SHORT QUESTIONS

2. What are the features shared by algae and plants?

Ans: Following are the features shared by algae and plants.

(i) Plants are multicellular, eukaryotic, photosynthetic, autotrophs as are brown red and certain green algae.

(ii) Plats have cell wall made of cellulose. Likewise, green algae, dinoflagellates and brown algae have also cellulose in their cell walls.

(iii) Chloroplasts with chlorophylls a and b are present in plants as well as in green algae.

3. What are the features shared by the green algae 'Charophyceans' and plants?

Ans: Following are the features shared by the green algae 'charophyceans' and plants.

(i) Both contain a higher percentage of cellulose than cell walls of non charophyceans algae

(ii) The peroxisomes of both contain enzymes that help to minimize the loss organic products as a result photorespiration.

(iii) The flagellated sperm of plants closely resembles that of charophyceans sperm.

(iv) In both the synthesis of new cross-walls during cell division involves the formation of phragmoplast.

(v) Comparisons of both nuclear and chloroplast genes agree that charophyceans as the closest relatives of land plants.

Note: it does not mean that these algae are the ancestors of plants however, they do offer a glimpse of what those ancestors might have been like.

4. What are the diagnostic features shared by all plants.

Ans: Plants are multicellular eukaryotes with well-developed tissue and have autotrophic nutrition.

Plants are well protected from being dried up in air by their cuticle, formed from a waxy substance called cutin. The plant body has root, stems and leaves having vascular tissue xylem, phloem and cellulose rich cell **walls.**

Plants show alternation of generation. It consists of the sporophyte the diploid generation that produces haploid spores by meiosis. Spores develop into a haploid generation. The gametophyte is the haploid generation, which produces gametes that unite to form a diploid zygote. The plants are oogamous the gametes are eggs and sperms.

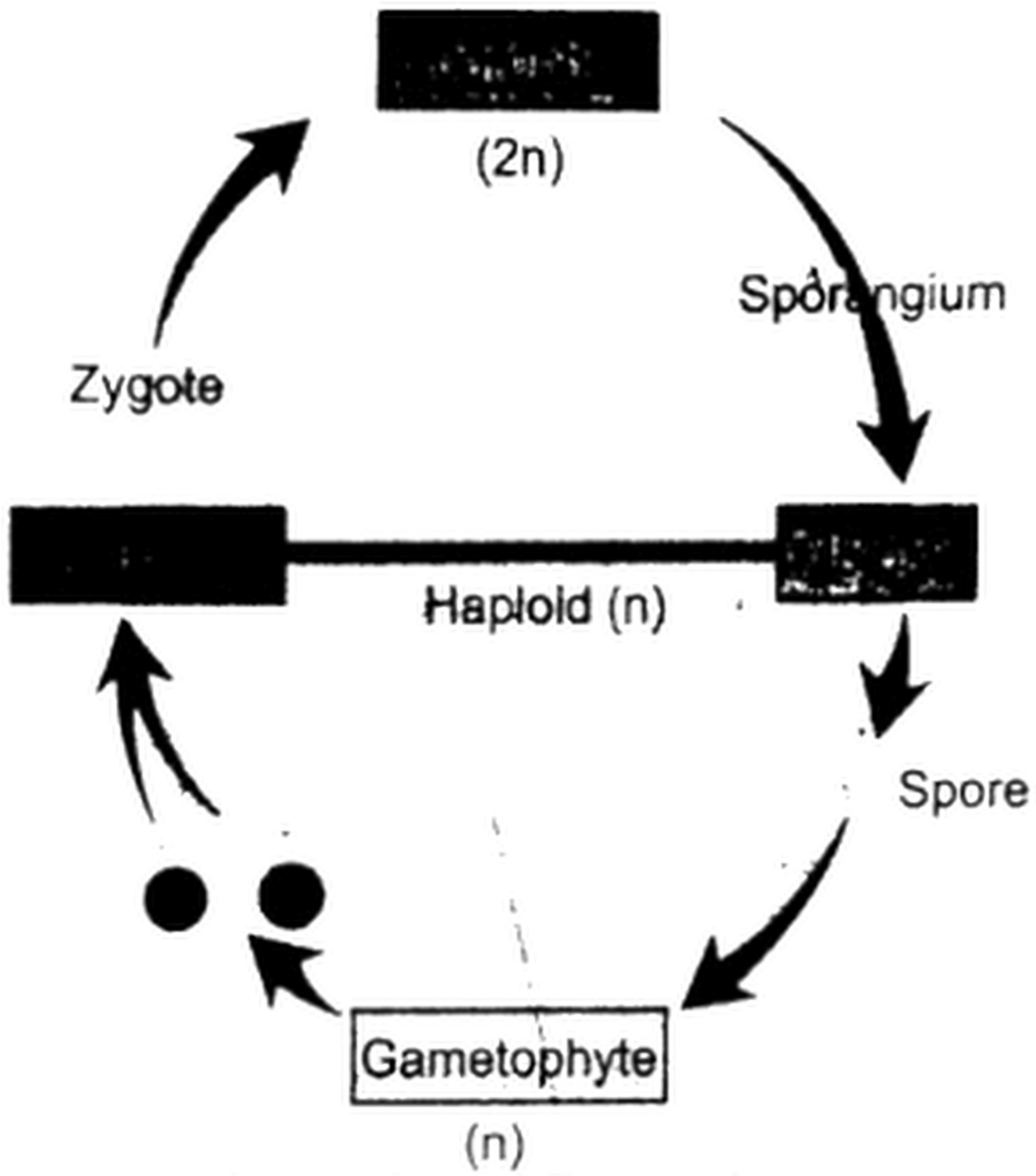
5. What is alternation of generation? Write its importance.

