SEXUAL REPRODUCTION IN FLOWERING PLANT

(A) NCERT QUESTIONS & SOLUTIONS

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

Ans. Development of male and female gametophytes takes place in anther and ovary Respectively.

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.

S.No	Microsporogenesis	Megasporogenesis
1	In this process, haploid microspore are formed from diploid mother cell or pollen mother cells (MMC or PMC).	In this process, haploid megaspore are formed from diploid mother cell (MMC).
2	It occurs inside the microsporangium or pollen sac of an anther.	It occurs inside the nucellus of ovule or megasporangium.
3	There are many microspore mother cells in a microsporangium.	There are generally a single megaspore mother cell in a megasporangium.
4	The four microspore formed from a single microspore mother cell are generally arranged in a tetrahedral structure.	The four megaspore formed from a megaspore mother cells are arranged in the form of a linear tetrad.
5	All the four mircrospore arranged in a tetrahedral tetrad are functional.	Only one megaspore remains functional while the other three degenerates.
6	The microspores give rise to male gametophytes.	The functional megaspore gives rise to female gametophytes.

Meiosis occurs during micro and megasporogenesis. Microspores (pollen grains) are formed at the end of microsporogenesis and female gametophyte (embryo sac) are formed at the end of megasporogenesis.

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

Ans. 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. Structure of megasporangium.

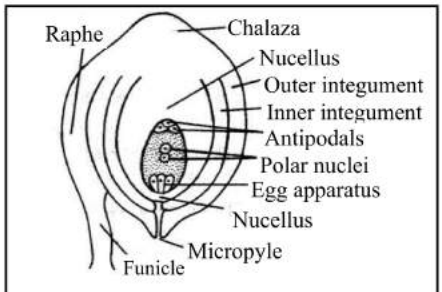


Fig:- Structure of megasporangium

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

Ans. Out of the four megaspores, three degenerate and only one remains functional which develops into a female gametophyte or embryo sac. This is called monosporic development i.e. when embryo sac develops from one single megaspore it is called monosporic embryo sac.

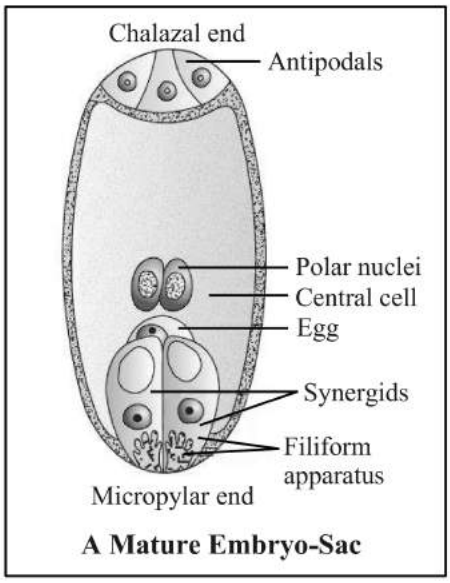
6. With a neat diagram and explain the 7-celled, 8-nucleate nature of the female gametophyte. [IMP.]

Ans. Female gametophyte or embryo sac is a small oval structure that contains a 3-celled egg apparatus, 3 antipodal cells and one binucleate central cell hence it is 7 - celled and 8 - nucleate structure.

(a) Egg apparatus: It consists of two synergids and an egg cell towards the micropylar end. The cells of egg apparatus are uninucleate. Synergids towards its micropylar end have cellular thickenings called filiform apparatus that helps in guiding the pollen tubes into the synergids

(b) Antipodal cells: Chalazal end of embryo sac contain three cells of various shapes and sizes called antipodal cells.

(c) Central cell: It is the single and largest cell which is bounded by a membrane of embryo sac. It contains two polar nuclei which later fuse to form diploid secondary nucleus. After fertilisation the central cell gets converted into triploid primary endosperm cell (PEC) which forms endosperm.



A Mature Embryo-Sac

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

Ans. Chasmogamous flowers are open flowers with exposed stamens and stigma which facilitate cross pollination.

No cross-pollination occurs in cleistogamous flowers as these flowers are closed and never open and thus no transfer of pollen from outside to stigma of the flower is possible.

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

Ans. (i) Maturation of anthers and stigma at different time periods in a bisexual flower prevents self pollination (dichogamy).

(ii) Production of unisexual flowers.

