CHAPTER

1

Sexual Reproduction in Flowering Plants

CLASS 12TH

NCERT EXERCISE AND SOLUTIONS - BIOLOGY

Q. 1. **Name the parts of an angiosperm flower in which development of male and female gametophyte take place.**

ANSWER:-

In angiosperm flower, male gametophyte (pollen grains) develops inside anther whereas female gametophyte (embryo sac) develops inside ovule.

Q. 2. **Differentiate between microsporogenesis and megasporogenesis. Which type of cell division occurs during these events? Name the structures formed at the end of these two events.**

ANSWER:-

Microsporogenesis	Megasporogenesis
In this process, pollen mother cell converts into four microspores after meiosis	In this process, haploid megaspores are developed from megaspore mother cell.
Occur inside anther	Occur inside ovule
pollen grains are obtained from it	Embryo sac are obtained from it.
All four microspores are functional	Out of four, only one megaspore is functional , rest degenerates

Meiotic type (reductional division) of cell division occurs during these events,

At the end of microsporogenesis, pollen grains are formed while after megasporogenesis, embryo sac is formed.

Q. 3. **Arrange the following terms in the correct developmental sequence: Pollen grain, sporogenous tissue, microspore tetrad, pollen mother cell, male gametes.**

ANSWER:-

Sporogenous tissue → pollen mother cell → microspore tetrad → pollen grain → male gamete.

Q. 4. With a neat, labelled diagram, describe the parts of a typical angiosperm ovule.

ANSWER:-

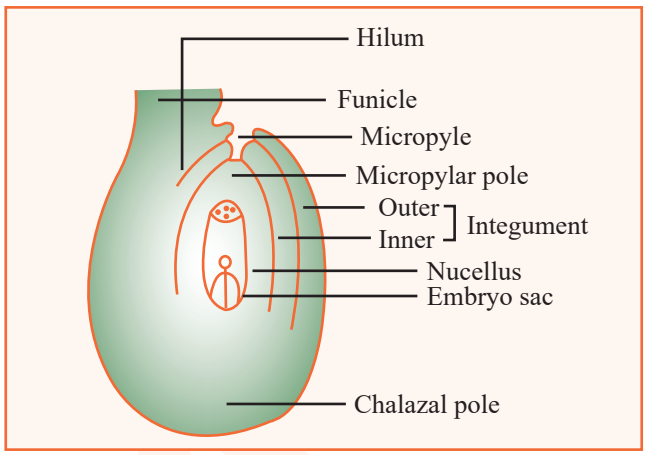
The various parts of an ovule are -

i. **Funicle** - It is a stalk-like structure which represents the point of attachment of the ovule to the placenta of the ovary.

ii. **Hilum** - It is the point where the body of the ovule is attached to the funicle

iii. **Integuments** -They are the outer layers surrounding the ovule that provide protection to the developing embryo.

iv. **Micropyle** - It is a narrow pore formed by the projection of integuments. It marks the point where the pollen tube enters the ovule at the time of fertilization.



v. **Nucellus** - It is a mass of the parenchymatous tissue surrounded by the integuments from the outside.The nucellus provides nutrition to the developing embryo. The embryo sac is located inside the nucellus

vi. **Chalazal** - It is the based swollen part of the nucellus from where the integuments originate.

Q. 5. What is meant by monosporic development of female gametophyte?

ANSWER:-

Monosporic development refers to the formation of a female gametophyte from a single functional megaspore. In angiosperms, a diploid megaspore mother cell undergoes meiosis, resulting in four haploid megaspores. Among these, only one remains functional and develops into the female gametophyte, while the other three disintegrate.

