AS-2984 Model Answer

B.Sc. (Rural Tech) III Semester
Examination - 2013
Botany Paper- First.
Morphology of Gymnosperm and Angiosperm

Section - A.

Answer :

(i) (d) Many
(ii) (a) Pycnoxylic
(iii) (a) Natural
(iv) (c) Hutchinson
(v) (d) xylem
(vi) (a) Root
(vii) (c) Both (a) and (b)
(viii) (b) Kaner
(ix) (a) Nawaschin
(x) (c) Triploid.

Section B'

Qu 2. (2)

Ans General features of Gymnosperms:

1. Plants are woody, perennial trees or shrubs.
2. Plant body is sporophytic which is differentiate into root, stem and leaves.
3. Leaves are dimorphic
   (a) Green leaves — foliage leaves
   (b) brown leaves — scale leaves
4. Foliage leaves are pinnately compound e.g. Cycas In-Pinus, these leaves are called needles.
5. In stem, the vascular bundles are conjoint, collateral open, and endarch.
6. Wood is compact which is called as pycnoxylic, but wood of Cycas is loose which is called as manoxylic.
7. Generally xylem lacks vessels and companion cells are absent in phloem.
8. Reproductive organs are called cones which are usually unisexual.
9. Numerous microsporophylls are arranged on the axis of male cones. Each microsporophyll bears numerous microsporangia which contain microspores or pollen grains.
10. Ovules are borne directly on the sporophylls and ovules are of orthotropous type.
11. Pollination takes place by wind.
12. Double fertilization is absent. The embryo develops from the basal part of zygote.
13. Polyembryony present. True fruits are not formed due to absence of the ovary.
14. Seeds are not enclosed within the ovary wall, therefore they are called naked seeded plant.
15. There is a distinct alternation of generation in the life cycle of plants.

Qu 3.

Ans. Merits and demerits of Bentham and Hooker's classification system of Angiosperm.

Merits:

1. This system is accepted by the whole British empire, USA and other European countries.
2. This system is very easily workable and is important from the point of its field applications.
3. It includes around 202 orders which are named as families.
4. This classification system begin with the family Ranunculaceae and end with the family Graminae.
5. In this system the greater emphasis has been given to on free and fused petals and Dicotyledons are divided into three groups— Polypetalae, Gamopetalae and Monochlamydeae.
6. Addition of Disciflorae and a curious arrangement of dividing certain groups on the basis of aquatic and terrestrial characteristics.
7. In monocotyledons, greater emphasis has been given on the characters of relative position of ovary and perianth.
8. Dicots are placed before monocots, which is considered correct and accepted by all botanist.

Demerits

1. Gymnosperm have been placed between Dicots and monocots for the sake of convenience instead of affinities.
2. Retention of the group Monochlamydeae, a number of orders which show affinities with the plants having biseriate perianth.
3. This system is mainly based on single character, as a result, such families that exhibit a very close relationship have been separated from each other.
4. Such orders and families which have inferior ovary have been placed second in polypetalae whereas the plants having inferior ovary have been placed first in gamopetalae.

5. The greater stress has been given on the relative position of ovary and perianth characters rather than comparative study of orders to determine affinities.

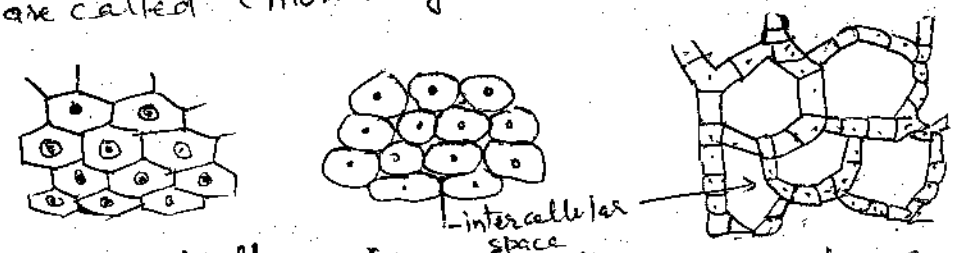
6. Some orders (families) like Orchidaceae and Scitamineae in which the corolla is complex and flowers are epigynous, have been called primitive. But other orders (families) like Gramineae and Cyperaceae that have simple flowers have been called more advanced.