Ans: Plants show alternation of generation. It consists of the sporophyte the diploid generation that produces haploid spores by meiosis. Spores develop into a haploid generation. The gametophyte is the haploid generation, which produces gametes that unite to form a diploid zygote. The plants are oogamous the gametes are eggs and sperms.

Importance:

Alternation of generation is an important aspect in terrestrial plant life which helps them to accommodate and adapt in land environment. The alternating

sporophyte and gametophyte generation helps the production of best plants which stand the favorable and unfavorable environmental conditions.



Alternation of Generation

6. Why bryophytes are called 'amphibious plants'.

Ans: The bryophyte is a group of plants comprising of liverworts, hornworts and mosses are the only nonvascular plants.

Bryophytes are typically quite small and a few exceed 2 centimeters in length. They generally require a most environment for active growth and reproduction, but some bryophytes tolerate dry **areas.** Bryophytes are also called amphibious **plants** because they need water for development, existence and reproduction.

7. Write the main four features of bryophytes?

Ans: The four main features of bryophytes are:

(1) They lack specialized vascular tissues.

(2) Multicellular sex organs produce embryo.

(3) Sporophytes are always smaller and obtain their food from the gametophyte.

(4) Their life cycles are similar to seed plants. Bryophytes are also called amphibious **plants** because they need water for development, existence and reproduction.

8. Name the land adaptation features of bryophytes.

Ans: Following are the land adaptation features of bryophytes.

(1) The multicellular plant body and conservation of water.

(2) Absorption of carbon dioxide.

(3) Absorption of water.

(4) Heterogamy.

(5) Protection of reproductive cells.

(6) Embryo formation.

(7) Alternation of generation.

9. What is the importance of bryophytes?

Ans: Importance of Bryophytes:

(i) Mosses play an important role in their environment. They hold the soil in place and help prevent erosion.

(ii) Mosses provide food for animals, especially birds and small animals.

(iii) Commercially the most important mosses are the **peat mosses.** Their leaves hold water and are beneficial as a soil conditioner.

(iv) When added the sandy soils peat moss helps to hold and retain moisture.

10. Write the features of seedless vascular plants.

Ans: Following are the features of seedless vascular plants. The **seedless vascular plants** (ferns and their allies) disperse the species by producing wind-blown **spores.** When the spores germinate a relatively **large gametophyte** is found which is independent of the sporophyte for its nutrition.

In these plants **flagellated sperms** are released by **antheridia** and swim in a film of external water to the **archegonia**, where fertilization occurs.

11. Describe the development of heterospory.

Ans: All seed plants are heterospory i.e. produce microspore and megaspore in microsporangia and megasporangia respectively. The megaspore grows into a female gametophyte and microspore grows into a male gametophyte. The megaspores of the seed plants are retained inside the sporangium, where the megaspore develops into tiny female gametophyte.

12. What is the importance of seedless vascular plants?

Ans: Following are the importance of seedless vascular plants.

(i) *Lycopodium* and Selaginella are chiefly grown as **ornamental plants** and are utilized in the preparation of Christmas wreaths.

(ii) Ducks and other aquatic animals feed upon the corm of Isoetes.

