Chapter 2. Sexual Reproduction in Flowering Plants

Flower and its Parts

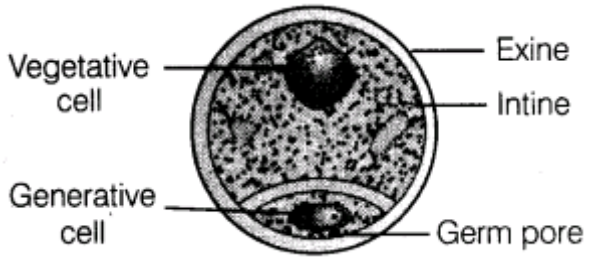
1 Mark Questions

1.Name the part of the flower which the tassels of corn cob represent.[All Indian 2014]

Ans. The part of the flower that represent the tassels of corn cob are stamens or male reproductive parts.

2.Draw a diagram of a matured microspore of an angiosperm. Label its cellular components only.[Foreign 2014]

Ans. The labelled diagram of a mature microspore of an angiosperm with its cellular components is given below:



3.State the function of filiform apparatus found in mature embryo sac of an angiosperm. [Foreign 2014]

Ans. The special cellular thickenings at the micropylar tip called filiform apparatus, found in mature embryo sac of an angiosperm helps in guiding the pollen tubes up to the synergids.

4.Abilobed, dithecous anther has 100 microspore mother cells per microsporangium. How many male gametophytes this anther can produce? [HOTS; Delhi 2010]

Ans. An anther is a four-sided (tetragonal) structure consisting of four microsporangia located at the corners, two in each lobe. Total microsporangium = 4 x 100 = 400.So, anther produces 400 male gametes

5.An anther with malfunctioning tapetum often fails to produce viable male gametophytes. Give one reason. [Delhi 2010]

Ans. The anther with malfunctioning tapetum cannot provide complete nutrition to the developing microspores or male gametophytes. So, it fails to produce viable male gametophyte.

2 Marks Questions

6.Name the organic materials of which exine and intine of an angiosperm pollen grains are made up of. Explain the role of exine.[Delhi 2014]

Ans. The angiosperm pollen grains comprises of outer exine made up of resistant organic material sporopollenin, while inner thin layer of intine is made up of cellulose and pectin.Since, the outer

hard layer of exine is made up of sporopollenin which is one of the most resistant organic substance, it helps the pollen grains to resist high temperatures, strong acids and alkali and it also protects them from enzyme degradation.

7.Differentiate between the two cells enclosed in a mature male gametophyte of an angiosperm.[All India 2013]

Ans. Haploid pollen grain represents the male gametophyte. It contains two cells,i.e.vegetative cell and generative cell. The vegetative or tube cell is larger in size as with prominent nuclei that gives rise to two male gametes, while vegetative cell does not.
compare to generative cell and have vacuolated cytoplasm. The generative cell on the other hand have thin dense cytoplasm

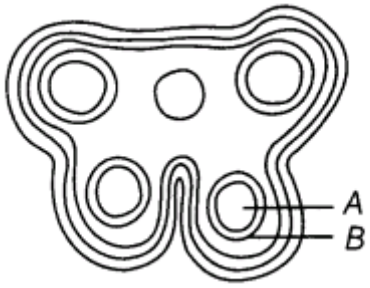
8.Name all the haploid cells present in an unfertilised mature embryo sac of a flowering plant. Write the total number of cells in it.[HOTS; All India 2013]
or
How many haploid cells are present in mature female gametophyte of a flowering plant? Name them.[Delhi 2013 C]

Ans. An unfertilised embryo sac of angiosperm is composed of 7 cells, i.e. 7-celled and 8-nucleated. Among 8-nuclei, 6 are enclosed by cell walls and organised into cells, which are haploid in number (3 antipodal, 2 synergids and 1 egg cell) and a large central cell with 2 pollen nuclei.

9.Where is sporopollenin present in plants? State its significance with reference to its chemical nature.[Delhi 2012]

Ans. Sporopollenin is present in exine of pollen grains in plants. It is one of the most resistant organic substances and can withstand high temperatures, strong acids and alkalis. It protect the pollen grains from enzymes and helps them to be well preserved**.**

10.In the TS of a mature anther given below, identify A and B and mention their functions. [Foreign 2009]



Ans.A-Sporogenous tissue

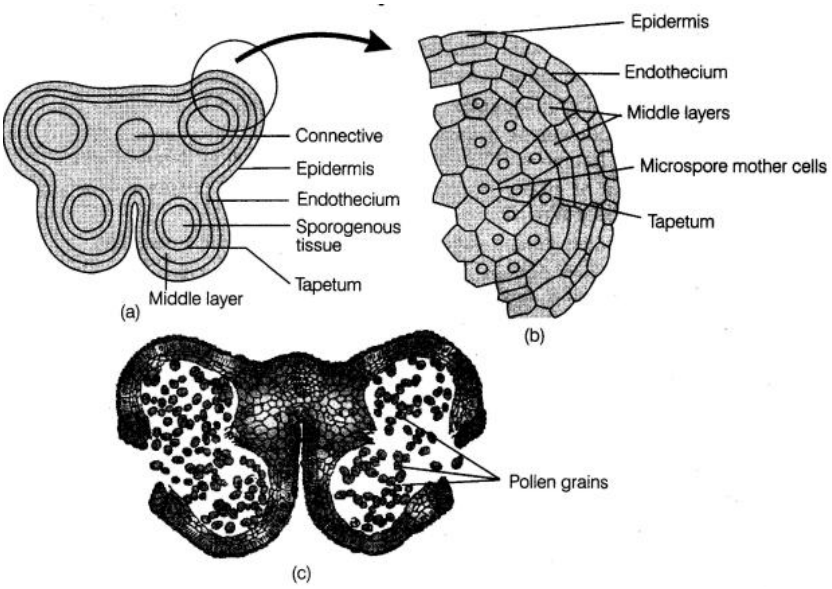
Function Its cells are potential mother cells and form pollen grains.
B-Tapetum
Function It nourishes the developing pollen grains.

11.(i) Draw a schematic diagram of TS of a mature anther. Label only the layers that help in dehiscence of the anther to release pollen grains.
(ii) Why is exine of the pollen grain not a continuous layer? [Delhi 2009]

Ans.(i) **Diagram of TS of a mature anther**: Anther is a bilobed structure with each lobe having two theca, therefore called dithecous. In a cross section, it is a four sided (tetragonal) structure consisting of four microsporangia, located at the corners, two in each lobe. Microsporangia develop

and becomes pollen sacs. Pollen sacs contain pollen grains.
Structure of microsporangium contains following features in a transverse section:

- Appears nearly circular in outline.
- It is surrounded by four wall layers. The outer three layers are epidermis, endothecium and middle layers. Outer three wall layers are protective in function and help in dehiscence of anther to release the pollen. The fourth and innermost layer called the tapetum nourishes developing pollen grains. It contains cells with dense cytoplasm and more than one nuclei.
- A sporogenous tissue occupies the centre of each microsporangium in a young anther.
- Each cell of sporogenous tissue undergo meiosis to form microspore tetrads. Each cell of the tetrad is known as microspore mother cell



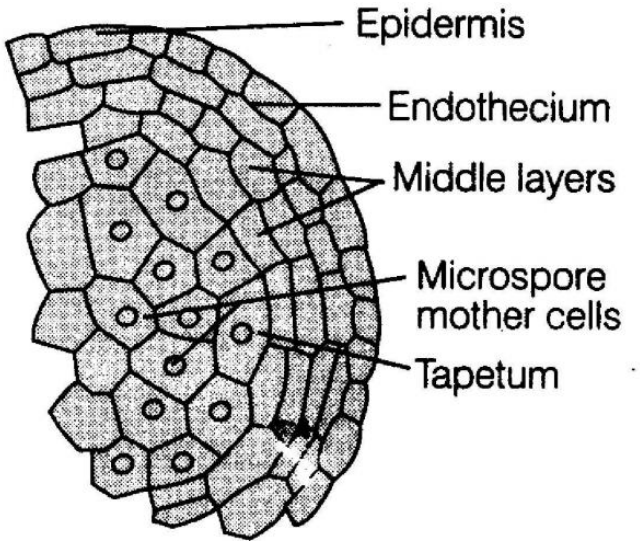
(a) TS of a young anther (b) Enlarged view of one microsporangium showing four wall layers (c) A mature dehisced anther

(ii) The exine is absent or very thin at regions called apertures (germ pore) through which pollen tube emerges at the time of germination on stigma.

3 Marks Questions

12.Why are angiosperm anthers called dithecous? Describe the structure of its microsporangium. [Delhi 2014]
or
Describe the structure of a mature microsporangium of an angiosperm.[Delhi 2014]

Ans. Since, the angiosperm anther are bilobed,each lobe bearing two theca, they are referred to as dithecous. The structure of a mature microsporangium can be described with the help of given alongside diagram. Microsporangium appears circular in outline and is usually surrounded by four wall layers. The outer three layers epidermis, endothecium and middle layers are protective in function. They also help in dispersal of pollens by dehiscing themselves. While, the innermost layer tapetum is nutritive in function and nourishes the developing pollen grains.



The centre of the microsporangium comprises of compact sporogenous tissue. These sporogenous tissue undergo meiotic divisions to form microspore tetrads, that further divide to form pollen grains.

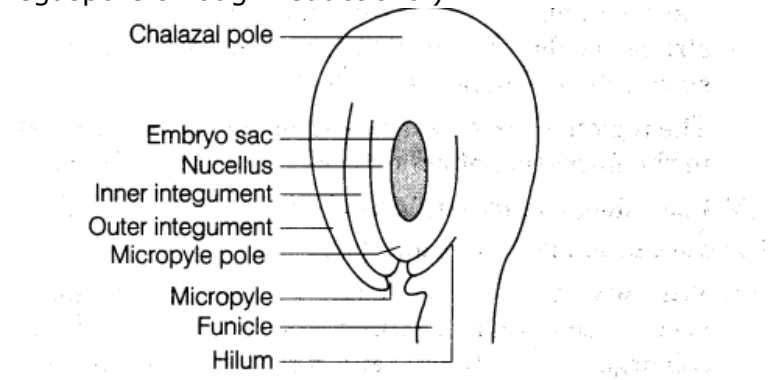
13.Draw a labelled diagram of a typical anatropous ovule. [Delhi 2014]

Ans. The structure or labelled diagram of anatropous ovule
Pistil/Gynoecium It is the female unit of flower. A flower may be monocarpellary (having one pistil) or multicarpellary (having more than one pistils). Pistils may be syncarpous (fused together) or apocarpous (free).
The main parts of pistils are:

- Stigma receives pollen grains.
- Style is the elongated slender part beneath the stigma.
- Ovary the bulged part at the base of style.

Placenta is located inside the ovarian cavity or locule. Megasporangia, commonly called ovules arise from the placenta. Ovule is attached to the placenta by a stalk called funicle. The number of ovules in an ovary may be one (wheat, paddy and mango) to many (papaya, water melon and orchids).
The main parts of megasporangium (ovule) are:
(i) **Hilum** is a junction between ovule and funicle.
(ii) Each **ovule** has one or two protective envelopes called integuments.
(iii)**Micropyle** is an opening present at the tip where integument is absent.
(iv) **Chalaza** is opposite to the micropylar end representing the basal part of the ovule.
(v) The integuments encloses a mass of cells called the nucellus which have food reserves.
(vi) **Embryo sac or female gametophyte** is located in the nucellus (generally one formed from a

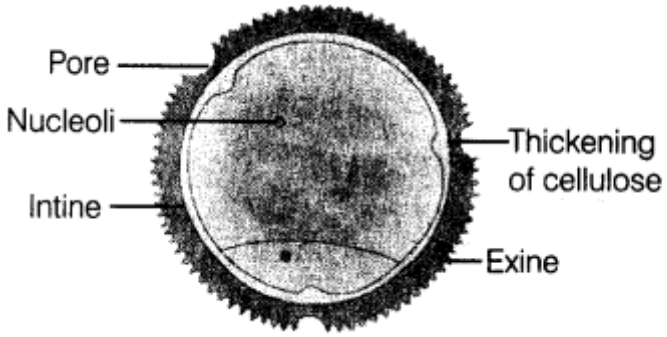
megaspore through reductional).