Q. 4. Simple permanent tissue ?

Ans. Generally three types of simple permanent tissues are found in plants.

(1) Parenchyma (2) Collenchyma (3) Sclerenchyma.

(1) Parenchyma: The cells are living, thin walled and isodiametric with intercellular spaces. They form the major part of the plant body. The cells of aquatic plants have very large air spaces, hence, they are called aerenchyma. Some cells contain chloroplasts which perform photosynthesis are called chlorenchyma.



Compact cell Intercellular space Aerenchyma

Kinds of Parenchyma

The main function of parenchymatous cells is storage of food material and water.

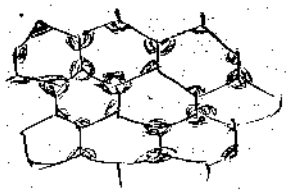
(2) Collenchyma: The cell are living and large in size. Thickening present at the corner and it is due to the presence of cellulose or pectin. It provide

internal strength to the plant. It forms hypodermis in dicot stems. It also stores food and performs photosynthesis (if chloroplast present). It is mainly three types:

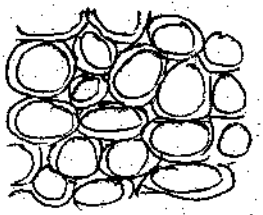
(i) Angular: when thickening occurs at the angles.

(ii) Lacunar: when thickening is localised bordering the cell-wall with intercellular spaces.

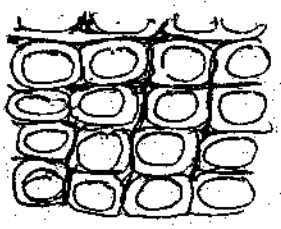
(iii) Lamellar: when thickening is found tangential to the cell wall.



Angular



Lacunar



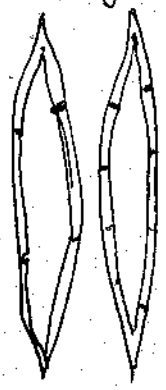
Lamellar

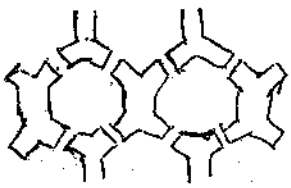
Various types of Collenchyma

3. Sclerenchyma: This tissue is made up of dead cells and walls with lignified thickening. They provide mechanical strength to the plants. They are of two types:

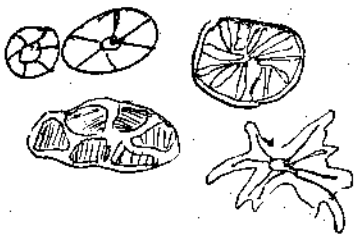
(i) Sclerenchymatous fibre: They are long with lignified walles. Their both ends are long and pointed. Their lumen is very narrow. They are present in phloem, pericycle and xylem.

(ii) Stone cells or sclereids: These cells are of uniform shape, and large amount of lignin is deposited on their walls. They are of different shapes. They are usually present in the hard seed coats.





Sclerenchymatous fibre (L.S. & T.S)



Stone cells.

Qu. 5.

Ans.

Phyllotaxy: The arrangement of leaves on stem is called phyllotaxy. The arrangement of leaves is always regular, i.e. the leaves are never arranged on stem in irregular manner. This arrangement is based on mathematical pattern. It is of two type:

(A) Cyclic phyllotaxy

(B) Alternate or spiral or Acyclic phyllotaxy

(A) Cyclic phyllotaxy: The leaves at each node form a whorl with the leaves placed on a circle in which the angles between adjacent leaves are the same.