(iii) The **ferns** are mostly ornamental plants of garden and green houses. Some of them are used in the preparation of bouquets. Stems and leaves of

trees ferns are used or **building purposes.**

(iv) Some genera, like Pteris, Ceratopteris and Marsilea, edible.

(v) The rhizome of the male fern yields are drug, which is utilized for removing the intestinal parasites.

(vi) Practically all the members of the seedless vascular plants have contributed extensively to coal formation.

13. Write the feature of Vascular plants.

Ans: Vascular plants (L. vasculum dim of vas vessel) include ferns and their allies, gymnosperms, and angiosperms.

Features of vascular plants:

(i) Vascular tissue consists of xylem (Gk *xylon,* wood), and phloem (Gk *phloios, bark)*

(ii) The vascular plants have true roots, stems, and leaves. Xylem, with its strong-walled cells, supports the body of the plant against the pull of gravity.

(iii) The leaves are covered by a waxy cuticle.

(iv) Leaves have small pores called stomata

(v) The sporophyte generation is diploid and dominant in vascular plants.

(vi) The vascular plants are widely distributed.

14. Describe evolution of pollen tube.

Ans: Evolution of Pollen Tube: The evolution of pollen tube parallels the evolution of seeds. The egg produced inside an ovule is very well protected in the sporangium. It is so well protected that flagellated sperm would not have the slightest chance of ever reaching an egg. This obstacle has been overcome by the development of **pollen tubes.** Once the pollen grain reaches the cone or

flower, it germinates. The germinated pollen grain is a tiny gametophyte. It produces a long pollen tube. Which grows to the ovule and then digests its way through the protecting layers to the enclosed egg.

15. What is importance of pollen tube?

Ans: The evolution of pollen tube parallels the evolution of seeds.

(i) It helps to transport flagellated sperm to the ovule.

(ii) It digests the protective layers enclosing the egg.

(iii) It is the main component of the male gametophyte.

(iv) It is the main adaptation of the terrestrial plants.

(v) It prevents the loss of plant reproductive structures that in flagellated sperm.

(vi) It indirectly helps in fertilization of sperm and egg.

16. What is the uses of gymnosperms?

Ans: Uses of gymnosperms:

(i) Pine seeds like chilghoze are eaten as dry fruits.

(ii) Ephedrine, a drug from *Ephedra* is used for the relief of asthma and other respiratory ailments.

(iii) Conifers are a source of soft wood for construction, packing, plywood, board and for making paper.

(iv) **Cycads** are grown as ornamental plants.

(v) *Cycads circinalis,* which grows as a wild cycad, serves as a source of "sago". It is pure starch extracted in liquid state and then solidifies to form small granules.

(vi) Resins, turpentine, tar and many oils are obtained from conifers.

17. What are angiosperms?

Ans: Angiosperms are the flowering plants. Their seeds are enclosed by fruits. The term angiosperms literary means **"enclosed seed"** *(angio:* enclosed, *sperm* seed). The leaves bearing ovules are folded and joined at the margins to form ovaries. The ovary after fertilization is changed into fruit. This is exceptionally a large and successful group of plants which is divided into Dicots and Monocots. They have common characters, like, vascular tissues, differentiated plant body, flowers, fruits and seeds.

18. What is the advantage of the seed?

Ans: Advantage of the seed:

(i) Safer crop emergence and earlier establishment of final populations.

(ii) More uniform rate of emergence and earlier and bigger plants.

(iii) Root shapes and sizes are improved.

(iv) Increased yield of an average 4% compared to unprimed sugar beet seed.

19. Describe the three types of inflorescence with examples.

Ans: Inflorescence:

Flowers are borne either single or in clusters. A flower is said to be **solitary** when occurring singly, e.g. *Hibiscus rosasinensis.*

Flowers borne in clusters along with the stem and associated whorls constitute **inflorescence.**

Depending upon the arrangement of flowers, inflorescence is classified into:

(a) Racemose **(b)** Cymose **(c)** Compound

(a) Racemose inflorescence:

Here the main axis of inflorescence does not end in a flower but it continues to grow and give off flowers laterally.