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

Ans. Self-incompatibility or self sterility is the inability of an intersexual or bisexual plant to produce viable seeds on self-pollination in spite of producing functional male and female gametes. Since fertilization does not take place, no seeds are produced. It is a genetic mechanism that prevents self pollen from fertilizing ovules by inhibiting pollen tube growth in pistil.

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

Ans. It is the covering of female plant with butter paper germ to avoid their contamination from foreign pollens during breeding programme.

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

Ans. Triple fusion is fusion of one male gamete and two polar nuclei (or secondary nucleus if the two have already fused) in the central cell of embryo sac to form primary endosperm nucleus. It takes place in the central cell of an embryo sac. Three nuclei are involved in triple fusion i.e. nuclei in the central cell one male nucleus and two polar nuclei in the central cell.

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

Ans. The zygote is dormant for sometime in a fertilised ovule because the embryo which is developed from zygote may obtain from endosperm.

13. Differentiate between: **[IMP.]**

(a) hypocotyl and epicotyl; **(b) coleoptile and (Coleorhiza)**

(c) integument and testa; **(d) perisperm and pericarp**

Ans. (a) hypocotyl and epicotyl

S.No.	Hypocotyl	Epicotyle
1.	The region of the embryonal axis that lies between the radical and the point of attachment of cotyledons is called as hypocotyle.	The region of the embryonal axis that lies between the plumule and cotyledons is called as epicotyle.
2.	Hypocotyle pushes the seed above the soil in epigeal germination.	Epicotyle pushes the plumule above the soil in hypogeal germination.
3.	It is an important component of embryonic root system.	It is an important component of embryonic shoot system.

(b) coleoptile and coleorhiza

S.No.	Coleoptile	Coleorhiza
1.	The shoot apex and few leaf Primordia are enclosed in a hollow foliar structure in epicotyl region in monocots and is called coleoptiles.	The radical and root cap are sitiated at the lower end of embryonal axis are enclosed by undifferentiated sheath called coleorhiza.
2.	It emerges from the soil turns green and carries out photosynthesis.	It remains in the soil and is non green in colour.

(c) integument and testa

S.No.	Integument	Testa
1.	It is part of pre-fertilization events.	It is part of post-fertilization events.
2.	It is the protective covering of the ovule may differentiate into inner and outer integument.	It is the protective outer covering of the seed formed from outer integument.
3.	It is thin and living in nature.	It is thick and dead in nature.

(d) perisperm and pericarp

S.No.	Perisperm	Pericarp
1.	It represent persistent remains of nucellus in the seed.	It represent the wall of fruit formed by the ovarian wall.
2.	It is a part that belongs to seed.	It is a part that belongs to fruit.
3.	It is usually dry.	It can be dry or fleshy.

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

Ans. False fruits are those fruits in which accessory floral parts also contribute to fruit formation. In apple, the thalamus also contributes to fruit formation. Therefore, it is called a false fruit. The fruit develops from the ovary of the flower.

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

Ans. Emasculation is a practice of removal of stamens/anthers before the anther dehiscence from bisexual flowers in female parent. A plant breeder employs this technique in the immature bud condition before the anthers begin to differentiate. It is required to prevent self-pollination.

Uses in plant breeding :

(i) Prevention of contamination and pollination of stigma of female flowers with foreign undesirable pollens.

(ii) Prevention of damage by animals.

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

Ans. Only fleshy fruits like orange watermelon, lemon, etc. should be selected as parthenocarpic fruit. Here seeds of fruits are irritant during consumption of seeds the fruits even more valuable. It is easy to make fruit juices, jams, etc. with seedless fruits.

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

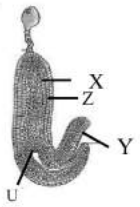
Ans. Tapetum is the innermost wall layer of a microsporangium. It nourishes the developing pollen grains and also help in the formation of wall of pollen grains. The cells of tapetum secrete Ubisch granules that provide sporopollenin and other materials for exine formation.

18. What is apomixis and what is its importance?

Ans. Apomixis is a type of asexual reproduction that mimics sexual reproduction to form seeds without fertilisation. In apomictic seeds parental characters are maintained in the progeny/offspring as there is no meiosis or segregation of characters. If desired hybrid seeds are made apomictics the farmers can keep on using the hybrid seeds to rise new crops year after year.

(B) PREVIOUS YEAR QUESTIONS

1. Select the option that shows the correctly identified 'U', 'X', 'Y' and 'Z' in a developing dicot embryo. **[CBSE 2023]**



(1) X-Plumule (2n), Y-Suspensor (n), Z-Cotyledon (2n), U-Radicle (2n).

