CHAPTER 1

Sexual Reproduction in Flowering Plants

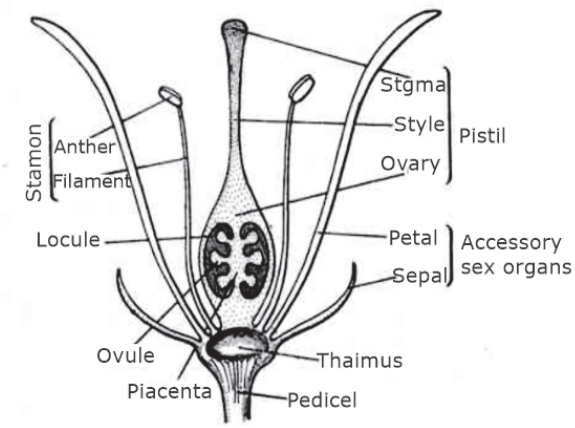
INTRODUCTION :

Reproduction is a vital process without which species cannot survive for long. An individual increases it number by asexual or sexual means. Sexual mode of reproduction enables creation of new variants so that survival advantage is enhanced. All flowering plants shows sexual reproduction. A look at the diversity of structures of the inflorescence, flowers and floral parts, shows an amazing range of adaptations to ensure formation of the end products of sexual reproduction, the fruits and seeds.

This chapter deals with morphology, structure and processes of sexual reproduction in flowering plants (angiosperms).

FLOWER - A FASCINATING ORGAN OF ANGIOSPERMS :

Flowers are object of aesthetic, ornamental, social, religious and cultural value. Flowers are morphological and embryological marvels and the sites of sexual reproduction in angiosperms



A typical angiospermic flower consists of four whorls floral appendages attached on the receptacle.

1. **Calyx** (consists of sepals) : Non-essential whorl (sterile)
2. **Corolla** (consists of petals) : Non-essential whorl (sterile)
3. **Androecium** (consists of stamens) - Male unit : Essential whorl (fertile)
4. **Gynoecium** (consists of carpels) - Female unit : Essential whorl (fertile)

FLOWER IS A MODIFIED SHOOT :

According by **Goethe**, **Flower is modified shoot which shows favourable adaptation for reproduction through a special method.** Flower has a small or long stalk like – structure called **pedicel**. Free end of the pedicel is flattaned or dome shaped is called **thalamus**. The **thalamus** is a type of **modified stem**, on which **nodes** and **internodes** are present.

- **Calyx** is also **modified vegetative leaves**. Such as in ***Mussaenda*** flower, one sepals of calyx modified into leaf like bright and attractive yellow colour structure called "**Advertising flag**". It helps in pollination
- On the basis of **above examples**, we can prove "**Flower is modified shoot**".

MONOCARPIC PLANTS :

- The plants in which **flowering** and **fruiting** takes place only **once** in the **whole life span** are called **monocarpic e.g. Annual & Biennial plants**.

POLYCARPIC PLANTS :

- The plants in which **flowering** and **fruiting** takes place **many times** in the entire life span are known as **polycarpic e.g. Perennial plant**.

EXCEPTION :

***Bamboo*, Banana, Centuary plant** (*Agave americana*) are **perennial** plants but they are the example of **monocarpic** plants.

PRE-FERTILIZATION - STRUCTURES AND EVENTS :

Much before the actual flower is seen on a plant, the decision that the plant is going to flower has take place. A number of hormonal and structural transformations occur prior to initiation of flowering. Shoot apical over which floral primordia develop. The primordia grow into floral buds and then flowers. In the flower, the androecium and gynoecium differentiate and develop.

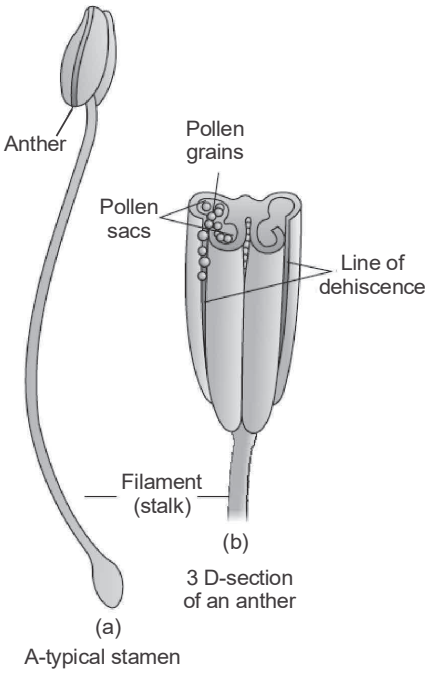
Male Reproductive Organ – Androecium

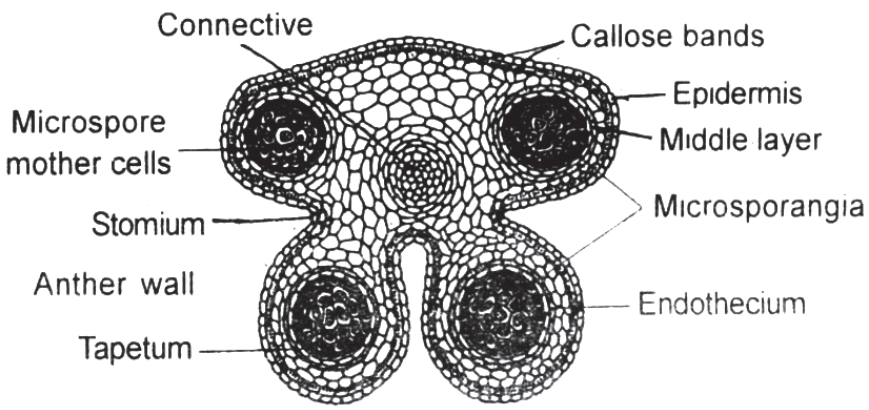
Male reproductive organ is called **androecium** and their unit is called **stamen**. Stamen is also known as **microsporophyll.** There are 6 stamens in *Capsella*. A typical stamen is differentiates into three parts -a long, thin structure is called **filament** which joins the stamen to the thalamus. The free end of the filament, a swollen spore bearing structure is called **anther**. Anther and filament are attached together with help of small region, called **connective**. Connective contains **vascular tissues**. The main parts of the stamen is the **anther**

Each **anther** generally **bilobed structure** i.e., anther has two **anther lobes** and each **lobe** of anther has **two chambers** which are called **pollen sacs** or **pollen chambers** or theca so it is called **dithecous**.

- Therefore, a typical anther has four pollen sacs is called **tetrasporangiate**.
- Pollen grains are formed inside the pollen sac through the meiotic division in pollen mother cells.

- At the maturity of the pollen grains, sterile tissue degenerate which are present in between the pollen sacs. Both the pollen sac fused together. Because of this reason, only one chamber appears in each anther lobe at maturity. So **two chambers** are seen in the **mature anther** at the time of dehiscence.





T.S. of anther, showing four microsporangia and anther walls

[A] STRUCTURE OF ANTHER :

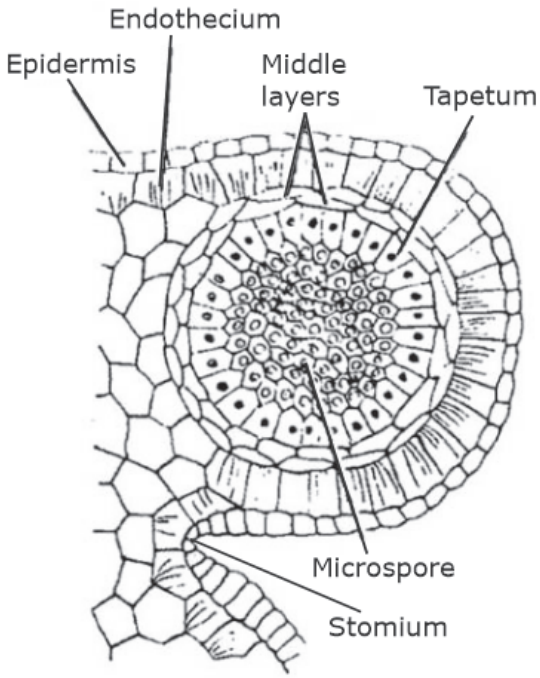
The development of **anther** in origin is **Eusporangiate** type i.e. it is developed from more than one archesporial cells.

- In the transverse section of anther, it is seen almost spherical.
- The following structures are present in the anther :-

(i) **Epidermis** :- It is the outermost layer of anther. It is single celled thick and continuous layer but not archesporial in origin. It forms the outermost **protective layer**.

(ii) **Endothecium** :- This layer is present below the epidermis. It is single celled thick layer. During the maturation of anther, various changes takes place in different walls of cells of endothecium. **Endothecium** becomes **hygroscopic nature** due to presence of fibrous thickening. So it helps in dehiscence of anther.

(iii) **Middle layer** :- Middle layer consists of parenchymatous cells.This layer is **one to three celled thick structure**. Food is stored by **parenchymatous** cells in this layer.



(iv) **Tapetum** :- It is the inner most layer which acts as **nutritive layer**. Pollen sacs are surrounded by tapetum. This is also single celled thick layer. The cells of the tapetum initially **diploid** but they become **polyploid** and **multinucleate** due to **endomitosis, free nuclear division and polyteny**. It means these cells contain many chromosomes.

Tapetum **absorbs food** from the **middle layer** and provide nutrition to the microspore mother cells or microspores. The cells of tapetum secrete **hormones** and **enzymes**. The tapetum layer disappears in the mature anther.

Before degeneration of cells of tapetum, they form special granules called **Proubisch bodies** in cytoplasm. Proubisch bodies transfer between cell wall and cell membrane of tapetal cells. Here they are surrounded by **sporopollenin**. Now they are called **Ubisch bodies** or **orbicules**. At last tapetum degenerates and ubisch bodies released into pollen sacs.

Generally, sporopollenin participates in the formation of **outer covering** (Exine) of Pollen grains.

Note

Tapetum helps in transfer of food, storage of food, formation of sporopollenin and pollenkit materials.

Pollen sacs : Four Pollen sacs are present in the anther. Pollen sacs are also known as **microsporangia**. Inside the pollen sacs, **microspores** are formed by the **meiotic division** of **microspore mother cells**.

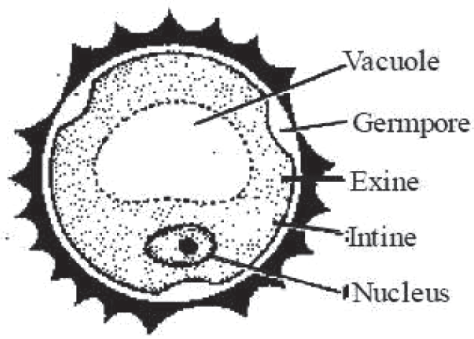
[B] MICROSPOROGENESIS

- Each **microspore mother cell** divide to form four **haploid microspore** or pollen grain by **meiotic division** or **reduction division**.
- During this period spherical bodies are formed inside the tapetal cells before their disintegration. These spherical bodies are known as **Ubisch-body**. Ubischbody is made up of a **complex substance** called **sporopollenin**. It is the **polymer of carotenoids**.
- After the formation of ubisch body, the tapetum layer degenerates. Ubisch bodies participate in the formation of exine of the microspores inside the pollen sacs. Now thick walled microspores are called **pollen grains**.
- At the initial stage all **four microspores** are attached together with the help of **callose layer.** This group of microspores is called **tetrad.** After some time, this callose layer dissolve by callase enzyme. Which is secreted by tapetum.

[C] STRUCTURE OF MICROSPORE OR POLLEN GRAIN :

Pollen grains represent the male gametophyte,

It is also termed as **immature male gametophyte**. Usually, they are in round shape. Pollen grain surrounded by **two distinct layers**. The **outer layer** (wall) is **thick, rigid** and **ornamented**, called **exine**. This layer is formed by **cutin** and **sporopollenin**. Sporopollenin is **highly resistent material**. It is **non-biodegradable.**



Structure of pollen grains

- Due to the presence of sporopollenin, **fossils of pollen grain** are always found in **good condition**.
- The **internal layer** is **thin, soft** and **elastic** in nature. It is called **intine**. It is made up of **pectin** and **Cellulose** or **pecto- cellulose.**

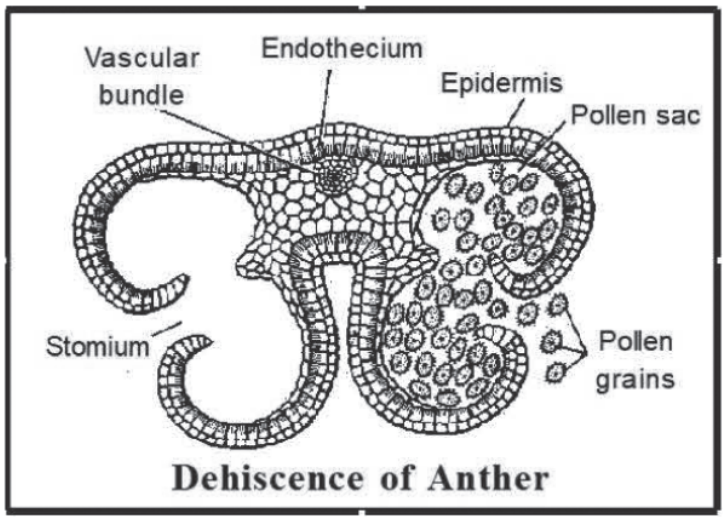
- Usually, at few places on outer surface exine is absent or present in the form of thin layer. These thin places are called **germ pore**. The intine comes out through the any one germpore during the germination of pollen grain in the form of **pollen tube**.
- The plants in which pollination takes place by **insects**, their pollen grains having **oily layer** around the pollen grain. It is called **pollen-kitt.** It is composed of **lipids** and **carotenoids.**

Function of pollen kitt :-
(i) This oily layer protects the pollen grain from the harmful ultraviolet rays.
(ii) Its sticky surface helps to attach with the insects.
(iii) Its yellow colour attracts the insects. Pollen kit is present on the pollens of *Capsella*.

[D] DEHISCENCE OF ANTHER :

During the maturation of anther, various changes are takes place in walls of anther.

- In the beginning, middle layer degenerates due to absorption of food by tapetum.
- In a **mature anther** only **two layers epidermis** and **endothecium** are present in the form of outer covering.



Dehiscence of Anther

- The sterile tissues are present between both the pollen sacs of each anther lobe degenerate. So both pollen sacs of the each anther lobe fuse together to form single pollen sac.
- Therefore, in the **T.S. of mature anther** only **two pollen sacs** are present.
- **Dehiscence** of anther takes place during the **dry season**. Due to the **hygroscopic nature** of endothecium, loss of water takes place from the cell of endothecium.

[E] MICRO-GAMETOGENESIS OR DEVELOPMENT OF MALE GAMETOPHYTE :

In **flowering plants**, **pollen grain** or **microspore** considered as **first cell** of **male gametophyte**. Germination or development of pollen grain takes place before dehiscence of anther. So it is called as **precocious development**. Development of pollen also takes place at **mother place** [inside pollensac of anther] is called **In-situ development**.

(i) Pre Pollination development :

In the beginning of the the process, only nucleus of pollen grain divided by **unequal mitotic division**, resulting **two unequal size** of nucleus are formed. Small nucleus present near the wall is called **generative nucleus** and large nucleus present inside the cytoplasm is called **Tube** or **Vegetative nucleus**.

Both the nucleus surrounded by cytoplasm and it becomes dense, then followed by **unequal cytokinesis**, resulting **two unequal size** of the **cells** are formed.

Larger cell in which **large nucleus** is present known as **Vegetative cell**, and **smaller cell** in which **small nucleus** is present , called **Generative cell**.

Now **pollen grains** come in **bicelled** and **binucleated stage**. In Angiosperms **pollination of pollen grains** take place in **bicelled** and **binucleated stage** in **60% Angiosperms** and in **40% Angiosperms** pollination occurs at **3-celled stage.** In this generative cell divides and form two male gametes. The development of gametophyte take place inside the sporangia is also known as **endosporic development**.

(ii) Post Pollination development :

Further **development of pollen grain** [Immature male gemetophyte] takes place on the **stigma** of Carpel after pollination. Pollens absorb moisture and sugar content from the stigma. Due to this volume of internal contents of cytoplasm increased. It exerts pressure on the both outer layers. Because of this pressure intine comes out through any one germpore in the form of tube like structure called **pollen tube**.

First of all **vegetative nucleus** enter into the pollen tube and assumes **terminal** [tips] position. This spindle shaped generative now enter into the pollen tube. Inside the pollen tube, **generative** cell divides **mitotically** and to form a two **non motile male gametes**. Now **male gametophyte** comes in **three celled structure** in which **one vegetative cell** and **two male gametes** are present.

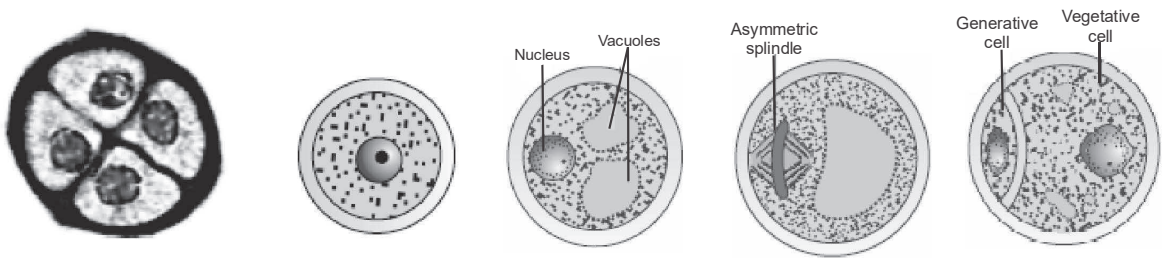


Figure : (a) Enlarged view of a pollen grain tetrad.
(b) Stages of a microspore maturing into a pollen grain.

FEMALE REPRODUCTIVE ORGAN-GYNOECIUM

Gynoecium is the **female reproductive organ**. The free **unit** of gynoecium is called **pistil** or **carpel**.

Carpel is also known as **megasporophyll**.

The **carpel** is differentiate into **three** distinct region -

[i] **Stigma** [ii] **Style** [iii] **Ovary**

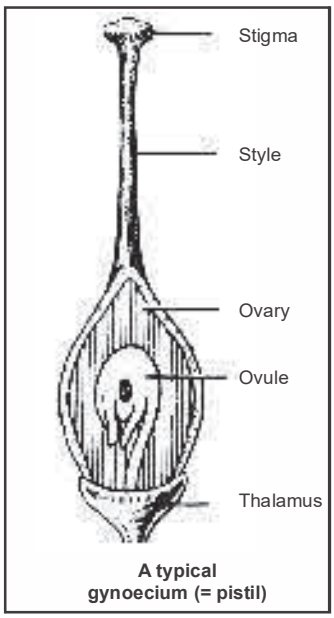
The free end of the carpel which receives pollen grains is called **stigma**. A long, narrow tubular structure is present in between the stigma and ovary called **style**. The basal swollen part of the carpel is called **ovary**. The ovules is also known as **megasporongia** which are borne on a cushion-like tissue called **placenta** in the ovary. **One** or **more than one** ovules are present inside the ovary.

[A] STRUCTURE OF OVULE OR MEGASPORANGIUM :

A ridge or stalk like out growth is formed from the placenta of the ovary on which body of ovules are present. Each ovule attached to the placenta by means of a thin stalk called **funicle** or **funiculus/Funiculum**

The point of attachment of the funicle with the ovule is called **hilum**.

The main region of the ovule is composed by mass of parenchymatous cells called **nucellus**. **Nucellus** is the **main part of ovule**. The nucellus is covered by **one** or **two** coats called **integuments**.



