

Model Answer
Guru Ghasidas Vishwavidyalay
B.Sc. (Botany) V Semester
Paper – LBC 502
Comparative Study of Phanerogams

AS - 2846.

Ans. 1.

- i. b. *Gnetum*
- ii. c. Both of the above
- iii. a. *Gnetum*
- iv. c. Four nuclei
- v. a. Defensive
- vi. b. Three subclasses
- vii. b. Orchidaceae
- viii. a. Tapetum
- ix. d. *Plumbago*
- x. b. 2-4 D

Ans. 2.

General Characters of Gymnosperms:

- i. Gymnosperms (gymnos - naked, sperma = seed) are naked - seeded plants. Here the ovules are not enclosed and thus the seeds remain naked.
- ii. Most of the gymnosperms are evergreen, woody perennials with shrubby or tree like habit. They show xerophytic characters.
- iii. The main plant body is a well differentiated sporophyte consisting of root, stem and leaves. Gametophyte is reduced and is dependent on sporophyte.
- iv. Xylem consists of only tracheids. Vessels are absent except in *Gnetum*.
- v. Companion cells are absent.
- vi. Reproductive parts are generally in the form of compact and hard cones or strobili. The cones are generally unisexual.
- vii. Archegonia lack neck canal cells.
- viii. Pollination is of anemophilous type.
- ix. The ovules are covered by single integument and are orthotropous type. The ovule is a modified mega sporangium borne directly on the surface of megasporophyll.
- x. Endosperm is haploid and is formed before the fertilization.

Ans. 3.

- (i) **Organ Genera:** In paleobotany, the term is occasionally substituted for the more correct term "organ taxon", meaning a group of fossils of a particular part of a plant, such as a leaf or seed, whose parent plant is not known because the fossils were

preserved unattached to the parent plant. Names given to organ taxa may only be applied to the organs in question - and cannot be extended to the entire organism. However, because a form genus is erected on morphological grounds (which do not change when its affinity is known), a form genus that can eventually be assigned to a higher biological group should not be renamed.

While organ genera can potentially be assigned to a family (even if the other parts of the plant are unknown), form genera usually cannot, although they may be referable to higher categories.

The part of the plant is often, but not universally, indicated by the use of a suffix in the generic name.

- wood fossils may have generic names ending in *-xylon*
- leaf fossils generic names ending in *-phyllum*

Form genera - an artificial taxonomic category established on the basis of morphological resemblance for organisms of obscure true relationships especially fossil forms.

(ii) Important features of Bennettitales:

1. Stems with wide pith, stout and relatively slender and forking.
2. Leaves compound (rarely simple) with open (rarely closed) venation.
3. Stomata syndetochealic.
4. Reproductive organs hermaphrodite or uni-sexual 'flowers' protected by numerous bracts.
5. Ovules stalked, very numerous, scattered over a conical, cylindrical or dome-shaped receptacle, along with interseminal scales, micropyles protruded.
6. Seeds with two cotyledons.
7. Pollen bearing organs in a whorl, free or united, pinnate or entire with numerous microsporangia.

Important features of Pentoxylales:

1. Fossil plants, habit unknown, but probably shrubs or very small trees.
2. Long and short shoots the latter bearing reproductive organs terminally and spirally arranged leaves.
3. Stem polystelic
4. Wood rays uniseriate.
5. Leaves thick, simple, lanceolate, venation open.
6. Female organs like stalked mulberries, seeds sessile, united by fleshy outer layer of integument.
7. Male organs consisting of a whorl of branched sporangiophores, fused basally into a disc.

Ans. 4.

Family Malvaceae:

Inflorescence: Flowers solitary or cymose rarely racemose

Flower: Bracteate, bracteolate, complete, bisexual, actinomorphic, hypogynous, pentamerous

Epicalyx: Outside the calyx several bracteoles form calyx like whorl called epicalyx, they are variable in number (usually 7 in *Hibiscus*)

Calyx: Usually 5 sepals, free, polysepalous, valvate aestivation, green in colour.

