

AS-2918

B.Sc. (First semester) Examination, 2013

Forestry

Paper: fourth - (Introductory botany)

Q. (1) chooses the correct answer:

Fill in the blanks

- (1) The root of tinospora plants are long, slender hanging and green which carry on photosynthesis.
- (2) In Gymnosperm the ovary is absent.

Multiple choices:

- (3) Aestivation is the arrangement of
 - a) Leaves
 - b) Petals
 - c) Branches
 - d) All of above

ANS (b) Petal

- (4) Ginger is the modification of:
 - a) Stem
 - b) Root
 - c) Rhizome
 - d) Tuber

ANS (c) Rhizome

Define the stem:

- (5) AMPHIBASAL: In concentric vascular bundle if the xylem surrounded the phloem, it is called amphibasal as formed in dracacha

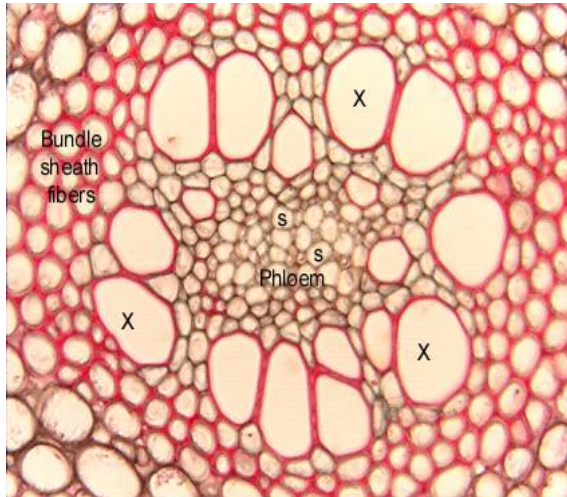


Figure: amphivasals

- (6) **Pneumatophores:** _ many plants are growing in the marshy places and salt lakes develop special kind of root called pneumetophores or respiratory roots for the purpose of respiration.
- (7) **Venation:-** the arrangement of the veins and the vein lets in the leaf blade is known venation (rationale & parallel)
- (8) **Bark:** - since the bark is the mass of dead tissue lying in the peripheral region of the plant body as a hard dry covering its function is protection.
- (9) **Pollination:** - pollination is the transfer of the pollen grains from the anther of a flower to the stigma of the same flower or of another flower of the same.
- 10) **Lanceolate leaf:** - when the shape of leaf like shat of a lance, as in bamboo, olender, etc.

Q. no. (2) Discuss the classification of cryptogams?

ANS:- In the old system of Eichler (1839 – 1887) plant kingdom approximately 3,00,000 species of plant were divided into two major group : -

Group I – cryptogamas – are lower plant which do not bear flower or seed and and are commonly known as flowerlees plant or seedlees plant.

Group II – phanarogamas or spermatocytes (seed plants) – are advance type of the vascular plants which always bear the seed that are evident it nacked eyes.

Division -A - Cryptogamas

Division 1 -> Thallophyta:

- (i) Thallus like plant body with no differentiation into root stems and leaves.
- (ii) Vascular tissues absent.

- (iii) Reproductive organs are simple, unicellular & non-jacketed.
- (iv) A sexual reproduction takes place by spores or zoospores during growing season.
- (v) No embryo formation after the fusion of gametes.
- (vi) This major division contains about 1, 10,000 species.

Subdivision 1 -> Algae:

- (i) Plants containing chlorophyll and thallus like plant body without true roots & leaves.
- (ii) In many of the algae chlorophyll is masked by brown, red or yellow pigments.
- (iii) Algae are divided into a number of classes on the basis of pigments and other features.

Class 1: Cyanophyceae-Blue green algae

Class 2: Chlorophyceae-Green algae

Class 3: Phaeophyceae-Brown algae

Class 4: Rhodophyceae-Red algae

Class 5: Xanthophyceae-Yellow green algae.

- (iv) Algae are microscopic, unicellular to larger multicellular plants.
- (v) In algae, generally the reproductive organs are unicellular but they may be multicellular in some brown algae.
- (vi) In multicellular reproductive organs all the cells are fertile and take part in reproduction.
- (vii) There is no jacket of sterile cells surrounding the reproductive organs.

Subdivision 2 -> fungi:

- 1) These plants grow mostly in places where organic material living or dead is present.
- 2) The thallus is simple unicellular or multicellular and is known mycelium it leaves root stem leaves vascular system and diploid embryonic stages
- 3) Usually the thallus is colorless non chlorophyllous thread like structure called hyphae
- 4) The mycelium in some fungi is coenocytic
- 5) Mode of nutrition is heterotrophic either as parasite or as saprophyte.

The important representative of the fungi are bacteria, yeast, molds, rhizopus, penicillium, etc. on the basis of different types of reproduction organs fungi are divided in following six classes

- 1) Class – I - schiromycetes, e.g. bacteria
- 2) Class – II - myxomycetes e.g. slime fungi
- 3) Class – III - phycomycetes e.g. mucor rhizopus,
- 4) Class – IV – ascomycete e.g. yeast, penicillium,
- 5) Class – V - basidiomycetes e.g. agaricus, puccinia,
- 6) Class – VI - deuteromycetes e.g. imperfecti fungi,

Division 2 -> Bryophyta:

Bryophytes are green simple non vascular cryptogams showing the following features:

1. The Plant body is a gametophyte. They grow in areas which are in between the aquatic and terrestrial habitats i.e. amphibious zone and hence known as amphibious plants.
2. They have thalloid or leafy multi cellular green plant body.
3. The smallest form is microscopic (e.g. Zoopsis). The largest genus recorded so far is an Australian Dawsonia which is about 70 cms in length.
4. The dominant plant body is gametophyte (n) which is independent.
5. The plant body lacks true roots, stem or leaves.
6. Rhizoids - (root like structure) serve the function of roots.
7. The plants are green and possess chloroplasts.
8. They show autotrophic mode of nutrition.
9. Vascular tissues are completely absent.
10. Sexual reproduction is oogamous.
11. Sex organs are multi cellular and jacketed.
12. Male reproductive organ is known as antheridium. It is a club shaped structure being borne by a narrow stalk. It produces biflagellate and motile male gametes or antherozoids.
14. The female sex organ is known as archegonium. It is a flask shaped structure having a swollen base and a narrow neck.
15. Water is essential for fertilization.
16. The diploid zygote undergoes repeated divisions to form a multi cellular sporophyte.

