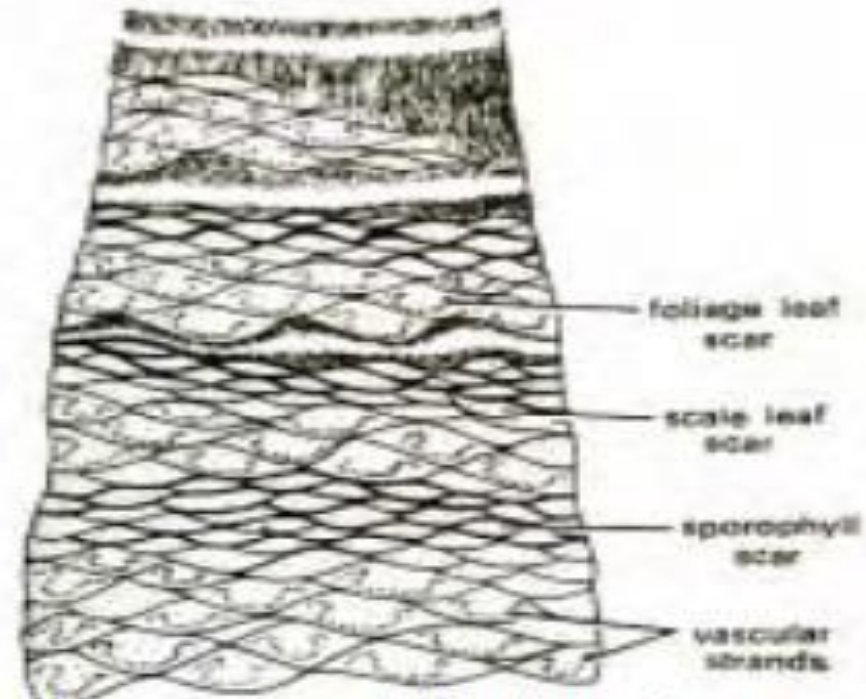


Fig. A part of mature stem



Fig. 1.57. Coralloid roots

- **MANOXYLIC AND PYCNOXYLIC WOOD**
- In some Gymnosperms ,the wood is **MANOXYLIC**, where as in others it is **PYCNOXYLIC**.
- **MANOXYIC** wood is found in **CYCAS**. This wood is **commercially useless**.wood is soft and relatively sparse with broad parenchymatous rays.
- **PYCNOXYLIC** wood is found in **PINUS**. This wood is **commercially most important** and used as good quality timber. Wood is hard , compact and densely packed with relatively few parenchymatous rays.
- **FOLIAGE LEAVES;**
- Leaves are well protected by a **thick layer of cuticle**.Stomata lie in sunken cavities,the leaves **donot have lateral veins** and thus,the translocation of nutrients occurs with the help of **TRASFUSION TISSUE**.
- **TRASFUSION TISSUE** Is the characteristic feature of gymnosperm leaves.
- *[in the picture 8.28, just observe the arrangement of transfusion tissue]*

