

# 24 Sexual Reproduction in Flowering Plants

**Question:** Transfer of pollen grains from another to stigma of another flower of same plant is known as :

**NEET 2023 Manipur**

**A** Geitonogamy

**B** Xenogamy

**C** Autogamy

**D** Cleistogamy

**Answer: A**

**Explanation**

The correct answer is :

Option A : Geitonogamy

Explanation :

Geitonogamy refers to the transfer of pollen from the anther of one flower to the stigma of another flower on the same plant. While this process involves pollination between different flowers, because it occurs on the same plant, it does not increase genetic diversity.

Here's a quick overview of the other terms :

Xenogamy refers to the transfer of pollen grains from the anther of a flower to the stigma of a flower on a different plant. This is cross-pollination and promotes genetic diversity.

Autogamy refers to the transfer of pollen from the anther to the stigma of the same flower. This is self-pollination.

Cleistogamy refers to a type of automatic self-pollination where the flowers do not open and are therefore self-pollinated before they open.

**Question:** In angiosperms the correct sequence of events in formation of female gametophyte in the ovule is :

- (A) 3 successive free nuclear divisions functional megaspore.
- (B) Degeneration of 3 megaspores.
- (C) Meiotic division in megaspore mother cell.
- (D) Migration of 3 nuclei towards each pole.
- (E) Formation of wall resulting in seven celled embryo sac.

Choose the correct answer from the options given below :

**NEET 2023 Manipur**

**A** (A), (B), (C), (D), (E)

**B** (C), (E), (A), (D), (B)

**C** (B), (C), (A), (D), (E)

**D** (C), (B), (A), (D), (E)

**Answer: D**

### **Explanation**

The process of female gametophyte formation in angiosperms, also known as megagametogenesis, involves several steps :

1. Meiotic division in the megaspore mother cell (megasporocyte) - This division leads to the production of four haploid cells, which are the megaspores.
2. Degeneration of three of the four megaspores - Typically, three of these megaspores degenerate, leaving a single functional megaspore.
3. Successive mitotic divisions (not meiotic) in the functional megaspore - These divisions are typically free-nuclear (the nuclear membrane does not break down between divisions), and result in a multinucleate cell.
4. Migration of the nuclei to the cell periphery and formation of cell walls - This results in the creation of a seven-celled structure known as an embryo sac or female gametophyte.
5. The final structure of the female gametophyte includes an egg apparatus (one egg cell and two synergids), two polar nuclei in the central cell, and three antipodal cells.

Given these steps, the correct sequence of events in the formation of the female gametophyte is :

**Option D : (C), (B), (A), (D), (E)**

**Question:** What is the function of tassels in the corn cob?

**A** To trap pollen grains

**B** To disperse pollen grains

☐ C To protect seeds

☐ D To attract insects

**Answer: A**

### Explanation

Tassels in the corn cob represent stigma and style which wave in the wind to trap pollen grains.

**Question:** Large, colourful, fragrant flowers with nectar are seen in

**NEET 2023**

☐ A Bird pollinated plants

☐ B Bat pollinated plants

☐ C Wind pollinated plants

☐ D Insect pollinated plants

**Answer: D**

### Explanation

Large, colorful, fragrant flowers with nectar are features that attract biotic pollinators. Insect pollinated plants, also known as entomophilous plants, often have these characteristics to attract insects such as bees, butterflies, and moths, which play a significant role in their pollination process.

**Question:** In angiosperm, the haploid, diploid and triploid structures of a fertilized embryo sac sequentially are :

**NEET 2023**

**A** Antipodals, synergids, and primary endosperm nucleus

**B** Synergids, Zygote and Primary endosperm nucleus

**C** Synergids, antipodals and Polar nuclei

**D** Synergids, Primary endosperm nucleus and zygote

**Answer: B**

### Explanation

Synergids are the cells of gametophyte and hence these are haploid Zygote is formed by fusion of two gametes and thus it is diploid.

Primary endosperm nucleus is formed by the fusion of diploid secondary nucleus with a male gamete. Therefore, it is triploid.

**Question:** Given below are two statements : One labelled as Assertion A and the other labelled as Reason R :

Assertion A : In gymnosperms the pollen grains are released from the microsporangium and carried by air currents.

Reason R : Air currents carry the pollen grains to the mouth of the archegonia where the male gametes are discharged and pollen tube is not formed.

In the light of the above statements, choose the correct answer from the options given below :

## NEET 2023

**A** Both A and R are true but R is NOT the current explanation of A

**B** A is true but R is false

**C** A is false but R is true

**D** Both A and R are true and R is the correct explanation of A

**Answer: B**

### Explanation

The correct answer is Option B : A is true but R is false.

Assertion A is true. In gymnosperms, the pollen grains are indeed released from the microsporangium and are typically carried by air currents, a method of pollination known as anemophily.

Reason R is false. Although it's true that air currents carry the pollen grains, the pollen grains do not directly reach the mouth of the archegonia in gymnosperms. Instead, they land on the ovule, where they germinate and form a pollen tube that delivers the male gametes to the egg. Therefore, a pollen tube is formed in gymnosperms, contrary to what Reason R suggests.

2022

## MCQ (Single Correct Answer)

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**Q.1.** The residual persistent part which forms the perisperm in the seeds of beet is

**A** Integument

**B** Calyx

**C** Endosperm

**D** Nucellus

NEET 2022 Phase 2

**Ans. (D)**

### Explanation

Mostly nucellus is consumed after fertilisation due to absorption of food by developing embryo in a seed. Sometimes, the nucellus remains persistent in the seed and is called perisperm.

**Q.2.** In general the egg apparatus of embryo sac in angiosperm consists of

**A** One egg cell, two synergids, two antipodal cells, two Polar nuclei

**B** One egg cell, two synergids, three antipodal cells, two Polar nuclei

**C** One egg cell, two synergids, two antipodal cells, three Polar nuclei

**D** One egg cell, three synergids, two antipodal cells, two Polar nuclei

## NEET 2022 Phase 2

**Ans. (B)**

### Explanation

The egg apparatus of an embryo sac consists of one egg cell and two synergids.

Whereas the embryo sac consists of one egg cell, two synergies, three antipodals and two polar nuclei.

As per the question none of the option is correct however considering the composition of embryo sac the correct option should be 2.

**Q.3.** Given below are two statements:

Statement I : Cleistogamous flowers are invariably autogamous

Statement II : Cleistogamy is disadvantageous as there is no chance for cross pollination

In the light of the above statements, choose the correct answer from the options given below :

- ☒ A Both Statement I and Statement II are correct
- ☐ B Both Statement I and Statement II are incorrect
- ☐ C Statement I is correct but Statement II is incorrect
- ☐ D Statement I is incorrect but Statement II is correct

## NEET 2022 Phase 1

**Ans. (A)**

### Explanation



Cleistogamous flowers does not open at all. In such flowers autogamy occurs. Lack of cross pollination is a disadvantage of cleistogamy.

**Q.4.** Identify the incorrect statement related to Pollination:

- A** Pollination by water is quite rare in flowering plants
- B** Pollination by wind is more common amongst abiotic pollination
- C** Flowers produce foul odours to attract flies and beetles to get pollinated
- D** Moths and butterflies are the most dominant pollinating agents among insects

**NEET 2022 Phase 1**

**Ans. (D)**

### **Explanation**

Among the animals, insects, particularly bees are the dominant biotic pollinating agents.

## TOPIC 1

### Pre-fertilisation Structures and Events

- 01** The term used for transfer of pollen grains from anthers of one plant to stigma of a different plant which, during pollination, brings genetically different types of pollen grains to stigma is [NEET 2021]

(a) xenogamy  
(b) geitonogamy  
(c) chasmogamy  
(d) cleistogamy

**Ans. (a)**

Xenogamy is a cross pollination in which pollen grains are transferred from anther of one flower to the stigma of another flower in order to get fertilised. This is the only type of cross pollination which during pollination brings genetically different types of pollen grains to the stigma, e.g. Sunflower.