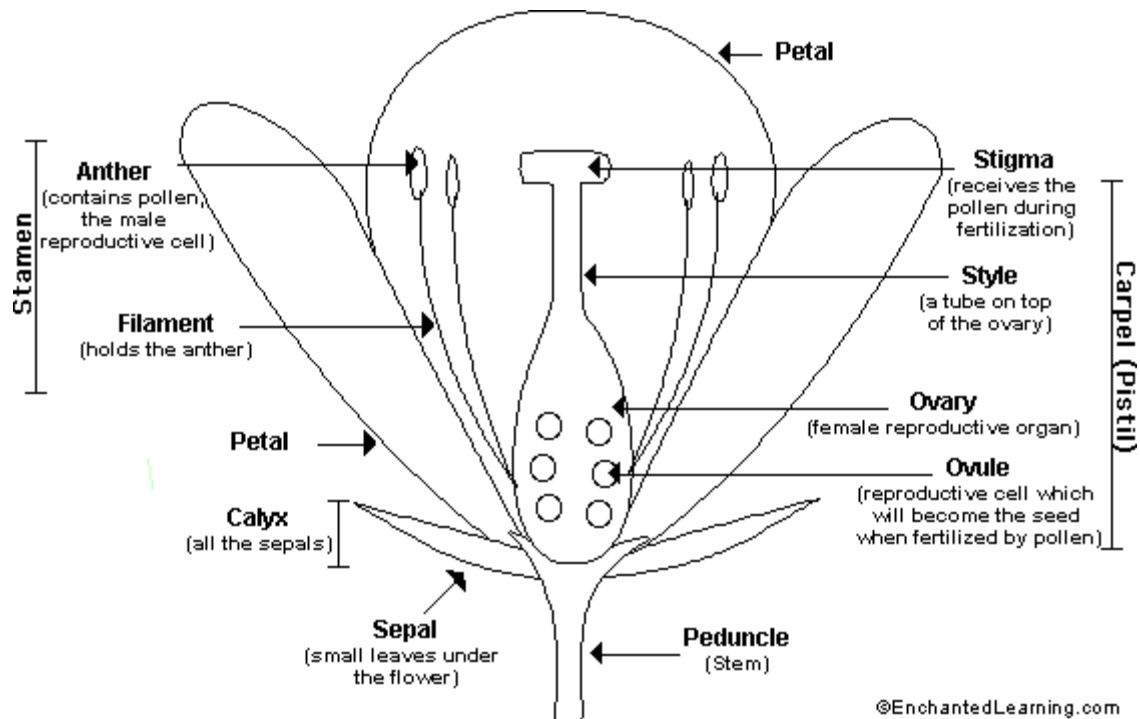
17. Sporophyte is dependent on the gametophyte for nutrition.
18. Sporophyte generally consists of foot, seta and capsule. It produces haploid spores (homospores).
19. Spores on germination give rise to gametophyte plant.
20. Gametophyte and sporophyte differ in form which alternate with each other, thus heterologous alternation of generation is seen in Bryophytes.

Division 3 -> Pteridophyta:

1. Members of this group are most primitive living vascular plants.
2. The main plant body is a sporophyte. It is differentiated into root, stem and leaves.
3. Plants (sporophyte) reproduce by spores formed in sporangia. Sporangia develop either on the ventral surface or in the axil of leaves.
4. Plants may be homosporous or heterosporous. The development of sporangium may be of eusporangiate (when develop from group of initials) or leptosporangiate. (When develop from a single initial) type.
5. Spores develop into a multi-cellular gametophytic body called prothallus - a thalloid structure. It is independent and chlorophyllous. It bears male reproductive organs called antheridia and female reproductive organs called archegonia. Reproductive organs are multi cellular and jacketed.
6. Water is essential to effect fertilization as male reproductive units are flagellated and motile.
7. Seed formation never takes place in living pteridophytes.
8. An embryo develops in situ after fertilization and the sporophyte remains attached to the gametophyte till the development of root.
9. Plants show clear alternation of generations. The sporophyte and gametophyte are independent of each other.

Q. no. 3 Explain the parts of typical flower ?

Ans :- flower is a reproductive part of any plant a flower consist two lower whorls- androecium & guynocium or pistil.



A stereotypical flower consists of four kinds of structures attached to the tip of a short stalk. Each of these kinds of parts is arranged in a **whorl** on the receptacle. The four main whorls (starting from the base of the flower or lowest node and working upwards) are as follows:

- **Calyx**: the outermost whorl consisting of units called **sepals**; these are typically green and enclose the rest of the flower in the bud stage, however, they can be absent or prominent and petal-like in some species.
- **Corolla**: the next whorl toward the apex, composed of units called **petals**, which are typically thin, soft and colored to attract animals that help the process of **pollination**.
- **Androecium** (from Greek *andros oikia*: man's house): the next whorl (sometimes multiplied into several whorls), consisting of units called **stamens**. Stamens consist of two parts: a stalk called a **filament**, topped by an **anther** where **pollen** is produced by meiosis and eventually dispersed.
- **Gynoecium** (from Greek *gynaikos oikia*: woman's house): the innermost whorl of a flower, consisting of one or more units called **carpels**. The **carpel** or multiple fused carpels form a hollow structure called an ovary, which produces ovules internally. Ovules are megasporangia and they in turn produce megaspores by meiosis which develop into female gametophytes. These give rise to egg cells. The gynoecium of a flower is also described using an alternative terminology wherein the structure one sees in the innermost whorl (consisting of an ovary, style and stigma) is called a pistil. A pistil may consist of a single carpel or a number of carpels fused together. The sticky tip of the pistil, the stigma, is the receptor of pollen. The supportive stalk, the style, becomes the pathway for **pollen tubes** to grow from pollen grains adhering to the stigma.