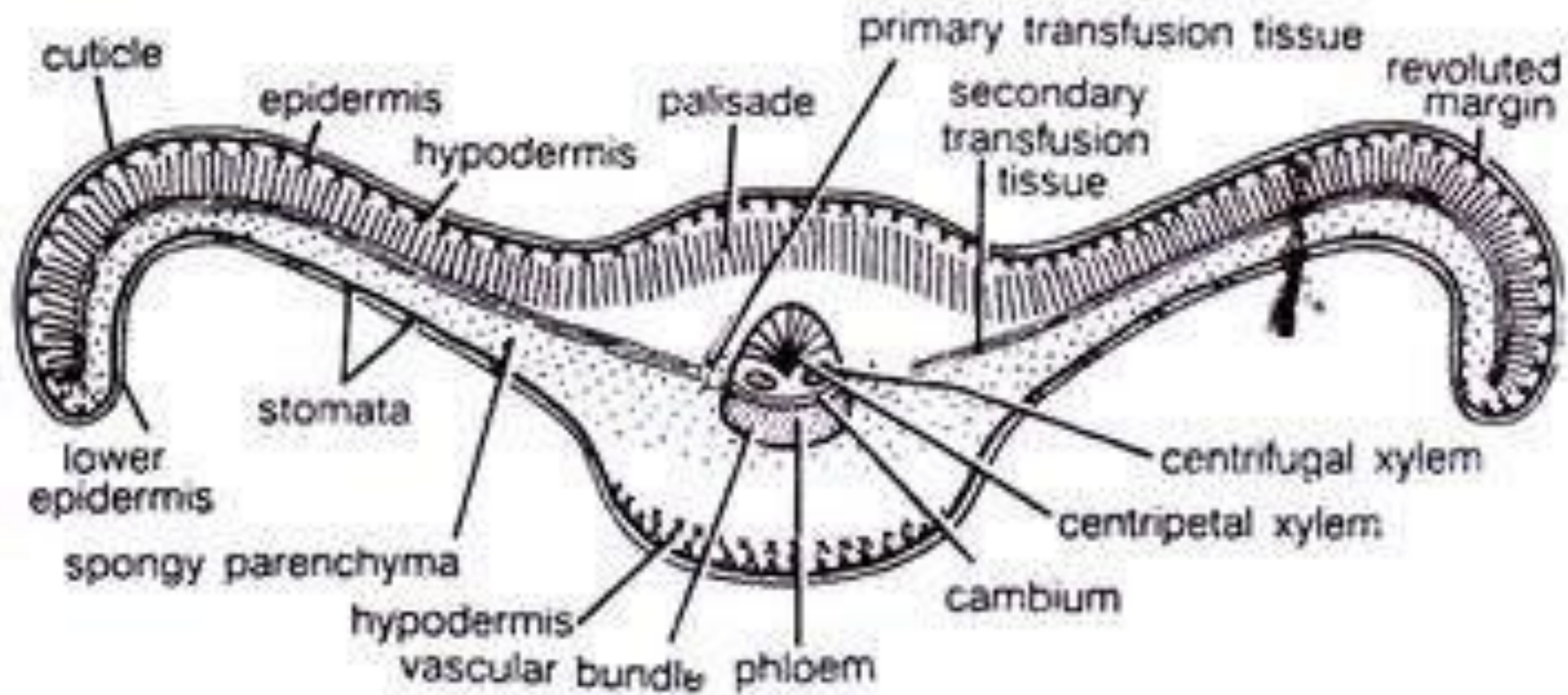


Fig. 8.28. *Cycas revoluta*. T.S. leaflet (diagrammatic)