(2) X-Plumule (2n), Y-Suspensor (2n), Z-Radicle (2n), U-Cotyledon (2n).

(3) X-Suspensor (2n), Y-Cotyledon (2n), Z-Radicle (2n), U-Plumule (2n).

(4) X-Cotyledon (2n), Y-Radicle (n), Z-Plumule (n), U-Suspensor (n).

Ans. (3) X-Suspensor (2n), Y-Cotyledon (2n), Z-Radicle (2n), U-Plumule (2n).

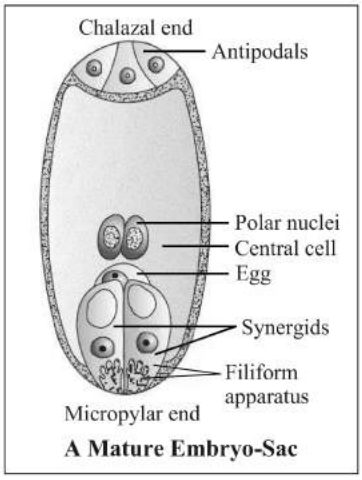
2. (i) Explain the monosporic development of embryo sac in the ovule of an angiosperm.

(ii) Draw a diagram of the mature embryo sac of an angiospermic ovule and label any four parts in it. **[CBSE 2023]**

Ans. (i) The process of formation of megaspores from megaspore mother cell (MMC) is called megasporogenesis.

- ❖ The four haploid megaspores are generally arranged in linear tetrad.
- ❖ In a majority of flowering plants the lower most or chalazal megaspore remains functional out of four megaspores and the other three which lie towards the micropyle degenerate.
- ❖ The functional megaspore produces female gametophyte (embryo sac).
- ❖ This method of embryo sac formation from a single megaspore is termed monosporic development.

(ii)



A Mature Embryo-Sac

3. One of the major approaches of crop improvement programme is Artific . Explain the steps involved in making sure that only the desired pollen grain pollinate the stigma of a bisexual flower by a plant breeder. [CBSE 2023]

Ans. Artificial hybridisation is one of the major approaches of crop improvement programme. In such crossing experiments it is important to make sure that only the desired pollen grains are used for pollination and the stigma is protected from contamination (from unwanted pollen).

This is achieved by emasculation and bagging techniques.

- If the female parent bears bisexual flowers, removal of anthers from the flower bud before the anther dehisces using a pair of forceps is necessary. This step is referred to as emasculation.
- Emasculated flowers have to be covered with a bag of suitable size, generally made up of butter paper, to prevent contamination of its stigma with unwanted pollen. This process is called bagging.
- When the stigma of bagged flower attains receptivity, mature pollen grains collected from anthers of the male parent are dusted on the stigma, and the flowers are rebagged, and the fruits allowed to develop.

4. The hilum in a typical angiospermic ovule represents the junction between:-

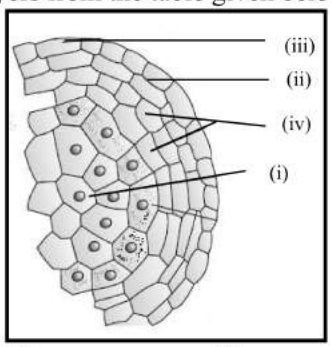
[CBSE Term-I 2022]

(1) Integuments and the embryo sac. (2) Embryo sac and the nucellus

(3) Body of the ovule and the funicle (4) Nucellus and the fumicle

Ans. (3) Body of the ovule and the funicle

5. In the given diagram of a transverse section of a young anther. Choose the labellings showing the correct placement of the wall layers from the table given below. **[CBSE Term-I 2022]**



(i)	(ii)	(ii)	(iii)
(1) Epidermis	Middle layers	Tapetum	Endothecium
(2) Tapetum	Endothecium	Epidermis	Middle layers
(3) Endothecium	Tapetum	Middle layers	Epidermis
(4) Middle layers	Epidermis	Endothecium	Tapetum

Ans. (2) (i) Tapetum (ii)Endothecium (iii)Epidermis (iv) Middle layers

6. The term used for the embryo entering into the state of inactivity as the seed mature is:-

[CBSE Term-I 2022]

(1) Quiescent (2) Parthenogenesis (3) Parthenocarpy (4) Dormancy

Ans. (4) Dormancy

7. The ploidy of the apomictic embryo developed from the integument cells and megaspore mother cell without reduction division respectively will be:– **[CBSE Term-I 2022]**

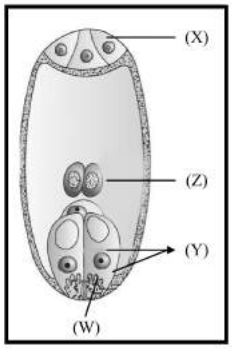
(1) 2 n and 2n (2) n and n (3) 2n and n (4) 3n and 2n

Ans. (1) 2 n and 2n

8. Given below is a diagrammatic representation of a mature embryo sac of a t plant.

[CBSE Term-I 2022]

Choose the option showing the correct labellings for the parts W, X, Y and Z from the table given below.