Although the arrangement described above is considered "typical", plant species show a wide variation in floral structure.^[1] These modifications have significance in the evolution of flowering plants and are used extensively by botanists to establish relationships among plant species.

The four main parts of a flower are generally defined by their positions on the receptacle and not by their function. Many flowers lack some parts or parts may be modified into other functions and/or look like what is typically another part. In some families, like Ranunculaceae, the petals are greatly reduced and in many species the sepals are colorful and petal-like. Other flowers have modified stamens that are petal-like, the double flowers of Peonies and Roses are mostly petaloid stamens.^[2] Flowers show great variation and plant scientists describe this variation in a systematic way to identify and distinguish species.

Specific terminology is used to describe flowers and their parts. Many flower parts are fused together; fused parts originating from the same whorl are connate, while fused parts originating from different whorls are adnate, parts that are not fused are free. When petals are fused into a tube or ring that falls away as a single unit, they are sympetalous (also called gamopetalous.) Connate petals may have distinctive regions: the cylindrical base is the tube, the expanding region is the throat and the flaring outer region is the limb. A sympetalous flower, with bilateral symmetry with an upper and lower lip, is bilabiate. Flowers with connate petals or sepals may have various shaped corolla or calyx including: campanulate, funnelform, tubular, urceolate, salverform or rotate.

Referring to "fusion," as it is commonly done, appears questionable because at least some of the processes involved may be non-fusion processes. For example, the addition of intercalary growth at or below the base of the primordia of floral appendages such as sepals, petals, stamens and carpels may lead to a common base that is not the result of fusion.^{[3][4][5]}

Many flowers have a symmetry. When the perianth is bisected through the central axis from any point, symmetrical halves are produced, forming aradial symmetry. These flowers are also known to be actinomorphic or regular, e.g. rose or trillium. When flowers are bisected and produce only one line that produces symmetrical halves the flower is said to be irregular or **zygomorphic**, e.g. snapdragon or most orchids.

Flowers may be directly attached to the plant at their base (sessile—the supporting stalk or stem is highly reduced or absent). The stem or stalk subtending a flower is called a **peduncle**. If a peduncle supports more than one flower, the stems connecting each flower to the main axis are called **pedicels**. The apex of a flowering stem forms a terminal swelling which is called the *torus* or receptacle.

The Flower:

The flower is the reproductive unit of some plants (angiosperms). Parts of the flower include petal sepal, one or more

- **Sepal** - green, leaf-like structure that protects the budding flower.
- **Petal** - colorful and often scented part of the flower that attracts insects.
- **Stamen** - the part of the flower that produces pollen. Consists of a filament and an anther.
 - **Anther** - sac located at the tip of the filament that contains pollen.
 - **Filament** - stalk that connects to and holds up the anther.

The Female Reproductive Organs:

The pistil is the collective term for the carpel(s). Each carpel includes an

ovary (where the ovules are produced; ovules are the female reproductive cells, the eggs),

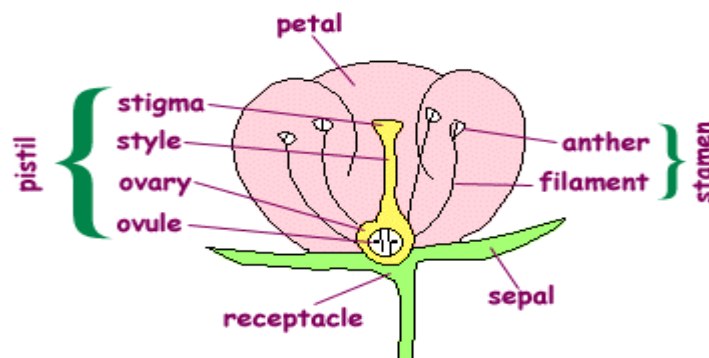
style (a tube on top of the ovary), and a **stigma** (which receives the pollen during fertilization).

The Male Reproductive Organs:

Stamens are the male reproductive parts of flowers. A stamen consists of an anther (which produces pollen) and a filament. The pollen consists of the male reproductive cells; they fertilize ovules.

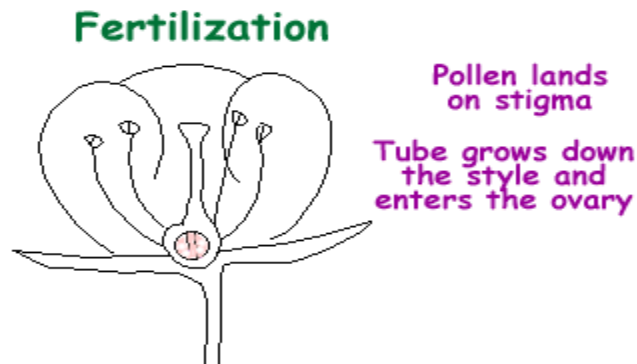
The male parts are called stamens and usually surround the pistil. The stamen is made up of two parts: the anther and filament. The anther produces pollen (male reproductive cells). The filament holds the anther up.

