# SEXUAL REPRODUCTION IN FLOWERING PLANTS

## MULTIPLE CHOICE QUESTIONS

**Choose the correct answer:**

1. The root cell of a wheat plant has 42 chromosomes. What would be the number of chromosomes in the synergid cell?

(a) 7 (b) 14 (c) 21(d) 28.

2.In Banana edible part is:

(a) Fleshy epicarp (b) Rudimentary mesocarp and fleshy endocarp

(c) Pericarp (d) Rudimentary endocarp and fleshy mesocarp

3 Egg apparatus consists of

(a)Egg (b) Egg and polar nuclei (c) Egg and synergids (d) Egg and antipodal cells.

4. Endosperm of flowering plants develops from:

(a) Haploid nucleus (b) Diploid nucleus (c) Triploid nucleus (d) Tetraploid nucleus.

5. Persistent nucellus in black pepper is called

(a) Pericarp (b) Perisperm(c) Primary endospermic nucleus

(d) Endosperm

6. In a monocot, endosperm cells have24 chromosomes. What shall be the chromosome number in embryo:

(a) 24 (b) 16 (c) 12 (d) 8

7. Secondary nucleus present in the middle of embryo sac is:

(a) Tetraploid (b) Triploid (c) Diploid (d) Haploid.

8.In nature cleistogamous flowers are:

(a) Wind pollinated (b) Bird pollinated (c) Self-pollinated (d) Insect pollinated

9.Triploid tissue in angiosperms is:

(a) Nucellus (b) Endosperm (c) Endothecium (d) Tapetum.

10. The outermost layer of maize endosperm is known as:

(a) Perisperm (b) Aleurone (c) Tapetum Endothecium

11. Through which cell of the embryo sac, does the pollen tube enter the embryo sac?

(a) Egg cell (b) Central cell (c) Persistent synergid (d) degenerated synergid.

12. Double fertilisation involves:

(a) Syngamy + triple fusion (b) Double fertilisation (c) Development of antipodal cell (d) None of the above.

## ASSERTION TYPE QUESTIONS

These questions consist of two statements each, printed as Assertion and Reason. While answering these questions, you are requested to choose any one of the following four responses.

A. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
B. If both Assertion and Reason are true but reason is not the correct explanation of Assertion.
C. If Assertion is true but Reason is false.
D. If both Assertion and Reason are false.

1. Assertion: Megaspore mother cell undergoes meiosis to produce four megaspores.
   Reason: Megaspore mother cell and megaspores both are haploid.
2. Assertion: Insects visit flowers to gather honey.
   Reason: Attraction of flowers prevents the insects from damaging the parts.
3. Assertion: 7-celled 8- nucleate and monosporic embryo sac is called polygonum type of embryo sac.
   Reason: It was discovered by Hofmeister for the first time in Polygonum.
4. Assertion: Seed disposal by wind is called as anemochory.
   Reason: The seeds are light, minute and may be winged.
5. Assertion: Ovule after fertilisation forms the fruit.
   Reason: The fruit contains diploid endosperm.
6. Assertion: Continued self-pollination generation after generation results in pure line formation.
   Reason: By continued self-pollination, plants become pure or homozygous for its characters.
7. Assertion: Cross pollination in true genetic sense within species is called xenogamy.
   Reason: When there is cross pollination, resultant hybrid is a combination of characters of two plants.
8. Assertion: The first part of the dicot embryo to appear above ground is the leaf.
   Reason: Leaves increase the size of plants.
9. Assertion: If an endosperm cell of angiosperm contains 24 chromosomes, the number of chromosomes in the cell of root will be 16.
   Reason: As the endosperm is triploid and root cells are diploid, the chromosome number in each of root cell will be 16.
10. Assertion: Some fruits are seedless or contain empty or non-viable seeds.
    Reason: They are produced without fertilisation.
11. Assertion: Red colour of flowers attracts butterflies and wasps, but not bees.
    Reason: Bees are colour-blind to red.
12. Assertion: Seeds fail to germinate at very low and high temperatures.
    Reason: Seed sown deep into the soil fails to germinate.

## SHORT ANSWER QUESTIONS.

1. Gynoecium of a flower may be apocarpous or syncarpous. Explain with the help of an Example each.
2. Mention the ploidy of the different types of cells present in the female gametophyte of an Angiosperm.

3. Name all the haploid cells present in an unfertilised mature embryo sac of a flowering plant. Write the total number of cells in it.