Other options can be explained as:

Geitonogamy is a type of self-pollination in which pollens are transferred from the anther of one flower to the stigma of another flower of the same plant, e.g. Corn.

Chasmogamy is the condition in which bisexual flowers have exposed anthers and stigma. Both self-pollination and cross pollination can occur in these flowers, e.g. *Catharanthus*.

Cleistogamy occurs in flowers that do not open, their anther and stigma lie close to each other thus, production of seeds is a result of autogamy, e.g. *Arachis hypogaea*.

- 02** Diadelphous stamens are found in [NEET 2021]

(a) China rose  
(b) *Citrus*  
(c) Pea  
(d) China rose and *Citrus*

**Ans. (c)**

Diadelphous condition is a condition of arrangement of filaments and stamen in a flower, e.g. Pea. In this condition, filaments of nine different stamens are connected into one unit and the tenth posterior stamen remains out of the bundle as a stand part.

The androecium of pea flower is diadelphous because the filaments of the anther are united in two bundles. In the case of pea, out of ten, nine stamens form a staminal tube while one is free. Thus, the correct answer is 'Pea' which exhibit diadelphous condition.

China rose of Malvaceae family possess numerous stamens. The filaments of stamens are united in one group thus forming a staminal tube around the style. Such stamens are called monadelphous.

The polyadelphous stamen is seen in *Citrus*, these have many small bunches of the fused stamen.

- 03** A typical angiosperm embryo sac at maturity is [NEET 2021]

(a) 8-nucleate and 7-celled  
(b) 7-nucleate and 8-celled  
(c) 7-nucleate and 7-celled  
(d) 8-nucleate and 8-celled

**Ans. (a)**

In dicotyledons, at the time of fertilisation, the female gametophyte develops from a single megaspore.

The megaspore will undergo three successive mitotic divisions to form eight nucleated embryo sac. Two nuclei generated in the first mitotic division in the megaspore will move to opposite poles. These nuclei divided and redivide at their ends to form eight nucleated stage. Thus, each end have four nuclei, out of which at micropylar end towards, three nuclei differentiate into two synergids and one egg cell, while at the chalazal end, three nuclei differentiate as antipodal cells.

The remaining two cells, one at micropylar end and other at chalazal end migrate the center and fuse.

Hence, a typical angiosperm embryo sac at maturity is 7 celled and 8 nucleated structure.

- 04** In some members of which of the following pairs of families, pollen grains retain their viability for months after release? [NEET 2021]

(a) Poaceae; Rosaceae  
(b) Poaceae; Leguminosae  
(c) Poaceae; Solanaceae  
(d) Rosaceae : Leguminosae

**Ans. (d)**

In some members of Rosaceae, Leguminosae and Solanaceae pollen grains maintain viability for a month due to sporopollenin.

The outer wall or exine of pollen grains contains sporopollenin. It is one of the most resistant organic compounds known. It protects pollen grains from external factors such as temperature, acid, alkali, etc. because of sporopollenin, pollen grains are preserved as fossils.

**05** Which of the following is incorrect for wind pollinated plants?  
[NEET (Oct.) 2020]

- (a) Well exposed stamens and stigma
- (b) Many ovules in each ovary
- (c) Flowers are small and not brightly coloured
- (d) Pollen grains are light and non-sticky

**Ans. (b)**

Option (b) is incorrect because wind pollinated plants have single ovule in each ovary. In case of wind pollination or anemophily, many pollens are produced because anemophily is highly wasteful and non-directional process.

These pollens are also light-weighted, small, dusty and dry. To catch the wind-borne pollens, stigma is exposed and hairy. Flowers are small and inconspicuous, colourless and nectarless.

**06** In water hyacinth and water lily, pollination takes place by  
[NEET (Sep.) 2020]

- (a) water currents only
- (b) wind and water
- (c) insects and water
- (d) insects or wind

**Ans. (d)**

In water hyacinth and water lily, the flowers emerge above the level of water and are thus pollinated by insects or wind. Water lily and water hyacinth are in the water but their stem part which is above the thalamus is not in water. The pollen grains are in the upper part of thalamus so pollination cannot be done by water. That is why it done by insects or wind.

**07** The plant part which consists of two generations, one within the other  
[NEET (Sep.) 2020]

- I. Pollen grains inside the anther.
  - II. Germinated pollen grain with two male gametes.
  - III. Seed inside the fruit.
  - IV. Embryo sac inside the ovule.
- (a) I, II and III
  - (b) III and IV
  - (c) I and IV
  - (d) Only I

**Ans. (c)**

The plant part which consists of two generations one within the other are pollen grains inside the anther and embryo sac inside the ovule.

This can be explained as :

In an ovule or megasporangia ( $2n$ ) there occurs an embryo sac or female

gametophyte which consists of an egg cell ( $n$ ). This egg cell or female gamete is the part of next generation which form zygote after syngamy. Likewise an anther ( $2n$ ) is a male reproductive structure of a plant. As the anther mature and dehydrate, it form pollen grains via microsporogenesis. These pollen grains represents the male gametophyte comprising of male gametes ( $n$ ). So in this way there occurs two generations one with the other.

**08** What type of pollination takes place in *Vallisneria*?  
[NEET (Odisha) 2019]

- (a) Pollination occurs in submerged condition by water
- (b) Flowers emerge above surface of water and pollination occurs by insects
- (c) Flowers emerge above water surface and pollen is carried by wind
- (d) Male flowers are carried by water currents to female flowers at the surface of water

**Ans. (d)**

*Vallisneria* is a water pollinated plant. In *Vallisneria*, the female flowers reach the surface of water by the long stalk and the male flowers or pollen grains are released on to the surface of water. They are carried passively by water currents to female flowers at surface of water.

**09** In which of the following, both autogamy and geitonogamy are prevented?  
[NEET (Odisha) 2019]

- (a) Wheat
- (b) Papaya
- (c) Castor
- (d) Maize

**Ans. (b)**

Autogamy and geitonogamy both are prevented in papaya plant. In papaya, male and female flowers are present on different plants that is each plant is either male or female (dioecy).

**10** Pollen grains can be stored for several years in liquid nitrogen having temperature of  
[NEET 2018]

- (a)  $-196^{\circ}\text{C}$
- (b)  $-80^{\circ}\text{C}$
- (c)  $-120^{\circ}\text{C}$
- (d)  $-160^{\circ}\text{C}$

**Ans. (a)**

Pollen grains can be stored for several years in liquid nitrogen having a temperature of  $-196^{\circ}\text{C}$ . Pollen grains can be later used in plant breeding programmes.

**11** Which of the following has proved helpful in preserving pollen as fossils?  
[NEET 2018]

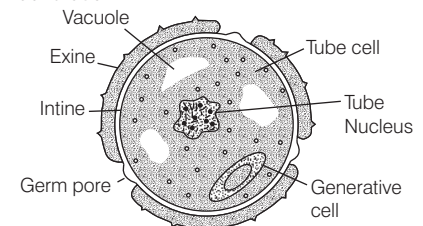
- (a) Oil content
- (b) Cellulosic intine
- (c) Pollenkitt
- (d) Sporopollenin

**Ans. (d)**

Sporopollenin has proved helpful in preserving pollen as fossils. The covering of pollen grain, sporoderm consist of two layers, viz., exine and intine. **Exine** is made of a highly resistant fatty substance called **sporopollenin**.

It could not be degraded by any enzyme. It is not affected by high temperature, strong acid or strong alkali. Thus, it keeps the pollen grains well-preserved as fossils.

