EXERCISE QUESTIONS

CHAPTER- 2 SEXUAL REPRODUCTION IN FLOWERING PLANTS

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

Ans- The male gametophyte or the pollen grain develops inside the pollen chamber of the anther, whereas the female gametophyte (also known as the embryo sac) develops inside the nucellus of the ovule from the functional megaspore.

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.

Ans-

	Microsporogenesis	Megasporogenesis
(i)	It is meiotic formation of haploid microspores from diploid microspore mother cell.	It is meiotic formation of haploid megaspores from diploid megaspore mother cell.
(ii)	The arrangement of microspores in a tetrad is generally tetrahedral.	The arrangement of megaspores in a tetrad is commonly linear.
(iii)	All the four microspores of a spore tetrad are functional.	Only one megaspore of a spore tetrad is functional.

During microsporogenesis and Megas-megasporogenesis meiotic cell division occurs which results in haploid gametes – the microspores or pollen grains and megaspores.

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

Ans- The correct developmental sequence for the formation of male gametes is : Sporogenous tissue —» Pollen mother cell —» Microspore tetrad —» Pollen grain —» Male gametes.

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

Ans- An angiosperm ovule consists of the following parts:

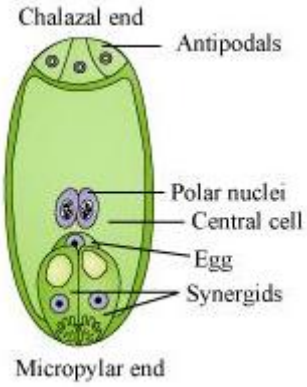
- The ovule is attached to placenta by means of a stalk called funicle or funiculus.
- The point of attachment of funiculus to the body of ovule is called hilum.
- The main body of ovule is made of parenchymatous tissue called nucellus.
- Nucellus is covered on its outside by one or two coverings called integuments and hence ovule is rightly called as integument megasporangium.
- The integuments cover entire nucellus except for a small pore at upper end, which is called the micropyle. Micropyle is formed generally by inner integument or by both integuments.
- The place of junction of integuments and nucellus is called chalaza.
- In inverted ovules (most common type), the stalk or funiculus is attached to the main body of ovule for some distance to form a ridge like structure, called- raphe.
- In the nucellus of ovule, a large oval cell is present at micropylar end, which is known as embryo sac (female gametophyte), which develops from the megaspore

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

Ans- The female gametophyte or the embryo sac develops from a single functional megaspore. This is known as monosporic development of the female gametophyte. In most flowering plants, a single megaspore mother cell present at the micropylar pole of the nucellus region of the ovule undergoes meiosis to produce four haploid megaspores. Later, out of these four megaspores, only one functional megaspore develops into the female gametophyte, while the remaining three degenerate.

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

Ans-



functional megaspore. This megaspore undergoes three successive mitotic divisions to form eight nucleate embryo sacs. The first mitotic division in the megaspore forms two nuclei. One nucleus moves towards the micropylar end while the other nucleus moves towards the chalazal end. Then, these nuclei divide at their respective ends and re-divide to form eight nucleate stages. As a result, there are four nuclei each at both the ends i.e., at the micropylar and the chalazal end in the embryo sac. At the micropylar end, out of the four nuclei only three differentiate into two synergids and one egg cell. Together they are known as the egg apparatus. Similarly, at the chalazal end, three out of four nuclei differentiates as antipodal cells. The remaining two cells (of the micropylar and the chalazal end) move towards the centre and are known as the polar nuclei, which are situated in a large central cell. Hence, at maturity, the female gametophyte appears as a 7-celled structure, though it has 8 nucleate.

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

Ans- There are two types of flowers present in plants namely Oxalis and Viola − chasmogamous and cleistogamous flowers. Chasmogamous flowers have exposed anthers and stigmata similar to the flowers of other species. Cross-pollination cannot occur in cleistogamous flowers. This is because cleistogamous flowers never open at all. Also, the anther and the stigma lie close to each other in these flowers. Hence, only self-pollination is possible in these flowers.

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

Ans- Self-pollination involves the transfer of pollen from the stamen to the pistil of the same flower. Two strategies that have evolved to prevent self-pollination in flowers are as follows:

(1) In certain plants, the stigma of the flower hasthecapability to prevent the germination of pollen grains and hence, prevent the growth of the pollen tube.It is a genetic mechanism to prevent self-pollination called **self- incompatibility**. Incompatibility may be between individuals of the same species or between individuals of different species. Thus, incompatibility prevents breeding.

(2) In some plants, the gynoecium matures before the androecium or vice-versa. This phenomenon is known as **protogyny** or **protandry** respectively. This prevents the pollen from coming in contact with the stigma of the same flower.

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

Ans- When the pollen grains of an anther do not germinate on the stigma of the same flower, then such a flower is called self-sterile or incompatible and such condition is known as self¬incompatibility or self-sterility.
The transference of pollen grains shed from the anther to the stigma of the pistil is called pollination. This transference initiate the process of seed formation. Self-pollination is the transfer of pollen grain shed from the anther to stigma of pistil in the same flower. But in some flower self¬pollination does not lead to the formation of seed formation because of the presence of same sterile gene on pistil and pollen grain.