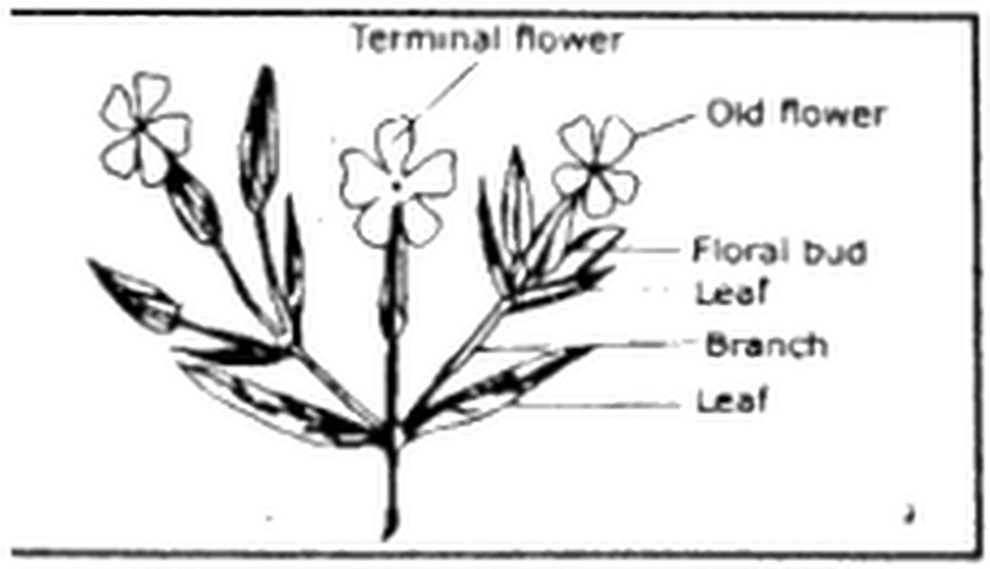
Examples: Radish and mustard (*Brassica*).

Racemose Inflorescence in mustard	

(b) Cymose Inflorescence:

Here the primary axis terminates in a flower but the growth continues through the lateral buds. These buds give rise to lateral branches which bear flowers. The flowers are arranged in basipetal succession, i.e. the outer or basal flowers are younger and the upper flowers are older,

Example: Dianthus (pink).

Cymose inflorescence in Dianthus (Pink)	

(c)`Compound Inflorescence:

In a compound inflorescence the peduncle or main axis of the inflorescence branches repeatedly in Racemose or Cymose manner and the ultimate branches bear flowers in a Racemose or Cymose manner.

Examples: Compound Racemose, e.g. Goldmohur (*Delonix regia*). Amaltas (*Cassia fistula*), etc., Compound Spike, e.g. rice (*Oryza sativa*).

The three main types of inflorescence also include various sub types of inflorescence.

Compound Inflorescence in Amaltas	

20 Give one example of: Whisk ferns, club mosses, horsetails and ferns.

Ans: (i) Examples of Whisk ferns, are Rhynia, Psilotum.

(ii) Examples of club mosses are *Lycopodium* and *Selaginella.*

(iii) Examples of horsetails in *Equisetum.*

(iv) Examples of ferns is Osmunda claytoniana.

21. Define/Describe/Explain briefly:

Cutin, gametophyte, sporophyte, archegonium, antheridium, rhizoids, microgametophye, macrogametophyte, strobilus, homosporous, heterosporous, pollen tube, double fertilization, raceme inflorescence, Cymose inflorescence, compound inflorescence.

Ans: Cutin:

Plants are well protected from being dried up in air by their cuticle, formed from a waxy substance called cutin.

Gametophyte:

The gametophyte is the haploid generation, which produces gametes that unite to form a diploid zygote.

Sporophyte:

A sporophyte is the diploid multicellular stage in the life cycle of a plant or alga. It develops from the zygote produced when a haploid egg cell is fertilized by a haploid sperm and each sporophyte cell therefore, has a double set of chromosomes, one set from each parent.

OR

It is the diploid multicellular individual or generation of a plant with alternation of generations that begins from a diploid zygote and produces haploid spores by meiotic division.

Archegonium:

An archegonium is a multicellular structure or organ of the gametophyte phase of certain plants, producing and containing the ovum or female gamete.

Antheridium:

An antheridium is a haploid structure or organ producing and containing male gametes. It is the male reproductive organ of some cryptogamous plants.

Rhizoids:

The structures for absorption of water in moss and liverworts are **rhizoids.** These are present on the lower surface of the *Marchantia* thallus. Rhizoids are long filamentous structures. They are unicellular and are extensions of the cell of the lower epidermis. Rhizoids increase the surface area for absorption of water from the soil and also help in anchorage.

Microgametophye:

The male gametophyte that develops from the microspores of heterosporous plants. The pollen grains of gymnosperms and angiosperms are microgametophytes. In seed plants, the microgametophyte is contained in the pollen grain.