**Pollenkitt** is a yellowish, viscous, sticky and oily layer that covers exine of some insect pollinated pollen grains. Intine of pollen grains is made up of pectin and cellulose.



A mature pollen grain of an angiosperm

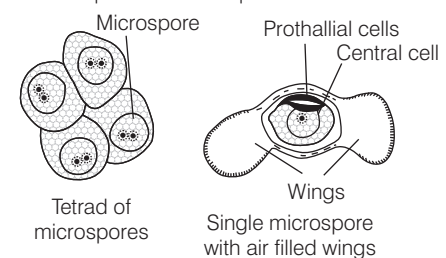
**12** Winged pollen grains are present in  
[NEET 2018]

- (a) mango
- (b) *Cycas*
- (c) mustard
- (d) *Pinus*

**Ans. (d)**

Winged pollen grains are present in *Pinus*. These wings are spirally arranged microsporophylls that arise from the lateral side and help in pollination.

The sperms (pollen grains) of *Cycas* are top-shaped. The pollen grains of **mango** are spheroidal, while that of **mustard** are prolate to subspheroidal.



*Pinus* : Pollen grain

**Concept Enhancer** In *Pinus*, the pollination is anemophilous. Pollen remains suspended in the air for a long time due to wings. It appears as yellow dust. This is popularly called as phenomenon of 'sulphur shower'.

- 13** Attractants and rewards are required for [NEET 2017]

(a) anemophily (b) entomophily  
(c) hydrophily (d) cleistogamy

**Ans. (b)**

Attractant and rewards are required for entomophily (insect pollination). Flowers produce specific odour and nectar to attract the insect for effective pollination. Entomophilous flowers are large with bright colours.

- 14** A dioecious flowering plant prevents both [NEET 2017]

(a) autogamy and xenogamy  
(b) autogamy and geitonogamy  
(c) geitonogamy and xenogamy  
(d) cleistogamy and xenogamy

**Ans. (b)**

Dioecious flowering plants contain unisexual flower. In dioecious condition two types of unisexual flowers occur on different plants.

Hence, it does not favour autogamy and geitonogamy because autogamy takes place in bisexual flowers and geitonogamy takes place between different flower of the same plant.

- 15** Functional megaspore in an angiosperm develops into [NEET 2017]

(a) ovule (b) endosperm  
(c) embryo sac (d) embryo

**Ans. (c)**

In angiosperms, functional megaspore develops into an embryo sac. The functional megaspore is the first cell of female gametophyte.

- 16** Which one of the following statements is not true? [NEET 2016, Phase I]

(a) Exine of pollen grains is made up of sporopollenin  
(b) Pollen grains of many species cause severe allergies  
(c) Stored pollen in liquid nitrogen can be used in the crop breeding programmes  
(d) Tapetum helps in the dehiscence of anther

**Ans. (d)**

Tapetum is the inner layer of microsporangium (anther) which provides nourishment to developing pollen grain after meiotic cell division.

- 17** Proximal end of the filament of stamen is attached to the [NEET 2016, Phase I]

(a) connective  
(b) placenta  
(c) thalamus or petal  
(d) anther

**Ans. (c)**

A typical stamen consist of anther and filament. The proximal end of filament is attached to thalamus or petal of the flower whereas distal end bears anther.

- 18** Which of the following statements is not correct? [NEET 2016, Phase I]

(a) Insects that consume pollen or nectar without bringing about pollination are called pollen nectar robbers  
(b) Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil  
(c) Some reptiles have also been reported as pollinators in some plant species  
(d) Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style

**Ans. (d)**

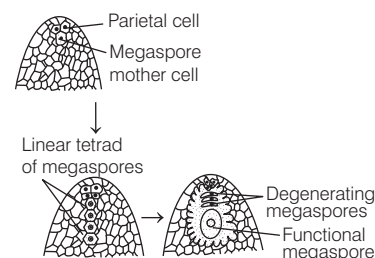
Pollen grains of different species are incompatible, so they fail to germinate. Only the pollen of the same species germinate and can form pollen tube which grows and finally dispatches male gamete to embryo sac.

- 19** In majority of angiosperms [NEET 2016, Phase II]

(a) egg has a filiform apparatus  
(b) there are numerous antipodal cells  
(c) reduction division occurs in the megaspore mother cells  
(d) a small central cell is present in the embryo sac

**Ans. (c)**

In most of the angiosperms megaspore mother cell ( $2n$ ) divides meiotically to produce 4 cells. Out of these 3 degenerate and one remains which forms functional megaspore. This divides mitotically and forms embryo sac which contains following structures.



- (i) One egg cell with 2 synergids forming an egg apparatus.  
(ii) There are 3 antipodal cells.  
(iii) There are two central cells which are seen as secondary nucleus ( $2n$ ).

Egg does not have filiform apparatus. It is the synergids which have special cellular thickenings at the micropylar tip which is called filiform apparatus. This guides pollen tube into the synergids.

- 20** Pollination in water hyacinth and water lily is brought about by the agency of [NEET 2016, Phase II]

(a) water  
(b) insects or wind  
(c) birds  
(d) bats

**Ans. (b)**

Water hyacinth has single spike of 8-15 conspicuous attractive flowers which attract bees and other insects. These insects pollinate them. This plant is an aquatic weed.

Water lily is also an aquatic plant with large conspicuous coloured flowers. Most of the species are bee pollinated except few species where wind pollination occurs. Insect pollinated flowers have coloured petals, big size and they offer fragrance and nectar to attract insects which bring about pollination in them.

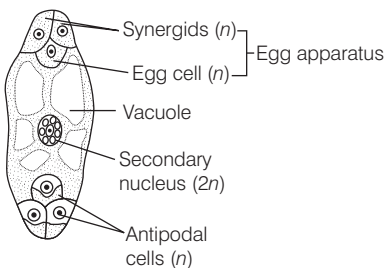
- 21** The ovule of an angiosperm is technically equivalent to [NEET 2016, Phase II]

(a) megasporangium  
(b) megasporophyll  
(c) megaspore mother cell  
(d) megaspore

**Ans. (a)**

Ovule of an Angiosperm is equivalent to megasporangium which consists of 2 synergids, 1 egg, 3 antipodal cells and a secondary nucleus.

Megaspore mother cell ( $2n$ ) gives rise to ovule. Megasporophylls are sterile structures on which ovules may be present.



Structure of an ovule

**22** Male gametophyte in angiosperms produces [CBSE AIPMT 2015]

- (a) two sperms and a vegetative cell
- (b) single sperm and a vegetative cell
- (c) single sperm and two vegetative cells
- (d) three sperms

**Ans. (a)**

Pollen grain or male gametophyte in angiosperms contain one generative cell. The generative cell further divides mitotically to form two male gametes (sperms). So, a mature male gametophyte in angiosperms contains two sperms and one vegetative cell.

**23** Filiform apparatus is characteristic feature of [CBSE AIPMT 2015]

- (a) generative cell
- (b) nucellar embryo
- (c) aleurone cell
- (d) synergids

**Ans. (d)**

Filiform apparatus are finger-like projections present at the micropylar end of synergids of embryo sac.

**24** In angiosperms, microsporogenesis and megasporogenesis [CBSE AIPMT 2015]

- (a) occur in anther
- (b) form gametes without further divisions
- (c) involve meiosis
- (d) occur in ovule

**Ans. (c)**

Both event microsporogenesis and megasporogenesis involve the process of meiosis which results in the formation of haploid gametes from the microspore or megaspore mother cells.

**25** Geitonogamy involves [CBSE AIPMT 2014, 10, 94]

- (a) fertilisation of a flower by the pollen from, another flower of the same plant
- (b) fertilisation of a flower by the pollen from the same flower
- (c) fertilisation of a flower by the pollen from a flower of another plant in the same population

- (d) fertilisation of a flower by the pollen from a flower of another plant belonging to a distant population

**Ans. (a)**

Geitonogamy is a type of self pollination. In other word geitonogamy is transfer of pollen grain from the anther of one flower to the stigma of another flower of either same or genetically similar plant.