Diagrammatic view of a typical anatropous ovule

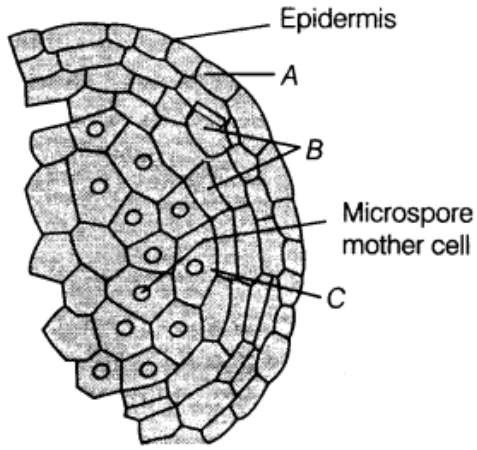
14.Draw a diagram of a male gametophyte of an angiosperm. Label any four parts. Why is sporopollenin considered the most resistant organic material?[Delhi 2011]

Ans.(i) The structure of a male gametophyte of an angiosperm is:



(ii)Sporopollenin is one of the hardest or resistant organic material known. It can withstand high temperatures, strong acids and alkalis. No enzyme that degrades sporopollenin is so far known.That's why it is considered the most resistant organic material

15.Given below is an enlarged view of one microsporangium of a mature anther



(i)Name A, B and C wall layers.
(ii)Mention the characteristics and function of the cells forming wall layer C. [Delhi 2008 C]

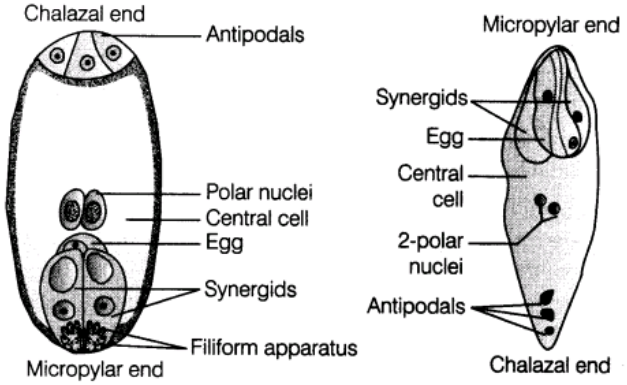
Ans.(i)A-Endothecium, 8-Middle layer, C-Tapetum
(ii) Wall layer C is tapetum. It is the innermost wall layer of microsporangium

cell of the tapetum possess dence cytoplasm and generally have more than one nucleus. It nourishes the developing pollen grains.

5 Marks Questions

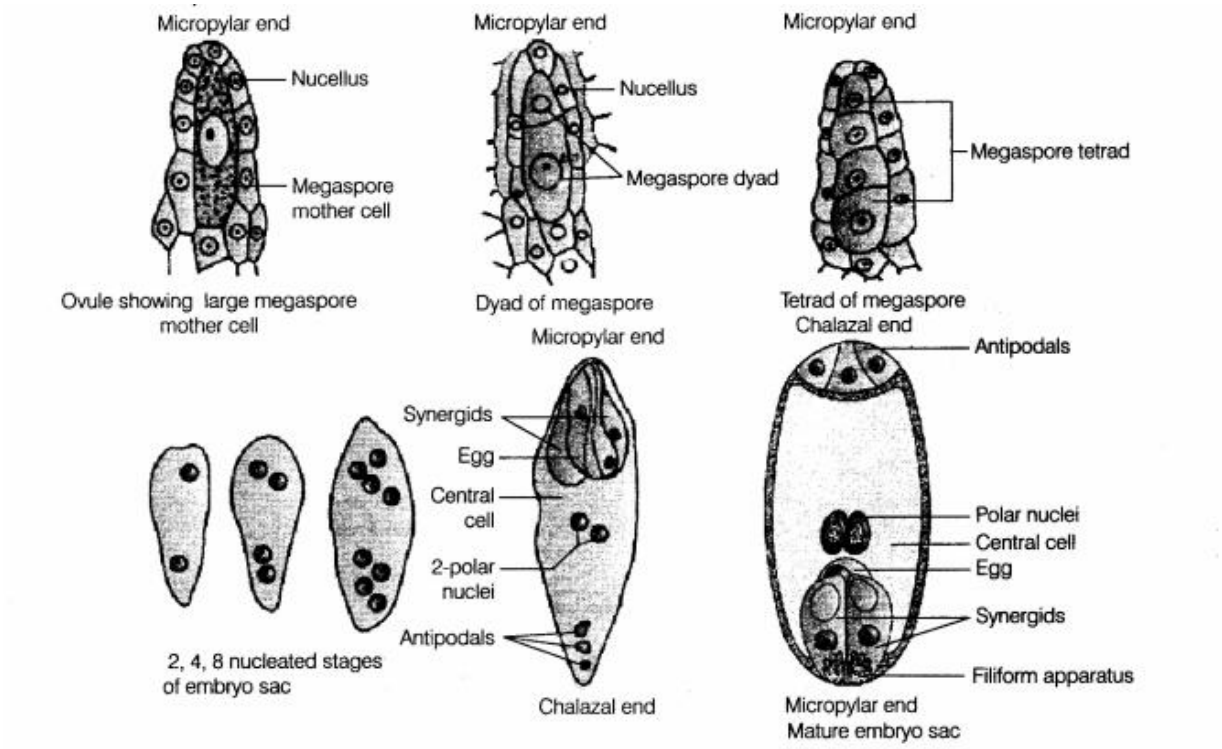
16.Draw a labelled diagram of sectional view of a mature embryo sac of an angiosperm. [Delhi 2014]

Ans. The sectional view of a mature embryo sac in an angiospermis. Chalazal end Antipodals



17.(i) Describe the formation of mature female gametophyte within an ovule in angiosperms.
(ii)Describe the structure of cell that guides the pollen tube to enter the embryo sac. [All India 2014]

Ans.(i) The functional megaspore undergoes mitosis to form two nuclei, which migrate to opposite poles, forming a 2-nucleate embryo sac. Further, mitotic divisions lead to the formation of 4-nucleate and 8-nucleate stages of the embryo sac. In these mitotic divisions, nuclear division is not followed by cell division. After the 8-nucleate stage, cell walls are laid down and a typical female gametophyte or embryo sac is formed.



Stages of development of embryo sac

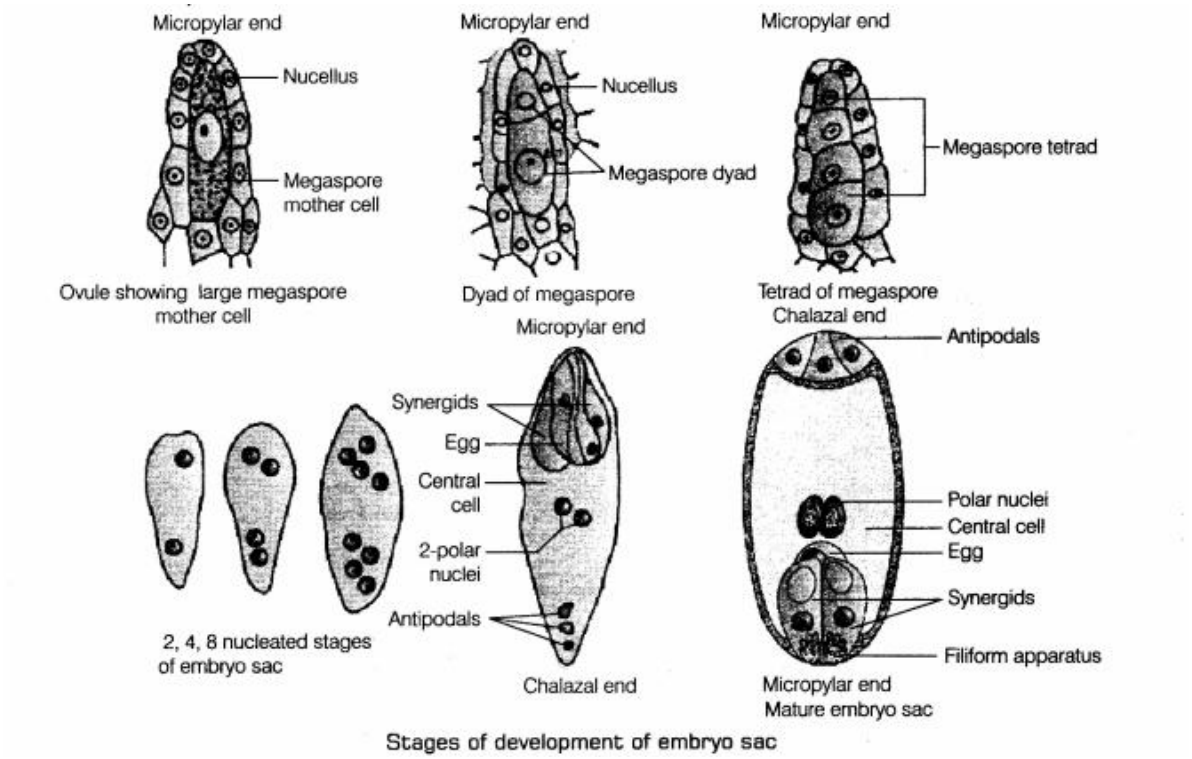
Among the eight nuclei, six are enclosed by cell walls and organised into cells, while the remaining two nuclei (polar nuclei) are situated above the egg apparatus in a large central cell. Out of the six cells, three are grouped at the micropylar end and constitute the egg apparatus made up of two synergids and one egg cell.

The other three cells are located at the chalazal end and are called antipodals. Thus, a typical angiosperm embryo sac after maturity is 8-nucleate and 7-celled.

(ii)The egg apparatus present towards the micropylar end, comprises of two synergids and an egg cell. These synergids possess special cellular thickenings at their micropylar tip which is called filiform apparatus. This filiform apparatus guides the pollen tube to enter embryo sac.

18.How does the megaspore mother cell develop into 7-celled and 8-nucleate embryo sac in an angiosperm? Draw a labelled diagram of a mature embryo sac.[Delhi 2012]
or
Explain with the help of diagram the development of mature embryo sac from a mega spore mother cell in angiosperm.[Foreign 2012; All India 2010 C; Delhi 2009]

Ans. The functional megaspore undergoes mitosis to form two nuclei, which migrate to opposite poles, forming a 2-nucleate embryo sac. Further, mitotic divisions lead to the formation of 4-nucleate and 8-nucleate stages of the embryo sac. In these mitotic divisions, nuclear division is not followed by cell division. After the 8-nucleate stage, cell walls are laid down and a typical female gametophyte or embryo sac is formed.