During the process of fertilization, pollen lands on the stigma, a tube grows down the style and enters the ovary. Male reproductive cells travel down the tube and join with the ovule, fertilizing it. The fertilized ovule becomes the seed, and the ovary becomes the fruit



Fertilization:

Pollen must fertilize an ovule to produce a viable seed. This process is called pollination, and is often aided by animals like bees, which fly from flower to flower collecting sweet nectar. As they visit flowers, they spread pollen around, depositing it on some stigmas. After a male's pollen grains have landed on the stigma during fertilization, pollen tubes develop within the style, burrowing down to the ovary, where the sperm fertilizes an ovum (an egg cell), in the ovule. After fertilization, the ovule develops into a seed in the ovary.



Types of Flowers:

Some flowers (called perfect flower) have both male and female reproductive organs; some flowers (called imperfect flower) have only male reproductive organs or only female reproductive organs. Some plants have both male and female flowers, while other have males on one plant and females on another complete flower have

stamens a pistil, petals, and sepals. Incomplete flowers lack one of these parts.

Q. NO. 4 compare the internal structure of a dicot stem with that of monocot stem.

Ans .no : - the common structure of the dicot stem are sunflower stem the TS. Stem show the following structure.

At first note the distribution of the different zones and sub zones, the arrangements of vascular bundles more or less in a ring close to the periphery and very large pith occupying the major part of the stem. Transverse section of internal structure of Dicotyledonous stem of sunflower shows the following structure. It consists of Epidermis, cortex and stele. In the stele there are numerous vascular bundles in a ring and also large pith.

(1) EPIDERMIS

This forms outer most layers and consists of single row of cells and fit along their radial walls with a well defined cuticle over it. It bears some multicellular hairs and few stomata but no chloroplasts except in the guard cells.

(2) CORTEX

It lies in between epidermis and pericycle and consists of hypodermis externally, general cortex centrally and endodermis internally.

(a) Hypodermis (collenchyma): This lies immediately below the epidermis and consists of 4 to 4 layers of collenchymatous cells.

These cells are thick at the corners against the intercellular spaces owing to deposit of cellulose and pectin. The cells are living and contain number of chloroplasts.

(b) General Cortex: This lies internal to hypodermis and consists of few layers of thin walled large rounded or oval parenchymatous cells. There are clear intercellular spaces in it.

(c) Endodermis: This is innermost layer of the cortex consisting of barrel shaped cells and surrounding the stele. Endodermis is conspicuous outside the hard bast but often loses its identity on either side. It contains many starch grains and is also known as starch sheath.

(3) PERICYCLE

This is region lying in between the endodermis and the vascular bundles and is represented by semi lunar patches of sclerenchyma and mass of parenchyma. Each patch associated with phloem of vascular bundle is called hard bast.

(4) MEDULLARY RAYS

A few layers of big polygonal or radially elongated cells lying in between two vascular bundles constitute a medullary ray.

(5) PITH

This is large in sunflower stem and occupies the major portion of it. It extends from below the vascular bundles to the centre and is composed of rounded or polygonal thin walled living cells with intercellular spaces in between them.

(6) VASCULAR BUNDLES

These are collateral and open and are arranged in a ring. Each bundle is formed of (a) Phloem or bast (b) cambium (c) xylem or wood.

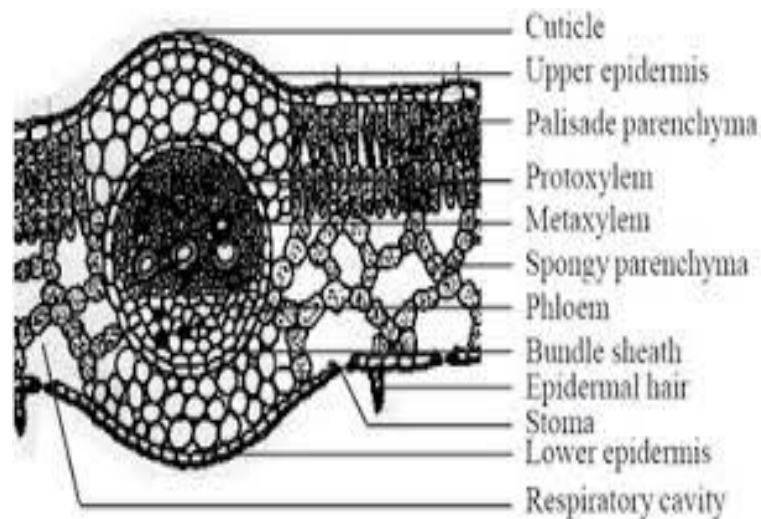
(a) Phloem: It is external and has (i) sieve tubes which are large elements (ii) companion cells which are smaller cells associated with sieve tubes and (iii) Phloem parenchyma which

is remaining mass of small cells. They are all thin and living. Phloem is meant to conduct prepared food material from leaves to storage organs.

(b) Cambium: It is band of thin walled tissue lying between phloem and xylem. Its cells are in radial rows and are rectangular in shape, very small in size and very thin walled. Cambium is responsible for secondary growth,

(c) Xylem or wood: It is internal and bears (i) wood vessels which are large thick walled and lie in a few radial rows. Smaller vessels towards centre form protoxylem and bigger ones lying away from centre form metaxylem. Tracheids and wood fibres are smaller thick walled and lignified cells lying around metaxylem vessels. Wood parenchyma is the patch of thin walled parenchyma lying on the inner side of the bundle around protoxylem. Its cells are living.

Inter structure of Monocot stem of maize consists of following parts.



Monocot stem

(1) EPIDERMIS

This is single outermost layer with thick cuticle on outer surface. In epidermis few stomata may be seen.

(2) HYPODERMIS (SCLERENCHYMA)

This forms narrow zone of sclerenchyma two or three layers thick below the epidermis.