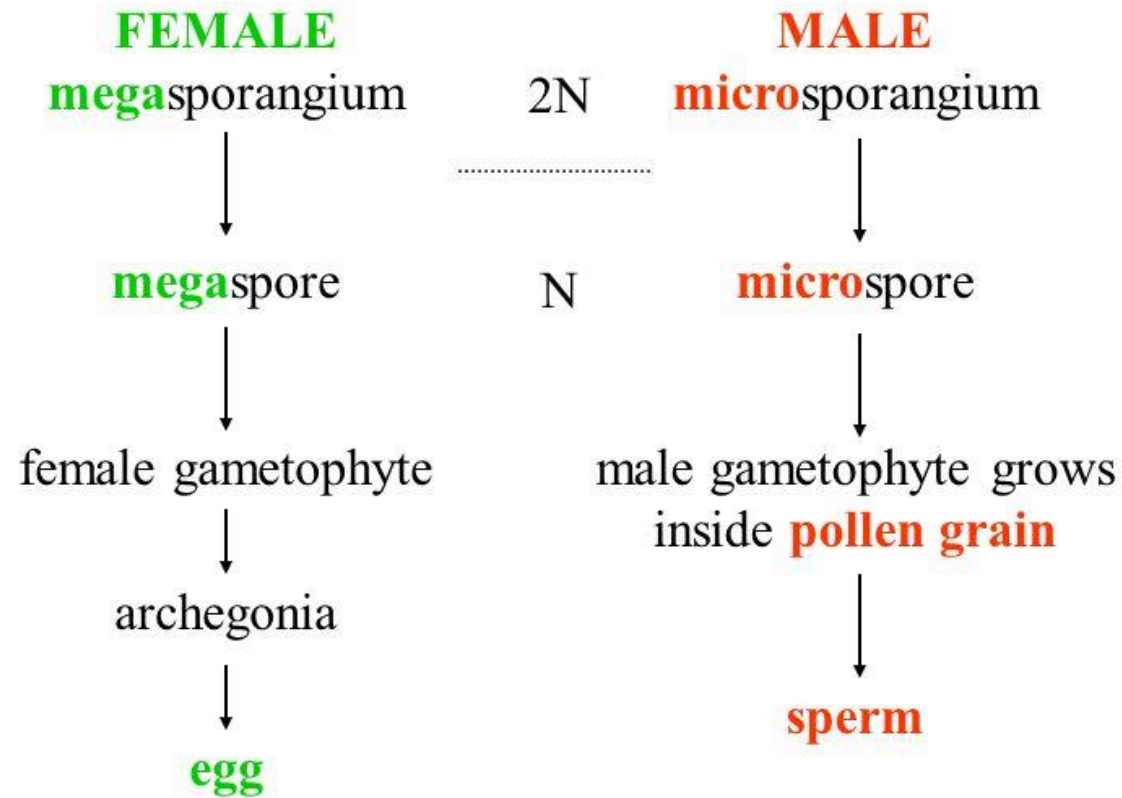
- **REPRODUCTION IN GYMNOSPERMS;**

- The plants are usually HETEROSPOROUS i.e, Produce two different kinds of spores.
- THE MALE -----**MICROSPORES**, and
- FEMALE-----**MEGASPORES**.
- **Microspores** are borne inside the **Microsporangia**. Which are borne on the lower surface of **Microsporophylls**.The microsporophylls are aggregated in the form of compact structures called **male cones**.
- **Megaspores** are borne inside the **Megasporangia[ovule]**. Which are borne naked on **megasporophylls**.The megasporophylls are aggregated in the form of **Female** cones.
- On germination ,the microspores[Haploid] produce **MALE GAMETOPHYTE**.
- POLLINATION is ANEMOPHILOUS.[WIND POLLINATED].[as the microspores need to reach the female structures].