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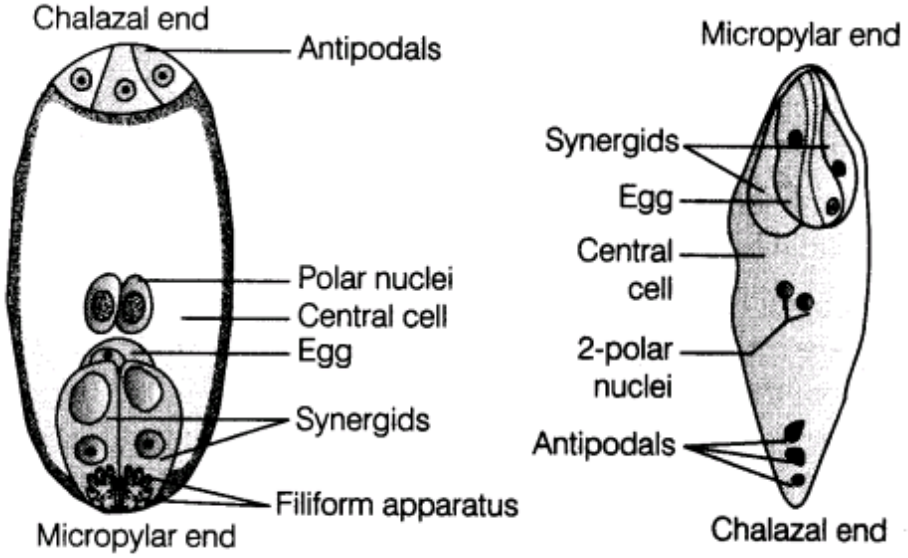
The sectional view of a mature embryo sac in an angiospermis. Chalazal end Antipodals



19.(i) Draw a diagram of an enlarged
(i)view of TS of one microsporangium of an angiosperm and label the following parts.

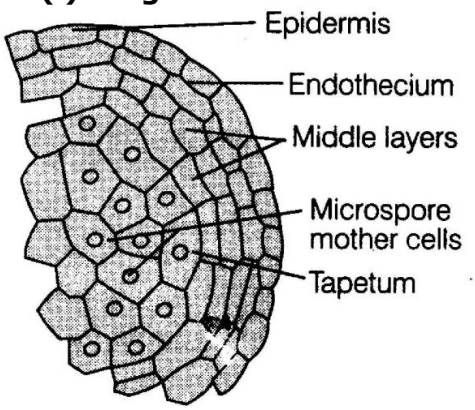
- **Tapetum**
- **Middle layers**
- **Endothecium**

- **Microspore mother cell**

(ii)Mention the characteristic features and function of tapetum.
(iii)Explain the following giving reasons

- **Pollen grains are well preserved as fossils.**
- **Pollen tablets are in use of people these days.[Foreign 2011]**

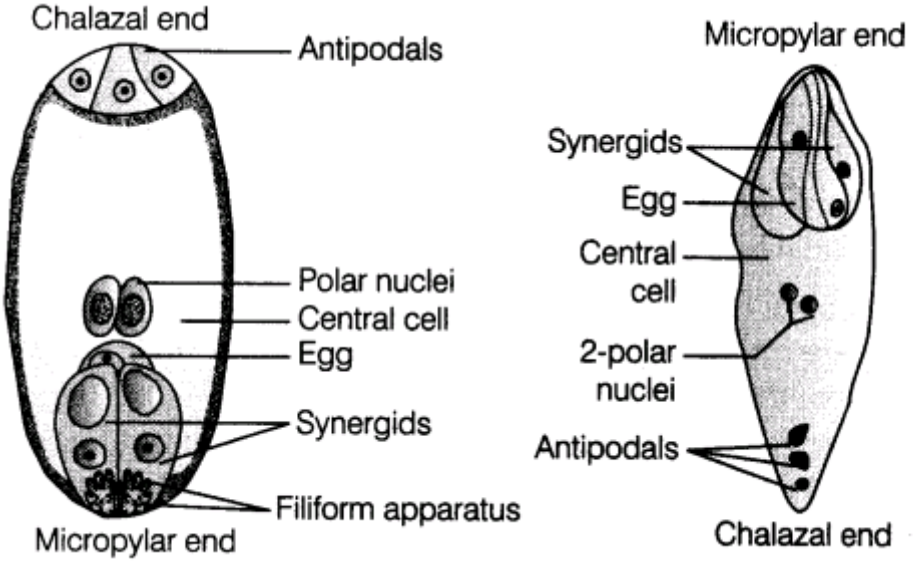
Ans.(i) Diagram



(ii)Tapetum is the inner nourishing layer of microsporangial wall. The cells of tapetum have dense cytoplasm and more than one nucleus.
(iii) (a) Since, the outer exine layer of pollen grain is highly resistant because of sporopollenin. It is an organic material which can withstand harsh conditions, action of alkalis and acids. No enzymes can degrade sporopollenin. Thus, pollen grains are well preserved as fossils.
(b) Pollen grains are rich in nutrients. So, used by people as health tablets or food supplements

20.(i) Draw a labelled diagram of a mature embryo sac.
(ii)Why does a pollen grain possess two male gametes? Explain.[Delhi 2009]

Ans. For diagram of mature embryo sac
The sectional view of a mature embryo sac in an angiospermis. Chalazal end Antipodals



(ii) In flowering plants, double fertilisation occurs. It involves, two fusions during fertilisation of an ovule. A pollen grain contains two male gametes. One of the male gamete fuses with female gamete to form zygote and the other one fuses with the polar nuclei to form the primary endosperm nucleus.

21.Draw a labelled diagram of an anther lobe at microspore mother cell stage. Mention the roles of different wall layers of anther.[Delhi 2009 C]

Ans.(i)Structure of an anther lobe at microspore mother cell stage

Anther is a bilobed structure with each lobe having two theca, therefore called dithecous. In a cross section, it is a four sided (tetragonal) structure consisting of four microsporangia, located at the corners, two in each lobe. Microsporangia develop and becomes pollen sacs. Pollen sacs contain pollen grains.

Structure of microsporangium contains following features in a transverse section:

- Appears nearly circular in outline.
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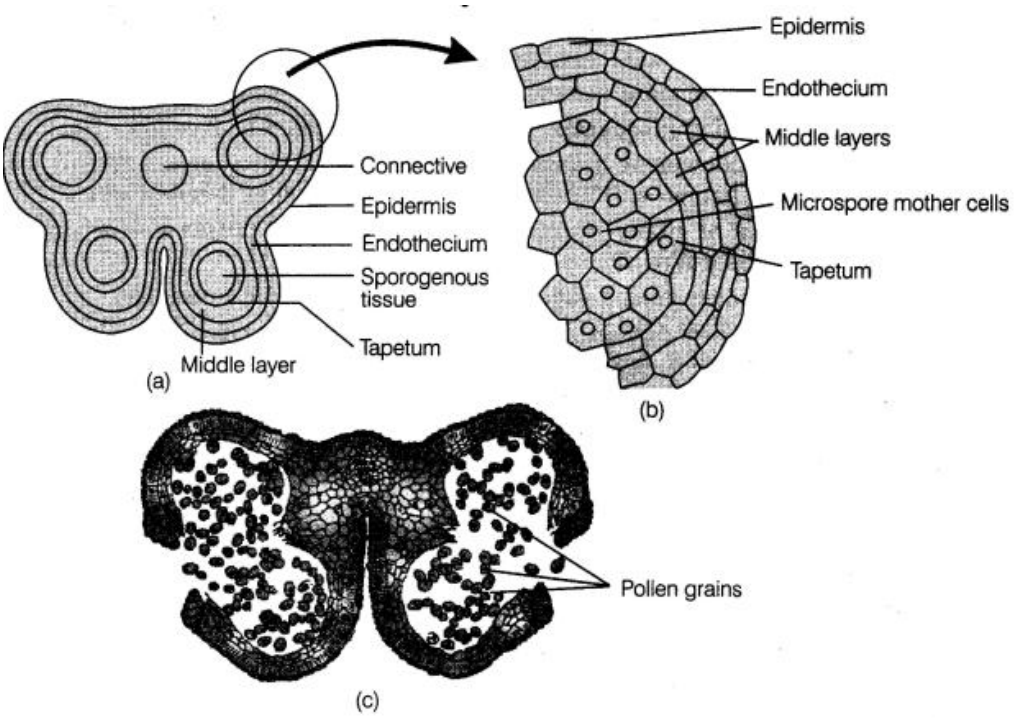
- Each cell of sporogenous tissue undergo meiosis to form microspore tetrads. Each cell of the tetrad is known as microspore mother cell



(a) TS of a young anther (b) Enlarged view of one microsporangium showing four wall layers (c) A mature dehisced anther

(ii) Role of wall layers of anther An anther is surrounded by four wall layers. These are epidermis, endothecium, middle layers and the tapetum. The outer three wall layers perform the function of protection and help in dehiscence of anther to release pollen. The innermost layer tapetum, nourishes the developing pollen grain cells.

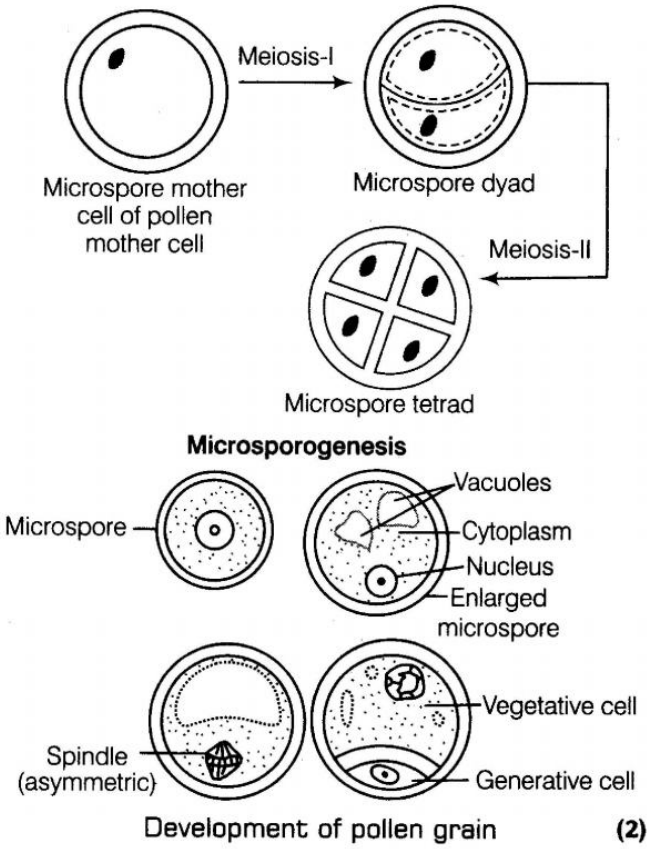
22.How does the pollen mother cell develop into a mature pollen grain? Illustrate the stages with labelled diagram. [All India 2009]

Ans. Development of pollen grain from pollen mother cell:

(i) Pollen mother cell or microspore mother cell undergoes meiosis to form microspore tetrad or haploid microspores.

(ii) As the anther matures, the microspores dissociate from the tetrad and develop into pollen

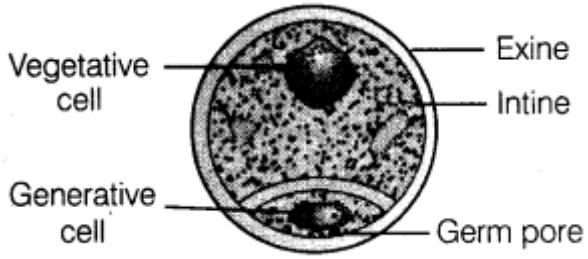
grains.
(iii)Nucleus of the microspores undergoes mitosis to form a large vegetative cell and small spindle-shaped generative cell.
(iv)They develop a two layered wall,the outer exine made of sporopollenin and the inner intine made of cellulose and pectin.
(v)Usually the pollen grains are liberated at this 2 celled stage. In certain species, the generative cell divides mitotically to form two male gametes and the pollen grains are 3 celled during liberation.



Development of pollen grain (2)

23.Draw a labelled diagram of the sectional view of a mature pollen grain in angiosperm. Explain the functions of its two different parts. [Delhi 2008]

Ans.(i) Sectional view of mature pollen grain
The labelled diagram of a mature microspore of an angiosperm with its cellular components is given below:



(ii) Functions of layers are:

- Exine provides protection.
- Intine grows out as pollen tube through one of the germ pores on the exine.