A typical gynoecium (= pistil)

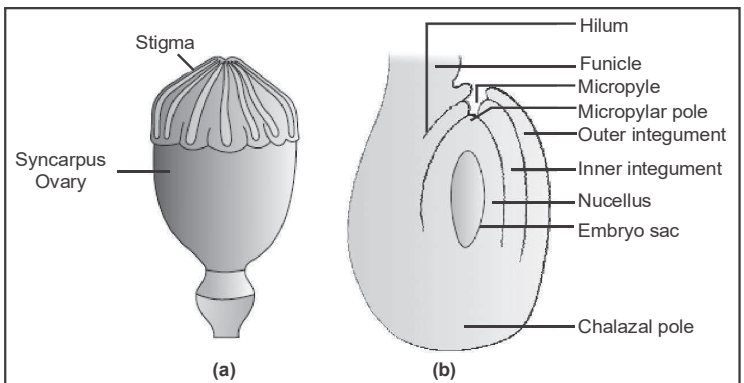


Figure : (a) Multicarpellary, syncarpous pistil of Papaver,
(b) A diagrammatic view of a typical anatropous ovule.

- In most of the ovule, funicle is attached to the main body of ovule for some distance (at lateral side) to form a ridge like structure known as ***Raphe.***
- Vascular tissues are present inside the funiculus which supply food material from the placenta to the body of ovule.
- A place from where **funicle** and **integuments** arise is called **Chalaza**.
  Integument is absent just opposite to the chalaza, so that a narrow passage (pore) is formed which is called **micropyle**.

- In most of the Angiosperm entire part of the nucellus is utilized by developing embryo sac but in some of the Angiosperm some part of the nuclellus remain inside the ovules that part of the nucellus present inside the seed in the form of a thin layer known as **perisperm.**

  Black pepper (*Piper nigrum*) and **Zingiberaceae Family** (Turmeric, Ginger) and **Beet.**
- Some filaments are attached with funicle [some times placenta] are known as **"Obturators"**.
- The function of obturators is to guide the passage of pollen tube towards the micropyle inside the ovary.

[B] TYPES OF OVULES :

There are **six** different **types of ovules** are found in **Angiosperms** on the **basis of relationship** of the **micropyle, chalaza,** and **hilum** with body of the ovule and **orientation on the funiculus**:
But only one in our syllabus.

B
Anatropous

ANATROPOUS OVULE :

In this type, the body of the ovule completely turned at **180^0 angle**, due to unilateral growth of funiculus, so it is also called inverted ovule. The chalaza and micropyle lie in straight line. The hilum and micropyle lie side by side very close to each other. This type of ovule is found in **80% families** of **Angiosperms** but not in ***Capsella***. In this ovule micropyle facing downward condition. This is the **most common type of ovule** so that it is considered as a **"typical ovule" of Angiosperms**. eg. Members of **Malvaceae, Cucurbitaceae, Solanaceae, Compositae** family, It is also called resupinate ovule. Exception - **Pea.**

[C] MEGASPOROGENESIS :

During the development of ovule, in the beginning of this process, **nucellus** develops from the **placenta** in the form of a small rounded out growth like structure. At this stage, all the cells of nucellus are undifferentiated, homogenous and meristematic. This mass of cells surrounded by single celled thick layer of epidermis.

Any **one hypodermal** cell of nucellus is differentiated and increase in size. It becomes different from rest of the cells due to presence of distinct nucleus. It is called **archesporial cell**. Archesporium divides periclinally to form an **outer primary parietal cell** and **inner Primary Sporogenous cell**. The primary sporogenous cell directly act as a **megaspore mother cell**. It divides **meiotically** to form, four haploid **megaspores**.

The four haploid megaspores generally arranged in **linear tetrad.** Generally the lower most or chalazal **megaspore** remains **functional** out of tetrad of megaspores and the **other three** lie towards the micropyle degenerate. This functional megaspore produces female gametophyte. In **most of Angiosperms *[Capsella]*,** Chalazal megaspore remains functional.

[D] DEVELOPMENT OF EMBRYOSAC OR FEMALE GAMETOPHYTE :

Megagametogenesis :- Megaspore is the **first** cell of the **female gametophyte**. This megaspore grows in size and obtains nutrition from the **nucellus**. The nucleus of megaspore divides mitotically to form a two nuclei. Each nucleus moves towards the opposite pole and reached at their respective poles. Both the nuclei lie at poles divide twice mitotically. Resulting, four-four nuclei are formed at each poles [Total 8-nuclei].

Out of the four, one-one nucleus migrates from the both poles [one nucleus from chalazal side and one nucleus from micropylar side] towards the centre. They are known as **polar nuclei**. Both polar nuclei are present in the centre.

Remaining three-three nuclei at each pole surrounded by cytoplasm to form cells as a result of cytokinesis. **Three cells** are formed towards the **micropyle** in which one cell is large and more distinct out of three cells. This is called **egg cell** and remaining **two smaller** cells are known as **synergids**. These three micropylar cells collectively known as **egg-apparatus**. [1 Egg cell + 2 Synergids]

The three cells are formed toward the Chalaza are called **antipodal cells**. Both the polar nuclei present in the central cell. But just before the process of fertilization they unite or fuse together in the centre to form **secondary nucleus**. It is **diploid in nautre [2n]** and one in number.

Therefore, **seven cells** and **eight nucleated** structure is formed. This **eight nucleated** and **seven celled structure** is called **female gametophyte** or **embryosac** of Angiosperms. This type of embryosac is known as "**polygonum type**" because it is discovered by **Strasburger** in ***Polygonum*** plant. Polygonum type embryosac is most **common type** in Angiosperms ***[Capsella]***. Polygonum type of embryosac develops from **single megaspore** so it is also known as **monosporic embryosac**.

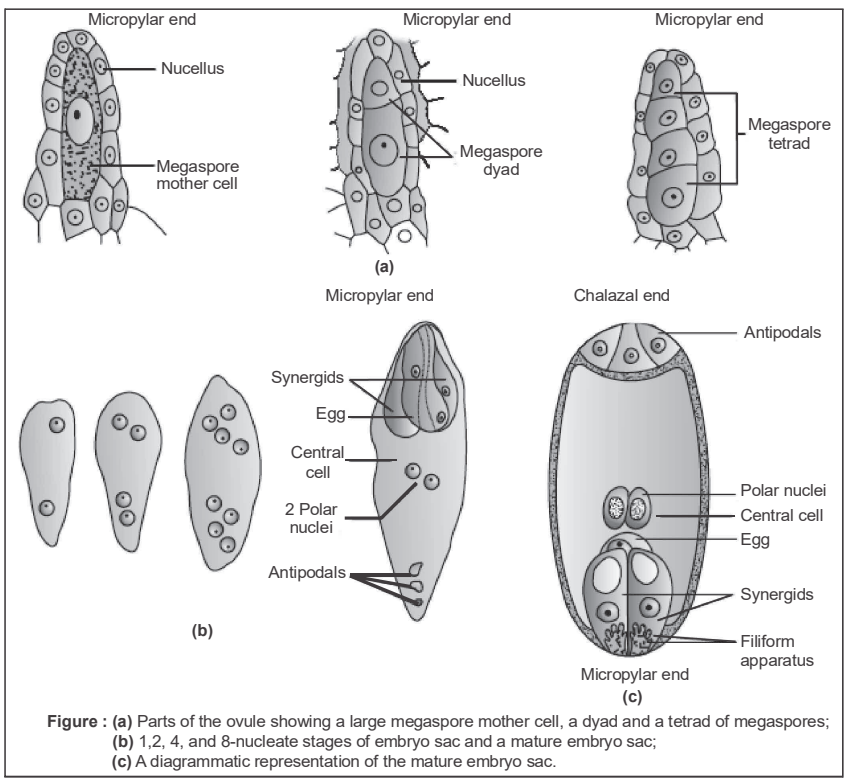


Figure : (a) Parts of the ovule showing a large megaspore mother cell, a dyad and a tetrad of megaspores; **(b)** 1,2, 4, and 8-nucleate stages of embryo sac and a mature embryo sac; **(c)** A diagrammatic representation of the mature embryo sac.

- Fingers like processes are produced from the outer wall of the synergids are known as **filiform apparatus**. With the help of these structures, synergids absorb food from the nucellus and transfer to the embryosac. Filiform apparatus is less developed in antipodal cells. Filiform also secrete **chemicals** which attracts the pollen tube.

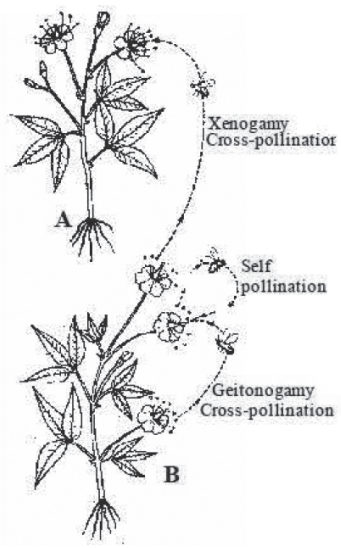
Difference between Male and Female gametophyte		
S.No.	Male Gametophyte	Female Gametophyte
1	It is developed from microspore or pollen grain.	It is developed form megaspore.
2	It does not remain embedded permanently in microsporangium.	It remains embedded permanently in megasporangium.
3	Male gametes come out of pollen grain due to the formation of pollen tube.	Female gamete always remains inside, covered by membrane of megasporangium.
4	There are two phases of growth - prepollination and post pollination.	Only single phase of growth.
5	It is three celled structure in mature stage.	It has seven cells in mature stage.
6	It will disintegrate after fertilization.	Two new structures are formed after fertilization, that is endosperm and oospore.

Difference between Egg cell and Secondary nucleus		
S.No.	Egg cell	Secondary nucleus
1	It is present near the micropyle, inside the embryosac.	It is present in the middle of the embryosac
2	Generally egg is surrounded by two synergids.	It is not surrounded.
3	Only single nucleus is present in it.	It is formed by fusion of two polar nuclei.
4	It is haploid structrue.	It is diploid structure.
5	It is fertilized with one male gamete and to form a diploid zygote (Embryo)	It is fused with one male gamete and to form a triploid primary endosperm nucleus (Endosperm)

POLLINATION

"Pollination is defined as the process of transfer of pollen grains from anther to the stigma of the same flower or of different flower of the same species."

Pollination is of different types :-



1. **Self pollination or Autogamy :**

If the pollen grain are transferred from an anther to the stigma of the **same flower** is called **self pollination** or **autogamy**.

2. **Geitonogamy :**

When, pollination takes place in between the **two flowers** of the **same plant** then it is called **geitonogamy**. From the **genetical point** of view geitonogamy is **self pollination** because all flowers of the same plant are genetically identical. But **ecologically and functionally**, it is considered as **cross pollination**.

3. **Cross pollination or Allogamy (Xenogamy) :**

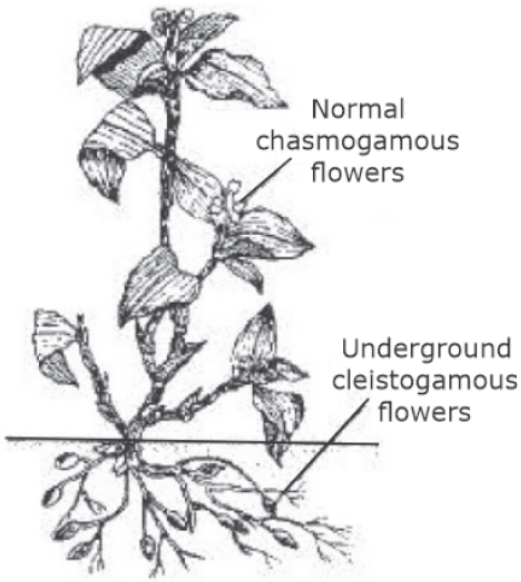
When the pollination takes place in between the two different flowers of **two different plants** of the same species then it is called **xenogamy**. This is **real or true cross pollination. Genetically,** as well as **ecologically**, it is **cross pollination**.

Contrivances or Adaptation for Self Pollination:

(i) Monocliny (Bisexuality) - It means flowers are bisexual.

(ii) Homogamy :- When both the sex organs of a flower mature at the same time. It is called **homogamy**. It increases chances for self pollination. E.g. ***Mirabilis, Catharanthus.***

(iii) Cleistogamy :- In some plants bisexual flower are formed which never opens throughout the life. Such flowers are called **cleistogamous flowers**, such as ***Commelina, Viola (Common pansy)***, ***Oxalis, Juncus, Drosera. Commelina*** plant have two types of flowers. One type of flowers are **cleistogamous** and another are **chasmogamous flowers**.



Commelina plant

- **In legume plants,** the sex organs are closed in a structure which is formed by joining of **some petals**. It is called **keel**. This keel never opens . So only self pollination takes place in these plants.

(iv) Bud pollination:- This pollination occurs in bud stage before the opening of flowers. E.g. **Wheat, Rice.**

Contrivances for Cross Pollination :

(i) **Dicliny (Unisexuality) :-** Presence of unisexual flowers confirm cross-pollination. Self pollination never takes place in these flowers. It means allogamy becomes compulsory.Examples – ***Morus*, Palms, Date Palms, *Cucumber* and *Cucurbita, Carica*.**

(ii) **Dichogamy :-** In many **bisexual flowers** of the plants, stamens and carpels of a flower do not mature at the **same time**. Dichogamy is of two types –

(a) **Protandry** :- The anther of a flower mature earlier than carpels, is called **protandry**. **Many plants of Angiosperms** are cross pollinated only because of **protandrus condition**. E.g. ***Salvia*, Sunflower, Cotton.**

(b) **Protogyny** :- The carpels of the flower mature earlier than stamens. It occurs in few plants e.g. ***Ficus bengalensis***, ***Saraca indica, Ficus religiosa*, *Aristolochia*,** most of plants of **Cruciferae** and **Rosaceae** family .

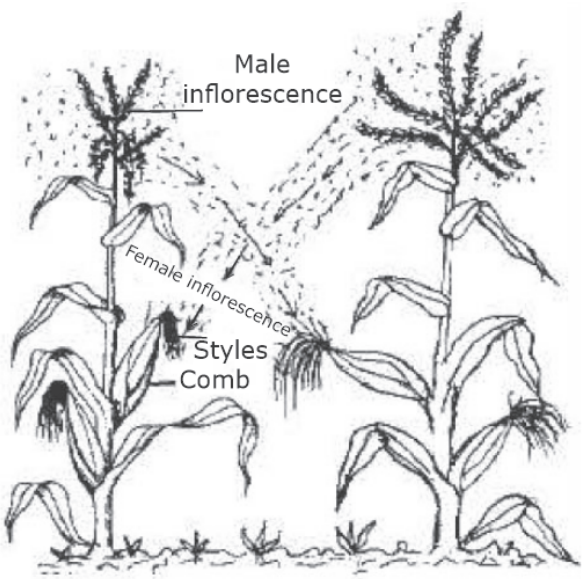
(iii) **Chasmogamy or Anthesis** :- Opening [blooming] of the floral bud in the form of a flower is called **anthesis**.

(iv) **Self sterility or self incompatibility or intraspecific incompatibility** :- In this condition the pollen grains of the flower can not germinates on the stigma of the same flower. This condition is called **self sterility**.

METHODS OF CROSS POLLINATION

1. ANEMOPHILY :

When the pollen grains are transfer from one flower to the another flower through the air is called **anemophily** and flower is known as **anemophilous flowers**. Such as **Cereal plants** :- **Maize** etc. Anemophily is also found in all **Gymnosperms**. The anemophilous plants produce **enormous amount of pollen grains**. The pollen grains are very **small, light weight** and **dry** and their stigma is **hairy or brushy** and **mucilagenous (Sticky)**.



Air pollination in maize plant

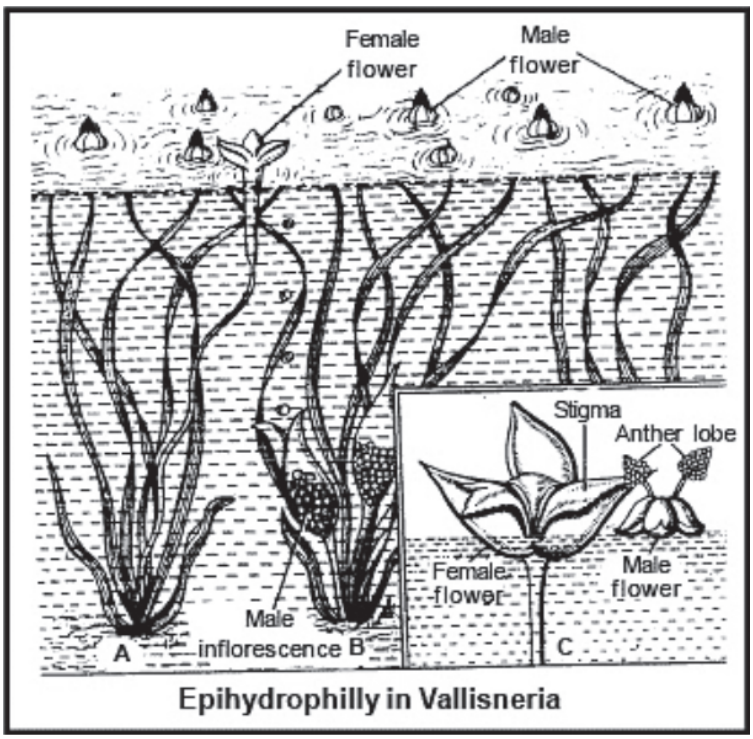
Anemophilous flowers are **neither attractive** nor with **fragrance**. They do not have nectar glands. Anemophilous flowers are generally unisexual.

E.g. - **Sugar cane, *Bamboo*, Coconut, *Cannabis*, Grasses**, **Date palms, *Typha*, Oak, Cucumber, Papaya, Cotton, *Eucalyptus*.**

- Wind pollination is quite common in grasses.
- Maximum loss of pollen grains takes place only in this pollination. It is completely **non directional process**.

2. HYDROPHILY :

When the pollination brings by water is known as **hydrophily**. It is of **two types**.



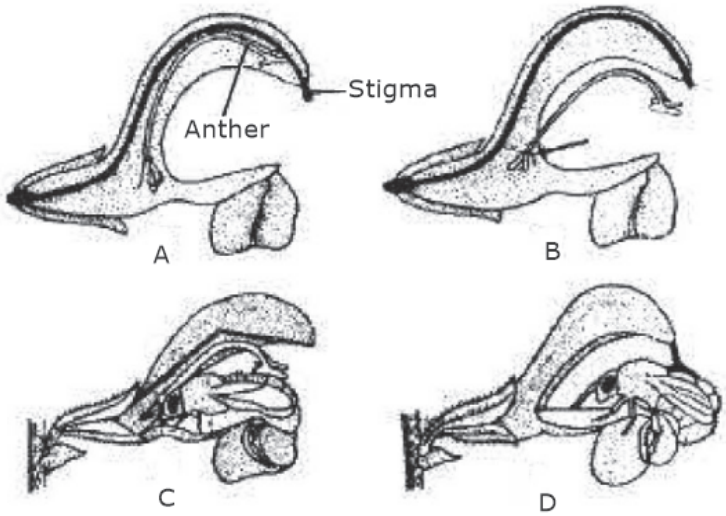
Epihydrophilly in Vallisneria

(i) **Epihydrophily** :- When the pollination takes place on the surface of water is called **epihydrophily** e.g. ***Vallisneria*** (Fresh water form) and ***Ruppia***.

(ii) **Hypohydrophily** :- When the pollination takes– place inside the water is called **hypohydrophily**. e.g. ***Ceratophyllum, Najas Zostera*** (Sea grasses) and **Specific gravity** is found in **pollen grains** so they remains **suspended** in water.