(i) Opposite phyllotaxy: In this type of cyclic phyllotaxy the two leaves at each node are always opposite to each other and these two leaves at an angular distance of two right angle (180°).

If the successive pairs of leaves forms right angle to one another, the arrangement is called opposite decussate. ex. Calotropis

If the succesive pairs of leaves are placed exactly on top of one another, the arrangement is called opposite superposed. ex. Quisqualis

(ii) Verticillate phyllotaxy: If there are more than two leaves in a whorl, the arrangement is called verticillate phyllotaxy: ex. Alstonia, Nerium.

(B) Alternate: When only one leaf present on the node and angular divergence between any two consecutive leaves is constant is called Alternate phyllotaxy. All leaves are found to lie in a fixed number of vertical rows called orthostichies and these orthostichies are evenly distributed in a circle and the angle between the adjacent orthostichies being constant. The angular divergence can be denoted by finding out a leaf which is exactly above the particular leaf.

Alternate phyllotaxy may be categorise as follows.

(i) Distichous or 1/2 phyllotaxy
(ii) Tristichous or 1/3 phyllotaxy
(iii) Pentastichous or 2/5 phyllotaxy
(iv) Octastichous or 3/8 phyllotaxy

Q4 C.

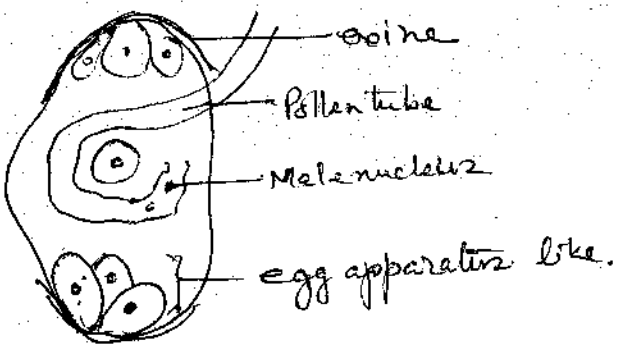
Ans: Pollen embryo sac:

Nemac (1898) noted that the pollen grain in the petaloid anthers of Hyacinthus orientalis, form large eight nucleate structure showing a surprising resemblance to embryo sacs. hence called - pollen embryo sac. He explained that generative nuclei degenerates in these pollengrains but the vegetative nuclei divides three times so that eight nuclei are formed.

Later on De Mol (1923) observed this phenomenon in the anthers of other varieties of H. orientalis. According to him this abnormality was due to a duplication of the generative nuclei.

Stow (1934) found similar embryo sac like pollen grain. According to him secretion of necro-hormone takes place by the dead pollen grains. This hormone helps the dividing nuclei and pollen grain nucleus exhibits abnormal behaviours, as a result of which 8 nuclei are formed and its three nuclei out of eight, give rise to an egg apparatus while the other three nuclei give rise to antipodal cells. The remaining two nuclei fuse in the centre and form the secondary nucleus.

Nathani (1937) suggested that temperature treated bulbs of H. orientalis is the causal factor and the death of some pollen induces hyperthrophy of others.

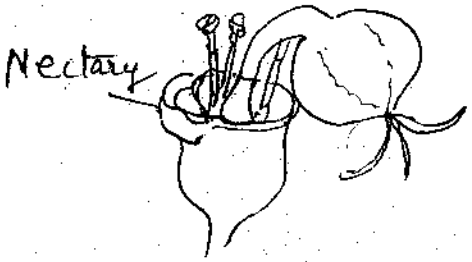


Pollen embryo sac

Qu 7.

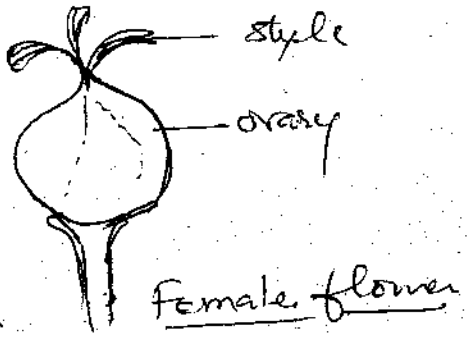
Ans: Cythium inflorescence:

It is a special type of inflorescence. It is found in family Euphorbiaceae. It consists of a cup-shaped involucre having nectar. The female flower is present at the centre surrounded by numerous male flower. The female flower is present as carpel and male flowers as stamens.