4. Mention one advantage and a disadvantage of a cleistogamous flower.

5. Explain the mechanism of pollination in marine /seagrass like Zostera.

6. Write the cellular contents carried by the pollen tube. How does the pollen tube gain its entry into the embryo sac?

7. Name the product of fertilisation that forms the kernel of coconut. How does the kernel differ from coconut water?

8. You are given caster and bean seeds. Which one of the two, would you select to observe the endosperm?

9. Name the type of fruit, apple is categorised under and why? Mention two other examples, which belong to the same category as apple.

10. It is said apomixes is a type of asexual reproduction. Justify.

11. If you squeeze a seed of orange, you might observe many embryos of different sizes. How is it possible? Explain.

12.Name and explain the mechanism by which the seeds from hybrid plants are developed that are able to retain the desired hybrid characters in the progeny.

## THREE MARK QUESTIONS

1. Where are the following structures present in a male gametophyte of angiosperms? Mention the function of each of them.
2. Do all pollen grains remain viable for the same length of time? Support your answer with two suitable examples.
3. Explain the different modes of pollination that can occur in a chasmogamous flower.
4. Write the differences between wind-pollinated and insect pollinated flowers. Give examples of each type.
5. Majority of angiosperms have hermaphrodite flowers, but self-pollination is discouraged by them. Explain any three outbreeding devices that they have developed to achieve it.
6. In plant breeding experiments, pistillate flowers are not emasculated, but are still bagged. Explain.
7. Differentiate between parthenocarpy and parthenogenesis. Give one example of each.
8. State what apomixis is. Comment on its significance. How can it be commercially used?
9. Apomixis resembles asexual reproduction as well as mimics sexual reproduction in plants. Explain the help of a suitable example.
10. Parthenocarpy and apomixis have been observed in some plants. Give an example of each. State a similarity and a difference observed between the two processes.

## LONG ANSWER TYPE QUESTION 5 MARKS

1. (a) Describe any two devices in a flowering plant, which prevent both autogamy and geitonogamy.
   (b)Explain the events up to fertilisation after the pollen tube enters one of the synergids in an ovule of an angiosperm
2. (a) when a seed of an orange is squeezed, many embryos, instead of one, are observed. Explain how it is possible.

(b) Are these embryos genetically similar or different? Comment.

## DIAGRAM BASED QUESTION

1. Read the following and answer any four questions from (1) to (v) given below:
   Cross pollination is the transfer of pollen grains from one flower to the stigma of a genetically different flower. It is performed with the help of an external agency which may be abiotic (Eg., wind, water) or biotic (eg.; insects, birds, bats, snails). The diagram shows the carpel of an insect pollinated flower.


i. The given diagram shows the carpel of an insect pollinated flower. What is the most likely reason for the non-germination of pollen grain Z?

(a) Pollen grains X and Y were brought to the stigma earlier, therefore, their germination inhibited the germination of pollen grain Z.

(b) Pollen grain Z was brought to the flower by wind, while pollen grains X and Y were brought to the flower by insects.

(c) Pollen grain Z lacks protrusions that allow it to adhere properly onto the stigma surface.

(d) Pollen grain Z comes from a flower of an incompatible species.

ii. Pollination by insect is called

a. entomophily

b. chiropterophily

c. anemophily

d. ornithophily

iii. Out of the following characters which one is not applicable for wind pollination

a. Stamen hang out of the flowers exposing the anthers to the wind

b. the pollen grains are tiny and light

c. the flowers are nectar less

d. the petals are brightly coloured

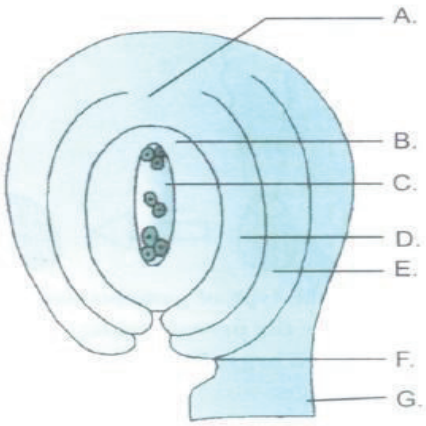
iv. How many of the above characteristics are of insect pollinated flower

a. 1 b.2 c. 3 d. 4

v. Pollen kit is generally found in

a. anemophilous flowers b. Entomophilous flowers c. ornithophilous flowers d. malacophilous flowers

2.




The diagram of an angiosperm ovule is presented above.

(a) Give the technical term for ovule.