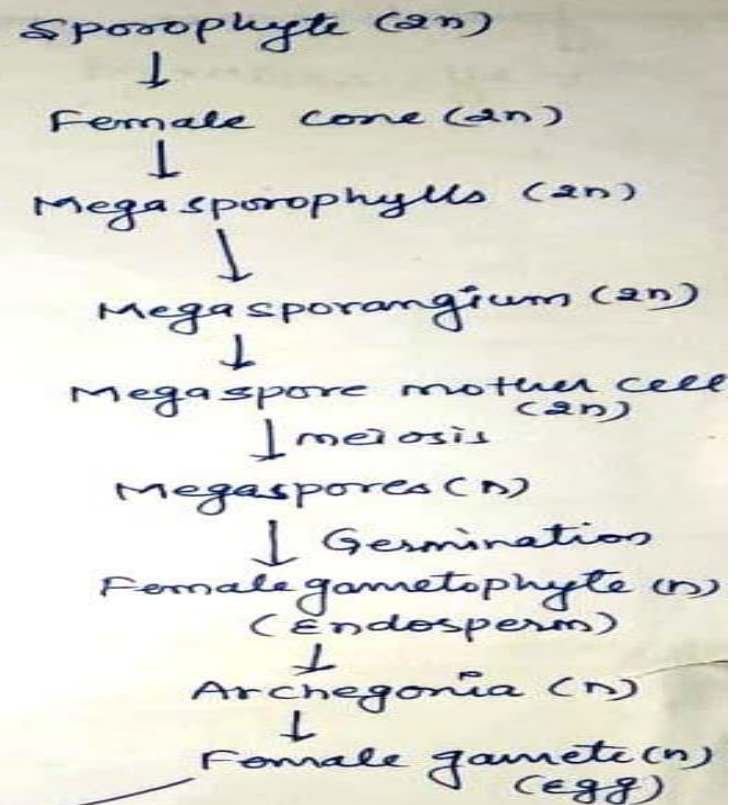
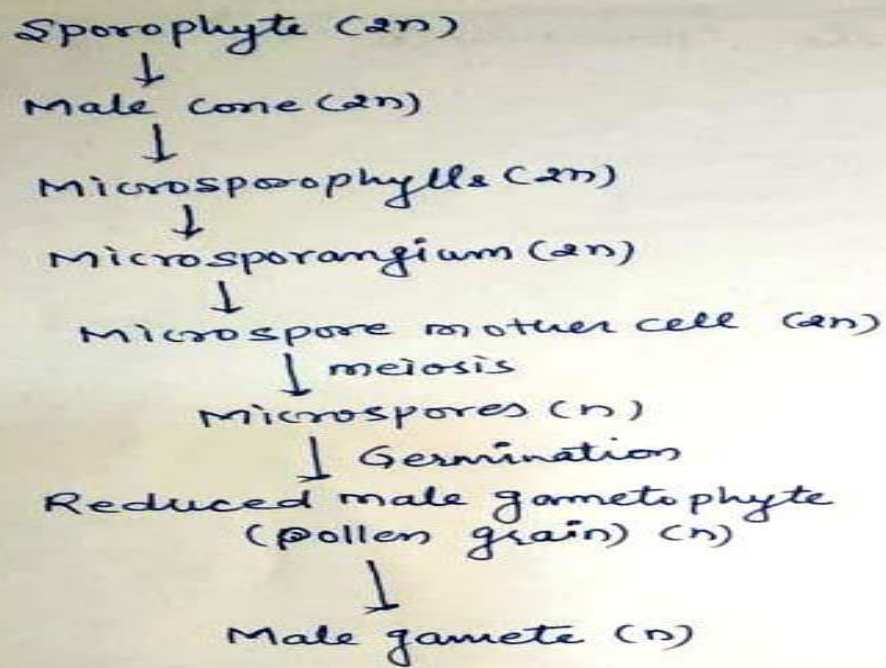
- The Haploid Megaspore develops into female gametophyte [ENDOSPERM].
- The mature Female gametophyte possesses Archegonia.
- Each Archegonium, possesses Single egg and a venter canal cell. THE NECK CANAL CELLS ARE ABSENT.
- FERTILIZATION occurs by SIPHONOGAMY, i.e, the male sperms are carried to the archegonia through POLLEN TUBE.
- Fusion of male and Female nuclei results in the formation of DIPLOID ZYGOTE.
- ZYGOTE is the first cell of sporophytic generation.
- ZYGOTE is the first cell of SPOROPHYTIC GENERATION.

Gymnosperms

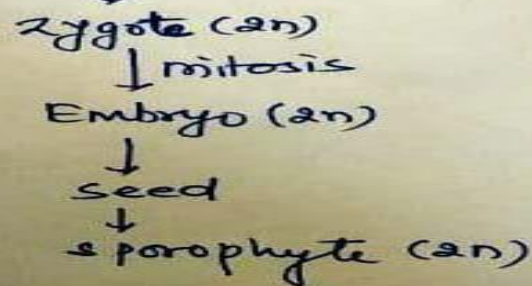
Sporophylls: modified leaves that contain sporangia (spore-producers)