3. ZOOPHILY :

When the **pollination** brings by **animals** is called **zoophily**. Generally in zoophillous plants, flowers are very **large, attractive** and maximum number of **nectar glands** are present (more than entomophilous).



Leave mechanism in Salvia

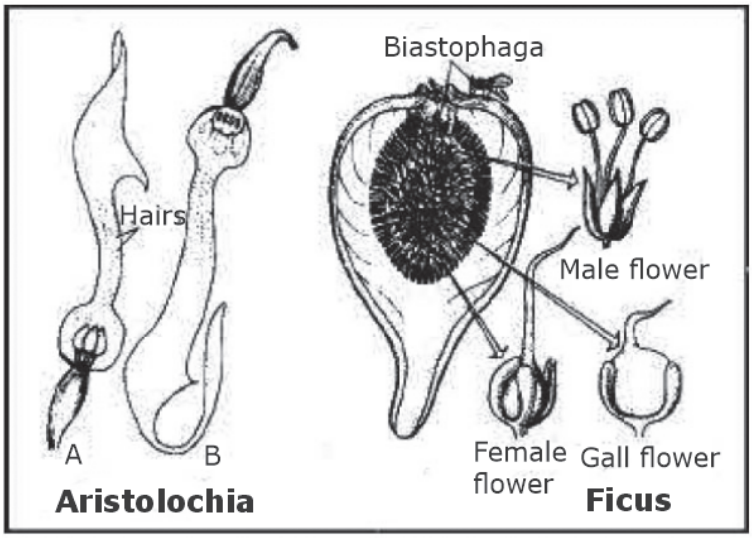
(i) ENTOMOPHILY :

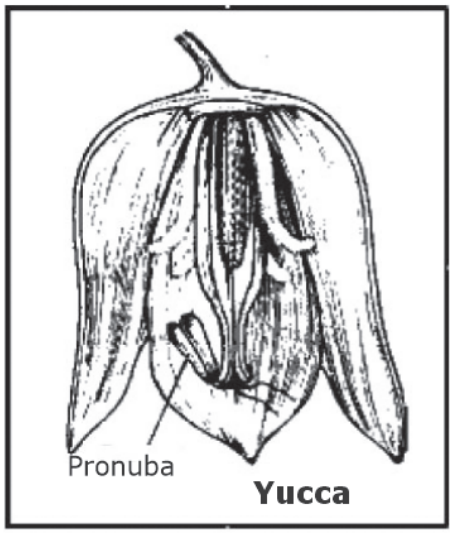
The pollination takes place with the help of **insects** is known as **entomophily**. Most of insect pollination **(80%)** only by **Honey bees**. Most of entomophilous plants are ornamental plants. **Ornamental plants** utilize their maximum energy in this pollination and develops different types of **adaptation** for attraction of insects. These flowers are attractive in colour. They posses **special fragrence**. Nectar glands is also present. e.g. **Rose, Lemon, Coriander, Onion.** The **pollen grains** of insect pollinated flowers become **sticky** due to presence of **pollen kitt**. The surface of **stigma** of flowers is **rough**.

Some of the plants develop special adaptation for insect pollination.

- In ***Mussaenda*** plant, **advertising flag** is present for attraction of insects.
- The **lever mechanism** or **turn pipe mechanism** is found in ***Salvia*** or **Sage plant** for pollination. The flowers of ***Salvia*** have **bilabiatecorollate tube**. The connective of stamen is long. The anterior anther lobe of connective is fertile while posteriorly lobe is sterile. When the insect lands on the lower lip, the fertile lobe automatically brings down to touch the back of insect and thus depositing the pollen grains on the back of insect.
- Some of the flowers have attractive **bracts** i.e. bright and coloured e.g. ***Bougainvillea***
- ***Yucca*** plant has develops an **obligate symbiotic** relationship with an insect- **Pronuba moth**. The **pollination** in "Yucca takes place only by Pronuba moth. This insect lays eggs in the ovary of flower. **Life cycle of both depend on each other.**

  In tallest flower of Amorphophallus (the flower itself is about 6 fect in height) process same as Yucca.





(ii) ORNITHOPHILY :-

Then process of **pollination** is taken place by **birds** is known as **ornithophily**. e.g. **Sun bird** and **humming bird** in ***Bignonia*** plant and by **Honey bird** in ***Strelitzia***, ***Callistemon*** (Bottle brush)**,** ***Bombax*** **[Silk cotton tree,]** ***Butea*** **monosperma, Tobacco.**

Humming bird

(iii) CHIROPTEROPHILY :-

If the **pollination** brings through the **bats (*Pteropus*)** is called **chiropterophily.** These flowers are big in size e.g. ***Anthocephalus kadamba***, ***Bauhinia***, ***Kigelia*** **plants (Sausage tree),** ***Adansonia, Musa (Banana).***

(iv) MYRMECOPHILY :-

This pollination brings about by **Termites and Ants. e.g.** ***Prosopis*** **(kikar),** ***Acacia*** **(Mimosoideae family), Mango and some members of Rubiaceae family.**

Difference between Self and Cross pollination		
S.No.	Self pollination	Cross pollination
1	Pollen grains are transferred to stigma of same or genetically similar flower.	Pollen grains are transferred to stigma of genetically different flower.
2	Anthers and stigma mature simultaneously.	They mature at different time i.e. protandry and protogyny.
3	It occurs in open as well as closed flower.	It occurs in only open flower.
4	It is very economical for plants.	It is not economical as the plant has to produce large number of pollen grains, nectar, scent and colouration .
5	External agencies are not required.	It is essential i.e. depends on agencies.
6	Young ones are homozygous.	Young ones are heterozygous.
7	It produces pure lines because of the non occurrence of genetic recombinations.	It produces variations due to genetic recombinations.
8	It cannot eliminate harmful traits.	It can eleminate harmful traits.
9	Useful characters are preserved.	Not preserved.
10	No adaptability in the changing environment.	It provides adaptability.
11	It cannot introduce new traits.	It can introduce new traits.
12	Disease resistance is low.	Disease resistance is optimum.
13	There is decrease in yield.	It increase the yield.
14	It does not help in the development of new species.	Helps in the development of new species.

POLLEN PISTIL INTERACTION

The fusion of male gamete with female gamete is called fertilization.

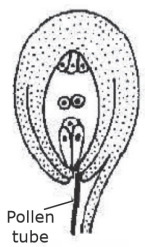
[A] GERMINATION OF POLLEN GRAINS :

After pollination, **pollen grains** germinate on the **stigma**. They absorb moisture and sugar contents from stigma and swellup. The intine of pollen grain grows out through the any one germinal pore of exine, in the form of tube like out growth is called **pollen tube**.

- When the pollen tube comes down from the stigma into the style, first of all vegetative nucleus enter, into the pollen tube then it is followed by generative cell. The tube nucleus always occupies in terminal position in pollen tube. The vegetative nucleus controls the growth of the pollen tube. Mean while, the generative cell divide mitotically to form **two male gametes**. Both of the male gametes are **non motile**.
- **Boron** and **calcium** ions (mainly Boron) are essential for the growth of pollen tube and best temperature for growth of pollen tubs is **20–30^{0}C**. Pollen tube shows **apical growth** and **chemotropic** movement.

[B] ENTRY OF POLLEN TUBE INTO OVULE:

Finally, the pollen tube enters in the ovary at that time, ovule becomes mature. Inside the ovary **obturators** guides the passage of pollen tube towards the micropyle. A mature ovule in which embryo sac also matured, has three paths for the entry of pollen tube:



Porogamy

(i) POROGAMY :- In this, pollen tube enters into the ovule through the micropyle. It is known as **porogamy**. It is found in **most of Angiosperms** ***[Capsella].***

[C] ENTRY OF POLLEN TUBE INTO EMBRYOSAC :

Pollen tube can enter into the ovule through the any passage but inside embryosac, it enter only through the **egg apparatus**. After the entrance inside the ovule, it grows towards the egg apparatus because synergids cells secrete the chemical (hormones) which attracts the growth of pollen tube. It means **pollen tube** shows **chemotropic movement** in ovule.

- Any one synergid starts degenerating when the pollen tube comes near egg apparatus. The pollen tube enter into the embryosac through the degenerating synergids.
- When tip of the pollen tube enters into the embryosac vegetative nucleus degenerates. The tip of the pollen tube swells and burst [Endosmosis] after reaching inside the embryosac. The pollen tube released all contents including both male gametes inside the degenerating synergids of embryosac.

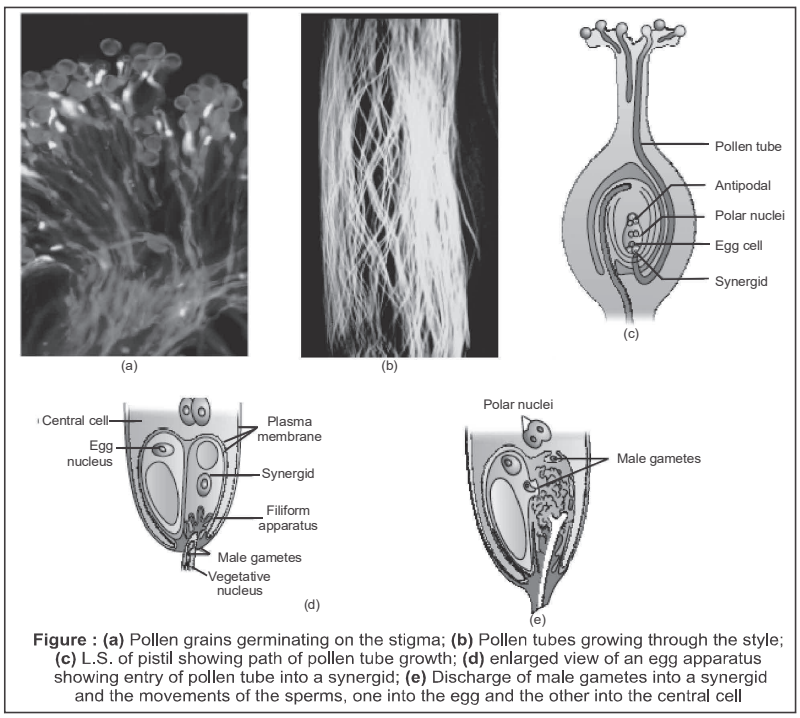


Figure : (a) Pollen grains germinating on the stigma; **(b)** Pollen tubes growing through the style; **(c)** L.S. of pistil showing path of pollen tube growth; **(d)** enlarged view of an egg apparatus showing entry of pollen tube into a synergid; **(e)** Discharge of male gametes into a synergid and the movements of the sperms, one into the egg and the other into the central cell

DOUBLE FERTILIZATION

- Before or after the entrance of pollen tube into the embryosac, both polar nuclei of the central cell fused together to form a **diploid nucleus**. It is known as **secondary nucleus** or **definitive nucleus**.
- Out of two, **one male gamete** fertilized with **egg cell** and to form a **diploid zygote**. This fusion is known as **syngamy**. This is **true mechanism of fertilization** process.
- The **second male gamete** fused with **diploid secondary nucleus** which is formed by the fusion of two polar nuclei. This fusion is known as **triple fusion** resulting, a triploid (3n) structure is formed. It is called **primary endosperm nucleus**.
- **Fertilization** takes place **twice** at a time in **Angiosperm** is called **double fertilization**.

- **Double fertilization** and **triple fusion** is the **specific** or **universal** characteristic of **Angiosperm.** There are **five nuclei** and three gametes participate in **double fertilization.**
- A zygote is formed by true fertilization (syngamy] develops into **embryo**. Triploid primary endosperm nucleus is formed by triple fusion develops into the **endosperm** which is used as nutrition for growing embryo.
- All the remaining cells of embryosac like **antipodal cells, synergids** degenerate excluding zygote and primary endosperm nucleus after the fertilization. At this time, zygote obtains food from degenerating synergids and antipodal cells.
- The **fertilization** in which **non-motile gametes** are carried to female gamete through **pollen tube** is known as "**Siphonogamy**".

Difference between Pollination and Fertilization		
S.No.	**Pollination**	**Fertilization**
1	Transfer of pollen grains from anther to stigma of the flower is called pollination.	Fusion of male gametes and egg cell in embryosac situated inside the ovule is called fertilization.
2	This process take place before fertilization.	This process take place after pollination.
3	For the completion of this process, insects, water, air like agencies are essential	There is no any external medium is utilized in this process
4	Pollen tube is not formed	Pollen tube is formed which transfer male gametes up to egg cell.
5	This process take place on outer parts of flower, so that it is external mechanism	This process take place inside the flower, so that it is internal mechanism.

Post-fertilization : structures and events

The post fertization event includes :

I. Endosperm development
II. Embryo development
III. Ovules maturing into seed
IV Ovary maturing into fruit

ENDOSPERM :

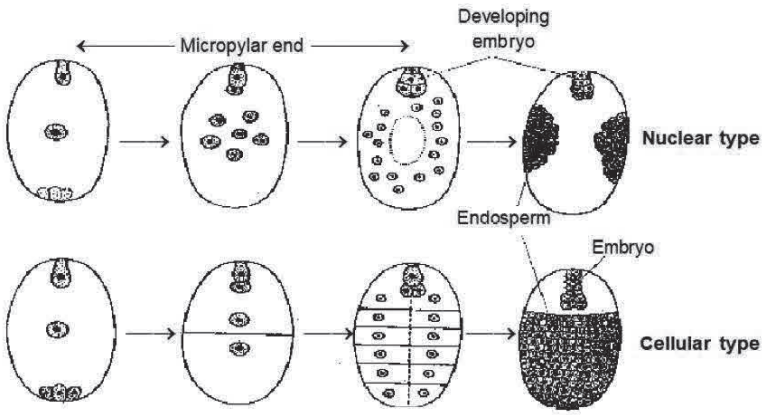
- First of all endosperm develops from the primary endosperm nucleus after the fertilization which stored food materials. It is utilized by the embryo during the early development then after at the time of seed germination. Food is present in the form of **starch** in endosperm. The endosperm is of **three types** on the basis of **development** :-

1. NUCLEAR ENDOSPERM :

- This type of endosperm mostly found in **Dicotyledon [Polypetalae].** Nuclear endosperm is also present in ***Capsella***.
  Such type of endosperm develops by **free nuclear divisions** of nucleus of primary endosperm nucleus, Thus a **multinucleated endosperm** is formed. Later on cytokinesis takes place, so that multicellular endosperm is formed.
- This type of endosperm is the most common in Angiosperms.
- The milky fluid is found in **green Coconut** is example of **nuclear endosperm**, which is called **liquid syncytium**.
- In ***Melastoma***, cytokinesis never take place so that it is always remains **nuclear endosperm**.

2. CELLULAR ENDOSPERM :

- This type of endosperm is found in **Gamopetalae group.** During the development, each division of primary endosperm nucleus is followed by cytokinesis. So that endosperm is remains cellular from the beginning.



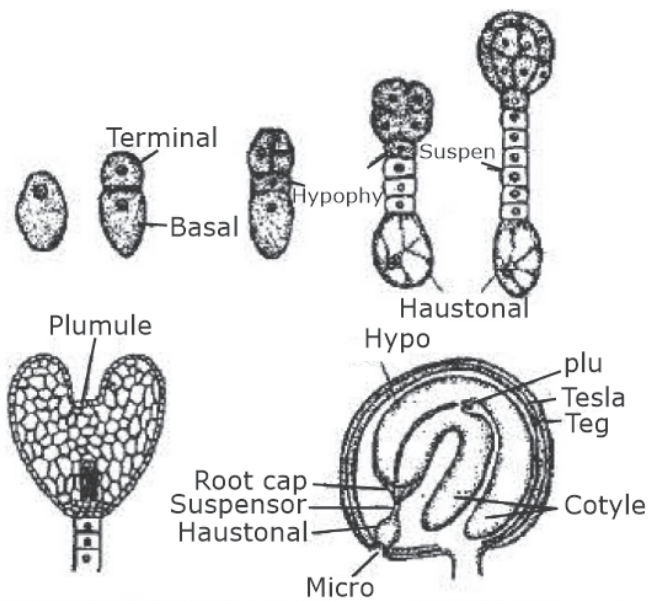
EMBRYO DEVELOPMENT

Development of Embryo in Dicot :

Development of **embryo** in ***Capsella*** is first time discovered by **"Hanstein"**.

- In Angiosperm, Zygote undergoes in resting phase. When the endosperm is formed, development of zygote starts. In the beginning it absorb food from the endosperm and increase in size then after a layer secreted by itself. Now it is called **Oospore**.
- The **first division** of Oospore is **transverse**, results two cells are formed. The one cell lies towards **micropyle** is called **basal cell** or **suspensor cell**. The other cell is formed towards the **Chalaza** is called **apical cell** or **terminal cell** or **embryonal cell**.
- The basal cell and embryonal cell divide simultaneously.
- The basal cell divides transversly and apical cell divides vertically resulting, two suspensor cells and two embryonal cells formed. This stage is made up of four cells which are arranged in **'T' shaped** structure. Embryonal cells divide **vertically** to form four Embryonal cells. This is the **quadrant stage** of embryo.
- The **two suspensor** cells divided by transverse divisions forming a **6-10 celled** long filament like structure is termed **suspensor**. The main function of suspensor is to pushes the developing embryo into food laden endosperm to provide nutrition.
- The **micropyler cell** of the **suspensor** swells up. This cell of suspensor is known as **haustorial-cell**.

- The **cell of suspensor** lies near the embryonal cells is called **hypophysis.** This cell combined with radicle to form the **apex of root** [Root cap].
- These four cells quadrent embryo further divide transversely to produce eight. The eight celled stage of embryo is called **octant stage**. The eight cells of octant are arranged in two tiers.
- The four cells of the octant embryo lies near the **hypophysis** is known as **hypobasal cells** and four cells present towards the **chalaza** termed **epibasal cells**.
- The **hypobasal cells** gives rise to **radicle** and **hypocotyl** and **epibasal cells** giverise to **two cotyledons** and **plumule** of the embryo.
- All the cells of octant divided by periclinal division so that a 16 celled **globular embryo** is formed.
- Due to fast division of embryonal cells of globular embryo, a **heart shaped embryo** is formed. All the cells of this embryo are meristematic.
- Due to the fast growth in **two lobes** of heart shaped embryo, they develop into **two cotyledons**. Both the growing cotyledons turn in **downwards** due to the **curved position of body of ovule** of ***Capsella***.
- The tissues are present above the joining place of both the cotyledons are responsible to form **plumule** and behind it **epicotyl** is formed.
- The tissues present opposite to the plumule give rise to **radicle**.
- This **curved position** of the embryo is called **Torpedo** or **Chordate stage**.
- An axis is present between plumule and radicle is called **embryonal axis**. It is also called **Tigellum [main embryonal axis.**
- Both the cotyledons are present at lateral position of embryonal axis and plumule is formed in terminal position in Dicotyledon embryo.
- **Ovule** modified into **seed** in which **testa** is formed by **outer integument** and **tegmen** is formed by **inner integument**.
- Only **micropyle of ovule** remains **unchanged** and also present in **seed**.
- Entire **ovary** modified into **fruit**. This fruit is formed by fertilized ovary so that it is called **true fruit**.
- In some of the Angiosperms fruit is formed from the ovary without fertilization known as **Parthenocarpic fruit**.
- In some fruit parthenocarpy is useless (If edible part is endosperm or seed).



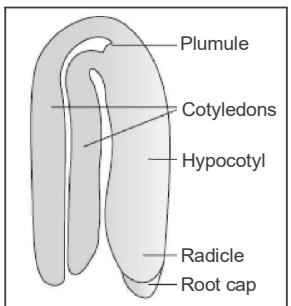
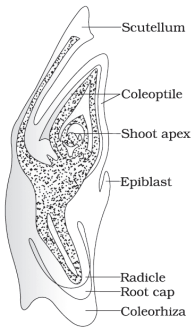


Fig. : A typical dicot embryo.