Functions of two cells
(i) Vegetative cell contain food reserves, i.e. starch, protein, fat.
(ii) Generative cell divides mitotically to produce two male gametes

Pollination

1 Mark Questions

1.What is pollen-pistil interaction and how is it mediated? [Foreign 2014]

Ans. Pollen-pistil interaction is a chain or group of events that takes place from the falling of pollen over the stigma to the formation of pollen tube and its entry into the ovule. It is basically the phenomenon of acceptance or rejection of pollen grains by the pistil (stigma), which is mediated by chemical components of pollen grain, interacting with that of pistil,

2.Differentiate between xenogamy and geitonogamy? [Delhi 2014 c]

Ans.Xenogamy is transfer of pollen grains from anther of one flower to stigma of another flower of a different plant, while geitonogamy is transfer of pollen grains from anther of one flower to stigma of another flower on same plant.

3.How do the pollen grains of Vallisneria protect themselves?[All India 2012]

Ans.As the pollination of **Vallisneria** takes place by means of water, the pollen grains are covered by mucilaginous coating that protects them

4.Why do the pollen grains of Vallisneria have a mucilaginous covering? [hots; Delhi 2010]

Ans.In Vallisneria,the male flowers are released on the water surface. So, to provide protection to these pollen grains, a mucilaginous covering is present. True hydrophily can be seen in **Vallisneria.**

5.Mention the pollinating agent of an inflorescence of small dull coloured flowers with well exposed stamens and large feathery stigma. Give any one characteristic of pollen grains produced by such flowers. [Delhi 2009]

Ans. The pollinating agent in the described inflorescence with small dull coloured flowers having well exposed stamens and large stigma is wind. The pollens are non-sticky and can be easily dispersed by wind currents and so large, feathery stigma easily traps air borne pollen grain. For example, corn cob, its ears or silk (stigma and style) wave in the wind to trap pollen grains.

6.Name the type of flower which favours cross-pollination. [All India 2009]

Ans.Chasmogamous flowers which are similar to flowers of other species with exposed anthers and stigma favour cross-pollination.

7.The following statements (i), (ii) and (iii) seem to describe the water pollinated submerged plants. Which one of these statements is incorrect?
(i)The flowers do not produce nectar.
(ii)The pollen grains have mucilaginous covering.
(iii)The brightly coloured female flowers have long stalk to reach the surface. [Foreign 2009]

Ans. Statement (iii) is incorrect. As in submerged plants, female flowers remain submerged, while pollen grains are long ribbon-like to reach passively to stigma inside water, so as to achieve pollination.

8.Name the type of pollination as a result of which genetically different types of pollen grains of the same species land on the stigma.[Foreign 2009]

Ans.Xenogamy/allogamy is the type of pollination as a result of which genetically different types of pollen grains of the same species land on the stigma.

9.In angiosperms, zygote is diploid while primary endosperm cell is triploid. Explain. [All India 2013]
or
Mention the reasons for difference in ploidy of zygote and primary endosperm nucleus in an angiosperm. [Delhi 2010]

Ans.In angiosperms or flowering plants, one of the male gamete fuses with egg cell which results in formation of zygote. So, zygote is diploid.While primary endosperm cell is triploid because the nucleus of the second male gamete fuses with the two haploid polar nuclei or diploid secondary nucleus of the central cell to form a triploid primary endosperm nucleus. The central cell is now called primary endosperm cell.

10.State one advantage and one disadvantage of cleistogamy.[All India 2012]

Ans. Advantage and disadvantage of cleistogamy are as follows:
Advantage Cleistogamous flowers produce assured seed-set even in the absence of pollinators.
Disadvantage Cleistogamous flowers are invariably autogamous. So, there is no chance of cross-pollination.

11.Why should a bisexual flower be emasculated and bagged prior to artificial pollination? [Foreign 2010]

Ans.Emasculation in a bisexual flower is required to prevent contamination of the stigma with self pollen grains.Bagging is done to prevent contamination of the stigma of the emasculated flower with any other unwanted pollen grains. That's why a bisexual flower should emasculated and bagged prior to artificial pollination

12.Explain any two devices by which autogamy is prevented in flowering plants. [All India 2009]

Ans.The two devices to prevent autogamy in flowering plants are:
(i) Anthers and stigma of a flower are placed in such a way that pollen of the same flower cannot fall on the stigma.
(ii) Self-incompatibility is a genetic process that prevents germination of pollen from the same flower on the stigma

13.The flower of brinjal is referred to as chasmogamous, while that of beans is cleistogamous. How are they different from each other? [Delhi 2008]

Ans. Differences between chasmogamous flower of brinjal and cleistogamous flowers of beans are:

Chasmogamous flower	Cleistogamous flower
These open at maturity and expose their stigma(s) and stamen(s).	These are bisexual flowers which do not open at all even in maturity.
They may be cross pollinated or self pollinated.	Self pollinated only.

14.What is geitonogamy? Give its one similarity to
(i)Autogamy (ii) Xenogamy. [Delhi 2008]

Ans. (i) Geitonogamy is pollen from onethe condition in which flower are deposited on the stigma of another flower borne on the same plant.
(ii) (a) **Similarity to autogamy** In autogamy, pollination is achieved within the same flower or plant (genetic similarity).

3 Marks Questions

15.Make a list of any three outbreeding devices that flowering plants have developed and explain how they help to encourage cross pollination. [All India 2014]

Ans. The three outbreeding devices that flowering plants have developed, so as to encourage cross-pollination are:
(i)Receptivity of stigma and release of pollen grain is not synchronised, i.e. stigma becomes receptive much before pollens are released or after they are released to avoid self-pollination.
(ii) Self-incompatibility, a genetic mechanism to prevent pollens from fertilising ovules of same flower by inhibiting their germination on stigma or pistil.
(iii) Production of unisexual flowers so that male and female parts will be present on different plants (dioecious) or on different flowers in same plant (monoecious). It prevents both autogamy and geitonogamy.

16.Explain the phenomenon of double fertilisation. [Delhi 2014]

Ans.The phenomenon of double fertilisation occur in following steps:
(i) In an angiospermic plant, two male gametes are discharged by a pollen tube into the embryo sac.
(ii) One of the male gametes fuses with the egg to form a zygote. This process is called syngamy.
(iii) Other male gamete fuses with the secondary nucleus to form the primary endosperm nucleus, this process is called triple fusion.
(iv) Since, there are two fusions (syngamy and triple fusion), inside an ovule during fertilisation, it is known as double fertilisation

17.Write the differences between wind pollinated and insect pollinated flowers. Give an example of each type. [Foreign 2014]

Ans. The differences between wind pollinated and insect pollinated flowers are:

Wind pollinated	Insect pollinated
These are small.	They are either large or grouped to form large clusters.
Usually inconspicuous due to dull colours.	The presence of bright colours in corolla, calyx or bracts to attract insects.
They are odourless and devoid of nectar.	Strongly odoured and usually possess nectar or edible pollen.
Pollens are produced in large numbers.	Fewer pollen grains are produced.
Examples *Urtica*, Maize, *Parthenium*.	Exmaples Rose, Snapdragon, *Calotropis*.

18.Name two end products of double fertilisation in angiosperms. How are they formed? Write their fate during the development of seed. [Delhi 2014c]

Ans.The two end products of double fertilisation in angiosperms are diploid zygote and a triploid primary endosperm nucleus.
Diploid zygote is formed by fusion of haploid gametes, i.e. male gamete and egg, while another male gamete and two polar nuclei of central cell fuses to form triploid primary endosperm nucleus.
During the development of seed, the zygote undergoes mitotic divisions to form a mature embryo

19.Differentiate between geitonogamy and xenogamy in plants. Which one between the two will led to inbreeding depression and why?[Delhi 2011]

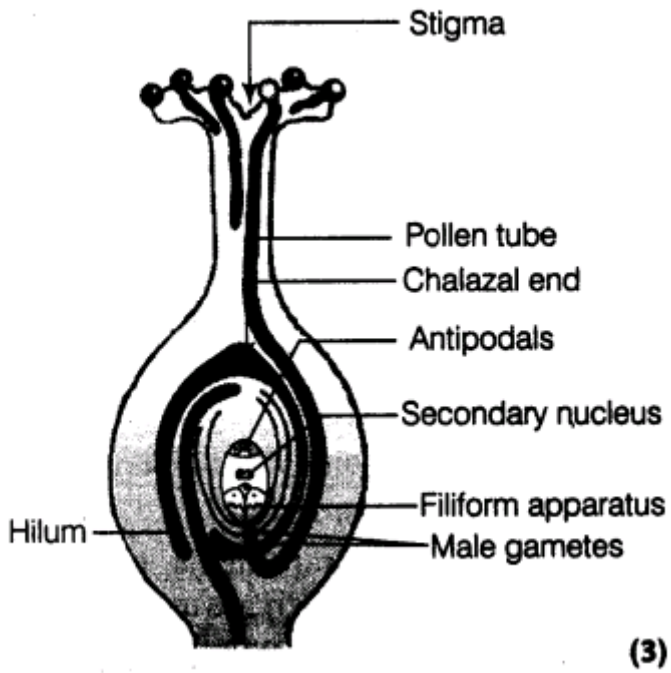
Ans. Differences between geitonogamy and xenogamy are:

Geitonogamy	Xenogamy
It is the transfer of pollen grains from the anther to the stigma of another flower of same plant.	It is the transfer of pollen grains from the anther to the stigma of different plants.
The pollen grains are genetically similar to the plant.	The pollen grains are genetically different from the plant.

Geitonogamy will lead to inbreeding depression because the pollen grains are genetically similar resulting into inbreeding. Continuous inbreeding reduces fertility.

20.Draw a Longitudinal Section (LS) of a post-pollinated pistil showing entry of pollen tube into a mature embryo sac. Label filiform apparatus, chalazal end, hilum, antipodals, male gametes and secondary nucleus. [Delhi 2010]

Ans. Longitudinal Section (LS) of a post-pollinated pistil is given below:



(3)

21.(i) Write the characteristic features of anther, pollen and stigma of wind pollinated flowers.
(ii)How do flowers reward their insect pollinator? Explain.[All India 2010]

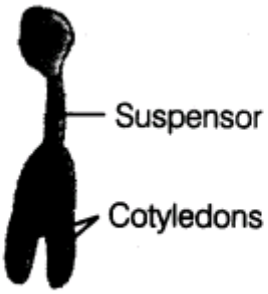
Ans.In wind pollinated flowers:
(i) (a) Anthers are well exposed for easy dispersal of pollen grains.
(b)Pollen grains are light and non-sticky, so that they can be transported by wind currents.
(c)Stigma is large and feathery to trap pollens.
(iii)Flower rewards their insect pollinators easily by offering: –
(a)Nectar and edible pollen grains.
(b)Safe place for insects to lay eggs by some flowers, e.g. Amorphophallus and Yucca.

22.(i) Mention any four strategies adopted by flowering plants to prevent self-pollination

Ans.(i) Strategies to prevent self-pollination are:
(a)Pollen grain release and stigma receptivity are not synchronised, either the anther matures first or the stigma.
(b)Anther and stigma are placed at different positions, so that the pollens cannot come in contact with the stigma of same flower.
(c)A genetic mechanism called self-incompatibility, which prevents self-pollen from fertilising the ovules either by inhibiting pollen germination or by retarding the growth of pollen tube in the pistil.
(d)By producing unisexual flowers. Plants are dioecious and continued self-pollination may cause inbreeding depression.
(ii) Geitonogamy is referred to as genetically autogamy because the pollen grains come from the same plant, though from a different flower.