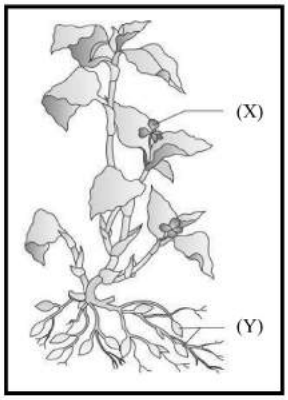


	W	X	Y	Z
(1)	Micropylar end	Antipodals	Synergids	Central cell
(2)	Chalazal end	Antipodals	Central cell	Synergids
(3)	Micropylar end	Synergids	Central cell	Antipodals
(4)	Chalazal end	Synergids	Central cell	Antipodals

Ans. (1) (W) Micropylar end (X) Antipodals (Y) Synergids (Z) Central cell

9. Given below is a figure of an angiosperm plant showing two different types of flowers 'X' and 'Y' and the possible type of pollination in them:

[CBSE Term-I 2022]



Select the correct option for the flower (X) and flower (Y) and the possible type of pollination from the given table:

	Flower X	Flower Y
(1)	Chasmogamous, assured seed set	Cleistogamous, cross pollination
(2)	Cleistogamous self/cross pollination	Chasmogamous, assured seed set
(3)	Chasmogamous self/cross pollination	Cleistogamous, self-pollination
(4)	Cleistogamous self-pollination only	Chasmogamous, cross pollination only

Ans. (3) Flower X - Chasmogamous self/cross pollination
Flower Y - Cleistogamous, self-pollination

10. An undifferentiated sheath covering the root cap of a monocotyledonous embryo is:

[CBSE Term-I 2022]

(1) Scutellum (2) Coleorhiza (3) Coleoptile (4) Epiblast

Ans. (2) Coleorhiza

11. Why does endosperm development precede embryo development? [CBS]

Ans. The cells of endosperm are filled with reserve food materials and are used for the nutrition of the developing embryo.

12. How many meiotic divisions are required to produce 76 seeds in a Guava fruit?

[CBSE IMP-Question]

Ans. 95

13. How does pollination take place in water hyacinth and water lily? [CBSE IMP-Question]

Ans. In water hyacinth and water lily, the flowers emerge above the level of water and are pollinated by insects or wind as in most of the land plants.

14. Self-pollination is fully ensured if **[CBSE 2020]**

(1) The flower is bisexual. (2) The style is longer that the filament.

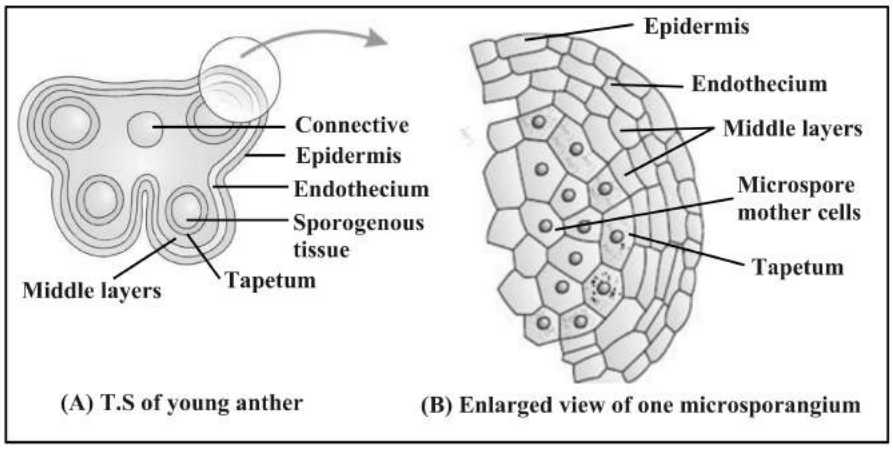
(3) The flower is cleistogamous. (4) The time of pistil and anther maturity is different.