(b) Identify and name the part that
(i) attaches the ovule to the placenta
(ii) remains as perisperm in some seeds.
(iii) forms the testa of seed.
(iv) represents the basal part of the ovule.
(v) represents the female gametophyte.

## ANSWER KEY

### MULTIPLE CHOICE QUESTION –ANSWERS

1. (D) 2. (D) 3. (C) 4. (C) 5. (C) 6. (B) 7. (C) 8. (C) 9. (B) 10. (B) 11. (D) 12. (A).

### ASSERTION –REASON TYPE QUESTIONS--ANSWERS

1.C 2.C 3.C 4.A 5. D 6.A 7.A 8.C 9.C 10.A 11.A 12.B.

### SHORT ANSWER TYPE TWO MARKS QUESTIONS –ANSWERS.

1. Apocarpous pistil:
When the carpels of a multicarpellary pistil are free, it is called an apocarpous pistil.

Eg. Michelia.

Syncarpous pistil:

When the carpels of a multicarpellary pistil are fused together, it is called a syncarpous pistil.

Eg. Papaver, brinjal.

2. (1). Antipodal cell—Haploid.
(2) Central cell—Diploid (when the two polar nuclei fuse to form a secondary nucleus)

(3). Female gamete (egg cell)—Haploid.

(4) Synergids- Haploid.

3. One female gamete, two synergids, and three antipodal cells are the haploid cells.

In total, there are seven cells in the mature embryo sac.

4. Advantage: Since cleistogamous flowers are autogamous, there is an assured seed set.

Disadvantage: Continued self-pollination leads to inbreeding depression.

5. In sea grasses like Zostera, the female flowers remain submerged in water.

The pollen grains are released inside the water.

pollen grains are long and ribbon like, they are carried passively by water

Some of them reach the stigma and achieve pollination.

6.Pollen tube carries two male gametes and the vegetative nucleus.

Pollen tube grows through the tissues of stigma and style to reach the ovary.

It enters the ovule through the micropyle and then enters the embryo sac through

The filiform apparatus of one of the synergids.

7. Primary endosperm cells form the kernel of coconut.

The kernel of coconut is the cellular endosperm, while the coconut water is the

Free-nuclear endosperm.

8. (a) Caster seeds.

(b) The development of endosperm precedes that of embryo as an adaptation

to Provide assured nutrition to the developing embryo.

9. Apple is categorised as false fruit, because the thalamus, a part of a flower other than the ovary, also contributes to fruit formation.

When the part of the flower other than the ovary becomes a part of the fruit,

The fruit is said to be a false fruit.

The other examples are strawberry and cashew.

10. Since apomixis does not involve formation and fusion of gametes, it is considered as a method of asexual reproduction.

Embryos develop from the cells of integument or nucellus involving mitotic division, apomictic, embryos are genetically similar.

11. It is a case of polyembryony, the phenomenon of occurrence of more than one embryo

In a seed.

Some of the nucellar cells surrounding the embryo sac start dividing, protrude

Into the embryo sac and develop into embryos.

12. Apomixis is the mechanism.

It refers to the form of asexual reproduction that mimics sexual reproduction and

Seeds are formed without fertilisation.

Since there will be no segregation of the hybrid characters in the progeny plants,

They will be maintained for a number of generations.

## SHORT ANSWER TYPE (3 MARK QUESTIONS )ANSWERS.

1. (a) Germ pore present in the exine, where sporopollenin is absent.
   The intine grows out through the germ pore as pollen tube

   (b) Sporopollenin forms the exine of pollen grain.

   (c)Generative cell floats in the cytoplasm of the vegetative cell of the

   Pollen grain.

   It divides mitotically to form two male gametes.

2. (a) No, the pollen grains of two different species remain viable for different periods of time.
   Eg. Pollen grains of cereals remain viable for less than 30 minutes whereas some members of Rosaceae, Leguminosae and Solanaceae retain the pollen viability for months.

   (b) In the pollen banks, pollen grains are stored in liquid nitrogen (at -196 C).

   such stored pollen grains can be used for breeding programmes whenever necessary.

3. (a) Autogamy: It refers to the transfer of pollen grains from the anther to the stigma of the same flower.
   (b) Geitonogamy: It refers to the transfer of pollen grains from the anthers of flowers to the stigma of another flower of the same plant.

   (c) Xenogamy: It refers to the transfer of pollen grain from the anther of a flower to the stigma of another flower on a different plant of the same species.