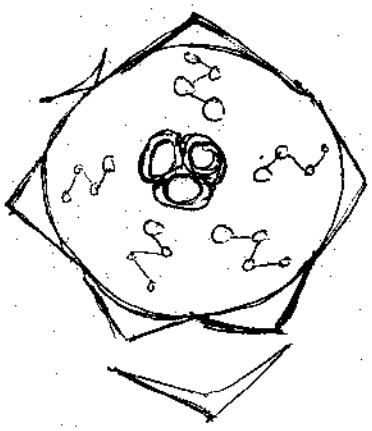


Inflorescence.

male flower



Female flower



Floral diagram E. pulcherrima

Section - C

Long answers

Answer 8.

Following structure has been found in the internal structure of cycas root:

Epiblema: It is the outermost and single layered.

Cortex: It is situated just below the epiblema and it composed of numerous thin walled parenchymatous cells. Intercellular spaces are found in this region. The cells of cortex are filled with starch and dark brown coloured tannin cells are present in the cortex.

Endodermis: Single layered and situated inner to cortex. Casparian strips are present in its cells

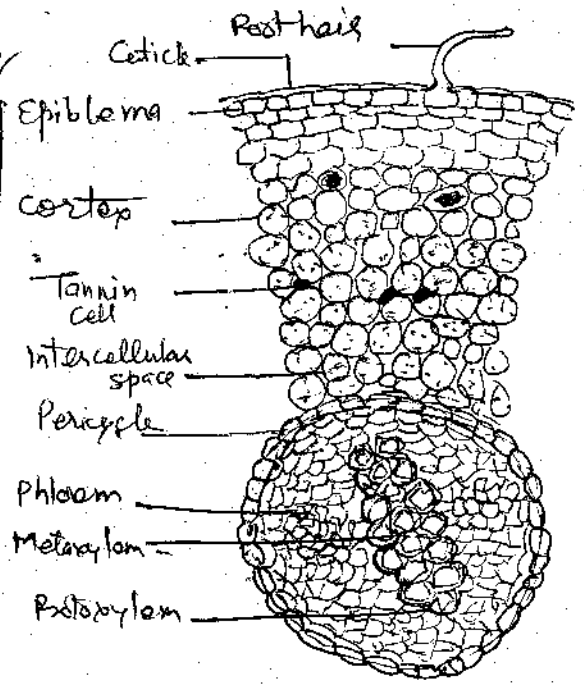
Pericycle: Multicellular parenchymatous pericycle is present just below the endodermis.

Stele: It is diarch in young stage but later on it become tetrarch.

Xylem: It is generally diarch and exarch. Metaxylem is present towards the centre and protoxylem towards the periphery.

Phloem: It is situated in the alternate manner to the protoxylem which consists of sieve tubes and phloem parenchyma.

Pith: It is usually absent.



T.S. of Normal tap root.

Secondary growth occurs in the old root as a result of which the concentric rings of vascular bundles and peridarm are formed.

In coralloid root of Cycas, the cortex is very wide which is made up of parenchymatous cells. Cortex is differentiated into three zones; (1) Outer cortex (2) Inner cortex (3) Algal zone (blue green algae present)

Q. 9.

Answer: Following structures are present in T.S. of monocot stem (Zea mays)

