# NEET Important Questions with Solutions from Sexual Reproduction in Flowering Plants

Q.1. Which of the following have a special cellular thickening at the micropylar tip of the embryo sac?

A) Central cell

B) Egg cell

C) Synergids

D) Antipodals

Answer: Synergids

Solution: Three cells grouped together at the micropylar end of the embryo sac are called as egg apparatus. The egg apparatus consists of two synergids and one egg cell. The synergids have special cellular thickenings, which play an important role in guiding the pollen tubes into the synergid, called as filiform apparatus. These cellular thickenings are located at the micropylar tip.

Q.2. In flowering plant, a mature gametophyte is derived from a pollen mother cell by

A) 3 mitosis

B) 1 meiosis and three mitosis

C) 1 meiosis and two mitosis

D) a single meiosis

Answer: 1 meiosis and two mitosis

Solution: Microsporogenesis in the anther involves the meiotic division of pollen mother cells, which each produce four microspores.

The development of the unicellular microspores into mature microgametophytes begins with the expansion of the microspore. This is accompanied by the displacement of the microspore nucleus to an eccentric position against the microspore wall. In this position the nucleus undergoes first pollen mitosis (pollen mitosis I) which results in the formation of two unequal cells, a large vegetative cell and a small generative cell. The generative cell subsequently detaches from the pollen grain wall and is engulfed by the vegetative cell forming a unique 'cell within a cell' structure. The engulfed generative cell divides once more by mitosis (pollen mitosis II) to form the two sperm cells. Hence, 1 meiosis and 2 mitosis are needed to get a mature gametophyte.

Q.3. The pollen grain is related to the embryosac as

A) Male gametophyte is to the egg

B) Male gametophyte is to the female gametophyte

C) Sperm is to the egg

D) Sperm is to the female gametophyte

Answer: Male gametophyte is to the female gametophyte

Solution: The microspore cell (n) undergoes two phases of development:

1. During in situ development, when the pollens are still inside the anther lobes, the cell undergoes a mitotic division to form one large vegetative cell and one small generative cell.

2. During ex situ development, after the dehiscence of the pollen sac, when the pollen is deposited on the stigma, the generative cell inside the pollen tube divided mitotically to form two functional male gametes.

Thus, a fully matured male gametophyte or pollen grain has three nuclei, (i) one vegetative nucleus and (ii) two male gamete nuclei.

The megaspore mother cell undergoes meiotic division to give rise to four haploid megaspores. A megaspore is the first cell of the female gametophytic generation. Out of these four megaspores, the remaining three at the micropylar end degenerate, and only a single megaspore at the chalazal end remains functional. The haploid functional megaspore then transforms into the female gametophyte or the embryo sac through three successive mitosis.

Thus, the pollen grain and the embryo-sac represent the male gametophyte and female gametophyte of angiospermic plants respectively.

Q.4. Embryo sac is called monosporic when it develops from:

A) All the four megaspores

B) Only from two functional megaspores

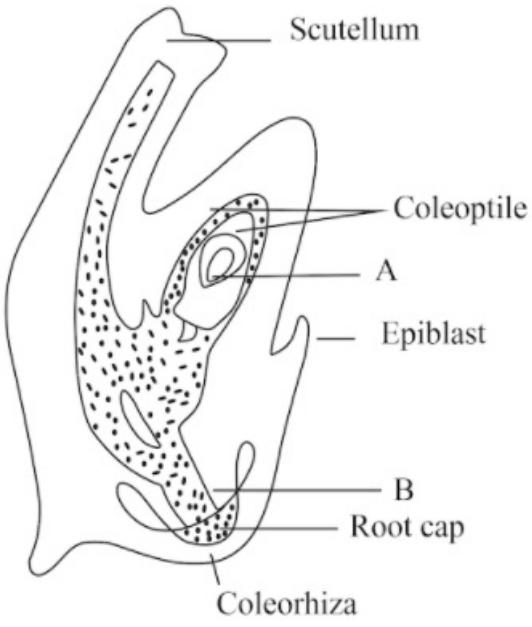
C) Three megaspores

D) One of the megaspores out of the four megaspores which are derived from division of megaspore mother cell