- In the grass family the cotyledon is called **Scutellum** that is situated towards one side (lateral) of the embryonal axis. At its lower end, the embryonal axis has the radicle and root cap enclosed in an undifferentiated sheath called **coleorrhiza**. The portion of the embryonal axis above the level of attachment of scutellum is the epicotyl. Epicotyl has a shoot apex and a few leaf primordia enclosed in a hollow foliar structure, the **coleoptile.**



L.S. of an embryo of gress

Difference between Embryo and Endosperm		
S.No.	**Embryo**	**Endosperm**
1	It is formed by fertilized egg (syngamy)	It is formed by fusion of secondary nucleus (triple fusion)
2	It is always diploid structure	It is generally triploid structure
3	It gives rise to new plant	It provides nutrition to the developing embryo.
4	Cotyledons, plumule and radicle are formed in embryo	Such type of structures are never formed.
5	Embryo is present in seed.	It is only found in endospermic seeds otherwise It degenerates with the formation of seed.
6	Embryo dies in the absence of endosperm	Endosperm does not die in the absence of embryo.
7	Germination of seed takes place.	There is no germination is found in endosperm.

SEED

Definition : A fertilized ovule is called a seed.

Seeds may be :

(1) **Endospermic/Albuminous seeds :** e.g., Wheat, maize, barley, sunflower, coconut, castor.

(2) **Non-endospermic/Exlbuminous seeds :** e.g., Pea, bean, groundnut.

(3) **Perispermic seeds :** Speeds in which remains of nucellus is seen. the residual, persistent nucellus is called perisperm, e.g., Black pepper, beet.

Structure of Seed :

A typical seed consists of :

(1) **Seed coat :** Formed from integuments of ovule. Its function is to give protection to the embryo. The outer layer of seed coat is called as **testa** and the inner one is called **tegmen**. The micropyle remains as a small pore in the seed coat. This facilitates entry of O_2 and water into the seed during germination.

(2) **Endosperm :** Present or absent.

(3) **Embryo :** It gives rise to the mature plant and maintains continuity of generation.

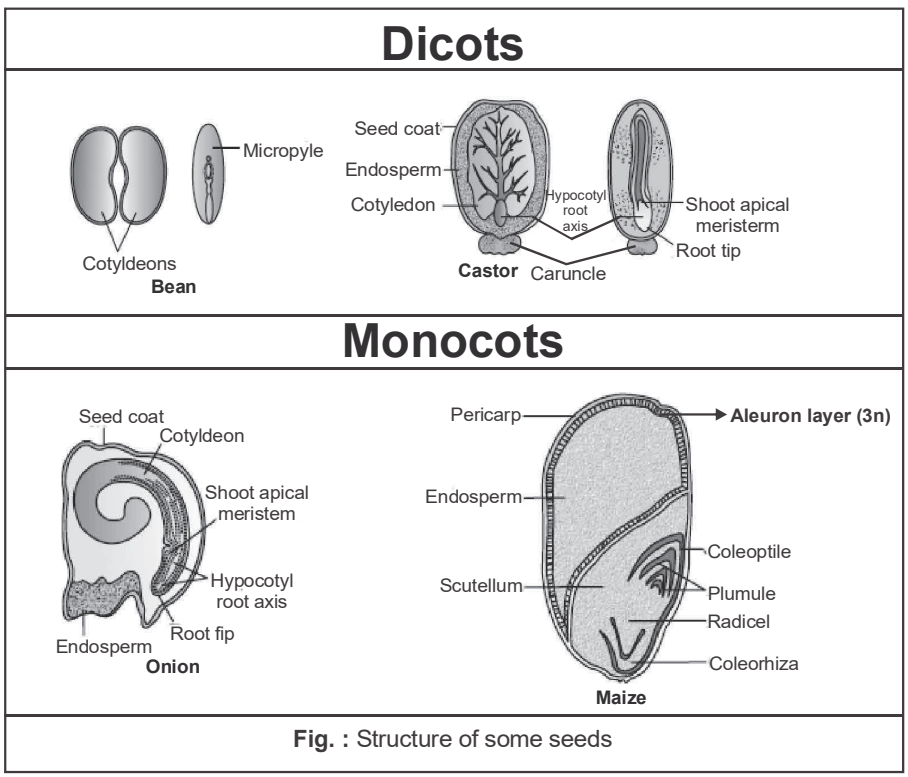


Fig. : Structure of some seeds

Dormancy and Seed Germination :

(1) **Dormancy :** It is a state of inactivity of embryo when the seed is not able to germinate. The moisture content of seed-decreases and reaches 10-15%.

(2) **Germination :** The ability of a seed to produce a seedling in presence of favourable environmental condition like adequate moisture, oxygen and suitable temperature

Advantage of Seed to Angiosperms :

(1) Seed have better adaptive strategies for dispersal to new habitat.
(2) It has sufficient food reserves for nourishment of young seedlings.
(3) Protection is provided to young embryo by the hard seed coat.
(4) Generate new genetic recombination as it is a product of sexual reproduction.

Seed - Basis of our agriculture :

Seeds form the basis of our agriculture as they show:
(1) Dehydration
(2) Dormancy
These two features help in storage of seeds which can be used as food throughout the year and also to raise crops in the next season.

Seed Viability :

The period for which the seeds retain their power of germination is called **seed viability.**
There are examples where seed lose viability within few months, e.g., *Oxalis*. Seeds of a large number of species live for several years. Some seeds can remain alive for hundreds of years. There are several records of very old yet viable seeds :
(1) The oldest is that of a **lupine,** *Lupinus arcticus* excavated from Arctic Tundra.
The seed germinated and flowered after an estimated record of 10,000 years of dormancy.
(2) During an archaeological excavation of King Herod's Palace near the Dead Sea, a 2000 years old viable seed of date palm, ***Phoenix dactylifera*** was found.
The number of seeds in a fruit is generally equal to or less than the number of ovules in a ovary. It never exceeds the number of ovules.
(1) Orchid's fruit contains thousands of tiny seeds.
(2) Parasitic species like ***Orobanche*** and ***Striga*** also contain many tiny seeds.

FRUIT

(1) A ripened ovary is called a fruit.
(2) The wall of the ovary forms the wall of the fruit which is called as **pericarp.**
(3) Fruits may be :
(i) **True fruit :** Fruit which develops from the ovary, e.g., Mango.
(ii) **False fruit :** Fruit which develops from other floral parts and thalamus along with the development of ovary wall, In Apple, Strawberry and Cashewnut, Thalamus, Contributes to fruit formation.
(iii) **Parthenocarpic fruit :** When fruits develop without the process of fertilization. These fruits are seedless and can be produced through application of growth homones like auxins, e.g., Banana.

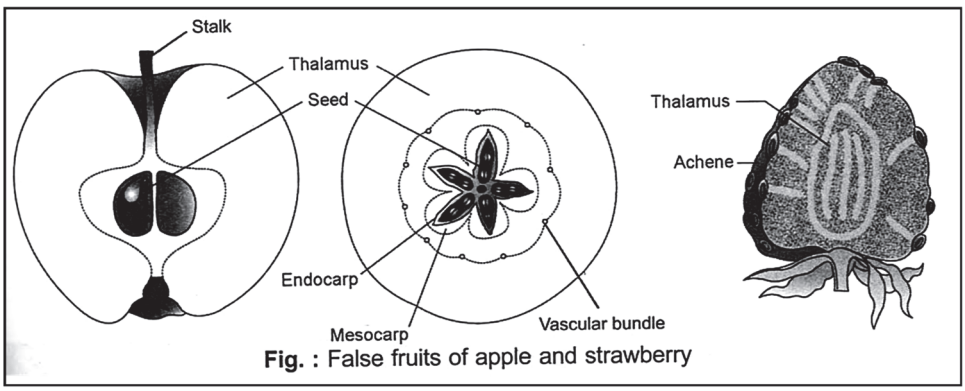


Fig. : False fruits of apple and strawberry

The first stimulus for fruit development comes from pollination while second stimulus is received from developing seeds and the third stimulus is provided by the availability of nutrients.

Difference between Monocotyledonous and Dicotyledonous seed		
S.No.	**Monocotyledonous Seeds**	**Dicotyledonous Seeds**
1	Only single cotyledon is present with embryo	Two cotyledon are present with embryo
2	Generally cotyledon is thin or papery	Cotyledons are thick
3	Generally seeds are endospermic (except orchids)	Generally seeds are non endospermic, some times may be endospermic (castor, solanaceae)
4	Cotyledon is also called scutellum	Not called by this name
5	In seed plumule is covered by coleoptile and radicle is covered by coleorrhiza.	Coleoptile and coleorhiza are not formed.
6	Plumule is in lateral position and cotyledon are is in terminal position	Plumule is in terminal position and cotyledons are present in lateral position
7	Radicle degenerates after sometime and adventitious roots are formed at that place.	Radicle is responsible to form primary root.
8	In some of the seeds, seed coats and cotyledon fused together e.g. Wheat etc.	Such types of seed are not found.

APOMIXIS AND POLYEMBRYONY

Apomixis :

Although seeds, in general, are the products of fertilisation, a few flowering plants such as some species of Asteraceae and grasses, have evolved a special mechanism, to produce seeds without fertilisation, called apomixis. It is a form of asexual reproduction that mimics sexual reproduction.

Types of Apomixis :

1. **Adventive Embryony (Sporophytic budding) :** Embryo arises from diploid sporophytic cells such as nucellus or integuments (other than egg), e.g., *Citrus, Opuntia, Mango.*
2. **Recurrent Agamospermy :** In this method, a diploid embryo sac is formed from megaspore mother cell of nucellar cell which has a diploid egg or oosphere. The diploid egg develops into a diploid embryo, e.g., Apple, Pear.

Polyembryony :

- Occurrence of more than one embryo in a seed is referred as polyembryony.
- More often, as in many *Citrus* & mango varieties, some of the nucellar cells surrounding the embryo sac starts dividing, protrude into the embryo sac & develop into the embryos. In such cases, each ovule contains many embryos.

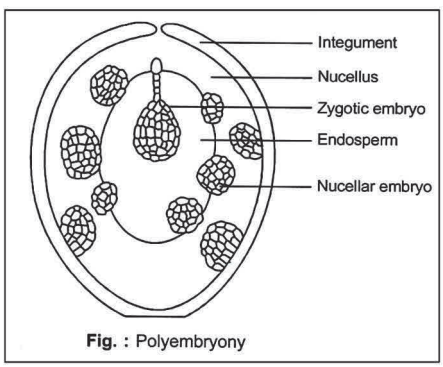


Fig. : Polyembryony

The diagram above shows several embryo formation.

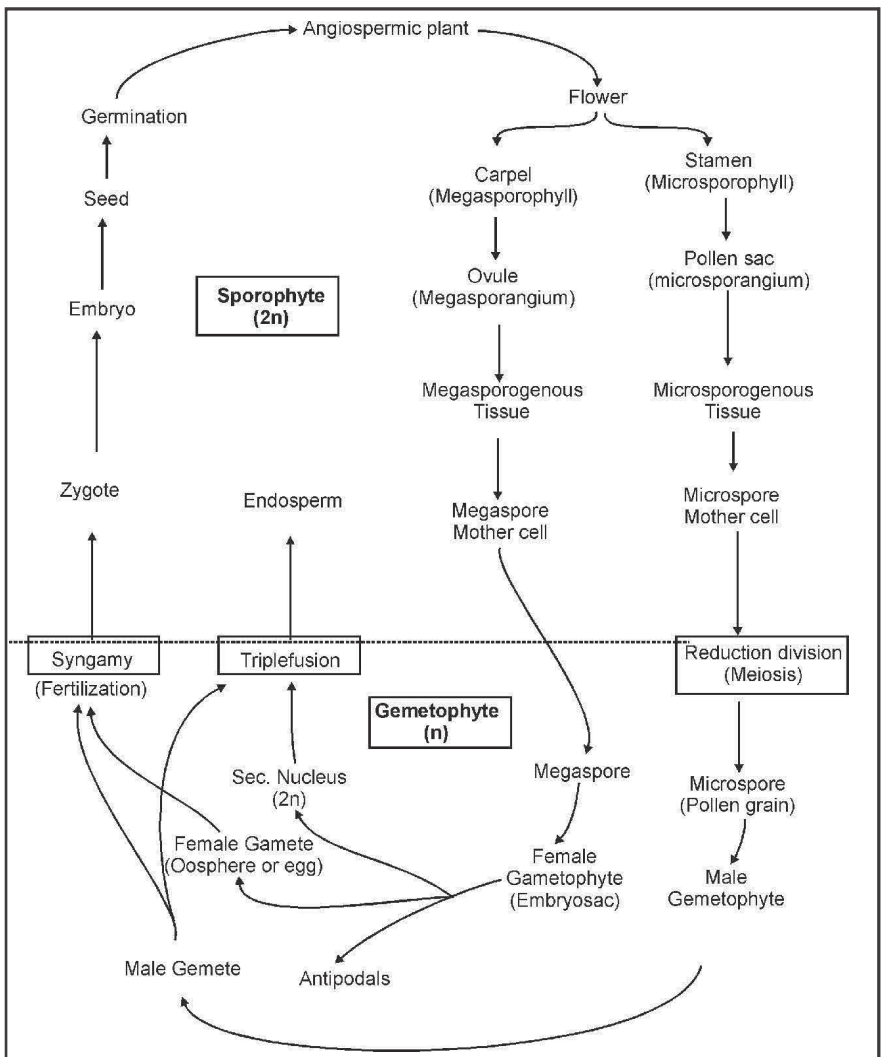
The embryos shown are :

1. Zygotic
2. Nucellar
3. Integumentary

The nucellar and integumentary embryos are apomictic. The genetic nature of these embryo is diploid (2n) and they would be genetically identical to each other and can be called as a **clone.**

Potential of Apomictic Polyembryony :

Hybrid varieties are preferred by agriculturists because of their higher yield, vigour and resistance to stresses. They have increased crop productivity, e.g., Maize, Tomato, Cauliflower etc.



OUT LINE DIAGRAM OF LIFE CYCLE OF ANGIOSPERMS

NUMBER OF CHROMOSOMES IN DIFFERENT PARTS OF PLANT

Sporophyte		
1	Zygote	2n
2	Embryo	2n
3	Endosperm	3n
4	Radicle	2n
5	Plumule	2n
6	Cotyledon	2n
7	Nucellus	2n
8	Integument	2n
9	Microspore mother cell	2n
10	Megaspore mother cell	2n
11	Ovary wall	2n
12	Carpel	2n
13	Sepal, Petal	2n
14	Stamen	2n
15	Leaf, Root, Stem	2n

Gametophyte		
S.No.	**Parts of Plants**	**Number of Chromosomes**
1	Microspore	n
2	Tube cell	n
3	Male gamete	n
4	Megaspore	n
5	Embryosac	n
6	Synergid	n
7	Antipodals	n
8	Egg cell	n
9	Polar nuclei	n + n

Introduction, Flower

1. The type of cells under going meiosis in the flowers are

(1) Micro spore mother cell & mega spore mother cell
(2) Ovule & stamen
(3) Tapetal cells
(4) Placental cell

[C. 68.03%, I.C. 11.99%, U.A. 19.98%]

2. Which of the following is monocarpic plant?

(1) Sheesham **(2)** Mango
(3) Pinus **(4)** Bamboo

[C. 64.49%, I.C. 33.94%, U.A. 1.57%]

3. Go through the following statements :
I. Flowers are small. They are often packed in inflorescence.
II. Flowers are colourless, nectarless and odourless
III. Well exposed stamens
IV. Pollen grains are produced in large numbers which are light and non-sticky
V. Flower often have a single ovule in each ovary
VI. Stigma is large and often feathery
The above contrivances favour

(1) Cross pollination
(2) Anemophily (pollination by wind)
(3) Ornithophily (pollination by birds)
(4) Entomophily (pollination by insects)

[C. 54.55%, I.C. 37.50%, U.A. 7.95%]

4. Essential whorls of a flowers

(1) Calyx and Corolla
(2) Corolla and Gynoecium
(3) Androecium and Gynoecium
(4) All the above

[C. 32.35%, I.C. 49.70%, U.A. 17.95%]

Male Reproduction Organ

5. The inner most wall layer of anther is tapetum; the main function of tapetum is-

(1) Division **(2)** Support
(3) Nutrition **(4)** None

[C. 90.05%, I.C. 8.60%, U.A. 1.36%]

6. Pollen allergy is caused by pollens of :-

(1) Rose **(2)** Clematis
(3) Parthenium **(4)** Sunflower

[C. 79.90%, I.C. 16.03%, U.A. 4.07%]

7. A typical angiosperm anther is _____ and _____.

(1) Bilobed, tetrasporangiate
(2) Bilobed, monosporangiate
(3) Bilobed, bisporangiate
(4) Tetralobed, monosporangiate

[C. 79.29%, I.C. 12.12%, U.A. 8.59%]

8. Which one of the following is resistant to enzyme action?

(1) Leaf cuticle **(2)** Cork
(3) Wood fibre **(4)** Pollen exine

[C. 75.08%, I.C. 22.03%, U.A. 2.88%]

9. The innermost wall layer of anther.

(1) Is nutritive in function
(2) Helps in dehiscence of anther
(3) Is haploid and protective in function
(4) Forms microspores

[C. 74.93%, I.C. 21.33%, U.A. 3.74%]

10. The thin and continuous wall layer of pollen is-

(1) Exine **(2)** Intine
(3) Germ pore **(4)** Endothecium

[C. 73.11%, I.C. 23.25%, U.A. 3.64%]

11. In 40% angiosperms, the pollen grains are shed at :-

(1) Four-celled stage
(2) Three-celled stage
(3) Two-celled stage
(4) Five-celled stage

[C. 71.43%, I.C. 25.65%, U.A. 2.92%]

12. The process of formation of microspores from a pollen mother cell is called?

(1) Megasporogenesis
(2) Microsporogenesis
(3) Megagametogenesis
(4) Microgametogenesis

[C. 71.29%, I.C. 25.66%, U.A. 3.05%]

13. Cryopreservation means storing of products in-

(1) Liquid nitrogen
(2) Liquid oxygen
(3) Liquid hydrogen
(4) Liquid helium

[C. 71.16%, I.C. 18.73%, U.A. 10.11%]

14. Tapetum is :-

(1) Parietal in origin usually the inner most layer of anther wall
(2) Modified endothecium of anther wall
(3) Outer most layer of sporogenous tissue modification
(4) Parietal in origin and is the inner most layer of ovule wall

[C. 70.14%, I.C. 22.01%, U.A. 7.85%]

15. The two-celled stage of mature pollen grain consists of

(1) Vegetative cell, generative cell
(2) Vegetative cell, one male gamete
(3) Two male gametes
(4) Generative cell, one male gamete

[C. 70.11%, I.C. 26.71%, U.A. 3.18%]

16. The most resistant organic material known which makes up the outermost layer of pollen wall is-

(1) Pectin **(2)** Cellulose
(3) Sporopollenin **(4)** Lignin

[C. 69.15%, I.C. 27.81%, U.A. 3.04%]

17. The special features of the endothecium of anther of angiosperms-

(1) Radially elongated
(2) Thickening of cellulose
(3) Hygroscopic
(4) All of the above

[C. 69.08%, I.C. 26.51%, U.A. 4.42%]

18. During formation of pollen grains, a microspore mother cell undergoes

(1) One meiotic division and one mitotic division
(2) One mitotic division
(3) One meiotic division
(4) One meiotic and two mitotic divisions

[C. 68.58%, I.C. 27.01%, U.A. 4.42%]

19. A microspore is a first cell of-

(1) Female gametophyte

(2) Male gametophyte

(3) Sporophyte

(4) Anther

[C. 68.46%, I.C. 24.21%, U.A. 7.33%]

20. The pollen viability period of rice and pea respectively, is :-

(1) 30 minutes and few days

(2) Several months and 30 minutes

(3) Few days and few months

(4) Few days in both the cases

[C. 68.09%, I.C. 26.92%, U.A. 4.99%]

21. How many pollen sacs are present in a mature anther?

(1) 4 **(2)** 1

(3) 3 **(4)** 2

[C. 66.10%, I.C. 32.63%, U.A. 1.27%]

22. Which is **incorrect** statement ?

I. Each cell of sporogenous tissue in anther is capable of giving rise to microspore tetrad.

II. The pollen grain represent male gametophyte.

III. Pollen grains are usually triangular and 10-15 µm in diameter.

IV. Sporopollenin is one of the most resistance organic material which can be destroyed only by strong acids and alkali.

(1) I, II are incorrect but III, IV are correct

(2) III, IV are incorrect but I, II are correct

(3) I, III are incorrect but II, IV are correct

(4) I, IV are correct but I, III are incorrect

[C. 66.10%, I.C. 26.55%, U.A. 7.34%]

23. Which state is **incorrect** ?

(1) Intine is the inner wall of pollen grain and exhibit fascinating array of patterns and designs

(2) The mature pollen grains has two cells, the bigger is vegetative cell and the smaller is generative cell which floats in cytoplasm of vegetative cell

(3) Carrot grass pollens cause pollen allergy

(4) Pollen grains of pea and rose maintain viability for months.