**26** Pollen tablets are available in the market for [CBSE AIPMT 14]

- (a) *in vitro* fertilisation
- (b) breeding programmes
- (c) supplementing food
- (d) *ex situ* conservation

**Ans. (c)**

Pollen grains are rich in nutrients. They are taken as tablets and syrups to improve health. Pollen consumption has been claimed to enhance the performance of athletes and race horses.

**27** Function of filiform apparatus is to [CBSE AIPMT 2014, 2008]

- (a) recognise the suitable pollen at stigma
- (b) stimulate division of generative cell
- (c) produce nectar
- (d) guide the entry of pollen tube

**Ans. (d)**

Filiform apparatus of synergids secrete some chemotropically active substances, which direct the pollen tube towards micropyle of ovule.

**28** Megasporangium is equivalent to [NEET 2013]

- (a) embryo sac
- (b) fruit
- (c) nucellus
- (d) ovule

**Ans. (d)**

Megasporangium is equivalent to an ovule. An ovule generally has a single embryo sac formed from a megaspore through reduction division. It is a small structure attached to the placenta by means of a stalk called funicle.

Each has one or two protective envelopes called integuments. Nucellus is a mass of cells enclosed with in the integuments. ovule forms Megaspore Mother Cell (MMC) by meiosis which further forms megaspore.

Megaspore nucleus forms embryo sac. Fruits develop from the ovary of flower, other floral parts degenerate and fall off.

**29** Which one of the following statement is correct? [NEET 2013]

- (a) Hard outer layer of pollen is called intine
- (b) Sporogenous tissue is haploid
- (c) Endothecium produces the microspores
- (d) Tapetum nourishes the developing pollen

**Ans. (d)**

Tapetum is the innermost layer of microsporangium. It nourishes the pollen grains. The inner wall of pollen grain is called intine. Endothecium is the wall around the microsporangium, which provide protection and help in dehiscence of anther to release the pollen. Sporogenous tissue is diploid. It undergoes meiotic division to form microspore tetrads.

**30** Advantage of cleistogamy is [NEET 2013]

- (a) higher genetic variability
- (b) more vigorous offspring
- (c) no dependence on pollinators
- (d) vivipary

**Ans. (c)**

In cleistogamous flowers, anthers and stigma lie close to each other. When anthers dehisces in the flower buds, pollen grains come in contact with the stigma to effect pollination. Thus, these flowers produce assured seed set even in the absence of pollinators.

The higher genetic variability and more vigorous offsprings are produced due to variations obtained by sexual reproduction. Vivipary relates to the birth of young babies from mammals.

**31** Both, autogamy and geitonogamy are prevented in [CBSE AIPMT 2012]

- (a) papaya
- (b) cucumber
- (c) castor
- (d) maize

**Ans. (a)**

Autogamy involves pollination within the same flower, while geitonogamy involves transfer of pollen grains from the anther of one flower to the stigma of another flower of the same plant.

Both the processes are prevented in papaya because it is a dioecious plant (i.e. male and female sex organs are born on separate plants) and it always needs cross-pollination.



**32** An organic substance that can withstand environmental extremes and cannot be degraded by any enzyme is [CBSE AIPMT 2012, 1994]

- (a) cuticle
- (b) sporopollenin
- (c) lignin
- (d) cellulose

**Ans. (b)**

Sporopollenin is a fatty substance present in the exine of pollen grains. It is resistant to microbial and chemical decomposition and can withstand the extreme environmental conditions. Due to the presence of sporopollenin, pollen grains are well preserved during fossilisation.

**33** Even in absence of pollinating agents seed-setting is assured in [CBSE AIPMT 2012]

- (a) *Commelina*
- (b) *Zostera*
- (c) *Salvia*
- (d) fig

**Ans. (a)**

*Commelina benghalensis* bears aerial, chasmogamous (stigma and anthers exposed to pollinating agents), insect pollinated flowers and underground cleistogamous flowers. Cleistogamous flowers are bisexual flowers which never open, i.e. always remain closed. In such flowers the anthers and stigma lie very close to each other. When anthers dehisce in the flower buds, pollen grains come in contact with the stigma of the same flower, i.e. autogamy occurs. So, these flowers produce assured seed set, even in the absence of pollinators.

**34** Filiform apparatus is a characteristic feature of [CBSE AIPMT 2011]

- (a) egg
- (b) synergid
- (c) zygote
- (d) suspensor

**Ans. (b)**

The synergid cell wall forms a highly thickened structure called the filiform apparatus at the micropylar end, consisting of numerous finger-like projections into the synergid cytoplasm. It is believed to play a major role in pollen tube guidance and reception.

**35** Wind pollination is common in [CBSE AIPMT 2011]

- (a) lilies
- (b) grasses
- (c) orchids
- (d) legumes

**Ans. (b)**

Wind pollination (anemophily) is quite common in grasses. Anemophilous flowers are small and inconspicuous with long and versatile stamens. Pollen grains are dry, powdery, light and non-sticky, e.g. maize, wheat, sugarcane, bamboo, *Pinus* and papaya.

**36** In which one of the following pollination is autogamous? [CBSE AIPMT 2011]

- (a) Xenogamy
- (b) Chasmogamy
- (c) Cleistogamy
- (d) Geitonogamy

**Ans. (c)**

Bisexual flowers which remain always closed are called cleistogamous and such condition of flowers is called cleistogamy. In such flowers, the anthers and stigma lie close to each other. When anthers dehisce in the flower buds, pollen grains come in contact with stigma to affect pollination. Thus, cleistogamous flowers are invariably autogamous.

**37** Wind pollinated flowers are [CBSE AIPMT 2010]

- (a) small, brightly coloured, producing large number of pollen grains
- (b) small, producing large number of dry pollen grains
- (c) large, producing abundant nectar and pollen
- (d) small, producing nectar and dry pollen

**Ans. (b)**

Pollination taking place by means of wind is known as anemophily, e.g. *Zea mays*, *Cannabis*, *Pinus*, etc. Anemophilous flowers are small and produce large number of pollen grains which are dry, powdery light and non-sticky.

**38** Which one of the following plants is monoecious? [CBSE AIPMT 2009]

- (a) *Marchantia*
- (b) *Pinus*
- (c) *Cycas*
- (d) Papaya

**Ans. (b)**

*Pinus* is monoecious as it bears male cone as well as female cone on same tree, (but on separate branches). *Marchantia*, *Cycas* and papaya are dioecious plants.

**39** Which one of the following is resistant to enzyme action? [CBSE AIPMT 2008]

- (a) Cork
- (b) Wood fibre
- (c) Pollen exine
- (d) Leaf cuticle

**Ans. (c)**

Pollen exine is resistant to enzyme action. The pollen wall is consisted of two layers, the outer exine and inner intine. The exine is chiefly made up of sporopollenin, which is derived by the oxidative polymerisation of carotenoids. Sporopollenin is one of the most resistant biological materials known. Exine is thin in beginning but becomes very thick with maturity.

**40** Unisexuality of flowers prevents [CBSE AIPMT 2008]

- (a) autogamy, but not geitonogamy
- (b) both geitonogamy and xenogamy
- (c) geitonogamy, but not xenogamy
- (d) autogamy and geitonogamy

**Ans. (a)**

Unisexuality of flowers prevents autogamy, but not geitonogamy. Autogamy also called self-pollination involves the transfer of pollen grains of one flower to the stigma of same flower. Self-pollination occurs only in bisexual or hermaphrodite flowers.

Geitonogamy involves the transfer of pollen grains from a male flower to stigma of female flower of same plant. Thus, geitonogamy operates only in monoecious plants, i.e. plants having male and female flowers on different places.