Answer: One of the megaspores out of the four megaspores which are derived from division of megaspore mother cell

Solution: The nucellus is a mass of thin-walled, parenchymatous cells of an ovule present inside the integument. It is the central part of the ovule in which the female gametophyte is present. One of the nucellar cells differentiates as a megaspore mother cell. The Megaspore Mother Cell (MMC) undergoes a meiotic division to form four megaspores. Out of the four megaspores, a single megaspore towards the micropylar region remains active. The other three towards the chalazal end degenerates. The functional megaspore, i.e., micropylar megaspore, is developed into the female gametophyte or embryo sac. This type of formation of an embryo sac is called monosporic development.
The nucleus of the functional megaspore, i.e., micropylar megaspore, is divided by mitosis and form two nuclei which move towards the opposite poles, forming the two nucleate embryo sac. Two more sequential mitotic divisions occur, resulting in developing a 4-nucleate stage and an 8-nucleate stage of the embryo sac. These divisions are completely free nuclear, i.e., the nuclear division is not followed by cell wall formation immediately.

Q.5. Identify A and B in the L.S. of an embryo of grass given below.




A) A-Shoot apex, B-Radicle

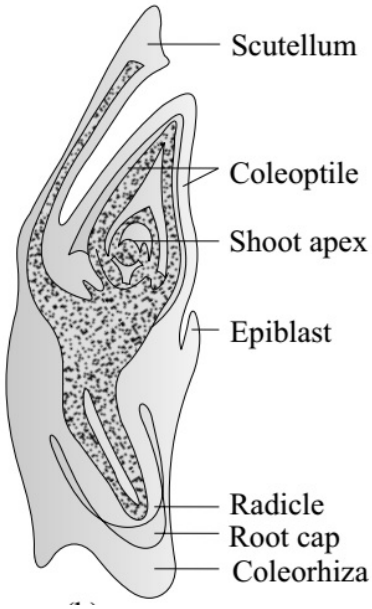
B) A-Root cap, B-Radicle

C) A-Shoot apex, B-Epiblast

D) None of these

Answer: A-Shoot apex, B-Radicle

Solution: The embryo develops at the micropylar end of the embryo sac, where the zygote is situated.
In the given diagram, the labels A and B are:
A-Shoot apex, B-Radicle




Q.6. In the formation of $50$ zygotes in a tobacco plant, the minimum number of meiosis involved will be

A) $59$

B) $63$

C) $109$

D) $99$

Answer: $63$

Solution: To find the minimum number of meiosis involved in formation of zygote, we should know the number of gametes involved because these gametes are product of meiosis. So the number of meiosis to form male gametes will be $n/4$ because one meiosis produces 4 cells and the number of meiosis to form female gametes will be $n$ because only one out four is functional.

To form 50 zygotes 50 male gametes and 50 female gametes are necessary. 50 male gametes will be formed after meiosis division of 13 cells (actually giving 52 pollens) and 50 female gametes will be formed after 50 meiotic divisions. So total 63 meiosis divisions are needed to form 50 zygotes.

Q.7. In the embryos of a typical dicot and a grass, true homologous structures are ----------.

A) hypocotyl and radicle

B) cotyledons and scutellum

C) coleoptile and scutellum

D) coleorhiza and coleoptile

Answer: cotyledons and scutellum

Solution: **In dicot seeds**, entire endosperm gets used up by the developing embryo and most of it is utilized during the formation of **two cotyledons**, which are also known as embryonic leaves. Therefore, in dicots, no remnants of cotyledons are seen.

**Grass is a monocot plant. In monocot seeds,** the embryo is unable to utilize entire endosperm and formation of only **one cotyledon (scutellum)** takes place (which is the reason that monocotyledonous seeds got this name) and only remnant of the second cotyledon is observed. This remnant of the second cotyledon is known as epiblast.