Macrogametophyte:

Macrogametophyte is the female gametophyte of plant it consists of an embryo sac which has eight nuclei than wall formation takes place these are

converted into cells these cells are antipodal cells, polar nuclei, synergids and egg.

Strobilus:

In club mosses the sporangia are born on terminal clusters of leaves called **strobili** (sing, *strobilus)* which are club shaped. They are only living plants to have microphylls.

Homosporous:

Homosporous produces only one type of spore that contains both male and female parts. The resulting gametophyte is monoecious that is both antheridia and archegonia are present on the same plant.

Example: *Lycopodium, Equlsetum.*

Heterosporous:

Produce two types of spores or distinct male and female spores or microspore and megaspores. The resulting gametophyte is dioecious.
Microspore germinate to form male gametophyte that bears antheridia.
Megaspore germinate to form female gametophyte that bears archegonia.

Example: Setaginella, Marsella

Pollen tube:

It is a slender tube that is formed by a pollen grain of a seed plant and penetrates the ovule, where it releases the male gametes.

OR

It is hollow tube which develops from a pollen grain when deposited on the stigma of a flower. It penetrates the style and conveys the male gametes to the ovule.

Double fertilization:

Union of one sperm with the egg and the second sperm with the fusion nucleus is called **double fertilization.** It only occurs in the flowering plants.

Racemose Inflorescence:

Here the main axis of inflorescence does not end in a flower but it continues to grow and give off flowers laterally.

Examples: Radish and mustard *(Brassica)*.

Cymose Inflorescence:

Here the primary axis terminates in a flower but the growth continues through the lateral buds. These buds give rise to lateral branches which bear flowers. The flowers are arranged in basipetal succession, i.e. the outer or basal flowers are younger and the upper flowers are older.

Example: *Dianthus* (pink)

Compound Inflorescence:

In a compound inflorescence the peduncle or main axis of the inflorescence branches repeatedly in Racemose or Cymose manner and the ultimate branches bear flowers in a Racemose or Cymose manner.

Examples: Compound Racemose, e.g. Goldmohur *(Delonix regia)*, Amaltas *(Cassia fistula)*, etc Compound Spike, e.g. rice *(Oryza sativa)*.

22. Write the differences between:

(a) Gametophyte and sporophyte
(b) Antheridium and archegonium
(c) Monoecious and dioecious
(d) Cutin and cuticle
(e) Mosses and liverworts
(f) Roots and rhizoids
(g) Homosporous and heterosporous

(h) Antherozoids and sperms
(i) Angiosperms and gymnosperms
(j) Polar nuclei and fusion nuclei
(k) Generative nucleus and pollen tube nucleus
(i) Antipodal cells and synergids
(m) Fertilization and double fertilization
(n) Diploid and triploid
(o) Racemose inflorescence and Cymose inflorescence

Ans: (a) Gametophyte and sporophyte:

Gametophyte	Sporophyte
It is haploid phase of life cycle.	It is diploid phase of life cycle.
It is specialized to produce gametes.	It produces spores.
All divisions are mitotic.	Meiosis occurs during formation of spores.
It is sexual generation.	It is asexual generation.
It is formed by germination of a mesopore.	It is formed by growth of a zygote.

(b) Antheridium and archegonium:

Antheridium	Archegonium
Antheridium is the male part of seedless plants.	Archegonium is the female part of seedless plants.

It is globular structure.	It is flask shape.
They consist of jacket cells.	They have a Venter and a neck. Venter contains egg while neck contains neck canal cells.
It produces flagellated antherozoids.	They produce egg.

(c) Monoecious and dioecious:

Monoecious	Dioecious
Monoecious organisms have both male and female reproductive parts.	Dioecious organisms consist of both male and female in separate individuals.
Bisexual	Unisexual maybe either male or female
Exhibit uni-parental reproduction	Exhibit bi-parental reproduction.
Plants are able to use both self and cross pollination.	Plants are able to use only cross pollination.

Examples: Earth worms, jelly fish Planaria and slugs.	**Examples:** Mammals, birds, reptiles and insects.

(d) cutin and cuticle:

Epidermal cells have covering of cutin, which is a wax like substance. It reduces the evaporation of water in plants. The layer of cutin is called cuticle.