Corolla: Usually 5 petals, polypetalous but basally fused, usually twisted aestivation sometimes imbricate, often coloured.

Androecium: Numerous stamens, monadelphous, anthers monothecous, reniform, extrorse, filaments of anthers fuse to form a staminal tube around the ovary.

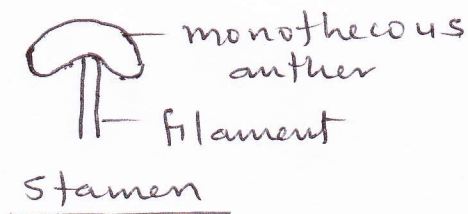
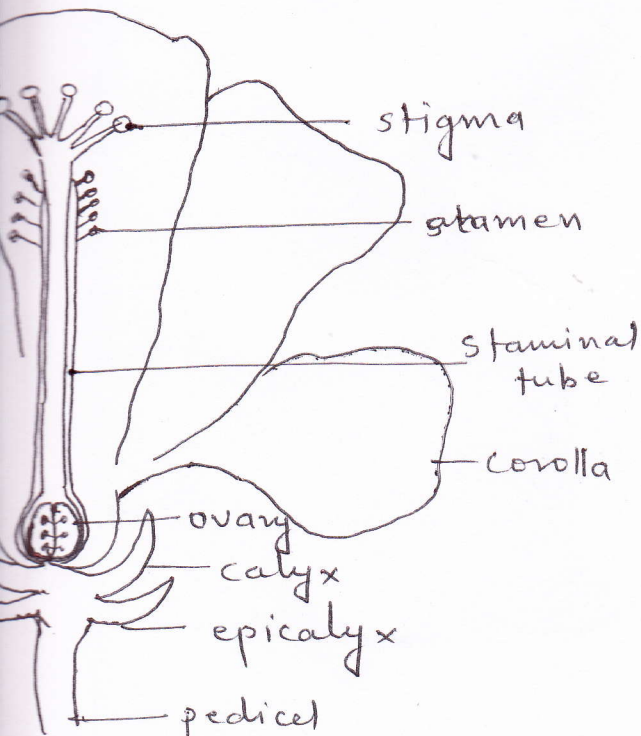
Gynoecium: 1-many carpels (usually 5 carpels) syncarpous, 2-5 locules, axile placentation, ovary superior, stigma as many as twice the carpels.

Fruit: Usually capsule

Floral formula: \overline{Br} brl \oplus ♀ Epk 5-8 $K_{(5)}$ C_5 A_{∞} $\underline{G_{(5)}}$

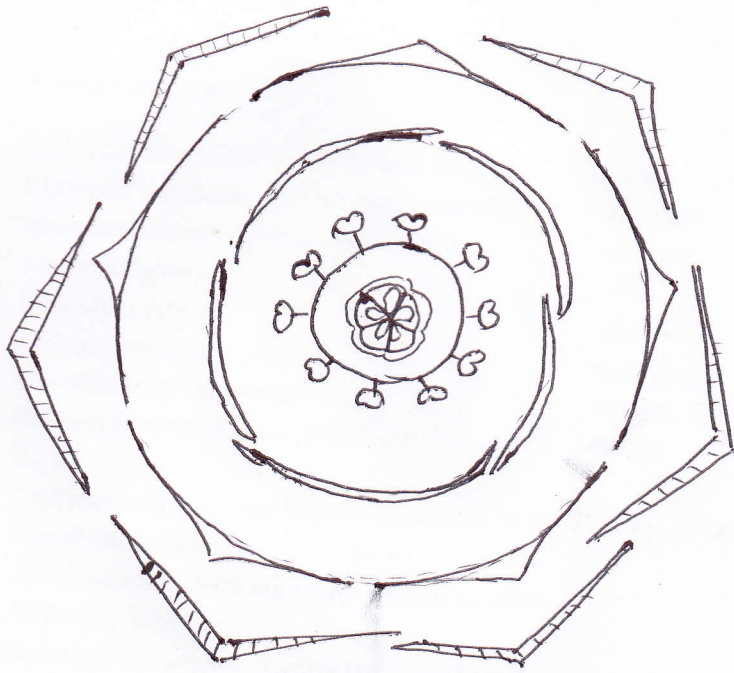
Economic Importance:

1. *Gossypium hirsutum*: (Cotton) The epidermal hairs of the seed form the commercial fibre which are used to make cotton cloths. Edible oil is obtained from the seeds.
2. *Hibiscus sabdrifa*: (Rozella hemp): bast fibres are obtained to make ropes
3. *Abelmoschus esculentus*: (Lady's finger): Fruits are used as vegetable
4. *Abutilon indicum*: Its roots are used against the fever
5. *Hibiscus rosa sinensis*: It is a common ornamental plant.



Flower

Hibiscus



Floral diagram
(Family - Malvaceae)

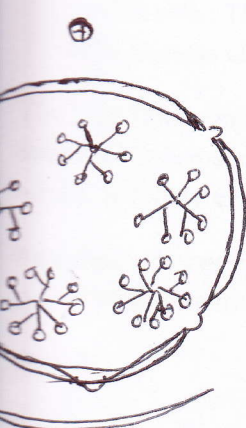
Ans. 5.

Family Euphorbiaceae

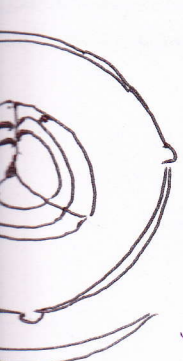
- 1. Inflorescence:** Cyathium, raceme or cyme
- 2. Flowers:** Bracteate, bracteolate, generally unisexual, actinomorphic, hypogynous rarely perigynous
- 3. Epicalyx:** Absent
- 4. Calyx:** may be present
- 5. Corolla:** may be present
- 6. Perianth:** present if calyx and corolla are absent
- 7. Androecium:** stamens highly variable 1- many free or Monadelphous, in cymose inflorescence there are many jointed stamens ditheous, introrse
- 8. Gynoecium:** usually tricarpellary, syncarpous trilocular, superior ovary, axile placentation styles 3 each bifurcate apically, nectariferous disc is present at the base of ovary.

Floral Formula:
 Male - Br ⊕ ♂ P₃₊₃ A_{1-∞} G₀
 or (3-5 or 0)
 Female - Br ⊕ ♀ P₃₊₃ A₀ G₍₃₎
 or (3-5 or 0)

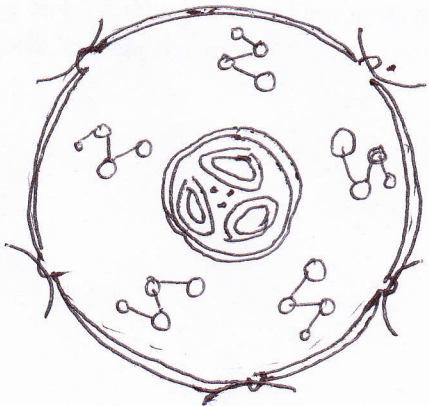
Floral diagram:



Flower
Euphorbiaceae)



Flower
Euphorbiaceae)