Q.8. Polyembryony is present in

A) *Citrus*

B) Mango

C) *Allium*

D) All the above

Answer: All the above

Solution: Polyembryony- The phenomenon of the development of more than one embryo in one ovule, seed, or fertilized ovum is called polyembryony.

Polyembrony is of two types-

1. Induced polyembryony- It includes cases of experimentally induced polyembryony.
2. Spontaneous polyembryony- It includes cases of naturally occurring polyembryony.

The types of spontaneous polyembryony given by Webber are-

- Cleavage polyembryony- A single fertilized egg breaks into two or more, i.e., undergoes cleavage and gives rise to several embryos.
- Apogamy- Embryos may be produced sometimes due to fertilization of cells of embryo sac other than the egg. The most common source is synergid. Production of Embryos from antipodal cells is rare. Example:- In *Allium odorum* embryos develop from antipodal cells.
- Adventive polyembryony- Embryos originate from diploid cells of the ovule lying outside the embryo sac and either belong to integuments or nucellus. This type of embryony is common amongst *Citrus* and mango.

Q.9. Which of the following statements is correct?

A) In $60\%$ of angiosperms pollen grains are shed at $2$ celled stage.

B) In less than $40\%$ of angiosperms the pollen grains ar shed at $2$ celled stage.

C) In $60\%$of angiosperms the pollen grains are shed at $3$ celled stage.

D) In more than $60\%$ of angiosperms the pollen grains are shed at $3$ celled stage.

Answer: In $60\%$ of angiosperms pollen grains are shed at $2$ celled stage.

Solution: The cytoplasm of pollen grain is surrounded by a plasma membrane. The mature pollen grain contains two cells, the vegetative cell and generative cell. The vegetative cell is bigger, has abundant food reserve and a large irregularly shaped nucleus. The generative cell is small and floats in the cytoplasm of the vegetative cell. It is spindle shaped with dense cytoplasm and a nucleus. In over 60 per cent of angiosperms, pollen grains are shed at this 2-celled stage. In the remaining species, the generative cell divides mitotically to give rise to the two male gametes before pollen grains are shed (3-celled stage).

Q.10. Which of the following pairs in angiosperms are diploid and triploid, respectively?

A) Secondary nucleus and endosperm

B) Microspore mother cell and egg cell

C) Polar nucleus and secondary nucleus

D) Endosperm and antipodal cells

Answer: Secondary nucleus and endosperm

Solution: **Microspore mother cell** (**2n**) produces microspores (n) after meiotic division which further develops as a female gametophyte. The embryo sac is the female gametophyte in angiospermic plants that contains **haploid cells**. A typical mature angiosperm embryo sac has a 7−celled 8−nucleate structure, contains **one egg** (**n**) and two **synergids** (**n**) forming an embryo sac towards the micropylar end. Three **antipodal cells** (**n**) are towards the chalazal end. **Two polar nuclei** (n) in the centre of the central cell that forms the secondary nucleus (2n) after fusion. Endosperm (3n) is the product of triple fusion formed during double fertilization.

Thus, the secondary nucleus and microspore mother cell are diploid (2n) in nature. The egg cell and antipodal cells are haploid (n) cells. The endosperm contains triploid (3n) cells.

Q.11. Which one of the following is a suitable reference to Xenogamy?

A) Ripening of androecium earlier to gynoecium

B) Pollen grains of one flower reaching the stigma of another flower present on the same plant

C) Pollen grains of one flower reaching the stigma of another flower, present on a different plant of the same species

D) The inability of pollen to germinate on the stigma of the same flower

Answer: Pollen grains of one flower reaching the stigma of another flower, present on a different plant of the same species

Solution: Dichogamy is the different maturation of male and female organs. In **protandry**, as in marigold, **ripening of androecium earlier to gynoecium**. In protogyny, as in *Mirabilis*, gynoecium matures earlier than androecium.

**Geitonogamy** is the transfer of pollen grains from the anther of one flower to the stigma of another flower of the same plant. Ecologically, this needs some agents, so it is a type of cross-pollination. But genetically, it is self-pollination.