Ans. (3)

15. Draw a schematic transverse section of a mature anther of an angiosperm. Label its epidermis, middle layers, tapetum, endothecium, sporogenous tissue and the connective.

[CBSE 2018,20]

Ans.



16. Differentiate between wind pollinated and insect pollinated flowers. [CBSE 2020]

Ans.

Wind Pollinated	Insect Pollinated
Wind Pollinated flowers do not have nectar.	Insect Pollinated flowers are rich in nectar to attract insects.
The petals are dull and does not attract the insects.	The petals of these flowers are very colourful and attractive.
They do not have any scent.	The scent of these flowers are another factor that attracts insects.
The pollen grains are non-sticky, light.	The pollen grains are sticky.
Stigma is feathery, to catch the pollen grain.	Stigma is non-feathery and sticky.

17. Some flowers, selected for artificial hybridization, do not require emasculation b essential for them. Give a reason. **[CBSE 2019]**

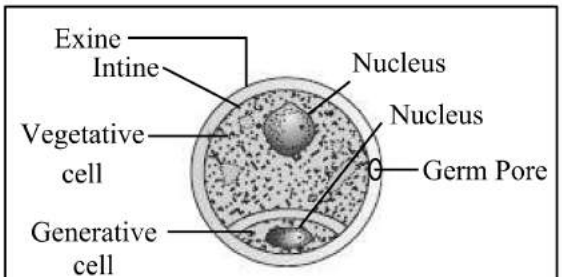
Ans. As some flowers are unisexual, to prevent contamination of its stigma with unwanted pollen grains.

18. Write any two ways by which apomictic seeds may be developed in angiosperms. **[CBSE 2019]**

Ans.
- ☛ Develops from a diploid egg cell (formed without reduction division) which grows into an embryo without fertilization.
- ☛ Develops from nuclear cell which divides and protrudes into the embryo sac and develops into an embryo

19. Draw a labeled diagram of a mature male gametophyte of an angiosperm. **[CBSE 2019]**

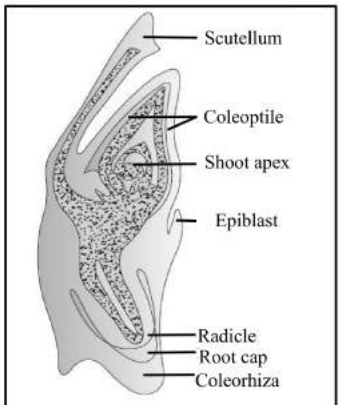
Ans.



Mature male gametophyte

20. Draw a diagram of L.S. of an embryo of grass and label any six parts. **[CBSE 2019]**

Ans.

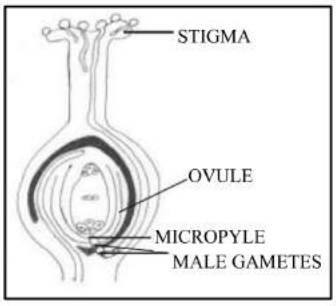


L.S. of an embryo of grass

21. (a) Draw a diagram of Pistil showing pollen tube growth in angiosperm and label (i) Stigma (ii) male gametes (iii) micropyle and (iv) Ovule.

(b) Write the function of micropyle. **[CBSE 2018]**

Ans. (a)



(b) The pollen tube enters the ovule through micropyle, it facilitates the entry of oxygen and water for seed germination.

22. State one difference and one similarity between geitonogamy and xenogamy. [CBSE 2018]

Ans. Difference - In geitonogamy pollen grains from one flower are transferred to the stigma of anther flower on the same plant whereas in xenogamy the pollen grains are transferred to the stigma of a flower on another plant (of the same species) genetically similar, genetically different.

Similarity - In both types of pollination pollen grains from the anther are transferred to the stigma of another flower of the same species.

23. Explain any three devices developed in flowering plants to discourage self pollination and encourage cross pollination. [CBSE 2018]

Ans. Pollen release & stigma receptivity not synchronised / hence the maturity of stigma and pollen are different /Protandry / Protogyny- Anther and Stigma are placed at different positions so that pollen cannot come in contact with stigma of the same flower.

☛ Self incompatibility/ Self sterility.

☛ Production of unisexual flowers.

24. Write one advantage and one disadvantage of cleistogamy to flowering plants. [CBSE 2018]

Ans. Advantage - Assured seed set / maintain purelines.