(3) GROUND TISSUE

It is continuous mass of thin walled parenchyma arising below sclerenchyma to the centre. It is not differentiated into cortex, endodermis, pericycle etc as in Dicot stem. The cells of ground tissue enclose many intercellular spaces.

(4) VASCULAR BUNDLES

These are collateral and closed and lie scattered in the ground tissue. They are more numerous and lie close together near periphery than the centre. Peripheral ones are also seen to be smaller in size than central ones. Each vascular bundle is oval and surrounded by a sheath of sclerenchyma developed on two sides upper and lower. The bundle consists of (a) Xylem (b) Phloem, but cambium is absent.

(a) Xylem: It consists of four distinct vessels arranged in the form of Y and a small number of tracheids arranged irregularly. Two smaller vessels (annular and spiral) lying radially towards the centre constitute protoxylem and two bigger vessels (pitted) laying laterally together with the small pitted tracheids lying in between them form metaxylem.

Besides thin walled wood (or xylem) parenchyma almost surrounding water containing cavity is present in the proto xylem and few wood fibres occur associated with tracheids in between two big pitted vessels.

(b) Phloem: It consists of sieve tubes and companion cells. No phloem parenchyma is present in Monocot stem. Outermost portion of phloem which is a broken mass is the protophloem and the inner portion is metaxylem. The former soon gets disorganized and the latter shows distinct sieve tubes and companion cells.

Q. NO. 5 differentiate between following:

(a) Phylloclade and phyllode :

ANS - :

| Phylloclade | Phyllode |
|--|--|
| it is a modification of stem | It is a modification of petiol |
| It develop in the axial leaves | It has a bud in its axial which developes into a branch. |
| It has node and flower | It does not have nodes and flower. |
| Modification flower are present in the form of spines and scales on its nodes. | It does not have spines and scales, as it is the modification of petiol. |

(b) Monoecios & dioecios

| Monoecious | Dioecious |
|---|---|
| Monoecious plant have staminate and carpilate flower on the same plants 2) cross pollination is common 3) ex . maize pinus. | 1) dioecious plant having both the sex on the different flower of the same plant or different plants 2) self pollination is the rule 3) ex . papaya |

(c) Epigyny and hypogyny

| <u>Epigyny</u> | <u>hypogyny</u> |
|---|---|
| Epigyny in an epigynus flower the margin of the thalamus grows for the upward further completely inclosing the ovary gating fused with it and bear the sepals petals and stamens above the ovary, the ovary in this case set to be inferior and the rest of the floral member superior Ex. Apple pear, sunflower , | In a hypogynus flower the thalamus is conical convex flat or slightly concave and the ovary occupy the highest position on the thalamus while the stamens petal, and sepal are separately successively inserted bellow the ovary. The ovary is set to be superior and rest of the floral member inferior Ex. China rose, mustered brinjal. |

Q. NO. 6 what do you understand by the alteration of generation?

ANS : - In an animal life cycle, male and female parents each create sex cells (sperm and eggs) that unite to form a fertilized egg and develop into an offspring organism. Plants, likewise, have sperm and eggs in their life cycles, but these are produced by an intermediate stage between the adult and the offspring.

These stages, which were explained by Dr. Judith Sumner in the video, can be thought of as different "generations" within the same life cycle. The adult generation produces spores, while the spore generation produces sex cells. The scientific terms for these generations are sporophyte (sporo = spore; phyte = plant; therefore, spore-producing plant) and gametophyte (gameto = sex cell; phyte = plant; therefore, sex-cell-producing plant).

To understand the differences between these two generations, it may help to revisit ideas explored in Session 3: Animal Life Cycles. In the body cells of animals, chromosomes exist in pairs — a condition we'll call doubles. Animal sex cells have half as many chromosomes as their body cells — a condition we'll call singles. In an animal life cycle, the sex cells are the only cells where chromosomes exist as singles. The rest of the life cycle involves body cells that carry chromosome doubles. This is where plants differ. In plants, one *entire* generation carries its chromosomes as singles, while the other carries its chromosomes as doubles. Let's take a closer look.

When we look at a plant, we're almost certain to be looking at the sporophyte generation. The sporophyte generation carries its chromosomes as doubles. In this sense, it is analogous to the adult animal, which also carries its chromosomes as doubles. The

sporophyte generation, as its name indicates, produces spores. Spores carry chromosomes as singles. The spores then develop into the gametophyte generation.

In most plants, the gametophyte is tiny compared to the sporophyte. As its name implies, the gametophyte generation produces sex cells — sperm and eggs. Like the gametophyte itself — and like the sex cells of animals — the sex cells carry chromosomes as singles. Fertilization brings chromosome doubles back together in the fertilized egg. The life cycle is completed with the development of the sporophyte, which carries chromosomes as doubles.

Significance:

Life scientists have developed several theories to account for the evolution of alternation of generations in plants. One theory has to do with having the “best of both worlds” in terms of variation in a population (a topic explored in Session 5: Variation, Adaptation, and Natural Selection). In the formation of spores, only one parent contributes the hereditary material. This could be beneficial if that parent exists in a stable environment — it creates offspring with the same characteristics that allowed it to survive and reproduce. With sex cells, two parents are involved, and a mixing of hereditary material occurs. This results in offspring that vary from both parents and from one another. This could be beneficial in a changing environment where some variants are likely to be suited to that environment while others may not be.

How can alternation of generations be observed in the plant kingdom?