4. Wind pollinated flowers:
   The flowers are small, and not showy or fragrant

   They do not produce nectar.

   Stamens are well exposed.

   Pollen grains are light and non-sticky

   Often, they have feathery stigma

   Eg. Maize, Cannabis

   Insect pollinated flowers:

   The flowers are large, showy and fragrant.

   They produce a large quantity of nectar.

   Stamens are not exposed

   Pollen grains are sticky

   stigma is also sticky

   Eg. Yucca, Sunflower.

5.The outbreeding devices are as follows.

(1) Self incompatibility is the genetic mechanism that prevent self-pollen from

Fertilising the ovule by inhibiting pollen germination or retarding the growth of

Pollen tube.

(2) Certain plant species produce male and female flowers on different plants, i.e. the plants are Dioecious; this prevents both autogamy and geitonogamy

(3) Pollen release and stigma receptivity are not synchronised, either the anthers

Mature first or the pistil mature first

(4) The anthers and stigma of a flower are placed in such a way that the pollen

of the flower cannot fall on the stigma of the same flower.

6. (a) In plant breeding experiments, pollen from the selected male parent only, are used for pollination

To prevent contamination of the stigma by any other pollen grain, the pistillate flowers are bagged.

(b) Continued self-pollination leads to inbreeding depression; hence

To discourage self-pollination, out breeding devices are developed by flowers.

7. Parthenocarpy:
Parthenocarpy is the phenomenon of formation of fruits without fertilisation

usually seeds are not produced or not viable

Eg. Banana.

Parthenogenesis:

Parthenogenesis is the phenomenon in which the unfertilised female gamete

Or ovum develops into an adult/individual

Eg. Drones of honey bees.

8. Apomixis is a form of asexual reproduction that mimics sexual reproduction and seed are formed without fertilisation
Apomixis Is of significance in the hybrid seed industry.

If the hybrids are made into apomicts, there will be no segregation of the hybrid characters in the progeny plant

The farmers can use the hybrid seeds to raise new crops year after year and they need not buy the costly hybrid seeds.

9.Apomixis resembles asexual reproduction, as there is no formation of gametes and fertilisation and the apomictic embryos are genetically identical among

Themselves and to the parent cell.

It mimics sexual reproduction as embryos and seeds are formed.

In citrus and mango, some of the cells of nucellus around the embryo

Sac starts dividing, get pushed into the embryo sac and develops into embryos.

In members of Asteraceae, a diploid egg cell is formed without meiosis

In the megaspore mother cell, it develops without fertilisation into an Embryo.

10 Parthenocarpy is seen in banana

Apomixis is seen in Citrus, mango, some members of Asteraceae and grasses.

Similarity: -
There is no fertilisation involved in both parthenocarpy and apomixis
Difference: -
Parthenocarpy is fruit formation without fertilisation, the fruits are seedless or the Seeds are not viable
Apomixis is seed formation without fertilisation

## LONG ANSWER TYPE 5 MARK ANSWERS

1. (A) Dioecy and self-incompatibility are the two phenomenon which can prevent Both autogamy and geitonogamy.

   Dioecy is a phenomenon in which male and female flowers are produced on different plants of the same species, as in date palm and papaya.

   Self-incompatibility is a genetic mechanism that prevents the self-pollen from fertilising the ovule by inhibiting pollen germination of pollen tube growth on the pistil.

   (b) Double fertilisation:

   The pollen tube discharges two male gametes after entering one of the synergids.

   One of the male gametes fuses with the female gamete to form a zygote; this process is called syngamy

The other male gamete fuses with the secondary nucleus (formed by the fusion of two polar nuclei) to form the primary endosperm nucleus (PEN); this process is called triple fusion

2. (a) It is a case of polyembryony, i.e. the occurrence of more than one embryo in a seed. In oranges, some of the nucellar cells around the embryo sac start dividing, protrude into the embryo sac and develop into the embryos, i.e. apomictic embryos are formed without fertilisation.

   (b All the apomictic embryos are genetically similar among themselves and to the female parent as they have developed from the nucellar cells and involve only mitotic division.

The zygotic embryo in the same seed will be genetically different from these

apomictic embryos, as it has developed from the zygote, which is formed by fusion of gametes from two different parents.

## DIAGRAM BASED QUESTION -ANSWERS

1. i. d ii. a iii. d iv. a v. b
2. (a) Megasporangium (b) i. F – Hilum ii. D – Nucellu iii. E – Outer Integument iv. A – Chalaza v. C – Embryo Sac