Allogamy or xenogamy also known as cross-pollination involves the transfer of pollen grains of male flower to the stigma of genetically different female flower. It takes place via various agencies like wind, water, insects, etc.

**41** Which one of the following pairs of plant structures has haploid number of chromosomes? [CBSE AIPMT 2008]

- (a) Megaspore mother cell and antipodal cells
- (b) Egg cell and antipodal cells
- (c) Nucellus and antipodal cells
- (d) Egg nucleus and secondary nucleus

**Ans. (b)**

Egg cell and antipodal cells have haploid number of chromosomes. In angiosperms a single diploid megaspore mother cell matures within an ovule. Through meiosis it gives rise to four megaspores (haploid). In most plants only one of these megaspores survive. This functional megaspore divides three times by mitosis and produces eight haploid nuclei enclosed within a 7-celled embryo sac.

One nucleus is located near the opening of embryo sac in egg cell.

Two nuclei are located in a single cell in the middle of embryo sac and are called polar nuclei, two nuclei are contained in cells called synergids that flank the egg cell and other three nuclei are resided in the cells called antipodals, located at the end of embryo sac opposite the egg cell.

- 42** Male gametes in angiosperms are formed by the division of  
[CBSE AIPMT 2007]

(a) microspore  
(b) generative cell  
(c) vegetative cell  
(d) microspore mother cell

**Ans. (b)**

Male gametes in angiosperms are formed by the division of generative cell. Before pollination the pollen grain cytoplasm divides in generative cell and vegetative cell. The generative cell divides to form two male gametes.

- 43** Which one of the following is surrounded by a callose wall?  
[CBSE AIPMT 2007]

(a) Microspore mother cell  
(b) Male gamete  
(c) Egg  
(d) Pollen grain

**Ans. (a)**

The wall of the pollen mother cell (microspore mother cell) is deposited by callose ( $\beta$ -1, 3-glucan). Callose plays a significant role in reproductive biology of angiosperms. It acts as a temporary wall to prevent the product of meiosis from cohesion and fusion and its dissolution results in the release of free spores.

- 44** The arrangement of the nuclei in a normal embryo sac in the dicot plants is  
[CBSE AIPMT 2006]

(a)  $3 + 2 + 3$   
(b)  $2 + 3 + 3$   
(c)  $3 + 3 + 2$   
(d)  $2 + 4 + 2$

**Ans. (a)**

In angiosperms (dicots), the *Polygonum* type of embryo sac is most common. In this embryo sac, the arrangement of the nuclei is  $3 + 2 + 3$ , i.e. 3 in antipodal cells, 2 as polar nuclei (which later fuse and form a diploid secondary nucleus) and 3 in egg apparatus (2 in synergids and 1 in egg cell).

- 45** What would be the number of chromosomes in the cells of the aleurone layer in a plant species with 8 chromosomes in its synergids?  
[CBSE AIPMT 2006]

(a) 24  
(b) 32  
(c) 8  
(d) 16

**Ans. (a)**

Synergids are two, short-lived, haploid cells lying close to the egg in mature embryo sac of flowering plant ovule. While the endosperm is a triploid tissue formed after triple fusion.

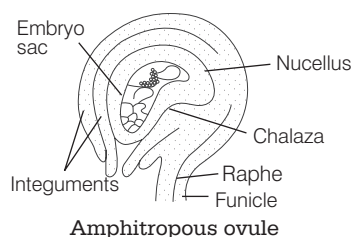
Thus, if the synergids have 8 chromosomes, the aleurone layer (part of endosperm) will have just triple of that of chromosomes in the synergids, i.e. 24 chromosomes.

- 46** Which one of the following represents an ovule, where the embryo sac becomes horse shoe-shaped and the funiculus and micropyle are close to each other?  
[CBSE AIPMT 2005]

(a) Amphitropous  
(b) Circinotropous  
(c) Atropous  
(d) Anatropous

**Ans. (a)**

In an amphitropous ovule, the embryo sac becomes horse-shoe shaped and the funiculus and micropyle are close to each other. This type of ovule is found in Alismaceae, Butomaceae families.



- 47** Anthesis is a phenomenon which refers to  
[CBSE AIPMT 2004]

(a) reception of pollen by stigma  
(b) formation of pollen  
(c) development of anther  
(d) opening of flower bud

**Ans. (d)**

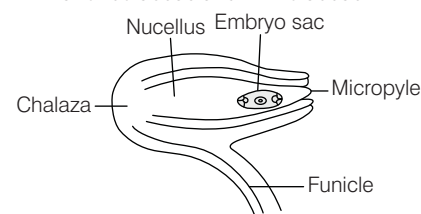
Anthesis is the opening of floral buds. Reception of pollen by stigma is called pollination. Formation of pollen is called microsporogenesis.

- 48** An ovule which becomes curved so that the nucellus and embryo sac lie at right angles to the funicle is  
[CBSE AIPMT 2004]

(a) hemitropous  
(b) campylotropous  
(c) anatropous  
(d) orthotropous

**Ans. (a)**

In hemitropous type, the ovule becomes curved and nucellus and embryo sac lie at right angles to the funicle, e.g. Ranunculaceae and Primulaceae.



- 49** In a flowering plant, archesporium gives rise to  
[CBSE AIPMT 2003]

(a) only tapetum and sporogenous cells  
(b) only the wall of the sporangium  
(c) both wall and the sporogenous cells  
(d) wall and the tapetum

**Ans. (c)**

The archesporial cells divide periclinally, cutting off primary parietal layer (forming wall later on) towards the outer side and primary sporogenous cells towards the inner side. The cells of the primary parietal layers divide by successive periclinal and anticlinal division to form concentric layers of pollen sac wall.

- 50** Which type of association is found in between entomophilous flower and pollinating agent?  
[CBSE AIPMT 2002]

(a) Mutualism  
(b) Commensalism  
(c) Cooperation  
(d) Co-evolution

**Ans. (a)**

A plant and its pollinator have a mutualistic relationship. The plant uses its pollinator to ensure cross-pollination while pollinator uses the plant as food.

- 51** In angiosperms all the four microspores of tetrad are covered by a layer which is formed by  
[CBSE AIPMT 2002]

(a) pectocellulose  
(b) callose  
(c) cellulose  
(d) sporopollenin

**Ans. (b)**

The deposition of callose starts in pollen mother cell as it enters meiosis and is complete by the end of first meiotic division. By the time tetrad are formed, the common callose wall dissolves, even then all the four microspores lie within a common callose wall.

**52** What is the direction of micropyle in anatropous ovule?

[CBSE AIPMT 2002]

- (a) Upward (b) Downward  
(c) Right (d) Left

**Ans. (b)**

Body of the anatropous ovule gets inverted and micropyle is on lower side (downward). Further micropyle and funiculus lie side by side and micropyle is close to hilum.

**53** Anemophily type of pollination is found in [CBSE AIPMT 2001]

- (a) *Salvia* (b) bottle brush  
(c) *Vallisneria* (d) coconut

**Ans. (d)**

Pollination through air is known as anemophily e.g. coconut.

In *Salvia*, the pollination is taken place by insects (entomophily).

In *Vallisneria*, the pollination occurs through water (hydrophily).

In bottle brush (*Callistemon*) the pollination occurs through birds (ornithophily).

**54** Eight nucleate embryo sacs are [CBSE AIPMT 2000]

- (a) always tetrasporic  
(b) always monosporic  
(c) always bisporic  
(d) sometimes monosporic, sometimes bisporic and sometimes tetrasporic

**Ans. (d)**

Megaspore is a haploid structure which divides and gives rise to embryo sac which is also called as female gametophyte.