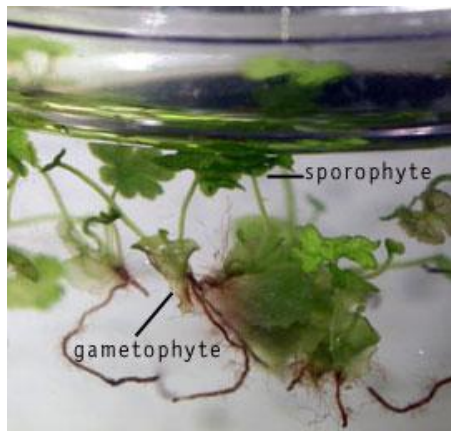
Mosses

It's actually easiest to observe alternation of generations in the most primitive group of plants: the mosses. If you've ever looked closely at a moss, you may have noticed a tiny leafy green mat from which a stalk protrudes at certain times of the year. The stalk is the sporophyte. From its cap, spores are cast that land on the ground and develop into the gametophyte—the leafy green mat. Special structures within the mat produce sperm and egg. The sperm swim to the eggs and fertilize them. A stalk, which remains attached to the mat, results from each fertilized egg. The moss life cycle thus requires

ground water in order to be completed—this is why mosses are always found in moist environments.

Ferns

Another major plant group includes the ferns. In ferns, the different generations exist as distinct individuals. The graceful fronds, or leaves, that we see adorn the sporophytes. If you look under the fronds of a mature plant, you'll see structures where the spores are produced. The spores are cast from these structures onto the ground, where they develop into gametophytes. The gametophytes are tiny heart-shaped structures that are nearly invisible to the naked eye. They require a moist environment to develop and, once mature, produce sperm and egg. Like the mosses, the sperm require water to swim to the eggs, with each fertilized egg developing into the familiar, frond-bearing sporophyte.



Ferns with gametophyte and sporophyte sections



Christmas fern with sporangia



Conifer sporophyte

Conifers

In the conifers, the stately needle- and cone-bearing trees are the sporophytes. Conifers actually have two different types of cones. The female cone is probably what you are familiar with, bearing hard, woody scales. In a structure on top of each scale of the female cone, female spores are produced, which develop into the microscopic female gametophyte — a plant that consists of only one cell for most of its existence. The gametophyte remains inside the structure that produced it, which itself remains attached to the scale.



Female cone

The male cones are much smaller than the female cones and are the structures that produce copious amounts of yellow “dust” in the Spring. On the underside of each tiny scale are structures that produce numerous male spores, which develop into gametophytes that consist of just four cells. The gametophyte and its covering are the pollen, which is carried by wind to the female cone. Pollination occurs when pollen lands at the sticky base of the scale and the sperm grows to and fertilizes an egg, which eventually forms a papery seed on top of the scale. Note that, unlike mosses and ferns, water is not required to bring sex cells together and that the embryo develops in a seed, where it is protected from drying-out and is supplied with food.

In the video, flowering plants were used to introduce alternation of generations.



Flowering plant (sporophyte)

Flowering plants

Alternation of generations in flowering plants is essentially the same as in the conifers (and just as complicated), except that flowers represent the sporophyte. Female structures, called ovaries, contain structures that produce the female spores. These develop into a seven-celled gametophyte inside the ovary — you can think of it as a tiny plant inside a plant. The male structures, called stamens, produce the pollen. As in the conifers, the male gametophyte develops inside the pollen grain.

Pollen from the male parts of one flower is delivered to the female parts of another flower in various ways: wind, insects, birds, bats, etc. When pollination occurs, sperm form and grow to the ovaries, where they fertilize eggs. A fertilized egg develops into a seed inside the ovary. Again, notice that this process does not require water to bring sex cells together, and that a seed protects the developing embryo. The difference between conifers and flowering plants is that the seeds develop within an ovary (the fruit) rather than on top of a cone scale.

Q. NO.7- Describe the characteristics and function of complex tissue found in angiosperm.?

ANS. :- there are following types of the tissue found in the angiosperm

Dermal Tissue System:

The dermal tissue system makes up the outside covering of the plant. This system consists of the epidermis and the periderm.

Epidermis:

The epidermis consists of a single layer of cells that covers the majority of young plants.

The epidermis is present throughout the life of plants that exhibit only primary growth. Primary growth refers to cells and tissues that originate from the apical meristems. Apical meristems are regions of dividing cells located at the tips of stems and roots.

Parenchyma Cells: Living, thin walled cells. Variable in shape. Lack chloroplasts. These cells cover the outside surface of herbaceous plants. Little gas exchange occurs through these cells, due to a thick covering of a lipid compound call cutin.

Sclerechyma Cells: Parenchyma cells that have developed secondary cell walls. There are two main types: **fibers** and **sclereids**. Fibers are long and narrow. They protect and support other tissues due to their thick lignified cell walls.

Stomata (pl.), **Stoma** (sing.): Small openings scattered throughout the epidermis. Stomata are important for gas exchange and transpiration. Each stoma is surrounded by two guard cells which contain chloroplasts. The guard cells control the size of the stomatal opening, and thus control the amount of gas exchange and transpiration.

Trichomes: These are small hairs on the plant surface. They are epidermal extensions that can alter the boundary layer over a leaf surface.. Trichomes function in light piping (concentrating light on the underlying tissues). They aid in reducing water loss through transpiration. They can also alter heat loss from a plant, and act in storage and secretion of secondary metabolites. Root hairs are also trichomes that aid in water and mineral absorption.

Periderm:

When plants increase in girth due to secondary growth, they slough off their epidermal tissues and replace them with periderm. The periderm is composed of cork cells (phellem) that have thick walls impregnated with suberin (a waxy substance which protects and waterproofs the surface of the cells). Cork cells are not very strong, and therefor are continually added to the plant as it grows. Periderm may also contain unsuberized, thin-walled parenchyma cells call phelloderm. Water and gas exchange occurs through openings called lenticles. Although the function of lenticles is the same as the stomata, lenticles cannot control the size of their openings. The corks found in wine bottles are cut from the bark of *Quercus suber*. In order to prevent wine bottle corks from leaking, they are cut at right angles to the lenticles

Ground Tissue System:

Ground tissue consists of all tissues not included in the Dermal and Vascular Tissue Systems. Ground tissue has a wide variety of functions, even though it is composed of fairly simple tissue types.