Disadvantage - No variation / only parental characters are preserved / it can lead to inbreeding depression

25. If the meiocyte of a maize plant contains 20 chromosomes, write the number of chromosomes in the endosperm and embryo of the maize grain and give reasons in support of your answer. [CBSE 2018]

Ans. Endosperm = 30, Embryo = 20

Diploid meiocyte (20 chromosomes) form haploid gametes (10 chromosomes) Two haploid gametes fuse to form diploid (20) zygote which develops into a (diploid = 20) embryo / syngamy of two haploid gametes to form a diploid zygote.

One haploid gamete (chromosome 10) fuses with two polar nuclei (chromosome 10 + 10) to form (triploid - 30) endosperm nuclei (which divides to form endosperm) / Triple fusion of three haploid nuclei (1 gamete + 2 polar nuclei) to form a triploid endosperm.

26. (a) Describe the process of microsporogenesis upto the formation of a microspore.

(b) Write the function of 'germ pore' in a pollen grain of an angiosperm. [CBSE 2018]

Ans. (a) The process of formation of microspore from a pollen mother cell by meiosis is called **micro sporogenesis.**

- ☛ Each cell of the sprogenous tissue in microsporangium acts as potential PMC (Pollen mother cell/ or micro sporemother cell.)
- ☛ PMC under goes meiotic divisions to form cluster of four cells called microspore tetrad.
- ☛ On maturity, the anther dehydrates and the microspores separate from each other to form pollen grains.

Sporogenous tissue $\xrightarrow{Mitosis}$ Microspore mother cell $\xrightarrow{Meiosis}$ microspore tetrad

(b) Germ pores allow the germinating / growing pollen tube with contents of the pollen grain/ male gametes + vegetative cell to come out of the pollen grains