Eight-nucleate embryo sacs may be monosporic (e.g. *Polygonum*) or bisporic (e.g. *Allium*) or tetrasporic (e.g. *Adoxa*).

**55** Flowers showing ornithophily show few characteristic like [CBSE AIPMT 1999]

- (a) blue flower with nectaries at base of corolla

- (b) red sweet scented flower with nectaries  
(c) bright red flower into thick inflorescence  
(d) white flowers with fragrance

**Ans. (b)**

Ornithophily is an allogamy performed by birds, such as long beaked small birds (sun birds, humming birds), crow, parrot, bulbul, etc. Ornithophilous flowers are large and showy cup-shaped with abundant nectar or edible part, e.g. *Bombax*, *Agave*, etc.

**56** How many pollen grains will be formed after meiotic division in 10 microspore mother cells?

[CBSE AIPMT 1996]

- (a) 10 (b) 20  
(c) 40 (d) 80

**Ans. (c)**

One microspore mother cell form four pollen grains after meiotic division, so, 10 microspore mother cells will form 40 pollen grains through dividing meiotically.

**57** In an angiosperm, how many microspore mother cells are required to produce 100 pollen grains?

[CBSE AIPMT 1995]

- (a) 25 (b) 50  
(c) 75 (d) 100

**Ans. (a)**

In angiosperms, each **Microspore Mother Cell** (MMC) undergoes meiosis to produce four microspores which develop into pollen grains. Thus, to produce 100 pollen grains, 25 microspore mother cells are required.

**58** Chief pollinators of agricultural crops are [CBSE AIPMT 1994]

- (a) butterflies (b) bees  
(c) moths (d) beetles

**Ans. (b)**

Bees are considered the most common pollinators which pollinate about 80% of the total insect pollinated flowers.

**59** Ovule is straight with funiculus, embryo sac, chalaza and micropyle lying on one straight line. It is [CBSE AIPMT 1993]

- (a) orthotropous  
(b) anatropous  
(c) campylotropous  
(d) amphitropous

**Ans. (a)**

Orthotropous or atropous is the erect ovule in which the body of ovule lies straight and upright over the funicle. Hilum, chalaza and micropyle occur on one straight line, e.g. family-Polygonaceae and Piperaceae.

**60** Number of meiotic divisions required to produce 200/400 seeds of pea would be [CBSE AIPMT 1993]

- (a) 200/400 (b) 400/800  
(c) 300/600 (d) 250/500

**Ans. (d)**

200 seeds of pea would be produced from 200 pollen grains and 200 embryo sacs. 200 pollen grains will be formed by 50 microspore mother cells, while 200 embryo sacs will be formed by 200 megaspore mother cells. Similarly 400 seeds of pea would be produced from 400 pollen grains and 400 embryo sacs. 400 pollen grains will be formed by 100 Microspore Mother Cell (MMC) and 400 embryo sacs formed by 400 Megaspore Mother Cell (MMC). Thus, number of meiotic divisions required to produce 200/400 seeds would be 250/500.

**61** Meiosis is best observed in dividing [CBSE AIPMT 1992]

- (a) cells of apical meristem  
(b) cells of lateral meristem  
(c) microspores and anther wall  
(d) microsporocytes

**Ans. (d)**

Microsporocytes or microspore mother cells are diploid cells formed from sporogenous cells in the anther. The pollen/microspore mother cells undergo meiosis and form tetrads of microspores or pollen grains. The wall of pollen mother cell degenerates and pollen or microspores separate.

**62** Point out the odd one [CBSE AIPMT 1991]

- (a) nucellus (b) embryo sac  
(c) micropyle (d) pollen grain

**Ans. (d)**

Nucellus is the parenchymatous nutritive tissue of ovule, micropyle is the pore present in the integuments at one end of ovule and embryo sac represents the female gametophyte. Thus, nucellus, micropyle and embryo sac are part of ovule, whereas, pollen grain/microspore represents the immature male gametophyte.



**63** Pollination occurs in  
[CBSE AIPMT 1991]

- (a) bryophytes and angiosperms
- (b) pteridophytes and angiosperms
- (c) angiosperms and gymnosperms
- (d) angiosperms and fungi

**Ans. (c)**

Pollination is the transfer of pollen grains from anther to stigma of same or different flower. It is a characteristic feature of higher plants, i.e. angiosperm and but also found in few gymnosperms.

**64** Embryo sac occurs in  
[CBSE AIPMT 1991]

- (a) embryo
- (b) axis part of embryo
- (c) ovule
- (d) endosperm

**Ans. (c)**

Embryo sac occurs in ovule. Megaspore mother cell is developed inside the nucellus of the ovule and by a meiotic division it forms four megaspores, out of which three degenerate. The functional megaspore divides mitotically to form embryo sac.

**65** Female gametophyte of angiosperms is represented by  
[CBSE AIPMT 1990]

- (a) ovule
- (b) megaspore mother cell
- (c) embryo sac
- (d) nucellus

**Ans. (c)**

In angiosperms, female gametophyte is represented by embryo sac. Embryo sac is produced by the functional megaspore formed through meiosis of megaspore mother cell in ovule.

The common type of embryo sac is monosporic *Polygonum* type, it is 7-celled and 8-nucleate structure covered by a thin membrane formed of megaspore wall.

**66** Male gametophyte of angiosperms/monocots is  
[CBSE AIPMT 1990]

- (a) microsporangium
- (b) nucellus
- (c) microspore
- (d) stamen

**Ans. (c)**

Microspore or pollen grain is an immature male gametophyte and thus, represents the first cell of gametophytic generation in angiosperms. Microspores are generally rounded, small, uninucleate haploid cells produced as a result of meiosis in microspore mother cell inside the microsporangia. The process of formation of microspore inside the pollen sacs of anthers is known as microsporogenesis.

**67** Male gametophyte of angiosperms is shed as  
[CBSE AIPMT 1988]

- (a) four-celled pollen grain
- (b) three-celled pollen grain
- (c) microspore mother cell
- (d) anther

**Ans. (b)**

In angiosperms, pollen grains are generally shed from the anther at 2-celled stage, i.e. one generative cell and one vegetative cell. But, in some angiosperms, the generative cell divides prior to the dehiscence of anther and shed at 3-celled stage, i.e. one vegetative cell and two male gametes. Double fertilisation was discovered by Nawaschin (1898) in *Fritillaria* and *Lilium*. It was confirmed by Guignard (1899).

## TOPIC 2

### Double Fertilisation

**68** Double fertilisation is  
[NEET 2018]

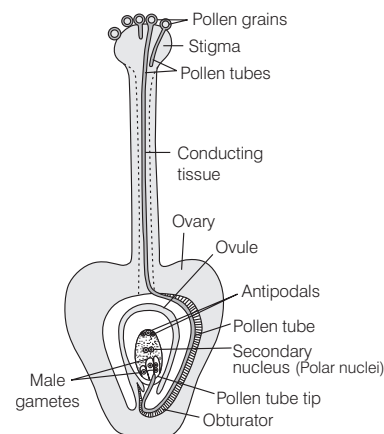
- (a) fusion of two male gametes with one egg
- (b) fusion of one male gamete with two polar nuclei
- (c) fusion of two male gametes of pollen tube with two different eggs
- (d) syngamy and triple fusion

**Ans. (d)**

**Double fertilisation** is the fusion of two male gametes to two different cells of the same female gametophyte. It consists of following two events

- (i) **Syngamy** Fusion of the egg nucleus with one male gamete is called syngamy.
- (ii) **Triple fusion** It is the fusion of second male gamete and central cell.

**Concept Enhancer** Syngamy results in the formation of diploid ( $2n$ ) zygote. Triple fusion involves three nuclei, i.e. one of male gamete and two polar nuclei. It gives rise to a triploid ( $3n$ ) endosperm.