23.(i)Identify the figure.
(ii)Name the initial cell from which this structure has developed.
(iii)Draw the next mature stage and label the parts.[Foreign 2009]

Ans.(i) It is a globular embryo of a dicot plant.
(ii)Zygote
(iii)Next mature stage



Mature embryo of a dicot plant

24.State the significance of pollination. List any four differences between wind pollinated and insect pollinated flowers. [Delhi 2008 C]

Ans. Significance of pollination are:
(i) Pollination is a pre-requisite for fertilisation in plants.
(ii) It brings male gametes for fertilisation.
(iii) It helps in recombinations.
(iv)It helps in developing hybrid seeds.

The differences between wind pollinated and insect pollinated flowers are:

Wind pollinated	Insect pollinated
These are small.	They are either large or grouped to form large clusters.
Usually inconspicuous due to dull colours.	The presence of bright colours in corolla, calyx or bracts to attract insects.
They are odourless and devoid of nectar.	Strongly odoured and usually possess nectar or edible pollen.
Pollens are produced in large numbers.	Fewer pollen grains are produced.
Examples *Urtica*, Maize, *Parthenium*.	Exmaples Rose, Snapdragon, *Calotropis*.

25.Enumerate any six adaptive floral characteristics of a wind pollinated plant. [Ml India 2008 C]

Ans.Floral characteristics of a wind pollinated plant are:
(i) Well exposed stamens for the pollen grains to be carried away easily.
(ii) Stigmas are often large and feathery to easily trap the wind-borne pollen grains.
(iii) Flowers normally packed together as an inflorescence.
(iv) Pollen grains are light and non-sticky.
(v)Normally, a single ovule is present in the ovary.
(vi)Non-essential whorls, calyx and corolla are much reduced or absent.

5 Marks Questions

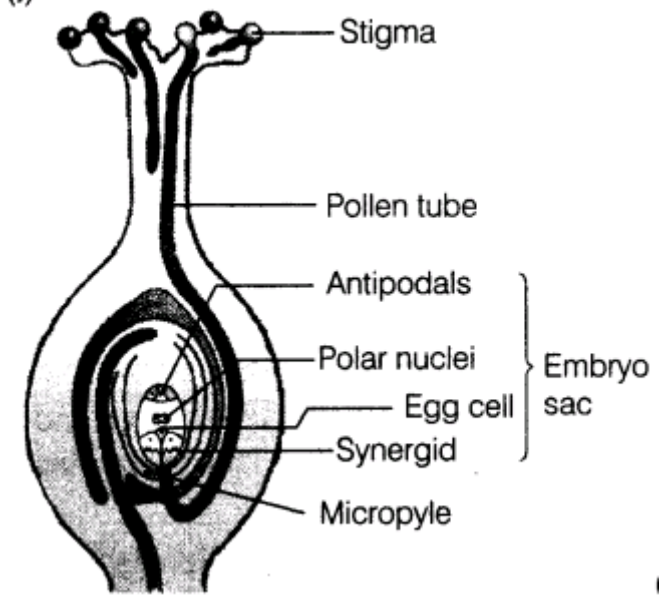
26.Angiosperm flowers may be monoecious, cleistogamous or show self incompatibility. Describe the characteristic features of each one of them and state. Which one of these flowers promotes inbreeding and outbreeding respectively. [All India 2014 c]

Ans.The characteristic features of angiospermic flowers:
(i)Monoecious flower are unisexual,i.e.they have either the male reproductive or female reproductive part in separate flowers, both produced on same plant. The flowers (male and female) are separate. It prevents self-pollination and promotes cross-pollination
(ii)Cleistogamous flowers are those flowers in which anthers and stigmas lie close to each other and do not open at all, even at maturity. These flowers are invariably autogamous and promotes inbreeding depression as there is no chance for cross-pollination at all.
(iii)Self incompatible in angiospermic flowers is a genetic mechanism wherein the flowers prevent the self pollens from fertilising the ovules or inhibits their germination on stigma. This device or mechanism promotes out breeding.

27.(i) Draw a longitudinal section of a pistil of an angiosperm showing the growth of pollen tube up to the micropyle of ovule. Label
(a)stigma, (b) embryo sac
(c)pollen tube (d) micropyle.
(ii)Explain the events that occurs, upto fertilisation, when the compatible pollen grain lands on the stigma. [Delhi 2014 C]

Ans.

(i)



(ii)The events that occur when compatible pollen grains falls on stigma in the sequence are as follow:

(a)Pollen-pistil interactions Once the compatible pollen grains fall on stigma which is receptive, it recognise and accepts the pollen with the aid of chemical components interacting with pollen.

(b)Germination of pollen grain Once the pollen is recognised, it germinates on the stigma of flower. The tube cell of pollen grain protrudes out through germ pores to form a pollen tube. The generative cell divides to form two male gametes and are released into the tube.

(c)Growth of pollen tube The pollen tube grows down through the tissues of stigma and style and enters ovule, usually through micropyle. Inside ovule, the filiform apparatus guides the pollen tube, carrying gametes to the egg.

(d)Double fertilisation After releasing the two male gametes into the synergids, one of them fuses with egg to form a diploid zygote (syngamy) and other male gamete fuses with 2 polar nuclei to form triploid primary endosperm cell (triple fusion). Because of occurrence of these two types of fusions, it is called double fertilisation.

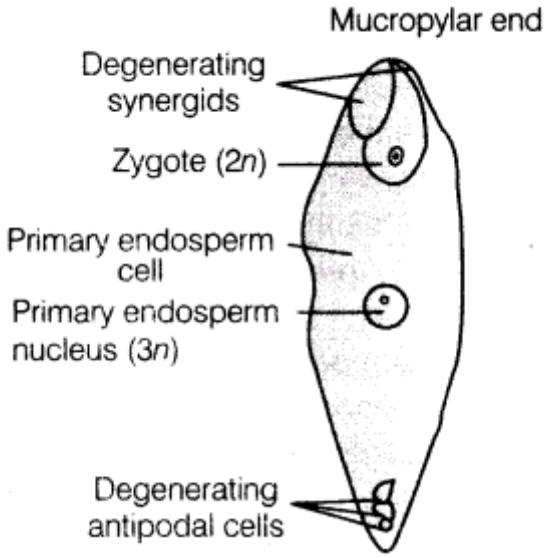
28.Why is fertilisation in an angiosperm referred to as double fertilisation? Mention the ploidy of the cells involved. [Ml India 2012]

Ans.In fertilisation (in angiosperm), two types of fusion occur, i.e. syngamy and triple fusion, in the embryo sac. That is why it is called double fertilisation.
Ploidy of cells involved in double fertilisation: Zygote is diploid (2n). It is formed as a result of syngamy, i.e. fusion of two haploid gametes (male gamete + egg). Primary endosperm nucleus (3n) is formed as a result of triple fusion, i.e. fusion of two haploid polar nuclei with male gamete

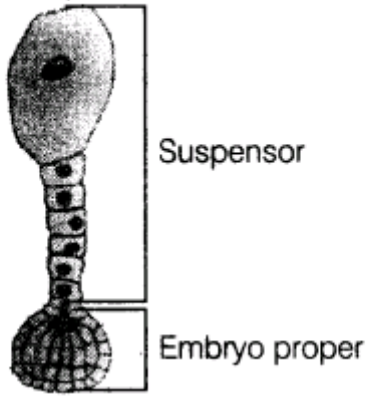
29.(i) Why is the process of fertilisation in angiosperms termed as double fertilisation? Explain.
(ii) Draw a diagram of an angiospermic embryo sac where fertilisation is just completed. Label the following parts
(a)Micropylar end of embryo sac.
(b)The part that develops into an embryo.
(c)The part that develops into an endosperm.
(d)The degenerating cells at the chalazal end.
(iii)Draw a labelled diagram of globular embryonic stage of an angiosperm. [Foreign 2011]

Ans.(i)The phenomenon of double fertilisation occur in following steps:
(a) In an angiospermic plant, two male gametes are discharged by a pollen tube into the embryo

(c) Other male gamete fuses with the secondary nucleus to form the primary endosperm nucleus, this process is called triple fusion.
(d) Since, there are two fusions (syngamy and triple fusion), inside an ovule during fertilisation, it is known as double fertilisation.
In fertilisation (in angiosperm), two types of fusion occur, i.e. syngamy and triple fusion, in the embryo sac. That is why it is called double fertilisation.
Ploidy of cells involved in double fertilisation: Zygote is diploid (2n). It is formed as a result of syngamy, i.e. fusion of two haploid gametes (male gamete + egg). Primary endosperm nucleus (3n) is formed as a result of triple fusion, i.e. fusion of two haploid polar nuclei with male gamete
(ii)Fertilised angiospermic embryo sac with label is given below:



(iii) Globular embryonic stage of an angiosperm.



30.(i) Explain the characteristic features of wind pollinated flowers. How are insect pollinated flowers different from them?
(ii) Explain the mutually rewarding relationship between Yucca plant and species of moth. [Foreign 2011]

Ans.(i) (a) Characteristic features of wind pollinated flowers.
Floral characteristics of a wind pollinated plant are:
(i) Well exposed stamens for the pollen grains to be carried away easily.
(ii) Stigmas are often large and feathery to easily trap the wind-borne pollen grains.
(iii) Flowers normally packed together as an inflorescence.
(iv) Pollen grains are light and non-sticky.
(v)Normally, a single ovule is present in the ovary.
(vi)Non-essential whorls, calyx and corolla are much reduced or absent.
(b) Difference between wind pollinated and insect pollinated flowers.

Wind pollinated	Insect pollinated
These are small.	They are either large or grouped to form large clusters.
Usually inconspicuous due to dull colours.	The presence of bright colours in corolla, calyx or bracts to attract insects.
They are odourless and devoid of nectar.	Strongly odoured and usually possess nectar or edible pollen.
Pollens are produced in large numbers.	Fewer pollen grains are produced.
Examples *Urtica*, Maize, *Parthenium*.	Exmaples Rose, Snapdragon, *Calotropis*.

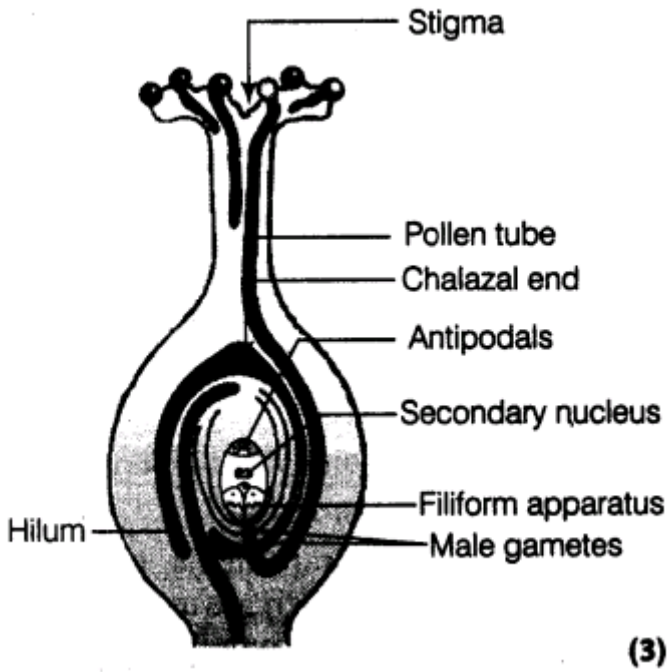
(ii) Yucca plant and moth cannot complete their life cycle without each other. The moth lays eggs in the locules of the ovary. The larva uses some of the seeds as food. The flower in turn are pollinated by the moth.