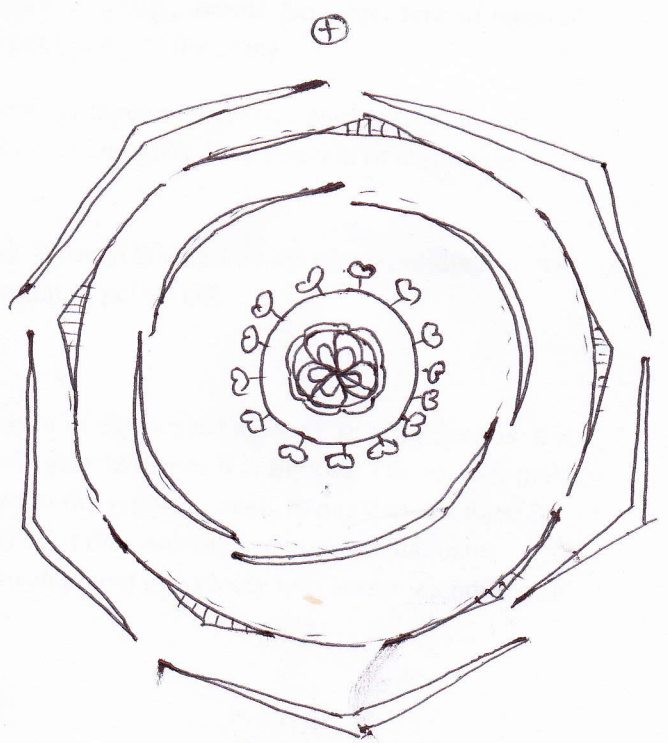


Cyathium inflorescence

Family Malvaceae

- Flowers solitary or cymose rarely racemose
 Bracteate, bracteolate, complete, bisexual, actinomorphic, hypogynous, pentamerous
- Present
 present, 5 in number, valvate aestivation
 present, 5 in number, twisted aestivation
 Absent
- 1-many, monadelphous, monotheous, extrorse
- Pentacarpellary, pentalocular, syncarpous, ovary superior, axile placentation, stigma as many as twice the carpel.

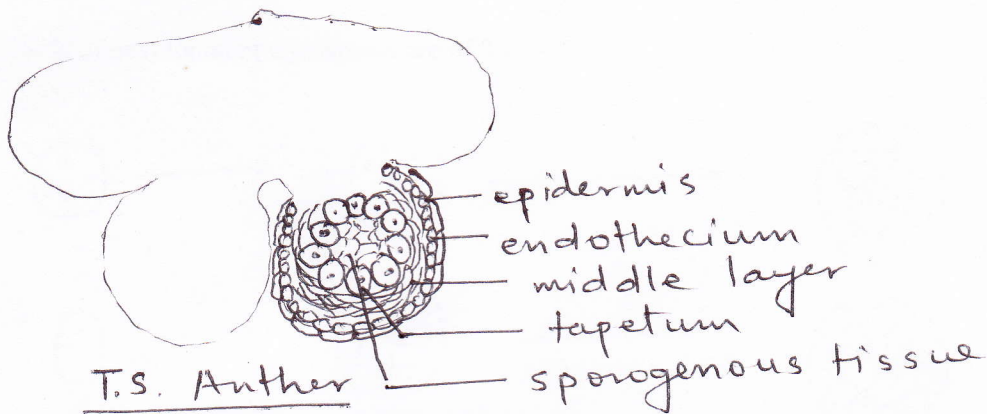
Br brl ⊕ ♀ Epk₅₋₇ K₅ C₅ A_∞ G₍₅₎



(Family Malvaceae)

Ans 6:

Tapetum: It is the innermost layer of anther wall and attains its maximum development during tetrad stage of microsporogenesis. It completely surrounds the sporogenous tissue and all the food material to sporogenous tissue pass through it. Tapetal cells are characterized by the presence of dense cytoplasm and prominent nuclei.



On the basis of behaviour the tapetum is of two kinds-

1. Amoeboid tapetum
 2. Secretory tapetum
1. **Amoeboid tapetum:** It is characterized by the early break down of the inner and radial wall of its cells. The breakdown of the tapetal cell wall occur at the premeiotic stage of sporogenous tissue due to the hydrolytic enzymes released by lysosomes present in tapetal cells. It is found in *Tradescantia, Typha*.
 2. **Secretory tapetum:** In this type the tapetal cells remain in its original position throughout the microspore development. Food substances are supplied to the anther sac by secretion of the tapetal cells. This kind of tapetum is found in majority of angiosperms. Secretory type of tapetum cells possess ubisch bodies which is involved in thickening of the exine.

The total DNA content of both the amoeboid and secretory tapetum increases enormously during meiosis in microspore mother cells. This is achieved by endomitosis, by formation of restitution nuclei, and polyteny.