(C) MULTIPLE CHOICE QUESTIONS

1. A typical angiosperm anther is _____ and _____.

(1) Bilobed, tetrasporangiate (2) Bilobed, monosporangiate

(3) Bilobed, bisporangiate (4) Tetralobed, monosporangiate

Ans. (1) Bilobed, Tetrasporangiate

2. The innermost wall layer of anther

(1) Is nutritive in function (2) Helps in dehiscence of anther

(3) Is haploid and protective in function (4) Forms microspores

Ans. (1) Is nutritive in function

3. The process of formation of microspores from a pollen mother cell is called

(1) Megasporogenesis (2) Microsporogenesis

(3) Megagametogenesis (4) Microgametogenesis

Ans. (2) Microsporogenesis

4. The pollen grain represents

(1) Male gamete (2) Male gametophyte

(3) Microsporophyll (4) Microsporangium

Ans. (2) Male gametophyte

5. The most resistant organic material known which makes up the outermost layer of pollen wall is

(1) Pectin (2) Cellulose (3) Sporopollenin (4) Lignin

Ans. (3) Sporopollenin

6. The ploidy level of nucellus and female gametophyte respectively is

(1) n, n (2) n, 2n (3) 2n, n (4) 2n, 2n

Ans. (3) 2n,n

7. The number of nuclei in a mature embryo sac are

(1) Eight (2) Seven (3) Six (4) Four

Ans. (1) Eight

8. The largest cell of the mature embryo sac is

(1) Antipodal cells (2) Synergids (3) Central cell (4) Egg cell

Ans. (3) Central cell

9. The structures which guide the pollen tube into synergid is

(1) Antipodals (2) Germ pore (3) Aril (4) Filiform apparatus

Ans. (4) Filiform apparatus

10. Geitonogamy is

(1) Genetically autogamous (2) Ecologically autogamous

(3) Genetically allogamous (4) Functionally autogamous

A lly autogamous

11. Which of the following plant provides safe place to insect for laying eggs?

(1) *Sage plant* (2) *Amorphophallus* (3) *Ophrys* (4) Mango

Ans. (2) *Amorphophallus*

12. Production of seed without fertilization is called

(1) Parthenocarpy (2) Parthenogenesis (3) Apomixis (4) Apogamy

Ans. (3) Apomixis

13. Examples of water pollinated flowers are

(1) *Zostera, Lotus, Water lily* (2) *Lotus, Vallisneria, Hydrilla*

(3) *Potamogeton, Vallisneria, Lotus* (4) *Vallisneria, Hydrilla, Zostera*

Ans. (4) *Vallisneria, Hydrilla, Zostera*

14. The central cell after triple fusion becomes the

(1) PEC (2) PEN (3) Endosperm (4) Embryo

Ans. (1) PEC

15. Choose the correct option w.r.t. the function of the germ pore.

(1) It allows growth of pollen tube (2) It allows water absorption in seed

(3) It helps dehiscence of pollen grain (4) More than one option is correct

Ans. (1) It allows growth of pollen tube

16. The thin and continuous wall layer of pollen is

(1) Exine (2) Intine (3) Germ pore (4) Endothecium

Ans. (2) Intine

17. The two-celled stage of mature pollen grain consists of

(1) Vegetative cell, generative cell (2) Vegetative cell, one male gamete

(3) Two male gametes (4) Generative cell, one male gamete

Ans. (1) Vegetative cell, generative cell

18. In 40% angiosperms, the pollen grains are shed at

(1) Four-celled stage (2) Three-celled stage (3) Two-celled stage (4) Five-celled stage

Ans. (2) Three-celled stage

19. Pollen allergy is caused by pollens of

(1) Rose (2) *Clematis* (3) *Parthenium* (4) *Sunflower*

Ans. (3) *Parthenium*

20. The pollen viability period of rice and pea respectively, is

(1) 30 minutes and several months (2) Several months and 30 minutes

(3) Few days and few months (4) Few days in both the cases

Ans. (1) 30 minutes and several months

(D) ASSERTION – REASON QUESITONS

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

(1) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(2) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(3) If Assertion is true but Reason is false.

(4) If both Assertion and Reason are false.

1. **Assertion :** Pollen mother cells (PMCs) are the first male gametophytic cells.
Reason : Each PMC gives rise to two pollens.

Ans (4)

2. **Assertion:** Gynoecium consists of pistil.
Reason: It represents the male reproductive part in flowering plants.

Ans (3)

3. **Assertion:** Flowers are the structures related to sexual reproduction in flowering plants.
Reason: Various embryological processes of plants occur in a flower.

Ans (1)

4. **Assertion:** A typical microsporangium of angiosperms is generally surrounded by four wall layers.
Reason: The outer three wall layers perform the function of protection and help in dehiscence of anther to release the pollen.

Ans (2)

5. **Assertion:** Exine of a pollen grain is made up of sporopollenin which are resistant to high temperatures, strong acids or alkali as well as enzymatic degradation.
Reason: Sporopollenins are absent in the region of germ pores.

Ans (2)

6. **Assertion:** An angiospermous flower represents the modified condensed shoot which performs the functions of sexual reproduction.
Reason: The fertile leaves of the shoot become modified into microsporophylls and magasporophylls which bear ovules and anthers respectively.

Ans (3)

7. **Assertion:** In angiosperms, the male gametophyte is the pollen grain.
Reason: Pollen grain contains stigma, style and ovary.

Ans (3)

8. **Assertion:** Tapetum helps in the dehiscence of microspores from tetrad.
Reason: It shows callose activity.

Ans (1)

9. **Assertion:** Megaspore mother cell undergoes meiosis to produce four haploid gametes.
Reason: Megaspore mother cell is $2n$, meiosis gives haploid structure.

Ans (1)

10. **Assertion:** Megaspore mother cell undergoes meiotic division.
Reason: All four megaspores form female gametophyte.

A

(E) VERY SHORT ANSWER QUESTIONS

1. **The diploid number of chromosomes in an angiospermic plant is 16. What will be the number of chromosomes in its endosperm and antipodal cells ?**

Ans. Endosperm - 24 chromosomes, Antipodals - 8 chromosomes.

2. **State the reason why pollen grains lose their viability when the tapetum in the anther malfunctioning.**

Ans. Lack of nourishment for the developing pollen grain due to malfunctional tapetum.

3. **Can a plant flowering in Mumbai be pollinated by pollen grains of the same species growing in New Delhi ? Provide explanations to your answer.**

Ans. Yes, By artificial means (any relevant explanation)

4. **How many microsporangia are present in a typical anther of an angiosperm?**

Ans. Four

5. **Name the part of the flower which the tassels of the corn-cob represent.**

Ans. Style and stigma.

6. **Write the function of coleoptile.**

Ans. It protects the plumule of the monocot embryo.

7. **Name the part of gynoecium that determines the compatible nature of pollen grain.**

Ans. Stigma

8. **What is shield-shaped single cotyledon of monocots called?**

Ans. Scutellum

9. **Who discovered double fertilisation in agiosperms?**

Ans. S.G. Nawaschin (1897) discovered double fertilisation in angiosperms.