**Xenogamy** is cross pollination in which transfer of pollen grains from the anther to the stigma of a genetically different plant of the same species, such type of plant has the advantage of variation.

**Self incompatibility**- Some pistils are incompatible with self-pollen. Thus, when self pollen lands on the stigma, it rejects the pollen and prevents the germination of the pollen tube. Thus, fertilization and self-pollination are prevented.

Q.12. Formation of seeds without fertilization is called

A) Parthenocarpy

B) Apomixis

C) Apospory

D) Polyembryony

Answer: Apomixis

Solution: In apomixis, seed production takes place without the fertilization of the egg cell and the sperm nucleus. All the seeds formed through apomixis are genetically similar. Apomixis is an asexual method of reproduction but commonly mimics sexual reproduction. E.g- some species of Asteraceae and grasses. There are several methods of apomictic development in seeds. The two common ones are recurrent agamospermy and adventitive embryony.

Q.13. Apomictic embryos in mango arise from:

A) Zygotes

B) Synergids

C) Sporophytic tissue of nucellus

D) Antipodal cells

Answer: Sporophytic tissue of nucellus

Solution: Apomixis is the asexual reproduction process without fertilization. The apomictic embryos in mangoes arise from the nucellus, a maternal sporophytic tissue present in the ovule. This type of asexual reproduction produces the apomictic embryo that is identical to the parent plant. There is no fusion of male and female gametes and so the genetic variation.

Q.14. Geitonogamy is

A) Functionally a self–pollination

B) Genetically a cross–pollination

C) Both $(A)$ and $(B)$

D) Ecologically a cross-pollination

Answer: Both $(A)$ and $(B)$

Solution: Transfer of pollen grains shed from the anther to the stigma of a pistil is termed as pollination. Flowering plants have an array of adaptations to achieve pollination.

Different types of pollination are -

**1. Autogamy**- In this type of pollination, pollen is transferred from the anther to the stigma of the same flower.

Flowers which open and expose the anther and stigma or the Chasmogamous flowers, complete autogamy is rare.

Autogamy in these flowers requires synchronisation in release of pollen and receptivity of stigma, and also the anther and stigma of these flower should be close to each other so that self-pollination became easy.

Some plants such as *Viola, Oxalis* and *Commelina* produce two types of flower- the normal Chasmogamous flowers which expose their anther and stigma; and Cleistogamous flowers which do not open at all.

In such flowers, anther lies close to stigma. When the anther dehisce in the flower bud, pollen grains come in contact with the stigma to effect pollination.

In Cleistogamous flowers production of seed is sure even if pollinators are absent.

**2. Geitonogamy-** (Geiton means neighbour) Transfer of pollen grains from the anther to stigma of another flower of same plant. It is functionally cross-pollination, but genetically self-pollination.

**3. Xenogamy-** Transfer of pollen grains from anther to stigma of another flower on a different plant of same species.

It is the only type of pollination in which genetically different pollen grains are brought upto stigma, so it helps in genetic recombination of traits.

Q.15. Identify the statements that are true for anemophilous flowers.
(a) Pollen grains are light and sticky.
(b) They possess large feathery stigma.
(c) They are not very colorful and do not produce nectar.
(d) They have many ovules in each ovary.

A) (a), (b), and (c)

B) (a), (b), and (d)

C) (b)and (c)

D) (b), (c), and (d)

Answer: (b)and (c)

Solution: Pollination is the transfer of pollen grains from the anther of one flower to the stigma of a pistil of either the same flower or some other flower of the same species. Angiosperms are known to use several agents for pollination, both biotic and abiotic.
A. Abiotic agents like wind (Anemophily) and water (Hydrophily) are used to pollinate.
B. Biotic agents can be:
I. Bees, butterfly, moth (entomophily) as in sunflower.
II. Bat (Chirropterophily) as in *Adansonia digitata*.
III. Bird (Ornithophily) as in *Callistemon*.
IV. Snail (Melacophily) as in *Aresaema*.
V. Ants (Myrmecophily) as in some Orchids.