(e) Mosses and liverworts:

Mosses	Liverworts
The plant body has a radial symmetry.	The plant body is dorsiventral.
The plants are always leafy.	The plants may be thallose or foliose.
The leaves generally have a midrib.	Leaves, when present, are without a midrib.
Branching is lateral and extra-axilllary.	Branching is generally dichotomous.
Rhizoids are multicellular.	Rhizoids are unicellular.
A filamentous protonema occurs.	A protonema stage is absent.

Seta grows slowly over a long period and fully developed before the spores mature.	Seta develops rapidly towards the maturity of spores.

(f) Roots and rhizoids:

Roots	Rhizoids
Roots are present in vascular plants.	Rhizoids are present in non vascular plants.
Roots are much more complicated.	Rhizoids are very simple.
They are always multicellular.	They are unicellular and some times multicellular.
They possess xylem and phloem	They lack xylem and phloem
Roots have sophisticated structures containing different layers.	Rhizoids are filamentous in structure.

(g) Homosporous and heterosporous:

Homosporous	Heterosporous

It produces bisexual gametophyte.	It produces unisexual gametophyte.
In the homosporous, Spores germinate in soil	In the heterosporous, Spores germinate within soil.
They produce independent gametophyte.	They produce dependent gametophyte.
Examples of Homosporous pteridophytes are Lycopodium.	Examples of Heterosporous pteridophytes are Selaginella and Salvinia.

(h) Antherozoids and sperms:

Sperms are the male gametes cells and antherozoids are flagellated sperms produced in the antheridia of Adiantum hence they can not be distinguished as different terms.

(i) Angiosperms and gymnosperms:

Characteristic	Angiosperms	Gymnosperms
Definition	Seed-producing flowering plants whose seeds are enclosed within any ovary	Seed-producing

		non-flowering plants whose seeds are unenclosed or "naked"
Seeds	Enclosed inside an ovary usually in a fruit.	Bare, not enclosed found on scales, leaves or as cones.
Life Cycle	Seasonal	Evergreen
Reproductive System	Present in flowers; can be unisexual or bisexual	Cones; unisexual
Leaves	Flat	Scale like, needle-like
Reproduction	Mostly rely on animals	Mostly rely on wind
Uses	Medications, food, clothing, etc.	Paper, Lumber, etc.
Wood	Hardwood	Softwood
Cotyledons	Present	Absent

(j) Polar nuclei and fusion nuclei:

Polar nuclei is the component of embryo sac formed by the mitosis in the mega spores followed by further division resulting into set of eight nuclei one of which polar nuclei, they are two in number, placed in

the centre. By the time egg has been fertilized, the two polar nuclei have combined to form a single fusion nucleus.

(k) Generative nucleus and pollen tube nucleus:

As the pollen tube develops, the two nuclei of the pollen grain move into it. The two nuclei are called generative nucleus and the pollen tube nucleus. Generative nucleus divides again to form somewhat elongated sperms. The tube nucleus is located near the tip of the pollen tube with two sperms following behind. The pollen tub, containing tube nucleus and the two sperms (male gametes), is the male gametophyte (microgametophyte).

(l) Antipodal cells and synergids:

Antipodal cells and synergids are the components of embryo sac forming the female gametophyte along with polar nuclei and egg. Antipodal cells are three in number and are present at the opposite end of the micropyle, and have no function and sooner or later get disorganized. Synergids are two in number at the micropyler end. These help in fertilization by guiding the pollen tube and as soon as their function is over these get disorganized.

(m) Fertilization and double fertilization

Fertilization	Double fertilization
It is union of two compatible gametes.	It is union of one male gamete with egg and the other male gamete with secondary nucleus of the same embryo sac.

It occurs in almost all eukaryotes.	It is restricted to angiosperms only
Fertilization produces a diploid zygote.	Double fertilization produces a diploid zygote and a triploid primary endosperm cell.

(n) Diploid and triploid:

Diploid	Triploid
Diploid is that carrying two sets of chromosomes in genome in nucleus.	Triploid consist of three sets of haploid number of chromosomes.

(o) Racemose inflorescence and Cymose inflorescence:

Racemose Inflorescence	Cymose Inflorescence
The growth of the inflorescence is indefinite.	The growth of the inflorescence is definite.
The main axis does not terminate in a flower and continuous to grow and forms flowers latterly.	The main axis and its branches terminate in a flower.
The floral axis is monopodial.	The floral axis is multipodia.

Young fruits are not protected by flowers.	Young fruits are protected by flowers.
Flowers develop from all sides	Flowers develop from one or two sides
Examples: Reddish, Brassica	**Examples:** Diantheus (pink)