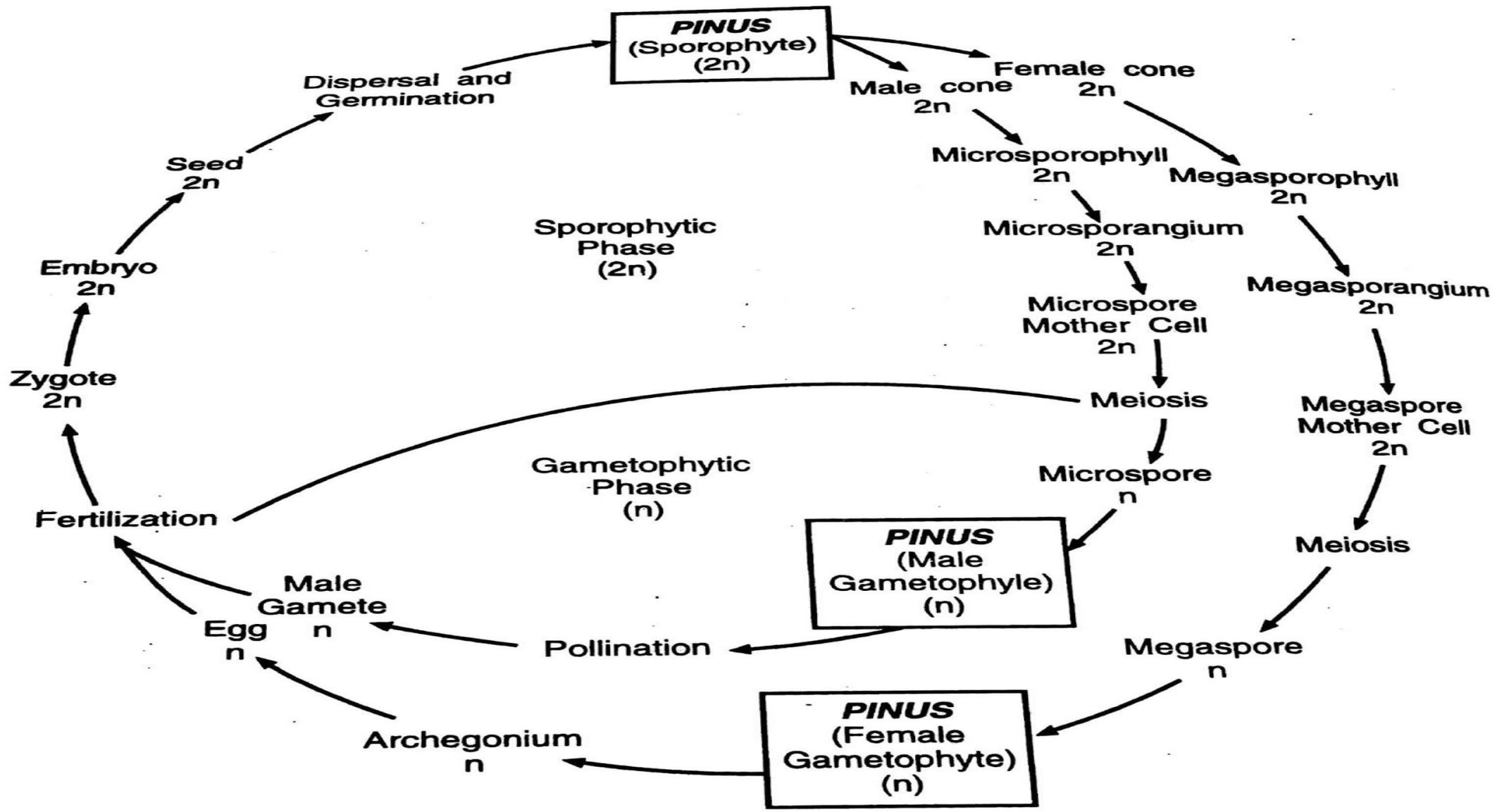
Life cycle of gymnosperm :-



Fertilization
by
Zoido-siphonogamy
OR
Siphonogamy.



- After FERTILIZATION, the zygote develops into EMBRYO.
- The development of zygote is MEROBLASTIC, i.e.; only the BASAL part of zygote develops into embryo, the remaining upper and lower parts give rise to HAUSTORIUM and SUSPENSOR respectively.
- The most characteristic feature in the EMBRYOLOGY of gymnosperms is the occurrence of POLYEMBRYONY. [DEVELOPMENT OF MORE THAN ONE EMBRYO IN THE SEED].
- However only one EMBRYO matures and the rest degenerates.
- OVULE [megasporangium] IS FINALLY CONVERTED INTO SEED.
- TRUE FRUITS ARE NOT FORMED AND THE SEEDS ARE UNPROTECTED .



thank
you