Several adaptations are observed in each type of plants which are specified for a type of pollinator.

Adaptations for anemophilous plants are:

1. Pollens are light and non-sticky.

2. Flowers are minute, non-colourful and inconspicuous.

3. Anther is versatile and well exposed outside the flowers.

4. Stigma is feathery or like a comb and there is no aroma or nectar in the flower.

5. Single ovule per ovary at the base.

Grasses are wind pollinated (Family Poaceae), like wheat, rice, grasses. All Gymnosperms are wind pollinated.

Sticky pollen is a characteristic feature of entomophilous flowers, i.e. the flowers which are pollinated by insects, like sunflower.

Q.16. Outbreeding device which prevents both autogamy and geitonogamy is

A) Being monoecious as in date palm

B) Self incompatibility as in tobacco

C) Being dioecious as in papaya

D) Being monocliny as in cucumber

Answer: Being dioecious as in papaya

Solution: Outbreeding devices- The majority of flowers produce hermaphrodite flowers, i.e. both male and female reproductive parts are produced on the same flower, and thus pollen grains are likely to come in contact with the stigma of the same flower. Thus flowers have developed features that can prevent self-pollination and encourage cross-pollination.

Non-synchrony in stigma receptivity and anther dehiscence. In some species, anther dehisces before stigma become receptive or much before the anthers dehisce.

Herkogamy is adapted in certain species, i.e. the difference in the position of androecium and gynoecium to avoid contact of pollen grains with the stigma.

Some pistils are incompatible with self-pollen. Thus when self pollen lands on the stigma, it rejects the pollen and prevents the germination of the pollen tube. Thus fertilisation and self-pollination are prevented.

Production of unisexual flowers is effective. If both male and female plants are present on the same plant, as in castor, it prevents autogamy but not geitonogamy. But if both male and female flowers are present on different plants, as in papaya, it prevents both autogamy and geitonogamy.

Q.17. The formation of a seedless fruit is due to:

A) Apospory

B) Apogamy

C) Adventive polyembryony

D) Parthenocarpy

Answer: Parthenocarpy

Solution: Parthenocarpy refers to the development of fruit without fertilization. The process produces a sterile fruit that lacks seeds. This means that the pollination results in a production of fruits that are completely seedless. It is the formation of diploid gametophytes without meiosis.

Q.18. When vegetative cell of zygote form embryo, it is called

A) Apospory

B) Apomixis

C) Diploid polyembryony

D) Adventive polyembryony

Answer: Adventive polyembryony

Solution: Growth of diploid nuclear or integument cells into embryos is adventive polyembryony, e.g., Mango.

The formation of an embryo directly from the diploid sporophytic cells (nucellus or integument) of the ovule is called **adventive embryony**. Such embryos are formed without involving meiosis and sexual fusion, e.g., Citrus, *Opuntia*, etc. In citrus, a seed may possess upto 40 embryos (one normal and rest **adventive**).

Q.19. What does the filiform apparatus do at the entrance into ovule ?

A) It helps in the entry of pollen tube into a synergid.

B) It prevents entry of more than one pollen tube into the embryo sac.

C) It brings about opening of the pollen.

D) It guides pollen tube from a synergid to egg.

Answer: It helps in the entry of pollen tube into a synergid.

Solution: The filiform apparatus helps in the entry of the pollen tube into a synergid in the ovule. Filiform apparatus is in form of finger-like projection comprising a core of microfibrils enclosed in a sheath. The filiform apparatus resembles transfer cells meant for short-distance movement of metabolites. The filiform apparatus is responsible for the absorption of food from the nucleus.

Q.20. Identify the wrong statement regarding post-fertilization development.

A) The ovary wall develops into pericarp

B) The outer integument of the ovule develops into a tegmen

C) The fusion nucleus (triple nucleus) develops into endosperm

D) The ovule develops into seed

Answer: The outer integument of the ovule develops into a tegmen

Solution: After double fertilization, events of endosperm and embryo development, maturation of ovule into the seed and ovary into fruit, are collectively termed post-fertilization events. The outer integument of the ovule develops into a testa. The inner integument of the ovule develops into a tegmen.