[C. 65.60%, I.C. 27.05%, U.A. 7.34%]

24. The vegetative cell is:-

(1) Small, has large irregularly shaped nucleus

(2) Large, has large irregularly shaped nucleus

(3) Large with spindle shaped nucleus

(4) Small, spindle shaped nucleus

[C. 65.56%, I.C. 24.44%, U.A. 10.00%]

25. The pollen grain represents :

(1) Male gamete **(2)** Male gametophyte

(3) Microsporophyll **(4)** Microsporangium

[C. 65.32%, I.C. 30.88%, U.A. 3.80%]

26. Sporopollenin is found in :-

(1) Exine **(2)** Intine

(3) Cytoplasm **(4)** Nucleus

[C. 64.54%, I.C. 33.23%, U.A. 2.24%]

27. Ubisch bodies are produced in

(1) Embryo sac **(2)** Endothecium

(3) Pollen grain **(4)** Tapetum

[C. 63.91%, I.C. 34.02%, U.A. 2.07%]

28. Pollen grains are generally _____ in outline measuring _____ micrometers in diameter.

(1) Spherical, 25-50
(2) Oblong, 25-50
(3) Oval, 10-25
(4) Spherical, 75-100

[C. 63.66%, I.C. 26.59%, U.A. 9.76%]

29. Anther is generally composed of

(1) One sporangium **(2)** Two sporangium
(3) Three sporangium **(4)** Four sporangium

[C. 60.55%, I.C. 37.61%, U.A. 1.83%]

30. How many and what type of male gametes are produced by the male gametophyte of *angiosperm*.

(1) One, multi cilliated
(2) Two, biciliated
(3) Two, multi ciliated
(4) Two, non motile

[C. 60.18%, I.C. 37.69%, U.A. 2.13%]

31. Main function of endothecium (in anther) is-

(1) Mechanical **(2)** Nutritive
(3) Dehiscence **(4)** None of above

[C. 59.79%, I.C. 28.83%, U.A. 11.38%]

32. Ubisch bodies are associated with the development of-

(1) Embryo **(2)** Pollen grains
(3) Endosperm **(4)** Embryo sac

[C. 58.60%, I.C. 29.35%, U.A. 12.05%]

33. Which part of the reproductive structure produces both enzyme & hormones-

(1) Archesporium **(2)** middle layer
(3) Tapetum **(4)** Endothecium

[C. 56.15%, I.C. 29.60%, U.A. 14.25%]

34. Which of the following statement is applicable for all flowering plants?

(1) Monosiphonous pollen tube
(2) Non-motile and morphologically dissimilar gametes
(3) Presence of pollinium
(4) Division of generative cell after pollination

[C. 54.84%, I.C. 37.63%, U.A. 7.53%]

35. Which one is female gametophyte

(1) Embryo **(2)** Embryosac
(3) Endosperm **(4)** Pistil

[C. 53.71%, I.C. 40.99%, U.A. 5.30%]

36. Example of polyploid tissue present in an angiosperm plant is

(1) Perisperm **(2)** Embryo
(3) Tapetum **(4)** Placenta

[C. 53.42%, I.C. 31.60%, U.A. 14.97%]

37. Two non-motile male gamete in angiosperm is produced by-

(1) Generative cell
(2) Microspore mother cell
(3) Vegetative cell
(4) Tube cell

[C. 52.00%, I.C. 44.00%, U.A. 4.00%]

38. Endothecium, middle layer and tapetum in anther are derived from-

(1) Primary sporogenous layer
(2) Primary parietal layer
(3) Both
(4) None of the above

[C. 51.69%, I.C. 46.82%, U.A. 1.50%]

39. Occurence of more than four spores from Spore mother cells is called

(1) Polysiphony **(2)** Polyspermy
(3) Polyspory **(4)** Poly embryony

[C. 48.44%, I.C. 49.38%, U.A. 2.19%]

40. Which one of the following is surrounded by a callose wall?

(1) Pollen grain
(2) Microspore mother cell
(3) Male gamete
(4) Egg

[C. 45.26%, I.C. 52.89%, U.A. 1.84%]

41. Male gametes in angiosperms are formed by the division of :-

(1) Microspore mother cell
(2) Microspore
(3) Generative cell
(4) Vegetative cell

[C. 33.33%, I.C. 64.65%, U.A. 2.02%]

Female Reproduction Organ

42. The part of pistil which acts as landing platform for pollen grain :-

(1) Stigma **(2)** Style
(3) Ovule **(4)** Ovary

[C. 74.49%, I.C. 18.37%, U.A. 7.14%]

43. The number of embryo sac in an ovule is generally-

(1) One **(2)** Many
(3) Four **(4)** Three

[C. 74.17%, I.C. 23.18%, U.A. 2.65%]

44. The number of nuclei in a mature embryo sac are-

(1) Eight **(2)** Seven
(3) Six **(4)** Four

[C. 73.70%, I.C. 21.31%, U.A. 4.99%]

45. The nutritive tissue present in the ovule is called-

(1) Nucellus **(2)** Funicle
(3) Embryo **(4)** Integuments

[C. 70.76%, I.C. 26.30%, U.A. 2.94%]

46. Go through the figure showing a dissected flower of Hibiscus showing pistil. Identify A, B, C and D respectively -

(1) Hilum, Carpel, Ovary and Thalamus
(2) Stigma, Style, Ovary and Thalamus
(3) Stigma, Style, Ovary and Placenta
(4) Stigma, Style, Gynophore, Anthopore

[C. 69.64%, I.C. 21.83%, U.A. 8.53%]

47. Long filamentous threads protruding at the end of a young cob of maize are

(1) Anthers **(2)** Styles
(3) Ovaries **(4)** Hairs

[C. 68.42%, I.C. 29.39%, U.A. 2.19%]

48. The ploidy level of nucellus and female gametophyte respectively is :-

(1) n, n **(2)** n, 2n
(3) 2n, n **(4)** 2n, 2n

[C. 68.27%, I.C. 28.70%, U.A. 3.03%]

49. Integumented megasporangium is

(1) Ovule **(2)** Pollen sac
(3) Pollen grain **(4)** Embryo sac

[C. 64.94%, I.C. 29.73%, U.A. 5.33%]

50. How many meiotic divisions are necessary for formation of 100 functional megaspores-

(1) 25 **(2)** 50
(3) 100 **(4)** 200

[C. 64.00%, I.C. 35.00%, U.A. 1.00%]

51. Haploid, diploid and triploid conditions respectively can be traced in-

(1) Egg, Nucellus, Endosperm
(2) Antipodal, Egg, Endosperm
(3) Endosperm, Nucellus, Synergids
(4) Antipodal, Synergids, Integuments

[C. 63.54%, I.C. 28.13%, U.A. 8.33%]

52. In angiosperm, if haploid number of chromosome is 12, then what will be the no. of chromosomes in the integuments and synergids?

(1) 12, 12 **(2)** 24, 12 **(3)** 24, 24 **(4)** 12, 24

[C. 63.04%, I.C. 33.70%, U.A. 3.26%]

53. The functional megaspore in Polygonum is always present towords.

(1) Micropylar end **(2)** Chalazal end
(3) All **(4)** Any

[C. 62.64%, I.C. 35.16%, U.A. 2.20%]

54. The largest cell of the mature embryo sac is

(1) Antipodal cells **(2)** Synergids
(3) Central cell **(4)** Egg cell

[C. 61.99%, I.C. 35.06%, U.A. 2.95%]

55. The types of flowers which always produce seeds even in the absence of pollinators :-

(1) Chasmogamous flowers
(2) Cleistogamous flowers
(3) Bisexual flowers
(4) Unisexual flowers

[C. 60.80%, I.C. 31.20%, U.A. 8.00%]

56. In angiosperm, if number of chromosomes in endosperm is 30, what will be the no of chromosomes in nucellus

(1) 15 **(2)** 30 **(3)** 20 **(4)** 40

[C. 60.61%, I.C. 36.36%, U.A. 3.03%]

57. Proliferation of integumentary cells at the micropylar region of the ovule in castor develops

(1) Aril **(2)** Funicle
(3) Caruncle **(4)** Apophysis

[C. 59.77%, I.C. 39.10%, U.A. 1.13%]

58. How many meiotic divisions are required to produce 40 seeds in the Capsella plant-

(1) 50 **(2)** 40 **(3)** 80 **(4)** 20

[C. 57.36%, I.C. 38.76%, U.A. 3.88%]

59. Choose the odd one w.r.t. gynoecium.

(1) Gynoecium represents the female reproductive part of flower
(2) The gynoecium may be syncarpous or apocarpous
(3) The number of ovules in papaya and mango is one
(4) The ovules are attached to placenta

[C. 54.57%, I.C. 38.32%, U.A. 7.11%]

60. Which one of the following pairs of plant structures has haploid number of chromosomes ?

(1) Egg nucleus and secondary nucleus
(2) Megaspore mother cell and antipodal cells
(3) Egg cell and antipodal cells
(4) Nucellus and antipodal cells

[C. 54.41%, I.C. 33.59%, U.A. 12.01%]

61. The number of mitotic generations required to form a mature embryo sac in most of the flowering plants is-

(1) One **(2)** Two **(3)** Three **(4)** Four

[C. 50.60%, I.C. 40.96%, U.A. 8.43%]

62. In angiosperms, functional megaspore generally develops into-

(1) Micropylar end **(2)** Embryo sac
(3) Both **(4)** None of these

[C. 47.44%, I.C. 52.56%]

63. Caruncle is formed by

(1) Peduncle **(2)** Cotyledons
(3) Integument **(4)** Perisperm

[C. 42.75%, I.C. 19.93%, U.A. 37.32%]

Pollination

64. Self-pollination means

(1) Transfer of pollen from anthers to stigma in the same flowers
(2) Transfer of pollen from one flowers to another on the different plant
(3) Occurence of male and female sex organ in the same flowers
(4) Germination of pollen

[C. 77.14%, I.C. 15.38%, U.A. 7.47%]

65. Transfer of pollen grains from the anther to the stigma of another flower of same plant

(1) Xenogamy **(2)** Autogamy
(3) Geitonogamy **(4)** Allogamy

[C. 75.84%, I.C. 20.33%, U.A. 3.83%]

66. Dioecious condition prevents

(1) Autogamy **(2)** Geitonogamy
(3) Xenogamy **(4)** Both (1) & (2)

[C. 74.24%, I.C. 22.51%, U.A. 3.25%]

67. Repeated self pollination over the generation produces-

(1) New species
(2) Better progenies
(3) Inbreeding depression
(4) Elimination of weak traits

[C. 72.69%, I.C. 24.07%, U.A. 3.24%]

68. A close relation between a flower and a pollinating agent is best exemplified by

(1) Cocos **(2)** Salvia **(3)** Yucca **(4)** Avena

[C. 70.40%, I.C. 16.97%, U.A. 12.64%]

69. Pollen robbers

(1) Consume pollen or nectar
(2) Are effective in bringing about pollination
(3) Do not visit flowers for pollen
(4) Take pollen from other insects

[C. 70.02%, I.C. 28.01%, U.A. 1.97%]

70. Geitonogamy is:-

(1) Genetically autogamous
(2) Ecological autogamous
(3) Genetically allogamous
(4) Functionally autogamous

[C. 68.93%, I.C. 28.93%, U.A. 2.14%]

71. When pollen grains of a flower are transferred to stigma of another flower of a different plant, the process is called

(1) Geitonogamy **(2)** Xenogamy
(3) Autogamy **(4)** Homogamy

[C. 67.62%, I.C. 30.00%, U.A. 2.38%]

72. "Lever mechanism" or " Turn pipe mechanism" for pollination is characteristic feature of

(1) Antirrhinum **(2)** Ocimum
(3) Salvia (Sage plant) **(4)** Ficus

[C. 66.20%, I.C. 30.05%, U.A. 3.76%]

73. Chasmogamy refers to the condition where-

(1) Flowers remains closed
(2) Flowers absent
(3) Flowers open
(4) Flowers gamopetalous

[C. 64.73%, I.C. 31.88%, U.A. 3.38%]

74. Maize is best example of :

(1) Anemophily **(2)** Ornithophily
(3) Entomophily **(4)** Hydrophily

[C. 64.11%, I.C. 33.49%, U.A. 2.39%]

75. Cleistogamous flower produce assured seed-set even in the absence of pollinator, why?

(1) Because they have fragrance
(2) Because they remain open
(3) Because they are autogamous
(4) Because they are coloured

[C. 63.67%, I.C. 29.58%, U.A. 6.75%]

76. Common floral reward provided by plants to pollinator are-

(1) Nactor and pollen
(2) Pollen and enzymes
(3) Hormones and nectar
(4) All of these

[C. 63.66%, I.C. 30.67%, U.A. 5.67%]

77. When anther and stigma mature at the same time is called as-

(1) Dichogamy **(2)** Allogamy
(3) Xenogamy **(4)** Homogamy

[C. 62.75%, I.C. 34.31%, U.A. 2.94%]

78. The type of pollination which brings genetically different types of pollen on the stigma is-

(1) Autogamy **(2)** Xenogamy
(3) Geitonogamy **(4)** Cleistogamy

[C. 60.53%, I.C. 31.14%, U.A. 8.33%]

79. Pollination in Yucca plant takes place by-

(1) Honey bee **(2)** Butter fly
(3) Pronuba moth **(4)** Bird

[C. 59.65%, I.C. 29.82%, U.A. 10.53%]

80. Feathery stigma and versatile anthers are characteristic of :-

(1) Wind pollinated flowers
(2) Insect pollinated flowers
(3) Water pollinated flowers
(4) Bat pollinated flowers

[C. 59.15%, I.C. 31.49%, U.A. 9.36%]

81. Protandry is the situation when :-

(1) Anther matures later than the stigma of flower
(2) Anther matures earlier than the stigma of flower
(3) Anther and stigma mature at the same time
(4) All of the above

[C. 57.63%, I.C. 31.36%, U.A. 11.02%]

82. Which of the following plant provides safe place to insect for laying eggs?

(1) Sage plant **(2)** Amorphophallus
(3) Ophrys **(4)** Mango

[C. 56.55%, I.C. 41.37%, U.A. 2.09%]

83. Examples of water pollinated flowers are

(1) Zostera, Lotus, water lily
(2) Lotus, Vallisneria, Hydrilla
(3) Potamogeton, Vallisneria, Lotus
(4) Vallisneria, Hydrilla, Zostera

[C. 56.05%, I.C. 41.87%, U.A. 2.09%]

84. The devices to discourage self pollination are :-

(1) Pollen release and stigma receptivity is not synchronised
(2) Anther and stigma are placed at different position
(3) Rejection of pollen by stigma of the same flowers
(4) All of these

[C. 54.19%, I.C. 36.13%, U.A. 9.68%]

85. The most common mode of pollination is -

(1) Entomophily
(2) Anemophily
(3) Hydrophily
(4) None of the above

[C. 52.11%, I.C. 45.07%, U.A. 2.82%]

86. Hydrophily is limited to 30 genera which are mostly :-

(1) Gymnosperms
(2) Monocots
(3) Dicots
(4) More than one option is correct

[C. 50.00%, I.C. 42.86%, U.A. 7.14%]

87. In papaya, male and female flowers are present on different plants. It permits :-

(1) Autogamy
(2) Geitonogamy
(3) Both autogamy and geitonogamy
(4) Xenogamy

[C. 49.13%, I.C. 44.51%, U.A. 6.36%]

88. Unisexuality of flowers prevents:-

(1) Autogamy and geitonogamy
(2) Autogamy, but not geitonogamy
(3) Both geitonogamy and xenogamy
(4) Geitonogamy, but not xenogamy

[C. 45.38%, I.C. 43.66%, U.A. 10.97%]

89. Which of the following is not a characteristic feature of insect pollinated flowers?

(1) Fragrance
(2) Nectaries
(3) Foul odour
(4) Mucilaginous covering on pollen grains

[C. 41.67%, I.C. 50.00%, U.A. 8.33%]

90. Insect pollinated flowers usually possess

(1) Brightly coloured pollens in large quantity
(2) Dry pollens with smooth surface
(3) Sticky pollen and rough surface stigma
(4) Light coloured scented pollen covered with nectar

[C. 38.10%, I.C. 57.14%, U.A. 4.76%]

Pollen Pistal Interaction, Double Fertilization

91. Which type of gametes are present in *angiosperm.*

(1) Flagellated **(2)** Motile
(3) Non-motile **(4)** None of these

[C. 77.51%, I.C. 20.88%, U.A. 1.61%]

92. Which type of growth is found in pollen tube

(1) Lateral growth **(2)** Apical growth
(3) Middle growth **(4)** No growth

[C. 76.51%, I.C. 21.88%, U.A. 1.61%]

93. The arrangement of the nuclei in a normal embryosac in the dicot plants is

(1) 2 + 4 + 2 **(2)** 3 + 2 + 3
(3) 2 + 3 + 3 **(4)** 3 + 3 + 2

[C. 74.04%, I.C. 15.37%, U.A. 10.59%]

94. After fertilization seed coat is formed by

(1) Chalaza **(2)** Ovule
(3) Integument **(4)** Embryo sac

[C. 70.83%, I.C. 19.79%, U.A. 9.38%]

95. The diploid and triploid product of double fertilization respectively are

(1) Zygote and primary endosperm nucleus
(2) Endosperm and cotyledons
(3) Embryo and perisperm
(4) Zygote and scutellum

[C. 69.68%, I.C. 28.05%, U.A. 2.26%]

96. The structures which guide the pollen tube into synergid is:-

(1) Antipodals
(2) Germ pore
(3) Aril
(4) Filiform apparatus

[C. 68.49%, I.C. 27.59%, U.A. 3.91%]

97. The central cell after triple fusion becomes the :-

(1) PEC **(2)** PEN
(3) Endosperm **(4)** Embryo

[C. 67.49%, I.C. 28.59%, U.A. 3.91%]

98. The role of triple fusion in angiosperms is to produce :-

(1) Cotyledons **(2)** PEN
(3) Endocarp **(4)** Seed

[C. 66.91%, I.C. 29.30%, U.A. 3.79%]

99. Double fertilization means

(1) Fusion of male gamete and ovum
(2) Fusion of two polar bodies
(3) A male gamete fused with egg and second male gamete fused with secondary nucleus
(4) All of the above

[C. 65.35%, I.C. 24.75%, U.A. 9.90%]