Parenchyma Tissue:

The most abundant, diverse, and versatile cells in a plant are found in the parenchyma tissue. Parenchyma cells have thin cell walls, and their structure is somewhat non-

descript, but tend to be more or less isodiametric (equal diameters in all directions). What distinguishes these cells are their many and varied functions. Some examples are:

Starch storage tissues of tubers: contain a large amount of amyloplasts (organelles where starch is stored).

Transfer Cells: rapid transport of food metabolites associated with veins of leaves and nectaries of flowers.

Stellate Parenchyma Cells: found in ground tissue in aquatic plants that are composed of star-shaped cells with large intercellular spaces between the arms used as air canals.

Water storage cells: the stems of cacti have cells within the cortex that store large amounts of water.

Chlorenchma Cells: found in the mesophyll of leaves contain large amounts of chloroplasts.

Collenchyma:

Collenchyma cells differentiate from parenchyma cells and are alive at maturity. Collenchyma cells have uneven thickenings in their primary cell walls. Collenchyma cells are important for support of the growing regions of shoots, roots, and leaves. They are found in expanded leaves, petioles, and near the apex of stems. Adaptations of collenchyma cells that aid in their support function are: (1) ability to stretch due to their nonlignified cell walls, (2) elongated or cylindrical structure which maximizes support.

Sclerenchyma:

Sclerenchyma have thick, nonelastic secondary cell walls and are dead at maturity. Sclerenchyma cells support and strengthen nonexpanding tissues of the plant such as mature roots, stems, and leaves. There are two types of sclerenchyma cells, sclereids and fibers, which are distinguished by their shape and grouping. Sclereids are variable in shape, are short, and exist singularly or in small groups. Fibers are elongated and slender and exist either singularly or in bundles.

Sclereids: occur throughout a plant. They are responsible for hard seed coats, and hulls of pea pods. Sclereids are found in the flesh of pears where they give the gritty texture.

Fibers: originally differentiate from parenchyma cells after their extension. Fibers are classified in several ways. Commonly, fibers are classified according to their location within the plant. For example, xylem fibers or phloem fibers. Commercially, fibers are classified according to their strength. For example, hard fibers (ones that contain large amounts of lignin - usually from associated xylem cells), and soft fibers (ones that do not contain lignin). Hard fibers such as jute (from *Corchorus capsularis*), hemp (from *Musa*

textilis, *Furcraea gigantea*, *Cannabis sativa*), and sisal (from *Agave sisalana*) are used for making ropes, cords, and twines. Soft fibers such as flax (from *Linum usitatissimum*) are used for making linen, and also ramie (from *Boehmeria nivea*) which is also used for making textiles. Cotton, however, is not a sclerenchyma fiber. Cotton is formed from elongated epidermal cells that form from trichomes on the surfaces of seed coats.

Vascular Tissue System:

The vascular tissue system is important in transport. The vascular tissue system is composed of the xylem (transport of water and dissolved minerals) and phloem (transport of food - usually sucrose and other sugars-, nitrogen containing compounds, and hormones). The xylem and phloem in the primary plant body are usually closely associated in the form of vascular bundles. In woody plants the xylem forms the wood of trunks and branches as well as the central core of the roots. The bark of a tree is a mixture of old, nonfunctional phloem and the young functional phloem (periderm).

Xylem: There are two types of conducting cells in xylem, tracheids and vessel elements. Both have thick lignified secondary walls and are dead at maturity. These cells create hollow cylinders that have high tensile strength. Materials moving within the xylem are under tension. Therefore the high tensile strength of the xylem cells keeps them from collapsing. Transport in the xylem occurs in one direction = roots->stems->leaves.

Tracheids: long, slender cells with overlapping, tapered ends. Water moves between tracheid cells via the bordered pits. Bordered pits are thin areas in the cell walls where only primary cell wall material has been deposited. Tracheids are the more primitive (less specialized) of the two xylem cells. They are found in most woody, nonflowering plants.

Vessel Elements: short, wide cells arranged end to end. Their end walls are partially or wholly dissolved allowing them to form long, hollow tubes up to 3 meters long. The larger diameter and lack of end walls allows vessel elements to transport water more rapidly. Vessel elements are evolutionarily more advanced than tracheids. They are found in angiosperms and are one of the major reasons why angiosperms the dominant land plant.

Xylem Fibers and Xylem Parenchyma: Fibers lend support to the woody tissues (especially in plants with tracheids) while the parenchyma cells function to store metabolites, or function in secretion (resin ducts and laticifers).

Phloem: Phloem transports dissolved organic material throughout the plant. Transport within the phloem is from source to sink. This means that the direction of movement of materials within the phloem may change over time. This movement depends on the time of year and age of the plant. Phloem cells are alive at maturity, mainly because movement

of materials within the phloem requires energy. Also, the materials moving within the phloem are under pressure, which means that the cell walls of the phloem cells do not have to have as great a tensile strength.

Sieve Cells: more primitive phloem conducting cells of ferns and conifers. Sieve cells are long and tapered with overlapping ends. They have sieve areas, fields of pores scattered over their cell wall surface. These areas allow direct contact between the protoplasts of adjacent cells. The pores are surrounded by callose, a complex carbohydrate that can block the pore opening after injury. Associated with the sieve cells are **Aluminous Cells** that play a role in aiding the movement of materials within the phloem.