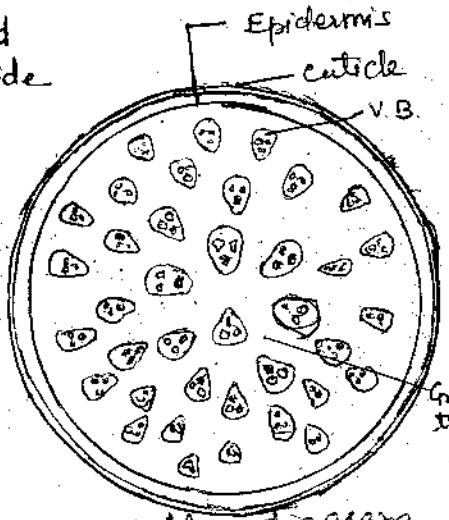
1 Epidermis: This is uniseriate and cuticle is present on its outer side

2 Cortex: In this cortex and ground tissue system are clearly differentiated. Hypodermis present just below the epidermis. This layer is made up of sclerenchymatous cells. All the ground tissue present internal to the hypodermis consist of thin walled parenchymatous cells having intercellular space. V.B. are embedded or scattered in the ground tissue.

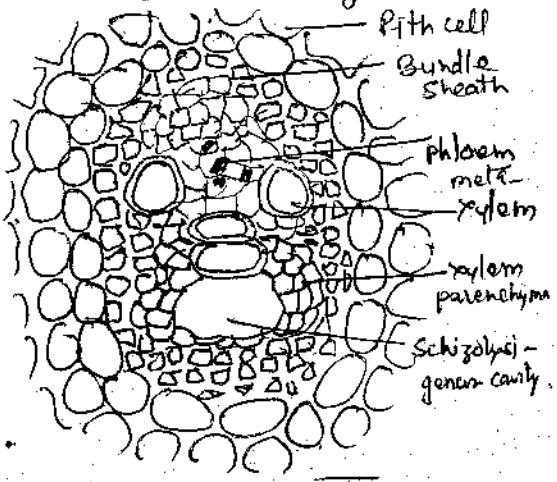
3. Endodermis: It is absent.

4 Pericycle: It is also absent.

5. Vascular bundles: V.B are conjoint, collateral and closed. Xylem occurs in the form of letter 'Y' having two metaxylem with wider cavities at the two arms and one or two protoxylem at the base. In a mature vascular bundle xylem elements undergo more and more lignification. as a result, the lowest protoxylem disintegrates forming a lacuna or cavity called protoxylem cavity or schizolysigenous cavity. Phloem is small and consist of only sieve tubes and companion cells but phloem parenchyma is absent. The whole V.B is surrounded by sclerenchymatous cell forming bundle sheath.



outline diagram

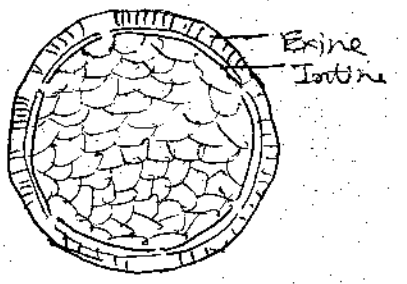


V.B. of the stem

Qu 10.

Answer:

Structure of microspore: Microspore or pollen grain is first cell of male gametophyte. Its size is very small. Dense cytoplasm is present in each pollen grain, in the middle of which a nucleus is present. Its outer wall is thick which called exine and inner wall is thin called intine. There are 2-4 germ pores on the exine. The exine, tough cutinized layer, which is often provided with ornamentation or sometimes smooth. The exine is made up of complex substance calle sporopollenin. The intine is a thin, delicate cellulose layer.



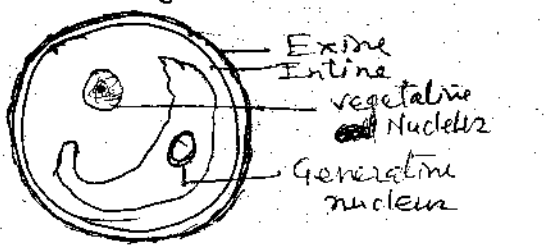
Pollen grain

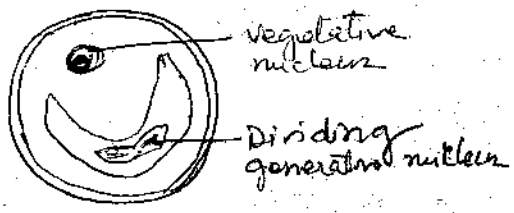
Development of male gametophyte:

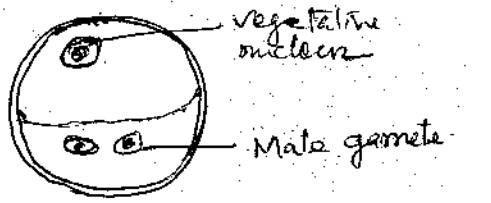
The development of male gametophyte is remarkably uniform in angiosperms. Usually development of male gametophyte starts inside the anther but its further development takes place after pollination.

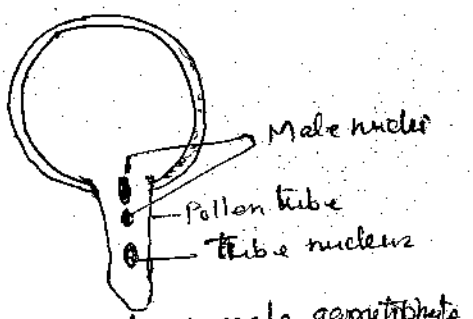
The pollen grain nucleus divides and a larg vegetative cell and small generative cell are formed. Vegetative nucleus does not divide. It forms vegetative cell or tube cell. Pollen grain liberates from microsporangia at two cell stage and further development takes place after pollination.

After pollination.









Development of male gametophyte

this generative cell separates from pollen grain wall and comes in the cytoplasm of vegetative cell. Pollen tube is formed from vegetative cell. It was considered previously that the vegetative nucleus direct the growth of the pollen tube but according to Swig (1937) vegetative nucleus is a vestigial structure without any role in the growth of the pollen tube.

Second division take place in generative nucleus only. This division may take place either in the pollen grain or in the pollen tube, and give rise to two male nuclei or male gametophyte.

Qu 11

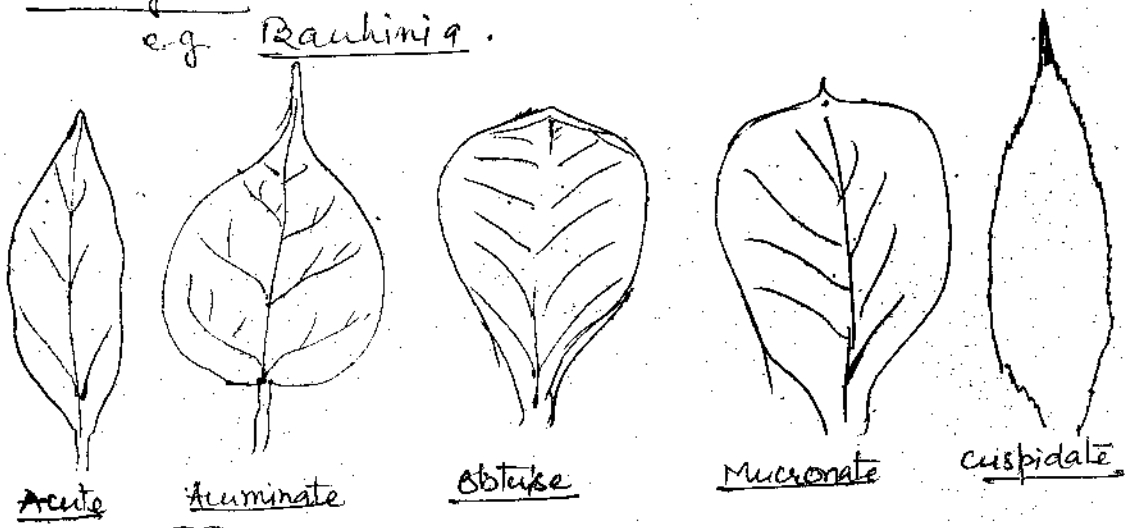
Answer:

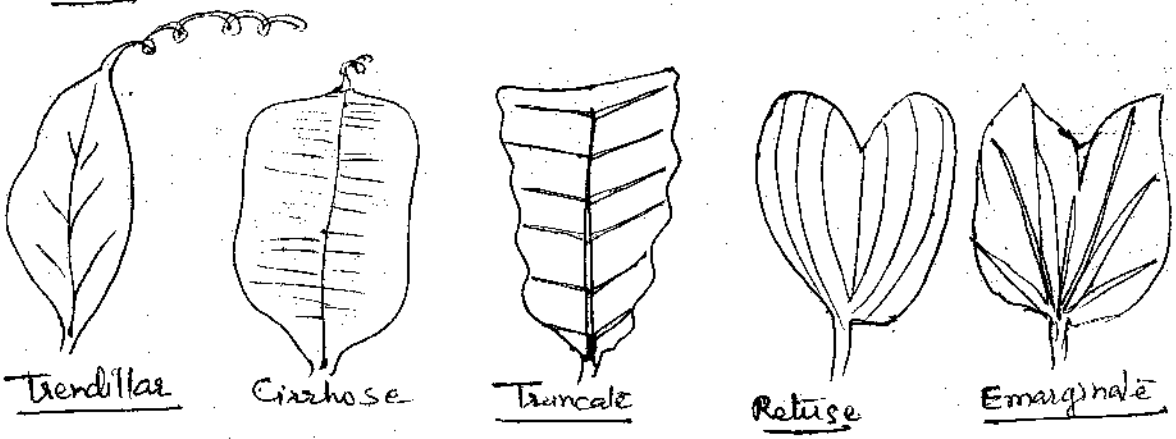
Leaf Apex: Following types of leaf apex is found in the leaves:

1. Acute: When apex forms a pointed and narrow angle e.g. Hibiscus, Mango.
2. Acuminate: When the apex is drawn out into a long tapering tail e.g. Ficus religiosa
3. Obtuse: When the apex is broad angled and blunt e.g. Bongan.
4. Mucronate: When the apex is broad but the tip ends into a small sharp point. e.g. Vinca rosea
5. Cuspidate: When the apex ends into thick and fleshy spinous structure e.g Agave
6. Trendrillar: When the apex forms a tendril which helps in climbing on other plants e.g. Gloriosa
7. Cirrhose: When the mucronate-like apex ends in a fine thread-like structure e.g. Banana.
8. Truncate: When the mucronate-like apex is abruptly cut across. e.g. Paris polyphylla

9. Retuse: When the obtuse apex is slightly notched e.g. Cliteria.

10. Emarginate: When the obtuse apex is deeply notched. e.g. Bauhinia.





Leaf Surface:

1. Glabrous: When surface is smooth and without hairs.
2. Glaucous: When the surface is smooth and shiny
3. Rough or scabrous - When the surface is rough and hard to touch.
4. Glutinous: When the surface is sticky.
5. Spiny: When the surface is covered by small spines
6. Hairy: When surface is covered by hairs.

On the basis of shape, size and position of hairs, the hairy surface may be of the following types:

(a) Puberulose - When the hairs are microscopic.

(b) Velutinous - When the surface covered by silky hairs. Hairs straight, apical and distinctly hard.

(c) Sericeous - When surface is covered by silky soft and curved hairs.

(d) Tomentose - When hairs are short, dense and cottony

(e) Wolly or Lanate - When have are long, soft and wollen like.

(f) Villous or shaggy - When hairs are long, soft and closely cosanged.

(g) Pilose - When hairs are long more or less stiff and scattered.

(h) Scabrous - When covered by hard hairs and rough to touch.

(i) Strigose - When surface is covered by stiff, rigid straight hairs which are hard swollen from lower side

(j) Hispid - When surface is covered by hard and rigid hairs

(k) Hirsute - When covered by rough and/or thick straight hairs.

(l) Setellate:- When surface is covered by wire like hairs.