Fertilisation in an angiosperm through porogamy

**69** Double fertilisation is exhibited by  
[NEET 2017]

- (a) gymnosperms
- (b) algae
- (c) fungi
- (d) angiosperms

**Ans. (d)**

Double fertilisation is the characteristic feature of angiosperms. In this type of fertilisation one male gamete fuses with an egg and forms zygote. The second male gamete fuses with diploid **secondary** nucleus of central cell to form a triploid primary endosperm nucleus.

**70** Through which cell of the embryo sac, does the pollen tube enter the embryo sac  
[CBSE AIPMT 2005]

- (a) egg cell
- (b) persistent synergid
- (c) degenerated synergid
- (d) central cell

**Ans. (c)**

Egg apparatus is present towards the micropylar end of an ovule. Egg apparatus has two lateral synergid cells and one centrally located egg cell. During entry of pollen tube within the ovule synergid cells become disintegrate and provide path for entry of pollen tube within the chamber of embryo sac.

**71** In angiosperms pollen tubes liberate their male gametes into the [CBSE AIPMT 2002]

- (a) central cell (b) antipodal cell  
(c) egg cell (d) synergid

**Ans. (d)**

The contents of the pollen tube are discharged in the synergid from where the first male gamete is transferred to the egg cell, while the other male gamete moves to the central cell through cytoplasmic current.

**72** Double fertilisation leading to initiation of endosperm in angiosperms require [CBSE AIPMT 2000]

- (a) fusion of one polar nucleus and the second male gamete only  
(b) fusion of two polar nuclei and the second male gamete  
(c) fusion of four or more polar nuclei and the second male gamete only  
(d) all of the above kinds of fusion in different angiosperms

**Ans. (b)**

In angiosperms the endosperm is a special tissue which is formed as a result of triple fusion. In triple fusion the second male gamete fuses with secondary nucleus (diploid nucleus formed by fusion of two polar nuclei) to form triploid primary endosperm nucleus.

**73** Fertilisation involving carrying of male gametes by pollen tube is [CBSE AIPMT 1994]

- (a) porogamy (b) siphonogamy  
(c) chalazogamy (d) syngonogamy

**Ans. (b)**

In angiosperms, the male gametes are carried by the pollen tube and such type of fertilisation or fusion of male and female gametes or syngamy is called **siphonogamy**. It was discovered by Strasburger (1884).

**74** Double fertilisation and triple fusion were discovered by [CBSE AIPMT 1993, 88]

- (a) Hofmeister  
(b) Nawaschin and Guignard  
(c) Leeuwenhoek  
(d) Strasburger

**Ans. (b)**

Double fertilisation was discovered by Nawaschin (1898) in *Fritilaria* and *Lilium*.

It was confirmed by Guignard (1899). Syngamy (one male gamete fuse with egg cell to form zygote) and triple fusion (second male gamete fuses nucleus to with two polar nuclei or secondary nucleus to form triploid primary endosperm nucleus occurs simultaneously in angiosperms and this is called double fertilisation.

**75** Double fertilisation is fusion of [CBSE AIPMT 1991]

- (a) two eggs  
(b) two eggs and polar nuclei with pollen nuclei  
(c) one male gamete with egg and other with synergid  
(d) one male gamete with egg and other with secondary nucleus

**Ans. (d)**

Double fertilisation deals with the fusion of one male gamete with egg to form zygote and the other male gamete with secondary nucleus to form Primary Endosperm Nucleus (PEN).

**76** Entry of pollen tube through micropyle is [CBSE AIPMT 1990]

- (a) chalazogamy (b) mesogamy  
(c) porogamy (d) pseudogamy

**Ans. (c)**

Porogamy refers to the most common method by which the pollen tube enters the ovule through micropyle, e.g. lily. When pollen tube enters through chalaza, it is known as chalazogamy and when it enters laterally through integuments, then such process is known as mesogamy.

**77** Generative cell was destroyed by laser but a normal pollen tube was still formed because [CBSE AIPMT 1989]

- (a) vegetative cell is not damaged  
(b) contents of killed generative cell stimulate pollen growth  
(c) laser beam stimulates growth of pollen tube  
(d) the region of emergence of pollen tube is not harmed

**Ans. (a)**

Pollen grain or microspore divides mitotically forming a larger tube or vegetative cell and a small generative cell. Since, vegetative cell gives rise to pollen tube and generative cell divides to form two male gametes, thus if a generative cell is destroyed by laser, a normal pollen tube will still form through the vegetative cell which is undestroyed.

**78** Total number of meiotic divisions required for forming 100 zygotes/100 grains of wheat are [CBSE AIPMT 1988]

- (a) 100 (b) 75  
(c) 125 (d) 50

**Ans. (c)**

Total number of meiotic divisions required for forming 100 zygote/100 grains of wheat are 125. Zygote is the fusion product of pollen grains and egg. 100 zygotes require 100 pollen grains and 100 embryo sacs. 100 pollen grains are produced from 25 microspore mother cells while 100 embryo sacs are formed from 100 functional megaspores which as a result being produced by 100 megaspore mother cells, since three, out of four megaspores degenerate in each case.

### TOPIC 3

#### Post-fertilisation: Structures and Events

**79** In some plants thalamus contributes to fruit formation. Such fruits are termed as [NEET (Oct.) 2020]

- (a) false fruits  
(b) aggregate fruits  
(c) true fruits  
(d) parthenocarpic fruit

**Ans. (a)**

A fruit in which floral parts other than ovary, like thalamus, base of sepals, petals, etc., fuse with pericarp and contribute in fruit formation is called false fruit or pseudocarp. Apple, mulberry and strawberry are false fruits.

**80** Which one of the following statements regarding post-fertilisation development in flowering plants is incorrect? [NEET (National) 2019]

- (a) Zygote develops into embryo  
(b) Central cell develops into endosperm  
(c) Ovules develop into embryo sac  
(d) Ovary develops into fruit

**Ans. (c)**

The statement that "ovules develop into embryo sac" is incorrect. Correct information about the statement is as follows. During post-fertilisation event, ovule develops into seed.

On the other hand, embryo sac is a multicellular structure which is derived from the megaspore. Rest statements regarding post-fertilisation development in flowering plants are correct.

- 81** Seed formation without fertilisation in flowering plants involves the process of  
[NEET 2016, Phase I]

(a) budding  
(b) somatic hybridisation  
(c) apomixis  
(d) sporulation

**Ans. (c)**

Apomixis is a special mechanism found in flowering plants to produce seeds without fertilisation. It is a type of asexual reproduction which mimics the sexual reproduction and is commonly found in *Citrus* varieties.

- 82** The coconut water from tender coconut represents  
[NEET 2016, Phase I]

(a) fleshy mesocarp  
(b) free-nuclear proembryo  
(c) free-nuclear endosperm  
(d) endocarp

**Ans. (c)**

Coconut milk represents free-nuclear endosperm where the division of primary endosperm nucleus is not followed by formation of cell walls (cytokinesis) thus all nucleus remain free in liquid form. It is rich in plant hormone cytokinin.

- 83** Cotyledon of maize grain is called  
[NEET 2016, Phase I]

(a) coleorhiza (b) coleoptile  
(c) scutellum (d) plumule

**Ans. (c)**

Large, shield shaped cotyledon of grass family is called scutellum. Coleorhiza is a sheath protecting the root of germinating grass.

Coleoptile is a sheath covering emerging shoot. Plumule is rudimentary shoot of an embryo plant.

- 84** The wheat grain has an embryo with one large, shield-shaped cotyledon known as  
[CBSE AIPMT 2015]

(a) epiblast  
(b) coleorrhiza  
(c) scutellum  
(d) coleoptile

**Ans. (b)**

The grain of wheat, maize or rice is a caryopsis. The embryo in such grains lies laterally near the base of the grain. The embryo consists of an upper large, shield shaped cotyledon known as scutellum. The scutellum is closely pressed against the endosperm and helps in the translocation of nutrients from endosperm to the growing embryo at the time of germination and seedling growth.