Q.21. The ability of the pistil to recognise the pollen followed is the result of a continuous dialogue that is mediated by ___

A) Chemical component of pollen cytoplasm with those of the pistil.

B) Chemical composition of pollen wall with those of the pistil.

C) Chemical composition of pollen wall interacting with those of the androecium.

D) Sporopollenin of the pollen exine interacting with those of stigma.

Answer: Chemical composition of pollen wall with those of the pistil.

Solution: During sexual reproduction in plants, pollination is a very important step in the sexual reproductive cycle. Pollination is the transfer of pollen grains from the anther to the stigma of the flower after which pollen tube germination takes place. For pollination to occur various pollinating agents take part which can be biotic or abiotic. The pistil is the female reproductive part of the flower which comprises stigma, style and ovary. The pollen grain first lands on stigma of the pistil. Stigma is a sticky part which releases certain chemicals which help the pollens to adhere onto it.

When a pollen grain lands on the stigma, it is very important for it to be compatible with the stigma to develop further. To ensure the pollen compatibility, pollen-pistil interactions take place. The pollen wall as well as the stigma secrete chemicals. If the pollen is found to be compatible with the stigma, it develops a pollen tube and reaches upon the ovule where two sperm cells are delivered and fertilisation takes place. Sometimes the flowers are self-incompatible. This is a condition in which the functional pollens of the flower fail to fertilize their own ovary and set seeds. This is genetically determined.

Q.22. Pollen tube after reaching the ovary generally enters the ovule through the

A) Nucleus.

B) Integument.

C) Chalaza.

D) Micropyle.

Answer: Micropyle.

Solution: In angiosperms, male reproductive organ consists of stamens which have anthers and filaments. The female reproductive organ comprises stigma, style and ovary. Stigma is where the pollen grains from the anthers land. Style is the elongated part of the pistil which further leads to the ovary. Ovary consists of many ovules. The ovules contain female reproductive cells. Ovule comprises:

Integument- The outermost layer of ovule.
Nucellus- Part of ovule containing embryo sac.
Female gametophyte- Embryo sac.

The integuments enclose ovule except the portion from which the pollen tube enters the ovule for releasing the sperm cells. This opening in the ovule is known as micropyle. Micropyle is important for fertilisation to take place.

There are three possible ways for the pollen tube to enter the embryo sac:

1. In most of the cases' pollen tube enters through micropyle, called Porogamy (as seen in *Ottelia*).

2. In *Casuarina* the pollen tube enters through chalaza, called Chalazogamy.

3. In *Cucurbita* the pollen tube enters through integuments or funiculi, called Mesogamy.

Q.23. Identify the following statements as true (T) or false (F), and select the correct option.

A. The pistil has the ability to recognize the pollen with respect to its compatibility.

B. Pollen tube discharges its male gametes on degenerating synergids.

C. Emasculation is required when a female parent produces unisexual flowers.

D. Bagging prevents contamination of stigma with unwanted pollen.

A) A–T; B–F; C–F; D–T

B) A–T; B–T; C–F; D–T

C) A–F; B–F; C–T; D–F

D) A–F; B–F; C–T; D–T

Answer: A–T; B–T; C–F; D–T

Solution: Statement A: True

Pollen-pistil interaction is one of the main events that take place on the stigma, when the pollen grains are deposited. Pistil has the ability to recognize the pollen with respect to its compatibility. Stigma can recognize the self- or non-self pollens. The foreign pollens, of some other species or genus, are not allowed to germinate. Pollens of the same species are germinated. If the pollen is faulty, then callose plug is generated by the pistil which prohibits any further development of the pollen.

Statement B: True

Pollen tube germinated is facilitated by stigmatic secretion and the vegetative nucleus helps in this process. Inside the pollen tube, generative nucleus mitotically divides to form two male gametes. Upon reaching the embryo sac through micropylar end (porogamy), the tube nucleus degenerates and tube tip also dissolves. The filiform apparatus, present at the micropylar end of synergids, further guides pollen tube and male gametes towards the egg.