100 The tip of pollen tube after entering into embryosac get swells and burst due to-

(1) Endosmosis **(2)** Exosmosis
(3) Diffusion **(4)** None of the above

[C. 60.82%, I.C. 27.84%, U.A. 11.34%]

101 Which of the following promote pollen germination and tube growth-

(1) Sucrose **(2)** Boron
(3) Calcium **(4)** Potassium

[C. 59.91%, I.C. 25.98%, U.A. 14.11%]

102 Pollen tube enters into embryosac of angiosperm through the-

(1) Egg cell
(2) Any one of the synergids
(3) Any one of the antipodal cells
(4) None of these

[C. 59.57%, I.C. 29.79%, U.A. 10.64%]

103 Just before fertilization the diploid structure in the ovule of Angiosperm is-

(1) Pollen tube **(2)** Secondary nucleus
(3) Synergids **(4)** Antipodals

[C. 59.38%, I.C. 20.53%, U.A. 20.09%]

104 Pollen pistil interaction is :-

(1) Chemically mediated process
(2) Dynamic process
(3) Genetically controlled process
(4) More than one option is correct

[C. 57.89%, I.C. 33.26%, U.A. 8.84%]

105 Double endosperm is found in :-

(1) Wheat **(2)** Rice
(3) Pea **(4)** Coconut

[C. 57.19%, I.C. 25.93%, U.A. 16.88%]

106 Emasculation–

(1) Prevent self-pollination in female parent
(2) Prevent cross pollination in female parent
(3) Prent self-pollination in male parent
(4) Prevent cross pollination in male parent

[C. 56.37%, I.C. 36.27%, U.A. 7.35%]

107 Which of the following nuclei participate in double fertilization ?

(1) The egg
(2) The secondary nucleus
(3) The two male nuclei
(4) All of the above

[C. 55.75%, I.C. 32.74%, U.A. 11.50%]

108 The primary Endosperm nucleus in *Polygonum* type of Embryosac is -

(1) Haploid **(2)** Diploid
(3) Triploid **(4)** Tetraploid

[C. 55.74%, I.C. 33.61%, U.A. 10.66%]

109 What does the filiform apparatus do at the entrance into ovule?

(1) It guides pollen tube from a synergid to egg
(2) It helps in the entry of pollen tube into a synergid
(3) It prevents entry of more than one pollen tube into the embryo sac
(4) It brings about opening of the pollen tube

[C. 46.91%, I.C. 40.99%, U.A. 12.10%]

Embryo Endosperm Develop

110 Endosperm development precedes embryo development, the endosperm of angiospermic plant is :-

(1) Triploid **(2)** Diploid
(3) Haploid **(4)** Tetraploid

[C. 74.73%, I.C. 19.49%, U.A. 5.78%]

111 After fertilization, the seed is developed from-

(1) Ovule **(2)** Ovary
(3) Nucellus **(4)** Endosperm

[C. 74.23%, I.C. 16.49%, U.A. 9.28%]

112 Water of coconut is

(1) Endosperm **(2)** Nucellus
(3) Endocarp **(4)** Mesocarp

[C. 72.45%, I.C. 20.41%, U.A. 7.14%]

113 The function of suspensor is

(1) To provide water
(2) To provide oxygen
(3) To thrust the embryo towards endosperm to provide more food
(4) To suck food

[C. 72.30%, I.C. 16.89%, U.A. 10.81%]

114 Perisperm is

(1) Persistant nucellus in seed
(2) Ovule wall
(3) Ovule coat
(4) Fossil of haustoria

[C. 65.16%, I.C. 30.74%, U.A. 4.10%]

115 Development of embryo occurs from

(1) Two polar nuclei of embryosac
(2) Secondary nucleus and male gametes
(3) Egg cell and male gamete
(4) Synergids

[C. 63.33%, I.C. 25.56%, U.A. 11.11%]

116 The fusion product of polar nuclei and male gamete is

(1) Nucellus
(2) Primary endosperm nucleus
(3) Zygote
(4) Secondary nucleus

[C. 60.57%, I.C. 21.67%, U.A. 17.75%]

117 Free nuclear division in an angiosperm takes place during-

(1) Gamete formation
(2) Endosperm formation
(3) Embryo formation
(4) Flower formation

[C. 60.53%, I.C. 32.75%, U.A. 6.73%]

118 An angiospermic plant is having 24 chromosomes in its leaf cells. The number of chromosomes present in synergid, pollen grain, nucellus & endosperm will be respectively :-

(1) 12, 12, 12, 72 **(2)** 8, 8, 12, 36
(3) 12, 12, 24, 36 **(4)** 12, 12, 12, 36

[C. 57.60%, I.C. 18.37%, U.A. 24.04%]

119 Which structure of the ovule will change after fertilization?

(1) Embryosac **(2)** Integument
(3) Central cell **(4)** All of the above

[C. 57.33%, I.C. 34.85%, U.A. 7.82%]

120 Pick out **wrong** statement :-

(1) Double fertilization is unique to angiosperms
(2) Sequoia, a gymnosperm, is one of the tallest tree
(3) Exine has apertures where sporopollenin is present
(4) Exine of pollen grains is made up of sporopollenin

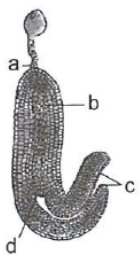
[C. 57.14%, I.C. 35.71%, U.A. 7.14%]

121 One of the male gamete moves towards the egg cell & fuses with its nucleus; the process is known as

(1) Syngamy **(2)** Triple fusion
(3) Double fertilization **(4)** None

[C. 57.14%, I.C. 41.56%, U.A. 1.30%]

122 Examine the figure given below and select the right option giving all the four parts a, b, c and d. **Correct** identify-



(1) a-suspensor , b-radicle, c-cotyledon, d-plumule.
(2) a-plumule , b-cotyledon, c-radicle, d-suspensor
(3) a-suspensor, b-plumule , c-radicle, d-cotyledon
(4) a-radicle, b-plumule , c-cotyledon d-suspensor

[C. 51.93%, I.C. 24.15%, U.A. 23.93%]

123 After fertilization, the outer integument of ovule changes into

(1) Testa **(2)** Tegmen **(3)** Fruit **(4)** Seed

[C. 49.09%, I.C. 41.82%, U.A. 9.09%]

Seed And Fruit

124 Perisperm is present in:

(1) Beet **(2)** Black pepper
(3) Both 1 & 2 **(4)** All angiosperms

[C. 77.27%, I.C. 20.45%, U.A. 2.27%]

125 The sheath enclosing plumule and radicle respectively in monocot seed are:-

(1) Coleoptile and coleorhiza
(2) Coleorhiza and coleoptile
(3) Scutellum and epiblast
(4) Aleurone layer and pericarp

[C. 72.40%, I.C. 24.94%, U.A. 2.66%]

126 Which of the following is a parthenocarpic fruit?

(1) Banana **(2)** Apple
(3) Strawberry **(4)** Pomegranate

[C. 69.70%, I.C. 27.65%, U.A. 2.65%]

127 Remnant of nucellus is known as :-

(1) Scutellum **(2)** Pericarp
(3) Tigellum **(4)** Perisperm

[C. 65.15%, I.C. 29.88%, U.A. 4.98%]

128 Suitable environmental conditions for seed germination are :-

(1) Adequate moisture, light, anaerobic conditions
(2) Adequate moisture, low temperature, light
(3) Adequate moisture, suitable temperature and oxygen
(4) Light, water, absence of oxygen

[C. 63.38%, I.C. 28.17%, U.A. 8.45%]

129 Aleurone layer that is protein rich found in some cereals is a part of :-

(1) Endosperm **(2)** Embryo
(3) Tegmen **(4)** Testa

[C. 62.03%, I.C. 37.97%]

130 The single cotyledon in monocots is :-

(1) Scutellum which is lateral in position
(2) Aleurone layer which is terminal in position
(3) Scutellum which is centrally placed
(4) Epiblast which is haploid and lateral in position

[C. 61.66%, I.C. 28.60%, U.A. 9.74%]

131 Perispermic seeds are.

(1) Castor, sunflower **(2)** Black pepper, beet
(3) Maize, beet **(4)** Barley, maize

[C. 60.08%, I.C. 37.60%, U.A. 2.33%]

132 Pericarp is dry in :-

(1) Guava, mango, mustard
(2) Mango, groundnut, orange
(3) Groundnut, mustard
(4) Orange, guava, mango

[C. 58.69%, I.C. 21.04%, U.A. 20.27%]

133 The part of castor seed that yields oil is :-

(1) Cotyledon **(2)** Caruncle
(3) Endosperm **(4)** Nucellus

[C. 58.33%, I.C. 41.67%]

134 The cylindrical portion below the level of cotyledons on embryonal axis is-

(1) Epicotyl **(2)** Hypocotyl
(3) Radicle **(4)** Plumule

[C. 57.42%, I.C. 36.36%, U.A. 6.22%]

135 Perisperm is

(1) Degenerate secondary nucleus
(2) Remnant of nucellus
(3) Peripheral part of endosperm
(4) Degenerate synergids

[C. 52.93%, I.C. 26.26%, U.A. 20.81%]

136 Endosperm is completely consumed by developing embryo before the seed maturation or exalbuminous / non-endospermic seeds are found in-

(1) pea, ground nut, beans
(2) coconut, castor
(3) maize, wheat, pea
(4) coconut, wheat

[C. 52.87%, I.C. 43.68%, U.A. 3.45%]

137 Production of seed without fertilization is called?

(1) Parthenocarpy **(2)** Parthenogenesis
(3) Apomixis **(4)** Apogamy

[C. 51.83%, I.C. 46.05%, U.A. 2.12%]

138 Exalbuminous seeds are of-

(1) Wheat, pea, groundnut
(2) Castor, pea, groundnut
(3) Pea, Groundnut, beans
(4) Wheat, castor, rice

[C. 51.30%, I.C. 46.85%, U.A. 1.85%]

139 Which one of the following is false fruit?

(1) Apple **(2)** Straw berry
(3) Cashew **(4)** All

[C. 42.11%, I.C. 42.11%, U.A. 15.79%]

140 In a cereal grain the single cotyledon of embryo is represented by –

(1) Coleorhiza **(2)** Scutellum
(3) Prophyll **(4)** Coleoptile

[C. 19.35%, I.C. 20.97%, U.A. 59.68%]

Apomixis And Polyembryony

141 Nucellar polyembryony is reported in species of-

(1) Citrus **(2)** Mango
(3) Both 1 & 2 **(4)** Capsella

[C. 80.75%, I.C. 14.97%, U.A. 4.28%]

142 In many plants, the sexual reproduction replaced by asexual reproduction it is called

(1) Semigamy **(2)** Apospory
(3) Apomixis **(4)** Amphimixis

[C. 80.29%, I.C. 16.09%, U.A. 3.62%]

143 Filiform apparatus are found in

(1) Antipodal cell **(2)** Egg cell
(3) Secondary nucleus **(4)** Synergids

[C. 72.54%, I.C. 19.90%, U.A. 7.56%]

144 Adventive polyembryony is common in.

(1) Wheat **(2)** Apple
(3) Mango **(4)** Orobanche

[C. 50.14%, I.C. 47.01%, U.A. 2.85%]

Exercise - 2 Objective Problems | NEET

1. Choose the **correct** option w.r.t. the function of the germ pore-

(1) It allows growth of pollen tube

(2) It allows water absorption in seed

(3) It helps dehiscence of pollen grain

(4) More than one option is correct

2. When embryo develops from a haploid cell of embryo sac, other than egg cell, the process is known as

(1) Apogamy

(2) Apospory

(3) Adventive embryony

(4) Diplospory

3. Androgenic haploid plants are produced from

(1) Pollen grains
(2) Connective tissues
(3) Tapetum
(4) Wall of the anther

4. Which is the most logical sequence with reference to the life cycle of angiosperm

(1) Germination, endosperm formation, seed dispersal, double fertilization.
(2) Cleavage, fertilization, grafting, fruit formation
(3) Pollination, fertilization, seed formation & germination
(4) Maturation, mitosis, differentiation

5. After culturing the anther of a plants few diploid plant were got along with haploid plant. Which of the following part might have given rise to diploid plant-

(1) Vegetative cell of pollen
(2) Exine of pollen wall
(3) Cells of anther wall
(4) Generative cell of pollen

6. Mustard is angiosperm because it possess-

(1) Seed **(2)** Pollen grain
(3) Vascular tissue **(4)** Fruit

7. How many cells or nuclei are present in mature male gametophyte of angiosperm?

(1) One **(2)** Two **(3)** Three **(4)** Many

8. Most reduced size gametophyte is of-

(1) Bryophytes **(2)** Pteridophyte
(3) Gymnosperm **(4)** Angiosperm

9. Pollen grain of dicot plants is :

(1) Monocolpate **(2)** Bicolpate
(3) Tricolpate **(4)** Polycolpate

10. Which statement is false:-

(1) Unisexuality of flower induces cross pollination
(2) Androgenic plants are developed by Guha & Maheshwari
(3) Morphological barriers are absent in Gloriosa flower
(4) All

11. Microsporophyll of Angiosperms is known as :-

(1) Androecium **(2)** Anther
(3) Filament **(4)** Stamen

12. Which of the following is **wrong** statement-

(1) Monothecous anthers are found in Malvaceae family
(2) Middle layer is ephemeral
(3) Amoeboid tapetum releases ubisch bodies
(4) Banana is a monocarpic plant

13. Development of male gametophyte is-

(1) Invivo **(2)** Insitu
(3) Both **(4)** None of the above

14. The embryo sac of Angiosperm derives it's nutrition from-

(1) Sporogenous **(2)** Tapetum
(3) Epithecium **(4)** Nucellus

15. Obturators which help in fertilization are out growth of-

(1) Pollen tubes
(2) Stigma
(3) Placenta or funiculus
(4) Pollen grains

16. Raphe and hilum in seed represent-

(1) Nucellus **(2)** Funiculus
(3) Integument **(4)** Micropyle

17. Micropyle in seed helps in the entry of-

(1) Male gamete **(2)** Pollen tube
(3) Water & air **(4)** All

18. In over 60 percent of angiosperms, pollen grains are shed at

(1) Four-celled stage
(2) Three-celled stage
(3) Two-celled stage
(4) Either (1) or (2)

19. Megasporophyll is called :-

(1) Gynoecium **(2)** Carpel
(3) Ovary **(4)** Stigma

20. Parthenium or carrot grass has become ubiquitous in occurrence and causes pollen allergy. Parthenium came into India as a contaminant with imported-

(1) Rice **(2)** Wheat
(3) Carrot **(4)** Rose

21. The structure is formed by outer integument which helps in germination is called :-

(1) Aril **(2)** Sarcotesta
(3) Caruncle **(4)** Operculum

22. In anatropous ovule, the micropyle is present:-

(1) In straight line with funiculum
(2) At right angles with funiculum
(3) At 45° with funiculum
(4) Side by side with funiculum

23. Which of the following types of embryosac is mostly found in Angiosperm-

(1) Bisporic polygonum type
(2) Tetra sporic type
(3) Monosporic - onagrad type
(4) Monosporic - polygonum type

24. Polysiphonous pollen grains occurs in

(1) Malvaceae

(2) Cucurbitaceae

(3) Both (1) and (2)

(4) None of these

25. Mark the **incorrect** statement-

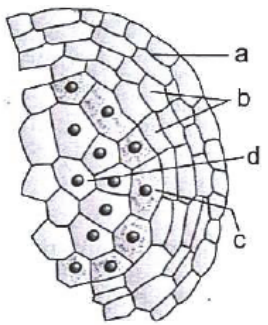
(1) Outer three layers of anther wall are protective in function

(2) Sporogenous tissue, occupies the centre of each microsporangium

(3) Cells of tapetum and endothecium show increase in DNA contents by endomitosis and polyteny

(4) Ploidy level of microspore tetrad is haploid

26. Examine the figure given below and select the right option giving all the four parts a, b, c and d **Correctly** identify :-



(1) a -endothecium ,b-tapetum ,c-microspore mother cell, d-middle layer

(2) a - tapetum, b-endothecium ,c-microspore mother cell,d-middle layer.

(3) a-endothecium, b-middle layer, c-tapetum, d-microspore mother cell.

(4) a-endothecium ,b-microspore mother cell, c-middle layer ,d-tapetum

27. Select **incorrect** statement regarding micro-sporogenesis in an anther :-

(1) Large number of microspore mother cells differentiate in one pollen sac

(2) Each microsporogenesis involves one meiosis and two mitosis

(3) Microspore tetrads may be tetrahedral isobilateral

(4) It consumes tapetum and middle layers

28. Which of the following statement about sporopollenin is wrong?

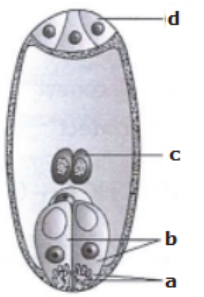
(1) Exine is formed of sporopollenin

(2) Sporopollenin is not degraded by any known enzyme

(3) Sporopollenin is most resistant organic material

(4) Sporopollenin occurs in the area of germ pores only

29. Examine the figure given below and select the right option giving all the four parts a, b, c and d **Correctly** identify :-



(1) a - synergids, b - Antipodal cells, c - Polar nuclei, d - Filiform apparatus

(2) a - Filiform apparatus, b - Egg, c - Polar nuclei, d - Nucellus

(3) a - Filiform apparatus, b - Synergids , c - Polar nuclei, d - Antipodal cell.