- 85** Coconut water from a tender coconut is  
[CBSE AIPMT 2015]

(a) immature embryo  
(b) free nuclear endosperm  
(c) innermost layers of the seed coat  
(d) degenerated nucellus

**Ans. (b)**

The coconut water from tender coconut that we are familiar with, is nothing but free nuclear endosperm (made up of thousands of nuclei) and the surrounding white kernel is the cellular endosperm.

In the most common type of endosperm development, the Primary Endosperm Nucleus (PEN) undergoes successive nuclear divisions to give rise to free nuclei. This stage of endosperm development is called free-nuclear endosperm.

- 86** Non-albuminous seed is produced in  
[CBSE AIPMT 2014]

(a) maize (b) castor  
(c) wheat (d) pea

**Ans. (d)**

Non-albuminous or non-endospermic seeds are those in which cotyledons are usually smaller and less developed like in pea. Such seeds are seen when most or all of the endosperm is used up much before germination.

- 87** Nucellar polyembryony is reported in species of  
[CBSE AIPMT 2011]

(a) *Gossypium* (b) *Triticum*  
(c) *Brassica* (d) *Citrus*

**Ans. (d)**

Nucellar polyembryony is reported in species of *Citrus*. Occurrence of more than one embryo in a seed is referred to as polyembryony. In many *Citrus* and mango varieties, some of the nucellar cells surrounding the embryo sac start dividing, protrude into the embryo sac and develop into the embryos.

- 88** Apomictic embryos in *Citrus* arise from  
[CBSE AIPMT 2010]

(a) synergids  
(b) maternal sporophytic tissue in ovule  
(c) antipodal cells  
(d) diploid egg

**Ans. (b)**

Apomictic embryos in *Citrus* arise from maternal sporophytic tissue (e.g. nucellus or integuments) in ovule. Apomixis is the formation of new individuals directly through asexual reproduction without involving the formation and fusion of gametes.

- 89** Endosperm is consumed by developing embryo in the seed of  
[CBSE AIPMT 2008]

(a) coconut (b) castor  
(c) pea (d) maize

**Ans. (c)**

Endosperm is consumed by developing embryo in the seeds of pea (*Pisum sativum*). These seed are called non-endospermic seeds. Other examples are gram, beans, orchids, etc.

- 90** The scutellum observed in a grain of wheat or maize is comparable to which part of the seed in other monocotyledons?  
[CBSE AIPMT 2010, 06]

(a) Cotyledon  
(b) Endosperm  
(c) Aleurone layer  
(d) Plumule

**Ans. (a)**

In wheat or maize (family-Poaceae), the scutellum is thought to be a modified cotyledon or seed leaf.

- 91** In angiosperms, triple fusion is required for the formation of  
[CBSE AIPMT 1996]

(a) embryo (b) endosperm  
(c) seed coat (d) fruit wall

**Ans. (b)**

In angiosperms, triple fusion is required for the formation of endosperm. Triple fusion refers to the vegetative fertilisation, i.e. the fusion of nucleus of a male gamete with the two polar nuclei or the diploid secondary (fusion) nucleus. Triple fusion converts central cell into triploid primary endosperm cell which forms the endosperm, a nutritive tissue.

**92** Study of formation, growth and development of new individual from an egg is [CBSE AIPMT 1993]

- (a) apomixis
- (b) embryology
- (c) embryogeny
- (d) cytology

**Ans. (b)**

Embryology (Gr. *en* – in; *bryo* – swell; *logos* – study) is the study of formation growth and development of embryo. It includes sporogenesis, fertilisation and embryogeny, i.e. the overall process starting from formation of gametes, fertilisation, zygote and embryo formation and development of new individual.

**93** Nucellus embryo is [CBSE AIPMT 1989]

- (a) amphimictic haploid
- (b) amphimictic diploid
- (c) apomictic haploid
- (d) apomictic diploid

**Ans. (c)**

Nucellus embryo is apomictic haploid. Nucellus is a parenchymatous, haploid nutritive tissue of the ovule of phanerogams. The phenomenon of formation of embryo or new individual directly through asexual reproduction or adventitiously from a cell other than egg, i.e. nucellus, integuments, etc., is known as apomixis. Nucellus embryo is thus, known as apomictic embryo.

## TOPIC 4

### Special Mechanism of Reproduction

**94** In some plants, the female gamete develops into embryo without fertilisation. This phenomenon is known as [NEET (National) 2019]

- (a) parthenocarpy
- (b) syngamy
- (c) parthenogenesis
- (d) autogamy

**Ans. (c)**

Parthenogenesis is the process by which the female gamete develops into embryo without fertilisation.

It is of two type-haploid and diploid. In former, embryo develops from haploid egg and in latter case, a diploid egg develops into embryo.

Parthenocarpy is the development of seedless fruits from an unfertilised egg of the flower.

Syngamy is the fusion of male and female gamete during sexual reproduction in plants.

Autogamy is a type of self-pollination in which a flower is pollinated by its own pollen.

**95** Which one of the following fruits is parthenocarpic? [CBSE AIPMT 2015]

- (a) Brinjal
- (b) Apple
- (c) Jackfruit
- (d) Banana

**Ans. (d)**

Parthenocarpy is a process of developing fruits without involving fertilisation/seed formation. Therefore, the seedless varieties of economically important fruits like orange, banana, watermelon, lemon, etc. are produced using this technique. This technique involves inducing fruit formation by the application of plant growth hormones such as auxins.

**96** In a type of apomixis known as adventive embryony, embryos develop directly from the [CBSE AIPMT 2005]

- (a) nucellus or integuments
- (b) zygote
- (c) synergids or antipodals in an embryo sac
- (d) accessory embryo sac in the ovule

**Ans. (a)**

Apomixis does not involve gamete formation and fertilisation as found in amphimixis. Adventive embryo formation is a type of apomixis in which embryos are formed from diploid integumental or nucellar cells.

**97** Adventive embryony in *Citrus* is due to [CBSE AIPMT 2001]

- (a) nucellus
- (b) integuments
- (c) zygotic embryo
- (d) fertilised egg

**Ans. (a)**

Nucellus embryony occurs in crassinucellate ovules (e.g. *Citrus*, *Opuntia*). On the other hand integumentary embryony occurs in tenuinucellate ovules (e.g. *Euonymus*).

**98** Formation of gametophyte directly from sporophyte without meiosis is (a) apospory [CBSE AIPMT 1988]

- (b) apogamy
- (c) parthenogenesis
- (d) amphimixis

**Ans. (a)**

Apospory is the formation of gametophyte directly from sporophyte without forming spores and meiosis. The gametophytes formed through apospory are usually diploid. Apospory leads to polyploidy and hence, new species in bryophytes and pteridophytes.

**99** Prothallus (gametophyte) gives rise to fern plant (sporophyte) without fertilisation. It is [CBSE AIPMT 1988]

- (a) apospory
- (b) apogamy
- (c) parthenocarpy
- (d) parthenogenesis

**Ans. (b)**

Apogamy refers to the development of sporophyte from gametophyte without fertilisation.

In fern plant, prothallus (gametophyte) gives rise to main plant body (sporophyte) directly from somatic cell without forming gametes. Sporophyte thus formed is haploid in nature.

**100** Development of an organism from female gamete/egg without involving fertilisation is [CBSE AIPMT 1989]

- (a) adventive embryony
- (b) polyembryony
- (c) parthenocarpy
- (d) parthenogenesis

**Ans. (d)**

Parthenogenesis can be defined as formation of embryo from an unfertilised egg or female gamete. Parthenogenetic plants are homozygous so, they have more importance in plant breeding and genetics.