31.(i) Geitonogamy is functionally a cross-pollination but genetically similar to autogamy. Explain.
(ii) Why do flowering plants need to develop outbreeding devices? Explain any three such devices developed by flowering plants.[All India 2010 C]

Ans.(i)Transfer of pollen grains from the anther to stigma of another flower of the same plant is called geitonogamy. It is functionally cross-pollination as it involves a pollinating agent but genetically similar to autogamy since, the pollen grains come from the same plant (genetically same parent).
(ii) Continued self-pollination results in inbreeding depression because majority of flowering plants produce hermaphrodite flowers and pollen grains generally come in contact with the stigma of same flower
To discourage this, flowering plants developed many devices. Some of them are Strategies to prevent self-pollination are:
(a)Pollen grain release and stigma receptivity are not synchronised, either the anther matures first or the stigma.
(b)Anther and stigma are placed at different positions, so that the pollens cannot come in contact with the stigma of same flower.
(c)A genetic mechanism called self-incompatibility, which prevents self-pollen from fertilising the ovules either by inhibiting pollen germination or by retarding the growth of pollen tube in the pistil.
(d)By producing unisexual flowers. Plants are dioecious and continued self-pollination may cause inbreeding depression.

32.(i) Draw a labelled diagram of LS of a flower to show the growth of pollen tube reaching egg apparatus.
(ii)Pistil of a flower does not accept pollen from any plant other than its own kind. How does it happen? Explain.
(iii)What is syngamy? [Foreign 2009]

Ans.(i) **Diagram**
Longitudinal Section (LS) of a post-pollinated pistil is given below:



(3)

(ii) Pollen-pistil interaction is mediated by interaction between chemical components secreted by pollen and those of pistil. So if the pollen is not of its kind or compatible to stigma, it does not germinate and the reaction is called pollen-pistil interaction.
(iii) The fusion of a male gamete with a female gamete (egg) to form a zygote is called syngamy.

Post-Fertilisation : Structures and Events

1 Mark Questions

1.Banana is a true fruit but is also a parthenocarpic fruit. Give reason.[Foreign 2010]

Ans. The fruit of banana is formed from the ovary, so it is a true fruit. It is a parthenocarpic fruit because the ovary develops into fruit without fertilisation and is thus, seedless.

2.Why is apple referred to as a false fruit? [HOTS; All India 2010 C]

Ans. In apple, the thalamus also contributes to fruit formation. So, apples are called false fruits.

3.Name the mechanism responsible for the formation of seed without fertilisation in angiosperms. Give an example of a species of flowering plants with such seed formation. [Delhi 2010]

Ans. Apomixis is the mechanism responsible for the formation of seeds without fertilisation in angiosperms, e.g. grasses.

4.Name the part of flower that contributes to fruit formation in strawberry and guava respectively.[All India 2009 C]

Ans.(i)In strawberry, the fruit develops from the ovary, other floral parts degenerate and fall off. Thalamus also contributes to fruit formation.
(ii)In guava, the wall of ovary develops into the wall of fruit called pericarp.

2 Marks Questions

5.List the post-fertilisation events in angiosperms.[Delhi 2014]

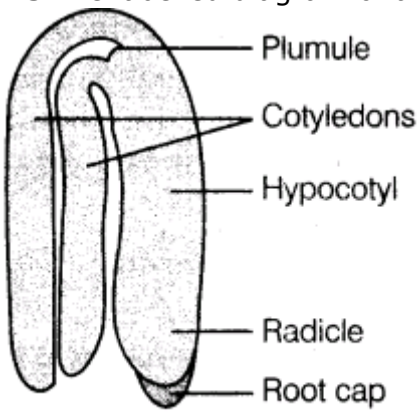
Ans.The post-fertilisation events in angiosperms include:
(i)Endosperm and embryo development.
(ii)Maturation of ovule into seed.
(iii)Maturation of ovary into fruit

6.Some angiosperm seeds are said to be 'albuminous', whereas few others are said to have a perisperm, Explain each with the help of an example. [Foreign 2012]

Ans.Some angiospermic seeds are albuminous as they retain endosperm even after embryo development, i.e. not completely consumed by embryo, e.g. wheat, maize, castor.While in some angiospermic seeds remnants of nucellus are persistent which is referred to as perisperm, e.g. black pepper and beet.

7.Draw a labelled diagram of a matured embryo of a dicotyledonous plant.[All India 2014 C]

Ans. The labelled diagram of a mature embryo of a dicotyledonous plant is as given below.



8.Differentiate between albuminous and non-albuminous seeds, giving one example of each. [Delhi 2011]

Ans. Difference between albuminous and non-albuminous seeds are:

Albuminous seed	Non-albuminous seed
Endosperm is not completely used by the developing embryo, so a portion of it remains in the seed.	Endosperm is completely used by the developing embryo before the maturation of seed, so there is no endosperm left in the seed.
Examples coconut, castor and maize.	Examples pea, bean and mustard.

9.Banana is a parthenocarpic fruit, whereas oranges show polyembryony. How are they different from each other with respect to seeds? [hots; Delhi 2009]

Ans. Since, banana is a parthenocarpic fruit, it is seedless, whereas oranges show polyembryony that leads to formation of many seeds

10.Name the cell from which the endosperm of coconut develops. Give the characteristic features of endosperm of coconut. [Delhi 2009]

Ans. In cpconut, cell formation occurs and the endosperm becomes cellular. The number of free nuclei formed before cellularisation varies greatly. The coconut water is free nuclear endosperm. It is made up of thousands of nuclei and the surrounding white kernel is the cellular endosperm.

11.Name the blank spaces A, B, C and D from the table given below.

Item	What it represents in the plant
Pericarp	*A*
B	Cotyledon in seeds of grass family
Embryonal axis	*C*
D	Remains of nucellus in a seed

Ans.A — Fruit wall, B — Scutellum
C — Plumule and radicle, D — Perisperm

3 Marks Questions

12.Describe endosperm development in angiosperm. [Foreign 2014]

Ans.(i)Embryo development occurs after endosperm development in angiosperms.
(ii) The three methods of endosperm development are:
(a)nuclear type (b) cellular type
(c)helobial type
(iii) Nuclear type is the common method in which triploid Primary Endosperm Nucleus (PEN) undergoes repeated mitotic division without cytokinesis. This stage is called free-nuclear endosperm.
(iv)Cell wall formation starts from the periphery and the endosperm becomes completely cellular, e.g. coconut, rice, etc.
(v)Cells of the endosperm store food materials.
(vi)Endosperm may be completely utilised by the developing embryo before the maturation of

(vii) In seeds like castor, maize, coconut, rice, etc., a portion of it may remain in the mature seeds, such seeds are called albuminous or endospermic seeds

13.(i) How is apomixis different from parthenocarpy?
(ii) Describe any two modes by which apomictic seeds can be produced.[Delhi 2014 C]

Ans.(i)Parthenocarpy is development and production of seedless fruits in the absence of fertilisation, whereas apomixis refers to development of seeds and fruits, without fertilisation. So, the main difference between apomixis and parthenocarpy is that seeds are formed in former, while absent in later.
(ii) The two modes by which apomictic seeds can be produced are:
(a)**Agamospermy** In which the seed or embryo is derived from diploid egg ceil, formed without meiosis and syngamy. This diploid egg cell develops into embryo without undergoing fertilisation, e.g. apple,
(b)**Adventive embryony** The method in which diploid cells surrounding the embryo sac, e.g nucellus and integument protrude into the sac and develops into embryo. This may also lead to formation of more than one embryos in an embryo sac or ovule, leading to condition called polyembryony, e.g. Citrus,Opuntia.

14.(i) Describe the endosperm development in coconut.
(ii)Why is tender coconut considered as healthy source of nutrition?
(iii)How are pea seeds different from castor seeds with respect to endosperm? [All India 2013]

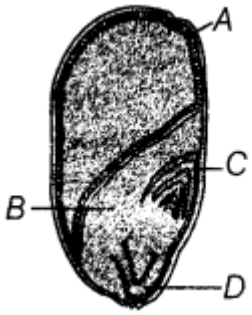
Ans.(i)Coconut endosperm formation is nuclear type. The primary endosperm nucleus undergoes nuclear division without cell wall formation.
(ii) Soft coconut is an endosperm. It is rich in nutrients like fats, proteins, carbohydrates, minerals, vitamins, etc. Hence, it is considered as a healthy source of nutrition.
(iii)The seeds of pea are non-endospermic, while castor seeds are endospermic. The endosperm in pea seeds is consumed completely during embryo development, but endosperm is not utilised in castor seeds.

15.Differentiate between perisperm and endosperm giving one example of each. [All India 2012]

Ans.

Perisperm	Endosperm
It represents persistent remains of nucellus (of ovule) in the seed.	It develops from Primary Endosperm Nucleus (PEN).
It is a part that belongs to seed.	It contains reserve food materials.
It is usually dry.	It is usually in fluid form or soft.
Example black pepper.	Example water of coconut, pea, beans.

16.LS of a maize grain is given below. Label the parts A, B, C and D in it. [All India 2012]



Ans.A — Pericarp
B — Scutellum (cotyledon)
C — Coleoptile
D — Coleorhiza

17.With the help of an example of each explain the following Apomixis, parthenocarpy, polyembryony. [All India 2012 c]
Ans.Apomixis The phenomenon in which seeds are produced without fertilisation is called apomixis or agamospermy, e.g. grass.
Parthenocarpy It is a commercially important process in which seedless fruit is formed without fertilisation, e.g. banana.
Polyembryony The occurrence of more than one embryo in a seed is known as polyembryony, e.g. orange.

18.Fertilisation is essential for the production of seed, but in some angiosperms seeds develop without fertilisation.
(i)Give an example of an angiosperm that produces seeds without fertilisation. Name the process.
(ii)Explain the two ways by which seeds develop without fertilisation.[All India 2009]

Ans.(i)The members of Asteraceae like sunflower produce seeds without fertilisation. The process is called apomixis.
(ii) The two ways by which cells develop without fertilisations are:
(a)A diploid egg cell is formed without meiosis and it develops without fertilisation into an embryo in some cases.
(b)In some cases, some of the cells of nucellus around the embryo sac develop into embryo, e.g. mango and citrus.

5 Marks Questions

19.(i) Explain the different ways apomictic seeds can develop. Give an example of each.
(ii)Mention one advantage of apomictic seeds to farmers.
(iii)Draw a labelled mature stage of a dicotyledonous embryo.[All India 2014]

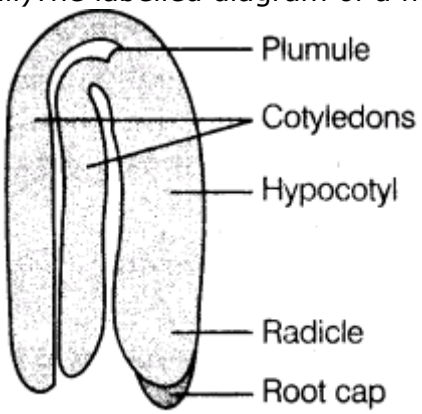
Ans.(i) The two modes by which apomictic seeds can be produced are:

(a)**Agamospermy** In which the seed or embryo is derived from diploid egg ceil, formed without meiosis and syngamy. This diploid egg cell develops into embryo without undergoing fertilisation, e.g. apple,

(b)**Adventive embryony** The method in which diploid cells surrounding the embryo sac, e.g nucellus and integument protrude into the sac and develops into embryo. This may also lead to formation of more than one embryos in an embryo sac or ovule, leading to condition called polyembryony, e.g. Citrus,Opuntia.

(ii)The introduction of apomixis genes into hybrid seeds results in apomictic seeds, which results in asexual reproduction or production of cloned seed. But the main advantage by which these apomictic seeds are advantageous to farmers as they lower the cost of production and increase the yield. Also unlike hybrid seeds they don't have to be produced every year and can be stored, thus saving time and money.

(iii)The labelled diagram of a mature embryo of a dicotyledonous plant is as given below.