(4) a - Synergids, b - Polar nuclei, c - Filiform apparatus, d - Antipodal cell

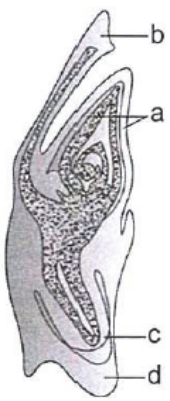
30. In monoecious plant like castor and maize :-

(1) Autogamy and allogamy are not prevented
(2) Geitonogamy is prevented
(3) Autogamy is not prevented
(4) Geitonogamy is not prevented

31. Select **incorrect** statement (w.r.t. artificial hybridisation)-

(1) Emasculation is removal of anther in their mature condition from bisexual flower
(2) Emasculation is not required in male sterile plants
(3) Unisexual female flower is bagged in bud condition to prevent contamination
(4) Emasculated flowers are bagged in bud condition

32. Examine the figure given below and select the right option giving all the four parts a, b, c and d. **Correctly** identify :-



(1) a- Coleoptile, b- Scutellum, c- Radicle, d- Coleorrhiza
(2) a- Coleorrhiza, b- Radicle, c- Scutellum, d- Coleoptile
(3) a- Scutellum, b- Coleorrhiza, c- Radicle, d- Coleoptile
(4) a- Radicle, b- Scutellum, c- Coleoptile, d- Coleorrhiza

33. Choose the **correct** option from the following:-

I. Dehydration and dormancy of mature seed are crucial for seed storage.

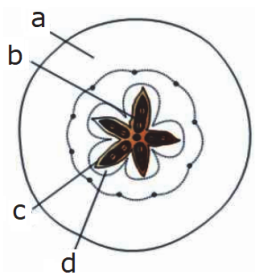
II. Seed of Lupinus arcticus is the oldest one which germinated after 2000 year

III. Orchid seed is one of largest seed in plant kingdom

IV. Seeds of parasitic plants Orobanche and Striga are tiny seeds.

(1) I, II are correct but III, IV are incorrect
(2) I, IV are correct but II, III are incorrect
(3) III, IV are correct but I, II are incorrect
(4) II, III are correct but I, IV are incorrect

34. Examine the figure given below and select the right option giving all the four parts a, b, c and d. **Correct** identify



(1) a- Thalamus, b- Seed, c- Endocarp, d- Mesocarp
(2) a- Thalamus, b- Seed, c- Mesocarp, d- Endocarp
(3) a- Mesocarp, b- Seed, c- Endocarp, d- Thalamus
(4) a- Endocarp, b- Seed, c- Thalamus, d- Mesocarp

35. Select the **correct** statement from the following :-

(1) Hanging drop method as in-vivo germination of pollen grain
(2) Obturator directs the growth of pollen tube towards micropyle of seed
(3) There are many embryos of different sizes and shapes in the seeds of orange
(4) Embryo arises parthenogenetically from the diploid egg in adventive embryony

36. Choose the **correct** option from the following statements :-
I. Apomixis is form of asexual reproduction which mimics sexual reproduction.
II. In Apomixis seeds develop either from diploid egg cell or from cells of nucellus.
III. Seeds collected from hybrids plant maintain hybrid character for a longer times.
IV. In Apomixis, there is segregation of character

(1) All are correct
(2) All are incorrect
(3) Only I and II are correct
(4) Only II, IV are correct

37. Pollen tube develops from

(1) Generative cell **(2)** Male gametes
(3) Vegetative cell **(4)** Vegetative nucleus

38. Movement of pollen tube is

(1) Tactic **(2)** Tropic
(3) Nastic **(4)** Autonomous

39. Tegmen of the seed develops from:-

(1) Perisperm **(2)** Funiculum
(3) Inner integument **(4)** Outer integument

40. 'Callase' enzyme which dissolve callose of tetrad of microspores to separate 4 microspores is provided by-

(1) Pollen grains **(2)** Middle layer
(3) Tapetum **(4)** Endothecium

41. Example of Epihydrophily is :-

(1) Zostera **(2)** Vallisneria
(3) Ceratophyllum **(4)** Nymphea

42. The anterior end of pollen tube burst by the process of _____ in embryo sac

(1) Imbibition **(2)** Exosmosis
(3) Enzymatic action **(4)** Endosmosis

43. The main embryo developed from the structure formed as a result of

(1) Double fertilization
(2) Triple fusion
(3) Syngamy
(4) fusion of two polar nuclei of an embryosac

44. In angiosperms, the pollen tube enters through the micropyle, therefore fertilization is -

(1) Porogamous **(2)** Chalazogamous
(3) Mesogamous **(4)** Basigamous

45. When a diploid ♀ plant is crossed with a tetraploid ♂ plant, the endosperm will be-

(1) Diploid **(2)** Triploid
(3) Tetraploid **(4)** Pentaploid

46. Stigma of the entomophilous flower is-

(1) Sticky **(2)** Rough **(3)** Hairy **(4)** Smooth

47. In pollination "Trap door mechanism" is found in :-

(1) Salvia **(2)** Aristolochia
(3) Ficus **(4)** Yucca

48. Synergids help in

(1) Pollen entry into embryo sac
(2) Endosperm formation
(3) Embryo sac nutrition
(4) Both 1 & 3

49. Embryonal development in Capsella is -

(1) Asteroid type
(2) Caryophylloid type
(3) Crucifer type
(4) Solanum type

50. The suspensor in dicots generally develops from-

(1) Apical - cell
(2) Basal - cell
(3) Micropylar - cell
(4) Apical & basal cell, both

51. Mosaic endosperm is characteristic of :-

(1) Wheat **(2)** Plumbago
(3) Maize **(4)** Coconut

52. Tigellum is known as :-

(1) Testa
(2) Tegmen
(3) Both of the above
(4) Main axis of the embryo

53. Apex of radicle is formed with help of-

(1) Epibasal cells
(2) Hypobasal cells
(3) Cotyledon
(4) Hypophysis

54. If the leaf of Angiospermic plant has 46 number of chromosomes then how many chromosomes number will be there in endosperm

(1) 46 **(2)** 23
(3) 69 **(4)** 138

55. If the nucellus cell of an angiosperm contains 24 chromosomes, the number of chromosomes present in pollen grain, endosperm & embryo will be

(1) 24, 36, 24 **(2)** 12, 36, 24
(3) 12, 24, 36 **(4)** 24, 12, 12

56. The number of nuclei taking part in double fertilization are-

(1) Two **(2)** Three
(3) Four **(4)** Five

57. How many meiotic divisions are required for the formation of 200 seeds of maize

(1) 200 **(2)** 400
(3) 250 **(4)** 300

58. Self-incompatibility
I. is a device to prevent inbreeding
II. provides a biochemical block to self fertilization
III. ensures cross fertilization
IV. is governed by pollen-pistil interaction
V. is governed by series of multiple alleles
VI. prevents self pollen (from the same flower or other flowers of the same plant) from fertilising the ovules by inhibiting pollen germination of pollen tube growth in the pistil.

(1) All are correct
(2) All are wrong
(3) Only I, II, III are incorrect
(4) IV and V are wrong

59. In albuminous seed, the food is stored in

(1) Testa **(2)** Plumule
(3) Cotyledon **(4)** Endosperm

60. The seeds of which type of plant have no dormancy

(1) Xerophytes
(2) Mesophytes
(3) Halophytes and hydrophyte
(4) Mangroves

61. In seeds, characterised by hypogeal germination, cotyledons generally do not becomes green because-

(1) They lack chloroplast
(2) They developed very early
(3) Contains inhibitor
(4) They remains below the soil

62. Match column-I with column-II, and choose the correct combination from the options given below.

	Column-I		Column-I
(a)	Stamen	(i)	Microsporangia
(b)	Pollen Sac	(ii)	Micro gamete
(c)	Pollen grain	(iii)	Microsporophyll
(d)	Male gamete	(iv)	Male gametophyte

(1) a-i, b-iv, c-iii, d-ii
(2) a-iii, b-i, c-iv, d-ii
(3) a-ii, b-iii, c-i, d-iv
(4) a-iv, b-i, c-iii, d-ii

63. Match column-I with column-II, and choose the correct combination from the options given below.

	Column-I		Column-II
(a)	Orange	(i)	Arctic Tundra
(b)	Lupinus	(ii)	Parthenocarpy
(c)	Banana	(iii)	Pseudocarp
(d)	Apple	(iv)	Polyembryony

(1) a-ii, b-i, c-iv, d-iii
(2) a-iii, b-iv, c-ii, d-i
(3) a-iv, b-i, c-ii, d-iii
(4) a-ii, b-i, c-iv, d-iii

64. Match column-I with column-II, and choose the correct combination from the options given below.

	Column-I		Column-II
(a)	Epiblast	(i)	Developed cotyledon
(b)	Scutellum	(ii)	Rudimentary cotyledon
(c)	Tigellum	(iii)	Hollow foliar structure
(d)	Coleoptile	(iv)	Embryo Axis

(1) a-ii, b-i, c-iv, d-iii
(2) a-ii, b-i, c-iii, d-iv
(3) a-i, b-ii, c-iv, d-iii
(4) a-iii, b-iv, c-ii, d-i

65. Match column-I with column-II, and choose the correct combination from the options given below.

	Column-I		Column-II
(a)	Suspensor	(i)	Dicots and monocots
(b)	Double fertilisation	(ii)	Artificial hybridisation
(c)	Emasculation	(iii)	Apomixis
(d)	Asteraceae	(iv)	Pushing the embryo

(1) a-iv, b-ii, c-i, d-iii **(2)** a-iii, b-i, c-ii, d-iv
(3) a-ii, b-iii, c-i, d-iv **(4)** a-iv, b-i, c-ii, d-iii

66. Match column-I with column-II, and choose the correct combination from the options given below.

	Column-I		Column-II
(1)	Apple	(i)	Cotyledon
(2)	Coconut	(ii)	Endosperm
(3)	Bean	(iii)	Thalamus
(4)	Beet	(iv)	Perisperm

(1) a-ii, b-iii, c-i, d-iv **(2)** a-iii, b-ii, c-i, d-iv
(3) a-i, b-ii, c-iii, d-iv **(4)** a-iii, b-i, c-ii, d-iv

67. Match column-I with column-II, and choose the correct combination from the options given below.

	Column-I		Column-II
(a)	Pericarp	(i)	Triple fusion
(b)	Perisperm	(ii)	Epicotyl and Hypocotyl
(c)	Endosperm	(iii)	Fruit wall
(d)	Tigellum	(iv)	Nucellus

(1) a-iii, b-iv, c-i, d-ii **(2)** a-iv, b-iii, c-ii, d-i
(3) a-iv, b-ii, c-iii, d-i **(4)** a-iii, b-ii, c-iv, d-i

68. Match column-I with column-II, and choose the correct combination from the options given below.

	Column-I		Column-II
(a)	Papaya	(i)	Monoecious
(b)	Maize	(ii)	Self incompatibility
(c)	Out breeding	(iii)	Self pollination
(d)	In breeding depression	(iv)	Dioecy

(1) a-ii, b-iv, c-iii, d-i **(2)** a-i, b-iv, c-iii, d-ii
(3) a-iv, b-i, c-ii, d-iii **(4)** a-ii, b-iii, c-i, d-iv

69. Match column-I with column-II, and choose the correct combination from the options given below.

	Column-I		Column-II
(a)	Cleistogamy	(i)	Zostera
(b)	Geitonogamy	(ii)	Amorphophallus
(c)	Hydrophily	(iii)	Oxalis
(d)	Entomophily	(iv)	Castor

(1) a-ii, b-iv, c-i, d-iii **(2)** a-iii, b-i, c-iv, d-ii
(3) a-iv, b-iii, c-i, d-ii **(4)** a-iii, b-iv, c-i, d-ii

70. Match column-I with column-II, and choose the correct combination from the options given below.

	Column-I		Column-II
(a)	Synergid	(i)	Largest cell
(b)	Central cell	(ii)	Filiform apparatus
(c)	Antipodal cell	(iii)	Female gamete
(d)	Egg	(iv)	Chalazal end

(1) a-ii, b-i, c-iv, d-iii **(2)** a-i, b-iv, c-ii, d-iii
(3) a-iv, b-ii, c-i, d-iii **(4)** a-iii, b-iv, c-i, d-ii

71. Match column-I with column-II, and choose the correct combination from the options given below-

	Column-I		Column-II
(a)	Michelia	(i)	Pentacarpellary
(b)	Papaver	(ii)	Apocarpous
(c)	Pea	(iii)	Syncarpous
(d)	Hibiscus	(iv)	Monocarpellary

(1) a-i, b-ii, c-iii, d-iv **(2)** a-ii, b-iii, c-iv, d-i
(3) a-iv, b-iii, c-i, d-ii **(4)** a-ii, b-iv, c-i, d-iii

72. **Assertion:** In majority of angiosperms a typical anther is bilobed.
Reason : It's each lobe having two theca.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

73. **Assertion:** Pollen grains can withstand high temperature and strong acids and alkali.
Reason : Their inner hard layer intine is made up of sporopollenin.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

74. **Assertion:-** lnner most layer of microsporangium or pollen sac, tapetum is of physiological significance.
Reason :- All kind of nutrition of developing pollen grains go through tapetum.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

75. **Assertion :** In western countries a large number of pollen products in form of tablets and syrups are available.
Reason : Pollen grains are rich in nutrients and used as food suppliment.

(1) If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
(2) If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
(3) If Assertion is True but the Reason is False.
(4) If both Assertion & Reason are false.

76. **Assertion:** Cleistogamous flowers are invariably autogamous.
Reason : These flowers do not open at all.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

77. **Assertion:** Cleistogamy is disadvantageous for plants.
Reason : Cleistogamous flowers do not open so sex organs do not receive sufficient light, which is essential for maturation of gametes.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

78. **Assertion:** Geitonogamy is functionally cross pollination and genetically self pollination.
Reason : It involves pollinating agent but pollen grains come from the same plant.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

79. **Assertion:** It is believed particularly for some bryophytes and pteridophytes that their distribution is limited.
Reason : They need water for transport of male gametes and fertilisation.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

80. **Assertion:** All aquatic plants use water for pollination.
Reason: In aquatic habitat water is the only medium for transfer of gametes.

(1) If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
(2) If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
(3) If Assertion is True but the Reason is False.
(4) If both Assertion & Reason are false.

81. **Assertion :** Both wind and water pollinated flowers are not very colourful and do not produce nectar.
Reason : Colour and nectar act as insect attractant.

(1) If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
(2) If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
(3) If Assertion is True but the Reason is False.
(4) If both Assertion & Reason are false.

82. **Assertion:** Non synchronised pollen release and stigma receptivity is of evolutionary significance.
Reason : It prevents self pollination and promotes more genetic variability.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false
(4) If both assertion and reason are false.

83. **Assertion:** In monoecious plants neither autogamy nor geitonogamy can be observed.
Reason : In monoecious plants male and female flowers are produced on different plants.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

84. **Assertion:** Most zygotes divide only after certain amount of endosperm is formed.
Reason: This is an adaptation to provide assured nutrition to the developing embryo.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

85. **Assertion:** Seed bearing plants like angiosperms show wide geographic distribution.

Reason : Seeds have better adaptive strategies for dispersal.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

86. **Assertion:** Apomixis is a form of asexual reproduction that mimics sexual reproduction.

Reason : In apomixis there is formation of seed without fertilisation.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

87. **Assertion:** Endosperm increases the success rate of seedling development.

Reason : Endosperm arises from PEN.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

88. **Assertion:** Clone is formed by amphimixis.

Reason : In amphimixis, new plants are formed without fertilization and meiosis.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false
(4) If both assertion and reason are false.

89. **Assertion:** Synergids of embryosac also help in fertilization in Angiosperms.

Reason : Obturators of synergids attract the pollen tube.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

90. **Assertion:** Pollen tube shows apical growth.

Reason : Growth of pollen tube is controlled by generative nucleus.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

91. **Assertion:-** Development of pollen grains begin only after pollination.
Reason :- Development of pollen grain takes place only on stigma.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

92. **Assertion**: In Angiosperms, sexual reproduction takes place through the flower.
Reason : All the parts of the flower are modification of stem.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

93. **Assertion:-** The main plant of angiosperms is in the form of sporophyte.
Reason :- Sporophyte is not differentiated into root, stem and leaves.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

94. **Assertion:-** Polygonum type of embryosac is most common in angiosperm.
Reason :- It is found in most of Angiosperm plants

(1) If both assertion and reason are true and reason is the correct explanation of assertion.
(2) If both assertion and reason are true but reason is not the correct explanation of assertion.
(3) If assertion is true but reason is false.
(4) If both assertion and reason are false.

Exercise - 3 Previous Year Problems | NEET

1. Which one of the following plants show a very close relationship with a species of moth, where none of the two can complete its life cycle without the other?

(1) Hydrilla **(2)** Yucca
(3) Banana **(4)** Viola

[C. 82.94%, I.C. 13.27%, U.A. 3.79%] NEET- 2018

2. An organic substance that can withstand environmental extremes and cannot the degraded by any enzyme is :

(1) Lignin **(2)** Cellulose
(3) Cuticle **(4)** Sporopollenin

[C. 80.14%, I.C. 18.32%, U.A. 1.54%] AIPMT PRE-2012

3. The morphological nature of the edible part of coconut is:

(1) Perisperm **(2)** Cotyledon
(3) Endosperm **(4)** Pericarp

[C. 78.60%, I.C. 19.18%, U.A. 2.23%] NEET-II - 2017

4. The body of the ovule is fused within the funicle at-

(1) Micropyle **(2)** Nucellus
(3) Chalaza **(4)** Hilum

[C. 78.35%, I.C. 19.61%, U.A. 2.04%] NEET- 2020

5. Seed formation without fertilization in flowering plants involves the process of-

(1) Apomixis
(2) Sporulation
(3) Budding
(4) Somatic hybridization

[C. 76.65%, I.C. 20.81%, U.A. 2.54%] NEET-I - 2016

6. Double fertilization is exhibited by :

(1) Algae **(2)** Fungi
(3) Angiosperms **(4)** Gymnosperms

[C. 74.79%, I.C. 21.64%, U.A. 3.58%] NEET-II - 2017

7. Coconut water from a tender coconut is.

(1) Degenerated nucellus
(2) Immature embryo
(3) Free nuclear endosperm
(4) Innermost layers of the seed coat

[C. 73.30%, I.C. 23.75%, U.A. 2.95%] RE-AIPMT-2015

8. Filiform apparatus is characteristic feature of :

(1) Synergids **(2)** Generative cell
(3) Nucellar embryo **(4)** Aleurone cell

[C. 72.30%, I.C. 24.75%, U.A. 2.95%] RE-AIPMT-2015

9. Function of filiform apparatus is to

(1) Recognize the suitable pollen at stigma
(2) Stimulate division of generative cell
(3) Produce nectar
(4) Guide the entry of pollen tube

[C. 71.93%, I.C. 19.39%, U.A. 8.69%] AIPMT-2014

10. Pollination in water hyacinth and water lily is brought about by the agency of-

(1) Water **(2)** Insects or wind
(3) Birds **(4)** Bats

[C. 71.46%, I.C. 26.12%, U.A. 2.43%] NEET-II - 2016

11. The coconut water and the edible part of coconut are equivalent to :

(1) Mesocarp **(2)** Embryo
(3) Endosperm **(4)** Endocarp

[C. 71.43%, I.C. 26.85%, U.A. 1.72%] AIPMT PRE-2012

12. Which of the following has proved helpful in preserving pollen as fossils?

(1) Pollenkitt **(2)** Cellulosic intine
(3) Oil content **(4)** Sporopollenin

[C. 71.17%, I.C. 26.04%, U.A. 2.78%] NEET- 2018

13. Advantage of cleistogamy is.

(1) More vigorous offspring
(2) No dependence on pollinators
(3) Vivipary
(4) Higher genetic variability

[C. 71.05%, I.C. 28.39%, U.A. 0.56%] NEET-2013

14. Which one of the following statements is **correct**?

(1) Sporogenous tissue is haploid
(2) Endothecium produces the microspores
(3) Tapetum nourishes the developing pollen
(4) Hard outer layer of pollen is called intine

[C. 70.55%, I.C. 28.89%, U.A. 0.56%] NEET-2013

15. Geitonogamy involves:

(1) Fertilization of a flower by the pollen from another flower of the same plant
(2) Fertilization of a flower by the pollen from the same flower
(3) Fertilization of a flower by the pollen from a flower of another plant in the same population
(4) Fertilization of a flower by the pollen from a flower of another plant belonging to a distant population

[C. 70.53%, I.C. 24.12%, U.A. 5.34%] AIPMT-2014

16. Pollen tablets are available in the market for-

(1) In vitro fertilization
(2) Breeding Programmes
(3) Supplementing food
(4) Ex situ conservation

[C. 70.53%, I.C. 24.12%, U.A. 5.34%] AIPMT-2014

17. Which one of the followig fruits is parthenocarpic?

(1) Banana **(2)** Brinjal
(3) Apple **(4)** Jackfruit

[C. 70.47%, I.C. 26.68%, U.A. 2.85%] RE-AIPMT-2015

18. What is common between vegetative reproduction and Apomixis ?

(1) Both occur round the year.
(2) Both produces progeny identical to the parent.
(3) Both are applicable to only dicot plants.
(4) Both bypass the flowering phase.