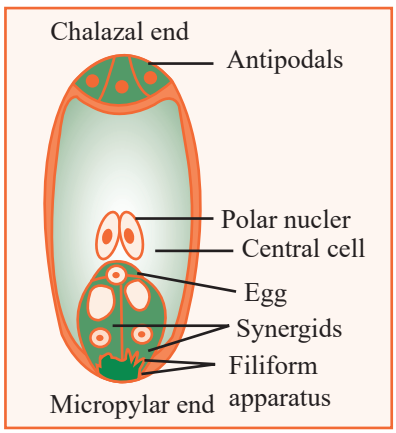
Q. 6. With a neat diagram explain the 7-celled, 8-nucleate nature of the female gametophyte.

ANSWER:-

The female gametophyte develops through mitotic divisions of the functional megaspore. The megaspore undergoes three rounds of mitosis, forming an 8-nucleate embryo sac. The steps involved in the formation of the 7-celled, 8-nucleate female gametophyte are as follows:

i. The first mitotic division produces two nuclei, which migrate to opposite ends of the cell: one to the micropylar end and the other to the chalazal end.

ii. These nuclei undergo two additional rounds of mitotic division, resulting in an 8-nucleate stage, with four nuclei at each end.



iii. At the micropylar end, three nuclei differentiate into an egg cell and two synergids.
iv. At the chalazal end, three nuclei develop into antipodal cells.
v. The remaining two nuclei, one from each end, move to the center and form the polar nuclei.
At maturity, the female gametophyte appears as a 7-celled structure.

Q. 7. What are chasmogamous flowers? Can cross-pollination occur in cleistogamous flowers? Give reasons for your answer.

ANSWER:-

Chasmogamous flowers are characterized by open petals that expose their reproductive organs, facilitating cross-pollination. In contrast, cleistogamous flowers are small and remain closed, with their reproductive organs concealed. As a result, cross-pollination is not possible in cleistogamous flowers. However, self-pollination occurs because the anther and stigma are positioned close to each other.

Q. 8. Mention two strategies evolved to prevent self-pollination in flowers.

ANSWER:-

Two strategies evolved to prevent self-pollination in flowers are:

(a) **Dichogamy:** The anther and stigma of a flower mature at different times, preventing the transfer of pollen within the same flower.
- ***Protandry:*** Anthers mature before the stigma.
- ***Protogyny:*** Stigma matures before the anthers.

(b) **Self-Incompatibility:** A genetic mechanism in which the pollen from the same flower or plant is unable to fertilize the ovule due to the inability of the pollen to germinate or grow on the stigma.

Q. 9. What is self-incompatibility? Why does self-pollination not lead to seed formation in self-incompatible species?

ANSWER:-

Self-incompatibility is a genetic mechanism in plants that prevents self-pollination and promotes cross-pollination. It occurs when the pollen from the same plant is unable to fertilize the ovule due to the recognition and rejection of genetically similar pollen by the stigma or style.

In self-incompatible species, self-pollination does not lead to seed formation because the pollen either fails to germinate on the stigma or the pollen tube's growth is inhibited before it can reach the ovule. This ensures genetic diversity by favouring cross-pollination.

Q. 10. What is bagging technique? How is it useful in a plant breeding programme?

ANSWER:-

Bagging technique involves covering the flowers of a plant with a bag made of waterproof or

breathable material, such as butter paper or plastic, before they mature. This prevents unwanted pollen from contaminating the stigma, ensuring controlled pollination.

Usefulness in plant breeding programmes:

- It protects flowers from cross-pollination by foreign or undesired pollen, maintaining genetic purity.
- It allows breeders to control pollination by manually introducing desired pollen to the flowers for hybridization. This technique ensures the success of specific breeding experiments and enhances the reliability of developing desired plant varieties.

Q. 11. What is triple fusion? Where and how does it take place? Name the nuclei involved in triple fusion.

ANSWER:-

Triple fusion is the fusion of one male gamete with two polar nuclei in the central cell of the embryo sac, resulting in the formation of a triploid (3n) primary endosperm nucleus. This process is part of double fertilization in flowering plants.

- **Location:** Triple fusion occurs in the central cell of the embryo sac.
- **Process:** After pollination, one of the two male gametes released by the pollen tube fuses with the two polar nuclei present in the central cell. This fusion forms the triploid primary endosperm nucleus, which later develops into the endosperm, a nutritive tissue for the developing embryo.