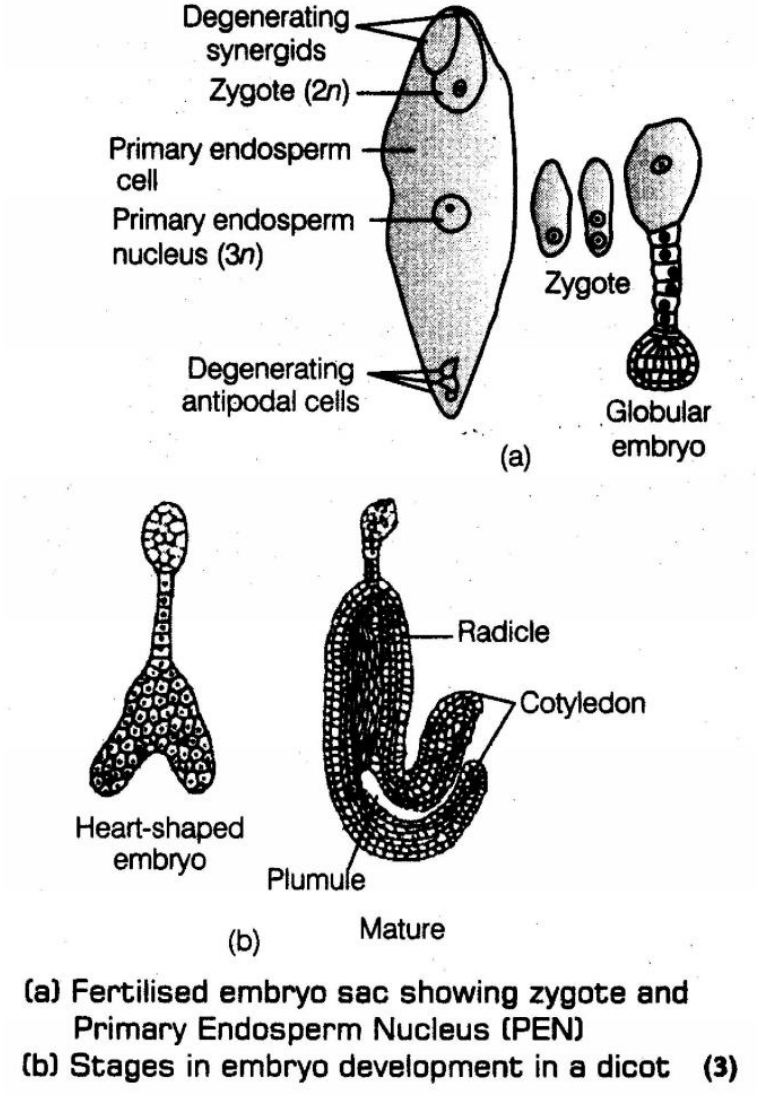


A typical dicot embryo

20.(i) Why does endosperm development precede embryo development in angiosperm seeds? State the role of endosperm in mature albuminous seeds.
(ii) Describe with the help of three labelled diagrams the different embryonic stages that include mature embryo of dicot plants.[Delhi 2014]

Ans.(i)The embryo development starts only after a certain amount of endosperm is formed. It is an adaptation for assured nutrition of the developing embryo. Therefore, endosperm development precedes embryo development. The role of endosperm in mature albuminous seeds is storage of reserve food for growing embryo.

(ii)The embryonic stages during the development of mature embryo sac are:



(a) Fertilised embryo sac showing zygote and Primary Endosperm Nucleus (PEN)
(b) Stages in embryo development in a dicot **(3)**

21.(i) Mature seeds of legumes are non-albuminous. Then, can it be assumed that

(ii) List the differences between the embryos of dicot (pea) and monocot (grass family). [Delhi 2014 C]

Ans.(i)Seeds of legumes are non-albuminous that implies that endosperm in such seeds is completely used up in providing nutrition to developing embryo. The endosperm is formed as a result of triploid fusion, i.e. between a male gamete and two polar nuclei. This making it obvious that it cannot be formed in the absence of double fertilisation.Therefore, though the seeds of legumes are non-albuminous, it clearly states the occurrence of double fertilisation in them.

(ii) The differences between the embryos of pea and grass can be summarised as:

Dicot embryo (Pea)	**Monocot embryo** (Grass)
The basal cell forms a 6-10 celled suspension.	Basal cell produces a single-celled suspension.
Terminal cell produces embryo, except the radicle.	Forms the whole of embryo.
First division of terminal cell is longitudinal.	First division is transverse.
It possess two cotyledons.	It possess one cotyledon.
Plumule is terminal and is present between the elongated cotyledons.	Plumule is laterally present to excessive growth of single cotyledon.

22.(i) Why are seeds of some grasses called apomictic? Explain.
(ii) State two reasons to convince a farmer to use a apomictic crop.[Delhi 2014 C]

Ans.(i)The seeds of some grasses develop seeds without fertilisation. It may be because a diploid egg cell develops into a embryo directly (without undergoing meiosis and syngamy) or some diploid cells of nucellus or integument surrounding the embryo sac, protrude inside and develop into embryos. This phenomenon of developing embryo and seeds without fertilisation is called apomixis and such seeds produced are referred to as apomictic.

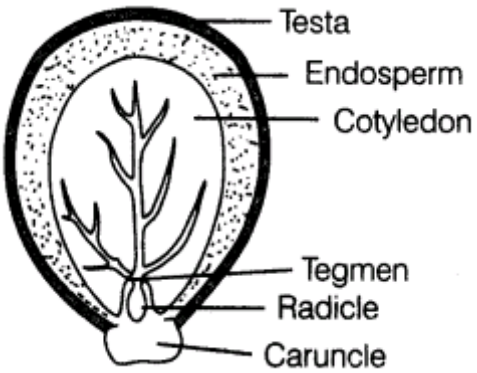
(ii) The introduction of apomixis genes into hybrid seeds results in apomictic seeds, which results in asexual reproduction or production of cloned seed. But the main advantage by which these apomictic seeds are advantageous to farmers as they lower the cost of production and increase the yield. Also unlike hybrid seeds they don't have to be produced every year and can be stored, thus saving time and money.

23.Give reasons why?
(i)Most zygotes in angiosperms divide only after certain amount of endosperm is formed.
(ii)Groundnut seeds are exalbuminous and castor seeds are albuminous.
(iii)Micropyle remains as a small pore in the seed coat of a seed.
(iv)Integuments of an ovule hardens and the water content is highly reduced as the seed matures.
(v)Apple and cashewnuts are not called true fruits.[All India 2011,2008]

(ii) (a) Groundnut seeds are exalbuminous because the developing embryo utilises the endosperm completely. So, there is no endosperm left in the seed.
(b)Castor seeds are albuminous because endosperm is not completely used up by the developing embryo. There is some amount of endosperm left in the seeds always.
(iii) Micropyle allows entry of water and oxygen during seed germination.
(iv) During unfavourable conditions, seeds become dormant. The loss of water reduces the metabolic activity of seeds and hardens the integuments.
(v)In these fruits, thalamus contributes in fruit formation. So, they are not called true fruits

24.(i)Draw a labelled longitudinal view of an albuminous seed.
(ii) How are seeds advantageous to flowering plants?[All India 2010,2008]

Ans.(i) LS of an albuminous seed is



(ii)Advantages of seeds to flowering plants are:
(a)Provides protection to embryo in most delicate stage.
(b)Help in dispersal to spread in new habitats.
(c)Contain sufficient food reserves.
(d)Produce genetic variations.
(e)Seeds are related to pollination and fertilisation.

25.Explain the development of the zygote into an embryo and of the primary endospermic nucleus into an endosperm in a fertilised embryo sac of a dicot plant. [All India 2010 c]

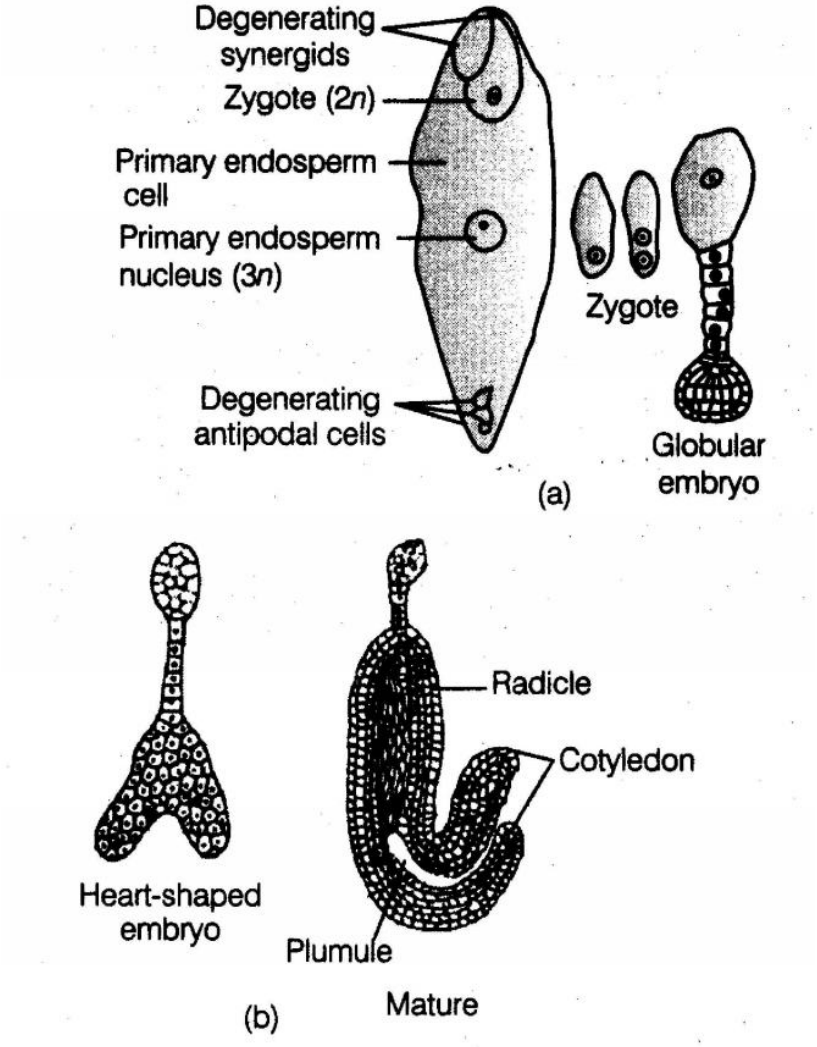
Ans.**Development of endosperm**
(i)Embryo development occurs after endosperm development in angiosperms.
(ii) The three methods of endosperm development are:
(a)nuclear type (b) cellular type
(c)helobial type
(iii) Nuclear type is the common method in which triploid Primary Endosperm Nucleus (PEN) undergoes repeated mitotic division without cytokinesis. This stage is called free-nuclear endosperm.
(iv)Cell wall formation starts from the periphery and the endosperm becomes completely cellular, e.g. coconut, rice, etc.
(v)Cells of the endosperm store food materials.
(vi)Endosperm may be completely utilised by the developing embryo before the maturation of seeds as in pea, bean, mustard, etc. These seeds are called non-albuminous or endospermic seeds.
(vii) In seeds like castor, maize, coconut, rice, etc., a portion of it may remain in the mature seeds, such seeds are called albuminous or endospermic seeds

Embryo development in dicot plant
(i) Embryo formation starts after a certain amount of endosperm is formed.
(ii) Zygote divides by mitosis to form a proembryo.
(iii) Formation of globular and heart-shaped embryo occurs which finally becomes horse shoe-shaped mature embryo.
(iv) In dicot plant, embryo consists of two cotyledons and an embryonal axis between them.
(v)The portion of embryonal axis above the level of attachment of cotyledons is epicotyl and

(vi)The portion of embryonal axis below the level of attachment of cotyledon is the hypocotyl, it becomes radicle (root tip).