Sieve Tube Members: more advance phloem conducting cells of angiosperms. Sieve tube members are short and wide, and arranged end to end into sieve tubes. The sieve pores are large and are concentrated along the end walls of adjacent sieve tube members. These specializations allow solutes to move more rapidly in sieve tube members and sieve cells. At maturity the nuclei in the sieve tube members disintegrate, the ribosomes disappear, and the tonoplast (vacuole membrane) breaks down. Mitochondria and plastids are still present. Sieve Tube Members are always associated with **Companion Cells** which control the metabolism of the cells. These two cells are connected by numerous plasmodesmata. The companion cells aid in the movement of materials into and out of the sieve tube members. Sieve tube members also contain P-protein, which stands for Phloem-protein. This protein is located along the longitudinal walls of the cells. Some sieve tube members also contain a glucose polymer called callose. Both P-protein and callose are responsible for sealing wounds in the sieve tubes.

Q. NO. 8 – Give an illustrated account of the structure and life history of chlamydomonas

ANS:- Chlamydomonas: features Chlamydomonas is an unicellular Green alga. Besides a nucleus and a true cell wall with two or more layers of cellulose and pectine, one can find in the cytoplasm of those organisms mitochondria, Golgi, and one or more chloroplasts. These chloroplasts have a variable shape, but they always contain a protein-rich center involved in the production of starch: a pyrenoid. Besides, in Chlamydomonas two contractive vacuoles are found, which play a role in expelling the excess of water that penetrates into the cell through osmosis. Two flagellae allow active displacement. One eyespot or ocellus is able to sense light; the flagelated alga can respond adequately to light intensity and direction by swimming towards the light or away from it (resp. positive and negative phototaxis).

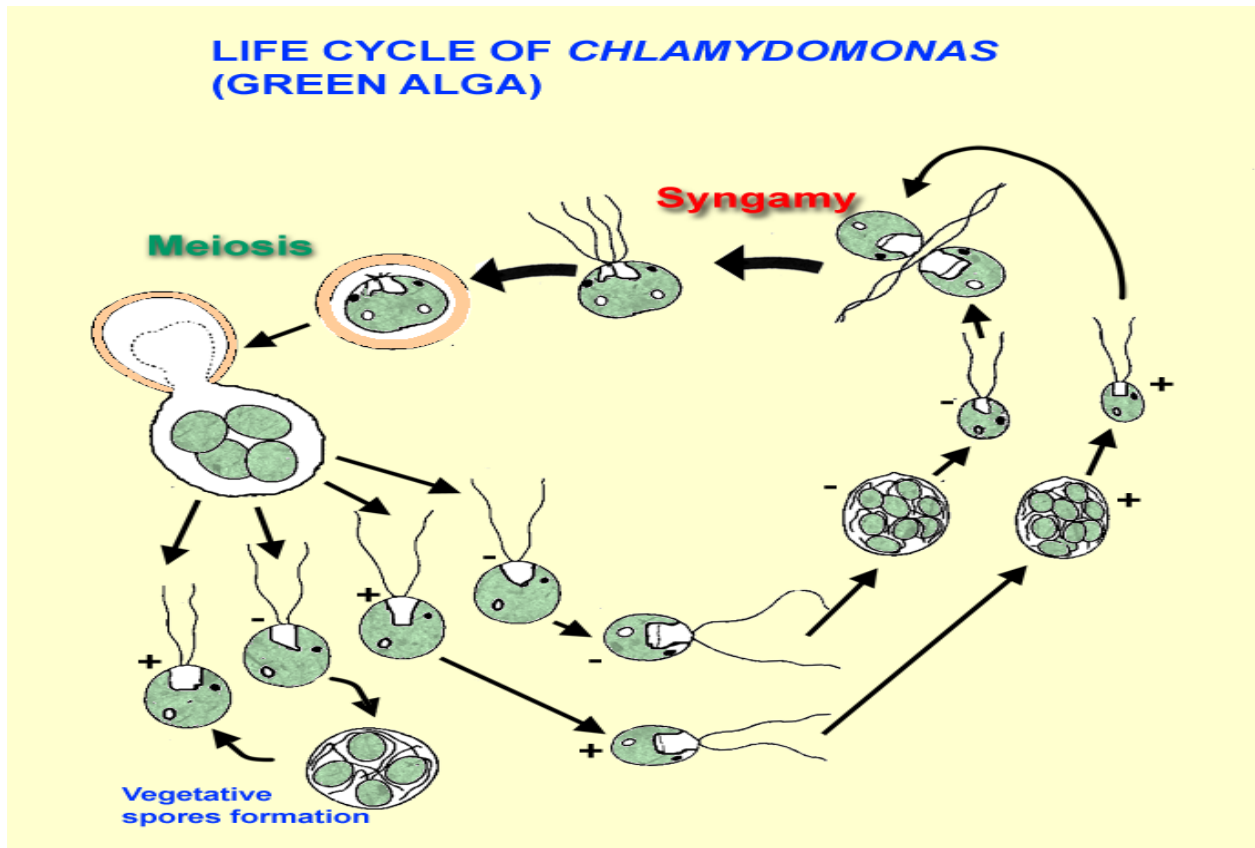


Fig. Life cycle of clamydomonas

Life cycle: - clamydomonas reproduces itself by both asexual and sexual methods

a) Asexual reproduction may takes place by

- 1) Zoospores
- 2) Palmella stage
- 3) Aplano stage

b) Sexual reproduction takes place by motile ciliate gametes which are formed in the same way at the zoospore are also alike but are somewhat smaller in size and more in number – 16 ,32,or 64 or even more. All gametes in smaller in size and are called isogametes and there fusion is known as isogamy gametes of different parents usually conjugates in pair. A zygospores the product of fusion of two similar gametes is formed there ciliate and conjugate first , soon after fusion the cilia are withdrawn and the zygospore clothes itself with a thick wall. It undergoes under goes a period of rest and then it contains divides and form 2-4 motile daughter cells.