Nuclei Involved:

i. One **male gamete** (haploid, n).
ii. Two **polar nuclei** (each haploid, n) from the central cell.

Q. 12. Why do you think the zygote is dormant for some time in a fertilised ovule?

ANSWER:-

The **zygote remains dormant** for some time in a fertilized ovule to allow the formation of the **endosperm**, which provides nourishment for the developing embryo. The endosperm forms through the process of **triple fusion** and begins to develop before the zygote starts its division.

This dormancy ensures:

i. **Synchronization:** The embryo develops only after the endosperm is ready to supply nutrients.
ii. **Resource Allocation:** The plant prioritizes the establishment of the endosperm to support subsequent embryonic growth, enhancing the chances of successful seed development.

Q. 13. Differentiate between:

(a) hypocotyl and epicotyl.
(b) coleoptile and coleorhiza;
(c) integument and testa;
(d) perisperm and pericarp.

ANSWER:-

(a)

Hypocotyl	Epicotyl
The part of the embryonic axis below the cotyledons.	The part of the embryonic axis above the cotyledons.
Lies between the radicle and cotyledons.	Lies between the cotyledons and plumule.
Contributes to the elongation of the stem below the cotyledons.	Contributes to the elongation of the stem above the cotyledons.

(b)

Coleoptile	Coleorrhiza
A protective sheath covering the plumule in monocot seeds.	A protective sheath covering the radicle in monocot seeds.
Comes out of the soil.	Remains inside the soil
Has a small opening at the tip for the plumule to emerge.	Does not have an opening; the radicle grows through it by breaking it.

(c)

Integument	Testa
The protective layer of tissue surrounding the ovule	The outer seed coat that forms from the integuments of the ovule after fertilization.
Protects the ovule during development.	Protects the seed from physical damage, pathogens, and desiccation.
Pre-fertilized structure.	Post-fertilized structure.
One or two layered	One layered.

(d)

Perisperm	Pericarp
It is a part of seed	It is a part of fruit
Found in few seeds	Found in all fruits
Role in providing additional nutrients	Role in protection, nutrition and dispersal

Q. 14. Why is apple called a false fruit? Which part(s) of the flower forms the fruit?

ANSWER:-

A false fruit develops from parts other than the ovary, such as secondary structures. For example, the apple is formed from the thalamus, making it a false fruit.

Q. 15. What is meant by emasculation? When and why does a plant breeder employ this technique?

ANSWER:-

Emasculation is the process of removing the stamens from bisexual flowers before the anthers mature to prevent self-pollination. This technique is used by breeders when they aim to produce plants with specific traits. The flowers are covered with bags prior to anther maturation. Once the

anther matures, pollen is released onto the covered stigma, allowing cross-pollination with flowers that exhibit the desired characteristics.

Q. 16. If one can induce parthenocarpy through the application of growth substances, which fruits would you select to induce parthenocarpy and why?

ANSWER:-

Parthenocarpy is the process of fruit development without fertilization. Seedless fruits, like watermelon and muskmelon, are highly sought after. As a result, these varieties can be cultivated through parthenocarpy.

Q. 17. Explain the role of tapetum in the formation of pollen-grain wall.

ANSWER:-

The tapetum is the inner layer of the microsporangium and is crucial in the formation of the pollen grain walls. It supplies nutrients to the developing pollen grains and produces various amino acids, enzymes, and hormones necessary for their maturation. Additionally, the tapetum is responsible for forming the exine layer of the pollen grains.

Q. 18. What is apomixis and what is its importance?

ANSWER:-

Apomixis is the process of seed formation without fertilization, specifically without meiosis and syngamy. It is crucial in hybrid seed production, as it prevents the loss of desired traits in hybrids. Additionally, the production of hybrid seeds through conventional breeding is costly, making apomixis a valuable method for generating hybrid seeds efficiently.