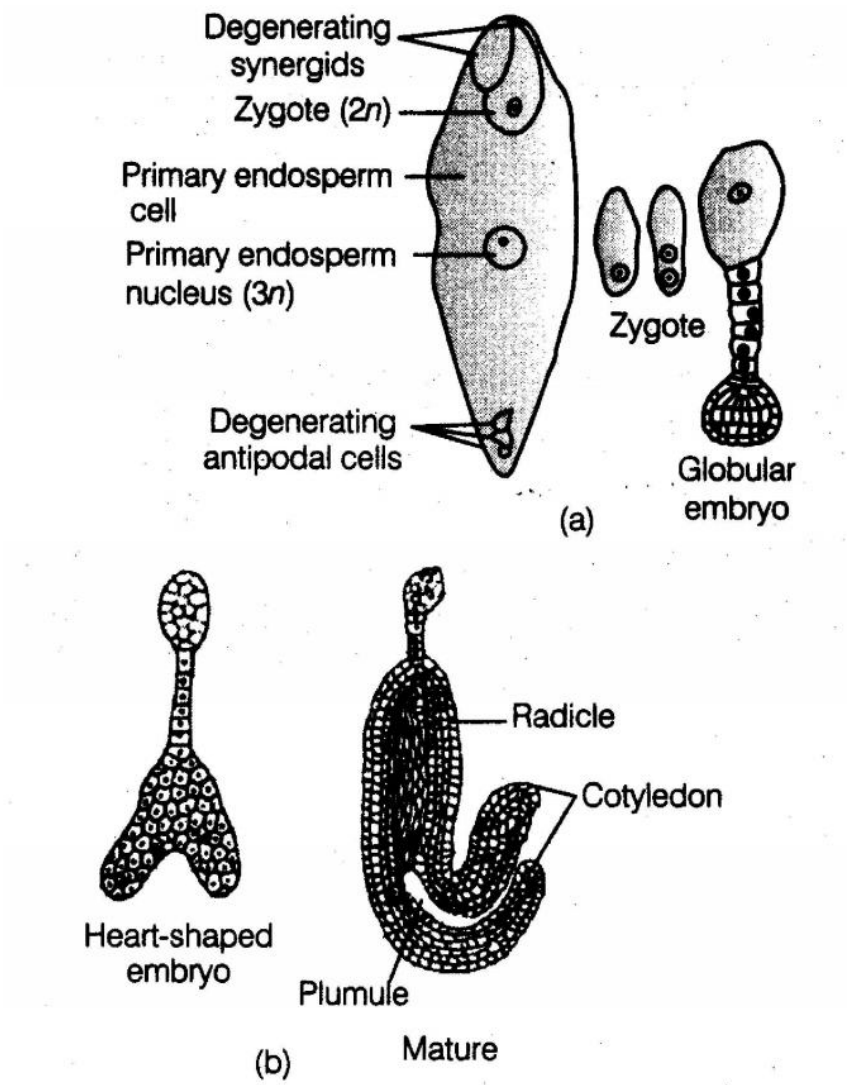
26.(i) Trace the development of embryo after syngamy in a dicot plant.
(ii)Endosperm development precedes embryo development. Explain.
(iii)Draw a diagram of a mature dicot embryo and label cotyledons, plumule, radicle and hypocotyl in it. [All India 2009,2008]

Ans.(i) **Development of embryo after syngamy.**
(a)The embryo development starts only after a certain amount of endosperm is formed. It is an adaptation for assured nutrition of the developing embryo. Therefore, endosperm development precedes embryo development. The role of endosperm in mature albuminous seeds is storage of reserve food for growing embryo.
(b)The embryonic stages during the development of mature embryo sac are:



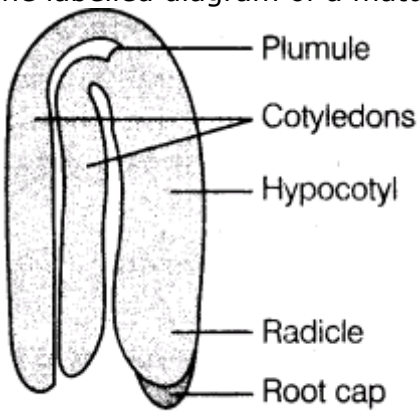
(a) Fertilised embryo sac showing zygote and Primary Endosperm Nucleus (PEN)
(b) Stages in embryo development in a dicot (3)

(ii) (a)The embryo development starts only after a certain amount of endosperm is formed. It is an adaptation for assured nutrition of the developing embryo. Therefore, endosperm development precedes embryo development. The role of endosperm in mature albuminous seeds is storage of reserve food for growing embryo.
(b)The embryonic stages during the development of mature embryo sac are:



(a) Fertilised embryo sac showing zygote and Primary Endosperm Nucleus (PEN)
(b) Stages in embryo development in a dicot **(3)**

(iii) **Mature dicot embryo.**
The labelled diagram of a mature embryo of a dicotyledonous plant is as given below.



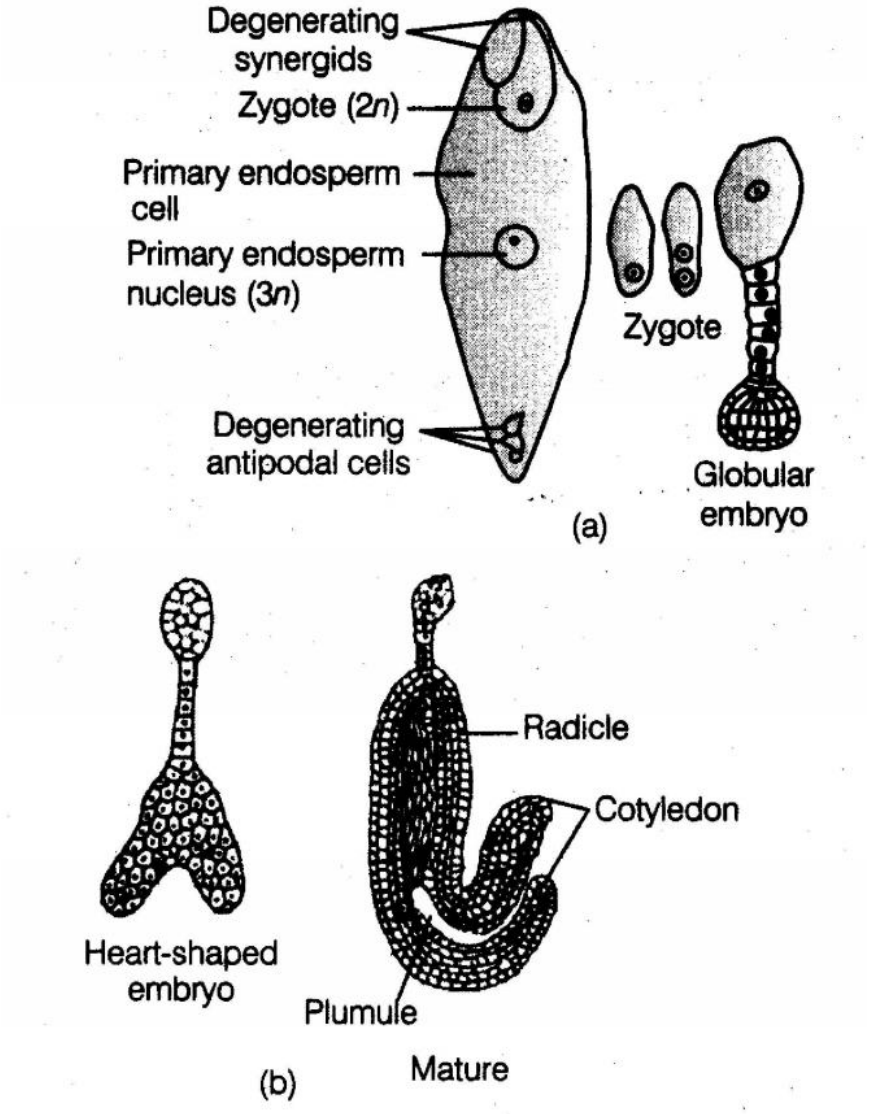
A typical dicot embryo

Miscellaneous Questions

5 Marks Questions

1.(i) Draw a LS of a pistil showing pollen tube entering the embryo sac in an angiosperm and label and six parts other than stigma, style and ovary.
(ii) Write the changes a fertilised ovule undergoes within the ovary in an angiosperm plant. [All India 2013]

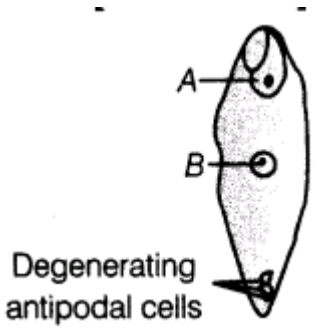
Ans.(i)The embryonic stages during the development of mature embryo sac are:



(a) Fertilised embryo sac showing zygote and Primary Endosperm Nucleus (PEN)
(b) Stages in embryo development in a dicot (3)

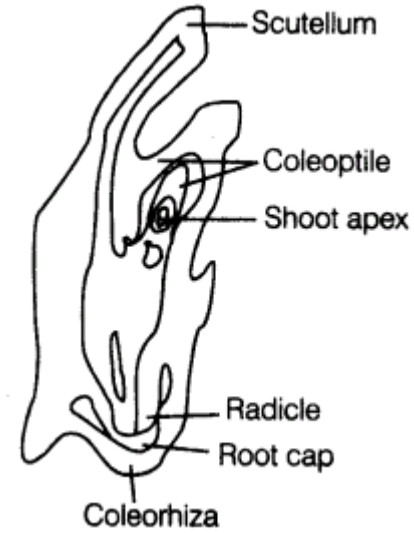
(ii)Changes taking place in a fertilised ovule within the ovary in an angiosperm plant are:
Unfertilised ovule —Seed
Funiculus —Present
Integument —Seed coat
(a)outer —Testa
(b)inner —Tegman
Polar nuclei —Endosperm
Nucellus —Utilised or remaining perisperm
Antipodal —Degenerate
Synergid —Degenerate
Egg —Embryo

2.(i) Name the structures which the parts A and B shown in the diagram alongside respectively develop into.
(ii)Explain the process of development which B undergoes in albuminous and exalbuminous seeds. Give one example of each of these seeds. [Foreign 2011]



Ans.(i) The part A develops into the embryo. The part B develops into the endosperm.
(ii) Endosperm formation
(a)Primary endosperm cell divides repeatedly and forms triploid endosperm nucleus.
(b)Primary endosperm nucleus undergoes successive free nuclear divisions to give rise to a number of free nuclei. At this stage, it is called free nuclear endosperm.
(c)Wall formation takes place from the periphery and proceeds towards the centre and the endosperm becomes cellular.
(d)In albuminous seeds, some amount of endosperm persists in the mature seed as the developing embryo does not consume it completely,
e.g. wheat /maize.
(e)In exalbuminous seeds, the endosperm is completely consumed by the developing embryo before seed maturation,
e.g. in pea/groundnut.

3.(i) Draw a labelled diagram of LS of an embryo of grass (any six labels).
(ii) Give reason for each of the following:
(a)Anthers of angiosperm flowers are described as dithecous.
(b)Hybrid seeds have to be produced year after year. [All India 2011]
Ans.(i) LS of grass embryo.



(ii) (a) A typical angiosperm anther is bilobed with each lobe having two thecae. So, anther is called dithecous.
(b) Hybrid seeds show segregation of traits and do not maintain the hybrid character in plants. So, they need to be produced every year and cannot be stored.

4.Explain double fertilisation and trace the post fertilisation events in sequential order leading to seed formation in a typical dicotyledonous plant.[All India 2008 C; Foreign 2010]
Ans.(i) Post-fertilisation events can be traced as:

- Development of endosperm, enlargement of seeds and fruit formation.
- Zygote develops into an embryo.
- Central cell becomes primary endosperm cell and the primary endosperm nucleus develops into the endosperm.
- Antipodals and synergids degenerate.

- Ovary ripens to form the fruit.

Embryo development in dicot plant

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