Function of tapetum: Food substances are transferred through tapetum which also contributes to the pollen wall formation. It also contributes to the formation of pollen kitt.

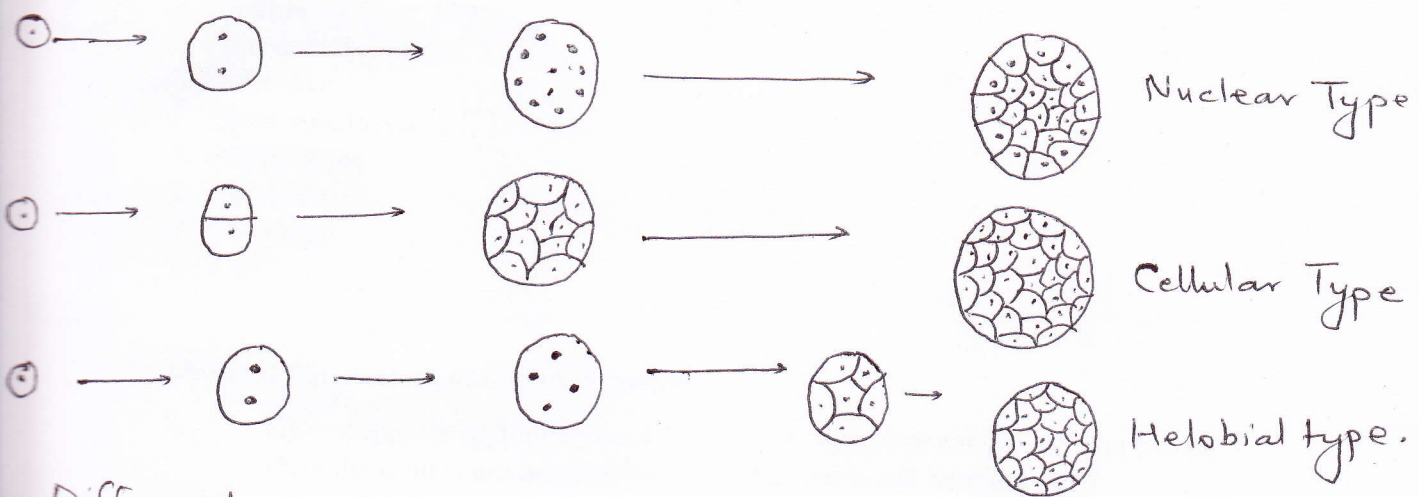
Ans. 7.

Endosperm: It is the nutritive tissue for the development of developing embryo. In angiosperms it is formed by the fusion between 2 polar nuclei and a male gamete hence, it is triploid. The another male nucleus fuses with the nucleus of the egg cell which form the zygote. Hence, in angiosperms there is two fusion events which is called 'Double Fertilization'. But the chromosome number fluctuates greatly depending on kindof embryosac. During its development polyploidy may occur in endosperm cells by endomitosis, nuclear fusion etc.

Seeds may be endospermous like cereals, coconut, or non-endospermous like beans, peas. The endosperm formation is suppressed or all together absent in Orchidaceae, Podostemaceae and Trapaceae.

Endosperm cells are isodimetric and store large amount of food material. Young endosperm fo coconut and maize containg growth substances like auxin, cytokinins .

On the basis of development endospems are of 3 kinds-



Different types of endosperms on the basis of development

1. **Cellular type:** Here the nuclear division is accompanied by wall formation. The occurrence of haustoria is common feature of this type of endosperm. Eg. Magnolia
 2. **Nuclear Type:** Here the primary endosperm nucleus undergoes several free nuclear division which are not accompanied by cytokinesis. Eg. Coconut
 3. **Helobial type:** It is intermediate type i.e. both the free nuclear division and wall formation stages may occur eg. *Lathyrus*. Such kind of endosperm is found in mainly in Monocots.
- These endosperms differ with each other on the basis of nuclear and cell division.