[C. 70.10%, I.C. 27.39%, U.A. 2.50%] AIPMT MAINS-2011

19. Which one of the following statements is **not** true?

(1) Stored pollen in liquid nitrogen can be used in the crop breeding programmes
(2) Tapetum helps in the dehiscence of anther
(3) Exine of pollen grains is made up of sporopollenin
(4) Pollen grains of many species cause severe allergies

[C. 68.83%, I.C. 29.09%, U.A. 2.08%] NEET-I - 2016

20. A typical angiosperm embryo sac at maturity is:

(1) 8-nucleate and 8-celled
(2) 8-nucleate and 7-celled
(3) 7-nucleate and 8-celled
(4) 7-nucleate and 7-celled

[C. 68.70%, I.C. 25.74%, U.A. 5.56%] NEET- 2021

21. Attractants and rewards are required for-

(1) Entomophily
(2) Hydrophily
(3) Cleistogamy
(4) Anemophily

[C. 68.17%, I.C. 26.05%, U.A. 5.79%] NEET-II - 2017

22. A dioecious flowering plant prevents both :

(1) Autogamy and geitonogamy

(2) Geitonogamy and xenogamy

(3) Cleistogamy and xenogamy

(4) Autogamy and xenogamy

[C. 68.02%, I.C. 26.23%, U.A. 5.75%] NEET-II - 2017

23. Pollen grains can be stored for several years in liquid nitrogen having temperature of -

(1) –120ºC **(2)** –80ºC

(3) –196ºC **(4)** –160ºC

[C. 67.44%, I.C. 28.74%, U.A. 3.82%] NEET- 2018

24. Which one of the following statements regarding post-fertilization development in flowering plant is incorrect?

(1) Central cell develops into endosperm

(2) Ovules develop into embryo sac

(3) Ovary develops into fruit

(4) Zygote develops into embryo

[C. 66.17%, I.C. 32.34%, U.A. 1.49%] NEET- 2019

25. Double fertilization is

(1) Fusion of two male gametes of a pollen tube with two different eggs

(2) Fusion of one male gamete with two polar nuclei.

(3) Fusion of two male gametes with one egg

(4) Syngamy and triple fusion

[C. 66.14%, I.C. 28.81%, U.A. 5.05%] NEET- 2018

26. What is the fate of the male gametes discharged in the synergid?

(1) One fuses with the egg, other (s) fuse(s) with synergid nucleus.

(2) One fuses with the egg and other fuses with central cell nuclei.

(3) One fuses with the egg. other(s) degenerate (s) in the synergid.

(4) All fuse with the egg.

[C. 65.18%, I.C. 32.11%, U.A. 2.71%] NEET- 2019

27. Filiform apparatus is a characteristic feature of :

(1) Zygote **(2)** Suspensor

(3) Egg **(4)** Synergid

[C. 64.95%, I.C. 31.83%, U.A. 3.22%] AIPMT PRE-2011

28. The wheat grain has an embryo with one large, shield-shaped cotyledon known as :-

(1) Coleoptile **(2)** Epiblast

(3) Coleorrhiza **(4)** Scutellum

[C. 62.14%, I.C. 34.13%, U.A. 3.74%] RE-AIPMT-2015

29. Nucellar polyembryony is reported in species of

(1) Brassica **(2)** Citrus

(3) Gossypium **(4)** Triticum

[C. 62.02%, I.C. 34.49%, U.A. 3.48%] AIPMT PRE-2011

30. In which one of the following pollination is autogamous?

(1) Cleistogamy **(2)** Geitonogamy

(3) Xenogamy **(4)** Chasmogamy

[C. 61.90%, I.C. 34.60%, U.A. 3.49%] AIPMT PRE-2011

31. Apomictic embryos in **Citrus** arise from-

(1) Diploid egg

(2) Synergids

(3) Maternal sporophytic tissue in ovule

(4) Antipodal cells

[C. 61.02%, I.C. 35.46%, U.A. 3.51%] AIPMT-2010

32. The hilum is a scar on the :

(1) Seed, where micropyle was present
(2) Seed, where funicle was attached
(3) Fruit, where it was attached to pedicel
(4) Fruit, where style was present

[C. 60.40%, I.C. 38.46%, U.A. 1.14%] AIPMT-2015

33. What is the function of germ pore?

(1) Emergence of radicle
(2) Absorption of water for seed germination
(3) Initiation of pollen tube
(4) Release of male gametes

[C. 60.00%, I.C. 32.90%, U.A. 7.10%] AIPMT MAINS-2012

34. In water hyacinth and water lily, pollination takes place by-

(1) Water currents only
(2) Wind and water
(3) Insects and water
(4) Insects or wind

[C. 59.96%, I.C. 38.24%, U.A. 1.80%] NEET- 2020

35. Which one of the following statements is wrong?

(1) When pollen is shed at two-celled stage, double fertilization does not take place
(2) Vegetative cell is larger than generative cell
(3) Pollen grains in some plants remain viable for months
(4) Initine is made up of cellulose and pectin

[C. 59.85%, I.C. 37.59%, U.A. 2.55%] AIPMT MAINS-2012

36. Functional megaspore in an angiosperm develops into?

(1) Endosperm **(2)** Embryo sac
(3) Embryo **(4)** Ovule

[C. 59.77%, I.C. 37.52%, U.A. 2.71%] NEET-II - 2017

37. In angiosperms, microsporogenesis and, megasporogenesis-

(1) Occur in ovule
(2) Occur in anther
(3) Form gametes without further divisions
(4) Involve meiosis

[C. 59.09%, I.C. 39.67%, U.A. 1.24%] RE-AIPMT-2015

38. Wind pollination is common in :-

(1) Orchids **(2)** Legumes
(3) Lilies **(4)** Grasses

[C. 59.05%, I.C. 36.51%, U.A. 4.44%] AIPMT PRE-2011

39. Megasporangium is equivalent to:

(1) Ovule **(2)** Embryo sac
(3) Fruit **(4)** Nucellus

[C. 59.02%, I.C. 35.45%, U.A. 5.53%] NEET-2013

40. In some plants the female gamete develops into embryo without fertilization. This phenomenon is known as-

(1) Syngamy **(2)** Parthenogensis
(3) Autogamy **(4)** Parthenocarpy

[C. 59.02%, I.C. 38.53%, U.A. 2.44%] NEET- 2019

41. In majority of angiosperms

(1) Egg has a filiform apparatus
(2) There are numerous antipodal cells
(3) Reduction division occurs in the megaspore mother cells
(4) A small central cell is present in the embryo sac

[C. 58.90%, I.C. 38.17%, U.A. 2.94%] NEET-II - 2016

42. Flowers which have single ovule in the ovary and are packed into inflorescence are usually pollinated by-

(1) Bee **(2)** Wind **(3)** Bat **(4)** Water

[C. 58.64%, I.C. 38.81%, U.A. 2.56%] NEET-II - 2017

43. The gynoecium consists of many free pistils in flowers of:-

(1) Papaver **(2)** Michelia
(3) Aloe **(4)** Tomato

[C. 58.46%, I.C. 38.46%, U.A. 3.08%] AIPMT PRE-2012

44. Transfer of pollen grains from the anther to the stigma of another flower of the same plant is called :-

(1) Autogamy **(2)** Xenogamy
(3) Geitonogamy **(4)** Karyogamy

[C. 58.32%, I.C. 31.16%, U.A. 10.52%] AIPMT-2010

45. Wind pollinated flowers are-

(1) Small, producing nectar and dry pollen
(2) Small, brightly coloured, producing large number of pollen grains
(3) Small, producing large number of dry pollen grains
(4) Large, producing abundant nectar and pollen

[C. 58.32%, I.C. 31.06%, U.A. 10.62%] AIPMT-2010

46. The coconut water from tender coconut represents :

(1) Fleshy mesocarp
(2) Free-nuclear proembryo
(3) Free-nuclear endosperm
(4) Endocarp

[C. 57.36%, I.C. 23.74%, U.A. 18.90%] NEET-I - 2016

47. The ovule of an angiosperm is technically equivalent to-

(1) Megasporangium
(2) Megasporophyll
(3) Megaspore mother cell
(4) Megaspore

[C. 57.24%, I.C. 28.18%, U.A. 14.58%] NEET-II - 2016

48. Which of the following are the important floral rewards to the animal pollinations ?

(1) Protein pellicle and stigmatic exudates
(2) Colour and large size of flower
(3) Nectar and pollen grains
(4) Floral fragrance and calcium crystals

[C. 57.14%, I.C. 40.48%, U.A. 2.38%] AIPMT-2015

49. Which one of the following statements is **not** true?

(1) Honey is made by bees by digesting pollen collected from flowers
(2) Pollen grains are rich in nutrients, and they are used in the form of tablets and syrups
(3) Pollen grains of some plants cause severe allergies and bronchial affictions in some people
(4) The flowers pollinated by flies and bats secrete foul odour to attract them

[C. 55.47%, I.C. 41.89%, U.A. 2.64%] AIPMT-2015

50. Persistent nucellus in the seed is known as :

(1) Hilum **(2)** Tegmen
(3) Chalaza **(4)** Perisperm

[C. 55.40%, I.C. 39.55%, U.A. 5.05%] NEET- 2019

51. Plants with ovaries having only one or a few ovules are generally pollinated by-

(1) Bees **(2)** Butterflies
(3) Birds **(4)** Wind

[C. 54.62%, I.C. 38.77%, U.A. 6.62%] AIPMT MAINS-2012

52. Proximal end of the filament of stamen is attached to the :

(1) Thalamus or petal **(2)** Anther
(3) Connective **(4)** Placenta

[C. 54.34%, I.C. 42.83%, U.A. 2.83%] NEET-I - 2016

53. The term used for transfer of pollen grains from anthers of one plant to stigma of a different plant which, during pollination, brings genetically different types of pollen grains to stigma, is-

(1) Cleistogamy **(2)** Xenogamy
(3) Geitonogamy **(4)** Chasmogamy

[C. 54.20%, I.C. 35.29%, U.A. 10.50%] NEET- 2021

54. Transmission tissue is characteristic feature of :-

(1) Wet stigma **(2)** Hollow style
(3) Solid style **(4)** Dry stigma

[C. 53.74%, I.C. 44.49%, U.A. 1.76%] AIPMT-2015

55. Which one of the following may require pollinators, but is genetically similar to autogamy ?

(1) Cleistogamy **(2)** Geitonogamy
(3) Xenogamy **(4)** Apogamy

[C. 52.91%, I.C. 45.29%, U.A. 1.79%] AIPMT-2015

56. In some members of which of the following pairs of families, pollen grains retain their viability for months after release?

(1) Rosaceae; Leguminosae
(2) Poaceae; Rosaceae
(3) Poaceae; Leguminosae
(4) Poaceae; Solanaceae

[C. 50.15%, I.C. 44.14%, U.A. 5.71%] NEET- 2021

57. Even in absence of pollination agents seed-setting is assumed in-

(1) Salvia **(2)** Fig
(3) Commellina **(4)** Zostera

[C. 49.83%, I.C. 44.64%, U.A. 5.54%] AIPMT PRE-2012

58. In angiosperms, functional megaspore develops into

(1) Endosperm **(2)** Pollen sac
(3) Embryo sac **(4)** Ovule

[C. 47.92%, I.C. 40.58%, U.A. 11.50%] AIPMT PRE-2011

59. Male gametophyte in angiosperms produces-

(1) Three sperms

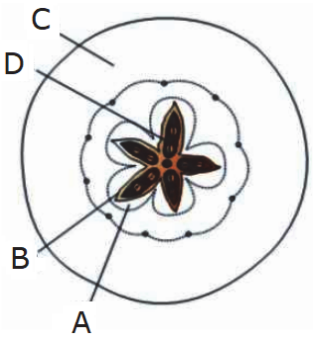
(2) Two sperms and a vegetative cell

(3) Single sperm and a vegetative cell

(4) Single sperm and two vegetative cells

[C. 47.89%, I.C. 43.07%, U.A. 9.04%] RE-AIPMT-2015

60. Which part of the fruit, labelled in the given figure makes it a false fruit ?



(1) B → Endocarp

(2) C →Thalamus

(3) D → Seed

(4) A → Mesocarp

[C. 45.52%, I.C. 44.79%, U.A. 9.69%] NEET- 2022

61. Identify the incorrect statement related to pollination

(1) Pollination by wind is more common amongs abiotic pollination
(2) Flowers produce foul odours to attract flies and beetles to get pollinated
(3) Moths and butterflies are the most dominant pollinating agents among insects
(4) Pollination by water is quite rare in flowering plants

[C. 44.35%, I.C. 47.92%, U.A. 7.74%] NEET- 2022

62. Winged pollen grains are present in :

(1) Mustard

(2) Cycas

(3) Mango

(4) Pinus

[C. 41.63%, I.C. 54.82%, U.A. 3.56%] NEET- 2018

63. Which of the following statements is **not correct**?

(1) Some reptiles have also been reported as pollinators in some plant species.
(2) Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style.
(3) Insects that consume pollen or nectar without bringing about pollination are called pollen/nectar robbers.
(4) Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil.

[C. 40.22%, I.C. 46.74%, U.A. 13.03%] NEET-I - 2016

64. In angiosperm, the haploid, diploid and triploid structures of a fertilized embryo sac sequentially are:

(1) Antipodals, synergids, and primary endosperm nucleus
(2) Synergids, Zygote and Primary endosperm nucleus
(3) Synergids, antipodals and Polar nuclei
(4) Synergids, Primary endosperm nucleus and zygote

[C. 38.78%, I.C. 41.76%, U.A. 19.47%] NEET- 2023

65. Given below are two statements :
Statement I :
Cleistogamous flowers are invariably autogamous
Statement II:
Cleistogamy is disadvantageous as there is no chance for cross pollination
In the light of the above statements, choose the correct answer from the option given below :

(1) Both statement I and Statement II are incorrect
(2) Statement I is correct but statement II is incorrect
(3) Statement I is incorrect but statement II is correct
(4) Both statement I and statement II are correct

[C. 38.11%, I.C. 41.62%, U.A. 20.27%] NEET- 2022

66. Perisperm differs from endosperm in

(1) Having no reserve food
(2) Being a diploid tissue
(3) Its formation by fusion of secondary nucleus with several sperms
(4) Being a haploid tissue

[C. 38.10%, I.C. 60.69%, U.A. 1.21%] NEET-2014

67. Both, autogamy and geitonogamy are prevented in

(1) Castor **(2)** Maize
(3) Papaya **(4)** Cucumber

[C. 33.77%, I.C. 62.69%, U.A. 3.54%] AIPMT PRE-2012

68. What would be the number of chromosomes of the aleurone cells of a plant with 42 chromosomes in its root tip cells?

(1) 21 **(2)** 42 **(3)** 63 **(4)** 84

[C. 33.33%, I.C. 50.00%, U.A. 16.67%] AIPMT PRE-2011

69. Large, colourful, fragrant flowers with nectar are seen in:

(1) Bird pollinated plants
(2) Bat pollinated plants
(3) Wind pollinated plants
(4) Insect pollinated plant

[C. 32.10%, I.C. 47.47%, U.A. 20.42%] NEET- 2023

70. What is the function of tassels in the corn cob?

(1) To trap pollen grains
(2) To disperse pollen grains
(3) To protect seeds
(4) To attract insects

[C. 29.05%, I.C. 52.97%, U.A. 17.98%] NEET- 2023

Answer Key

Exercise - 1 — Objective Problems | NEET

1. 1	**2.** 4	**3.** 2	**4.** 3	**5.** 3	**6.** 3	**7.** 1	**8.** 4
9. 1	**10.** 2	**11.** 2	**12.** 2	**13.** 1	**14.** 1	**15.** 1	**16.** 3
17. 4	**18.** 3	**19.** 2	**20.** 1	**21.** 4	**22.** 2	**23.** 1	**24.** 2
25. 2	**26.** 1	**27.** 4	**28.** 1	**29.** 4	**30.** 4	**31.** 3	**32.** 2
33. 3	**34.** 2	**35.** 2	**36.** 3	**37.** 1	**38.** 2	**39.** 3	**40.** 2
41. 3	**42.** 1	**43.** 1	**44.** 1	**45.** 1	**46.** 2	**47.** 2	**48.** 3
49. 1	**50.** 3	**51.** 1	**52.** 2	**53.** 2	**54.** 3	**55.** 2	**56.** 3
57. 3	**58.** 1	**59.** 3	**60.** 3	**61.** 3	**62.** 2	**63.** 3	**64.** 1
65. 3	**66.** 4	**67.** 3	**68.** 3	**69.** 1	**70.** 1	**71.** 2	**72.** 3
73. 3	**74.** 1	**75.** 3	**76.** 1	**77.** 4	**78.** 2	**79.** 3	**80.** 1
81. 2	**82.** 2	**83.** 4	**84.** 4	**85.** 1	**86.** 2	**87.** 4	**88.** 2
89. 4	**90.** 3	**91.** 3	**92.** 2	**93.** 2	**94.** 3	**95.** 1	**96.** 4
97. 1	**98.** 2	**99.** 3	**100.**1	**101.**2	**102.**2	**103.**2	**104.**4
105.4	**106.**1	**107.**4	**108.**3	**109.**2	**110.**1	**111.**1	**112.**1
113.3	**114.**1	**115.**3	**116.**2	**117.**2	**118.**3	**119.**4	**120.**3
121.1	**122.**1	**123.**1	**124.**3	**125.**1	**126.**1	**127.**4	**128.**3
129.1	**130.**1	**131.**2	**132.**3	**133.**3	**134.**2	**135.**2	**136.**1
137.3	**138.**3	**139.**4	**140.**2	**141.**3	**142.**3	**143.**4	**144.**3

Exercise - 2 — Objective Problems | NEET

1. 1	**2.** 1	**3.** 1	**4.** 3	**5.** 3	**6.** 4	**7.** 3	**8.** 4
9. 3	**10.** 3	**11.** 4	**12.** 3	**13.** 3	**14.** 4	**15.** 3	**16.** 2
17. 3	**18.** 3	**19.** 2	**20.** 2	**21.** 3	**22.** 4	**23.** 4	**24.** 3
25. 3	**26.** 3	**27.** 2	**28.** 4	**29.** 3	**30.** 4	**31.** 1	**32.** 1
33. 2	**34.** 1	**35.** 3	**36.** 3	**37.** 3	**38.** 2	**39.** 3	**40.** 3
41. 2	**42.** 4	**43.** 3	**44.** 1	**45.** 3	**46.** 2	**47.** 3	**48.** 4
49. 3	**50.** 2	**51.** 3	**52.** 4	**53.** 4	**54.** 3	**55.** 2	**56.** 4
57. 3	**58.** 1	**59.** 4	**60.** 4	**61.** 4	**62.** 2	**63.** 3	**64.** 1
65. 4	**66.** 2	**67.** 1	**68.** 3	**69.** 4	**70.** 1	**71.** 2	**72.** 2

73. 3	**74.** 1	**75.** 1	**76.** 1	**77.** 3	**78.** 1	**79.** 1	**80.** 4
81. 1	**82.** 1	**83.** 4	**84.** 1	**85.** 1	**86.** 1	**87.** 2	**88.** 4
89. 3	**90.** 3	**91.** 4	**92.** 3	**93.** 3	**94.** 1		

Exercise - 3 Previous Year Problems | NEET

1. 2	**2.** 4	**3.** 3	**4.** 4	**5.** 1	**6.** 3	**7.** 3	**8.** 1
9. 4	**10.** 2	**11.** 3	**12.** 4	**13.** 2	**14.** 3	**15.** 1	**16.** 3
17. 1	**18.** 2	**19.** 2	**20.** 2	**21.** 1	**22.** 1	**23.** 3	**24.** 2
25. 4	**26.** 2	**27.** 4	**28.** 4	**29.** 2	**30.** 1	**31.** 3	**32.** 2
33. 3	**34.** 4	**35.** 1	**36.** 2	**37.** 4	**38.** 4	**39.** 1	**40.** 2
41. 3	**42.** 2	**43.** 2	**44.** 3	**45.** 3	**46.** 3	**47.** 1	**48.** 3
49. 1	**50.** 4	**51.** 4	**52.** 1	**53.** 2	**54.** 3	**55.** 2	**56.** 1
57. 3	**58.** 3	**59.** 2	**60.** 2	**61.** 3	**62.** 4	**63.** 2	**64.** 2
65. 4	**66.** 2	**67.** 3	**68.** 3	**69.** 4	**70.** 1		

POINTS TO REMEMBER