Statement C: False

Emasculation is the process of removal of anthers (male part) from a flower of bisexual or hermaphrodite flower to avoid unnecessary pollination. It is practised during artificial hybridisation in which only selective pollen grains are used to pollinate the flower so that the desired characters from both the parents can be acquired by the progeny. This practice is done only in bisexual flowers because in them self-pollination takes place due to the presence of both the reproductive parts.

Statement D: True

Bagging prevents contamination of stigma with unwanted pollen. Bagging is the process of covering the flowers of emasculated plants with bags to avoid contamination with unwanted pollination. Emasculation is the process of removal of anthers of bisexual flowers to avoid self-pollination. Instead, pollen grains of selective flowers are used to carry out pollination in them. This makes the progeny of these plants to acquire the best characters from both the parent plants.

If after emasculation, bagging is not done, it will lead to contamination of stigma with unwanted pollen grains. Therefore, bagging prevents these flowers from getting pollinated by unwanted pollen grains.

Q.24. The ploidy of endosperm will be _____ if the male and female parents are tetraploid and hexaploid, respectively.

A) $16\times$

B) $8\times$

C) $7\times$

D) $10\times$

Answer: $8\times$

Solution: Angiosperms have devised double fertilisation or triple fusion. The syngamy results in the formation of a diploid zygote when a haploid male gamete fuses with another haploid female gamete.

Male gamete (n) + Female gamete (n) = Zygote ($2n$)

The second male gamete fuses with the definitive nuclei ($2n$), thus resulting in the formation of the triploid primary endosperm nucleus (PEN).

Male gamete (n) + Polar nuclei ($2n$) = PEN ($3n$)

The endosperm is triploid, formed by the fusion of two polar nuclei and a haploid sperm cell.

Its main function is to provide nourishment to the growing embryo inside the seed until it germinates and carries out photosynthesis of its own.

Here,

Male parent $4x$; thus, gametes will be $2x$.

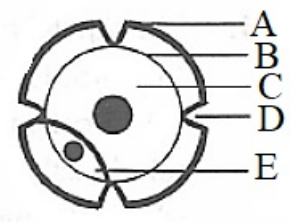
Female parent $6x$; thus, gametes will be $3x$ each.

Polar nuclei will be a fused cell, that is $3x + 3x = 6x$.

PEN will be $8x$ = Polar nuclei ($6x$) + Male gamete ($2x$)

Therefore, the ploidy of the endosperm will be $8x$.

Q.25. Name the parts A, B, C, D and E in the given diagram.




A) A - Germ pore
B - Generative cell
C - Intine
D - Exine
E - Vegetative cell

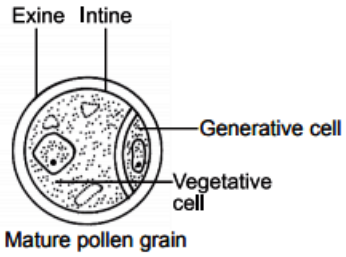
B) A - Germ pore
B - Generative cell
C - Exine
D - Intine
E - Vegetative cell

C) A - Intine
B - Exine
C - Germ pore
D - Generative cell
E - Vegetative cell

D) A - Exine
B - Intine
C - Vegetative cell
D - Germ pore
E - Generative cell

Answer: A - Exine
B - Intine
C - Vegetative cell
D - Germ pore
E - Generative cell

Solution:




- A-Exine: The outer layer of pollen grain is made up of sporopollenin.
- B - Intine: The inner pecto-cellulosic layer.
- C - Vegetative cell: It functions in the extension of a pollen tube to transport the two sperm cells to the embryo sac.
- D - Germ pore: A thin-walled area through which the germ tube or pollen tube emerges on germination.
- E - Generative cell: This cell divides to form two male gametes (sperm cells).

Practice more on Sexual Reproduction in Flowering Plants