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

Ans- It is the covering of emasculated flowers (removal of anthers in bud condition from a bisexual flower by a bag of butter paper or polythene in their bud condition i.e., before anthesis) to prevent contamination of its stigmas with unwanted pollens. When the stigmas of emasculated flowers mature the bags are removed, stigmas are dusted with pollen grains of desired male . plants by means of a presterilized brush and flowers are rebagged till fruit develop. This technique is mainly used in artificial hybridization. Plant breeders often use this technique to prevent the contamination of stigma of the flowers from unwanted pollen grains.

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

Ans- Triple fusion is the fusion of the male gamete with two polar nuclei inside the embryo sac of the angiosperm.

This process of fusion takes place inside the embryo sac.

When pollen grains fall on the stigma, they germinate and give rise to the pollen tube that passes through the style and enters into the ovule. After this, the pollen tube enters one of synergids and releases two male gametes there. Out of the two male gametes, one gamete fuses with the nucleus of the egg cell and forms the zygote (syngamy). The other male gamete fuses with the two polar nuclei present in the central cell to form a triploid primary endosperm nucleus. Since this process involves the fusion of three haploid nuclei, it is known as triple fusion. It results in the formation of the endosperm.

One male gamete nucleus and two polar nuclei are involved in this process.

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

Ans- The zygote after a period of rest develops into embryo. Most zygotes remain dormant till certain amount of endosperm forms. They do so, to provide assured nutrition to the developing embryo.

13. Differentiate between: (a) hypocotyl and epicotyl; (b) coleoptile and coleorrhiza; (c) integument and testa; (d) perisperm and pericarp.

Ans- (a)

	Hypocotyl	**Epicotyl**
1.	The portion of the embryonal axis below the level of cotyledons is called the hypocotyl.	The portion of the embryonal axis above the level of cotyledons is called epicotyl.
2.	It terminates at its lower end in the radicle or root tip covered with a root cap.	It terminates with the plumule.
3.	In epigeal germination, the hypocotyl elongates so that the cotyledons come out of the soil.	In hypogeal germination, the epicotyl elongates so that the cotyledons remain in the soil.

(b)

	Coleoptile	**Coleorrhiza**
1.	It is a conical protective sheath over the epicotyl bearing the shoot apex and leaf primordia.	It is a protective sheath over the radicle and root cap.
2.	It has a terminal pore for the emergence of the first leaf.	It is a solid structure.

3.	It comes out of the soil.	It remains inside the soil.
4.	It protects the plumule during its emergence from the soil.	It does not protect the radicle during its passage into the soil.
5.	It grows much beyond the grain.	It stops growing after its emergence from the grain.
6.	It emerges from the soil, turns green in colour and carries out photosynthesis.	It remains inside the soil and is non-green

(c)

	Integument	**Testa**
1.	It is the protective covering of the ovule.	It is the protective covering of the seed.
2.	It is a thin covering.	It is a thick covering.
3.	The cells are living.	The cells are dead.
4.	Sclereids are absent in the cells.	Sclereids are present in abundance in the cells.
5.	It arises from the chalazal end of the ovule.	It is derived from the outer integument of the ovule.
6.	It is a pre-fertilisation structure.	It is a post-fertilisation structure.

d)

	Perisperm	**Pericarp**
1.	It represents residual persistent nucellus.	It represents the fruit wall derived from the ovary wall.
2.	It is part of the seed.	It is part of the fruit.
3.	It is generally dry.	It can be dry or fleshy.
4.	It is often non-functional for the seed.	It acts like a protective covering, helps in dispersal and providing nutrition.
5.	It is present only in few seeds.	It is found in all fruits.

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

Ans- Botanically ripened ovary is called a true fruit. The fruits in which thalamus and other floral parts develop along with the ovary are called false fruits. For example – apple, strawberry, cashew etc. In apple the main edible portion of the fruit is the fleshy thalamus. Ovary forms the fruit after fertilization or without fertilization in parthenocarpic fruits

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

Ans- Emasculation is the removal of stamens mainly the anthers from the flower buds before their dehiscence. This is mainly done to avoid self-pollination. Emasculation is one of the measures in the artificial hybridization. Plant breeders employed this technique to prevent the pollination within same flower or to pollinate stigmas with pollens of desired variety.

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

Ans- Parthenocarpy is the process of developing fruits without involving the process of fertilization or seed formation. Therefore, the seedless varieties of economically important fruits such as orange, lemon, water melon etc. are produced using this technique. This technique involves inducing fruit formation by the application of plant growth hormones such as auxins.

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

Ans- Tapetum is the innermost layer of the microsporangium. It provides nourishment to the developing pollen grains. During microsporogenesis, the cells of tapetum produce various enzymes, hormones, amino acids, and other nutritious material required for the development of pollen grains. It also produces the exine layer of the pollen grains, which is composed of the sporopollenin.

18. What is apomixis and what is its importance?

Ans- Apomixis is a mode of asexual reproduction that produces seeds without

fertilization, e.g.- some species of Asteraceae and Grasses. This method is important in hybrid seed industry. Hybrids are extensively cultivated for increasing productivity. But the main drawback is that the hybrid seeds are to be produce every year because the seeds of the hybrid plants da not maintain hybrid characters for longer period due to segregation of characters. This can be avoided if apomixis can be introduced in hybrid seeds. For this reason scientists are trying hard to identify genes for apomixis.