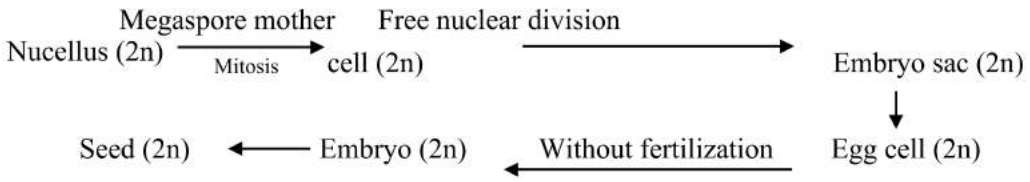
10. **Name a plant is which dichogamy is found.**

Ans. *Magnolia*

(F) SHORT ANSWER QUESTIONS

1. How do plants produce seeds through apomixis?

Ans.



2. Why do moss plants produce very large numbers of male gametes? Provide one reason. What are these gametes called?

Ans. To ensure the fertilization of egg cell, because it depend on water. High numbers of male gametes confirm the continuity of life. These gametes are called as antherozoid.

3. Explain the role of tapetum in the formation of pollen –grain wall.

Ans. The tapetum forms ubsich bodies sporollenin, which participate in the formation of outer hard layer of pollen grain, called exine. Tapetum also deposits compatibility proteins in exine as well as pollen –kitt in insect pollinated pollen grains.

4. Geitonogamous flowering plants are genetically autogamous but functionally pollinated. Justify.

Ans. In these plants male and female flowers are present on same plant but different branches. Pollination occur in between these male and female flowers by medium. So, functionally cross pollination. Genetically pollen grain belongs to the same plant so it is genetically autogamous.

5. Differentiate between Parthenocarpy and Parthenogenesis. Give one example of each.

Ans.

S.No.	Parthenocarpy	Parthenogenesis
1	Formation of fruit without fertilization	New organism develops without fertilization
2	-e.g. banana / grapes / any other	e.g. Drones /rotifers/male honey bee / turkey

6. A single pea plant in your kitchen garden produces pods with viable seeds, but the individual papaya plant does not. Explain.

Ans. **Pea-** flowers of pea plants are bisexual, monoecious / self pollinated (to produce pods with viable seeds)

Papaya- Dioecious plant / unisexual plant bearing male and female flowers on separate plants, unable to produce viable seeds as there is no cross pollination / it could be a male plant which is unable to produce fruit and seeds

(G) LONG ANSWER QUESTIONS

1. As a senior biology student you have been asked to demonstrate to the students of secondary level in you school, the procedure(s) that shall ensure cross-pollination in a hermaphrodite flower. List the different steps that you would suggest and provide reasons for each one of them.

Ans. The following steps would be followed :

(i) Emasculation or removal of anthers from the flower bud, before the anther dehisce, to avoid self pollination.

(ii) Bagging, to prevent contamination of its stigma with unwanted pollen grains.

(iii)Rebagging, the stigma of the mature ovary are dustred with desired pollen grains and rebagged to allow the fruit to develop.

2. (a) Why both wind water pollinated flowers are not very colourful and do not produce nector.

(b) How do flowers reward their insect pollinators? Explain.

(c) Write the characteristics feature of anther, pollen and stigma of wind pollinated flowers.

Ans. (a) Because there pollinator are abiotic (water and wind) so that do not required any substrate for attraction of water and wind.

(b) Insect pollinators are rewarded in following ways:

- The flowers offer floral reward like nector and pollen grain.
- In some species floral reward provided safe place to laying egg.

(c) The characteristics of wind pollinated flowers are:

- Pollen grains are light in weight, non sticky, dry and winged, so that they can be easily transported.
- Well –exposed stamens for easy dispersal of pollen grains in the wind.
- The stigma is sticky, large, feathery to trap the pollen grains in air.
- Numerous flower are packed together to form inflorescence.
- The flowers are small and inconspicuous.

3. A flower of brinjal plant following the process of sexual reproduction procedure 360 viable seeds. Answer the following questions giving a reasons :

(a) How many ovule minimally involved?

(b) How many megaspore mother cells are involved?

(c) What is the minimum number of pollen grains that must land on stigma for pollination?

(d) How many male gametes are involves in the above case?

(e) How many microspore mother cells must have undergone reduction division prior to dehiscence of anther in the above case?

Ans. (a) 360 ovules are involved. One ovule after fertilization forms one seed.

(b) 360 MMC. Each MMC form four megaspore out of which only one remains functional.

(c) 360 pollen grains .One pollen grains participate in fertilization of one ovule.

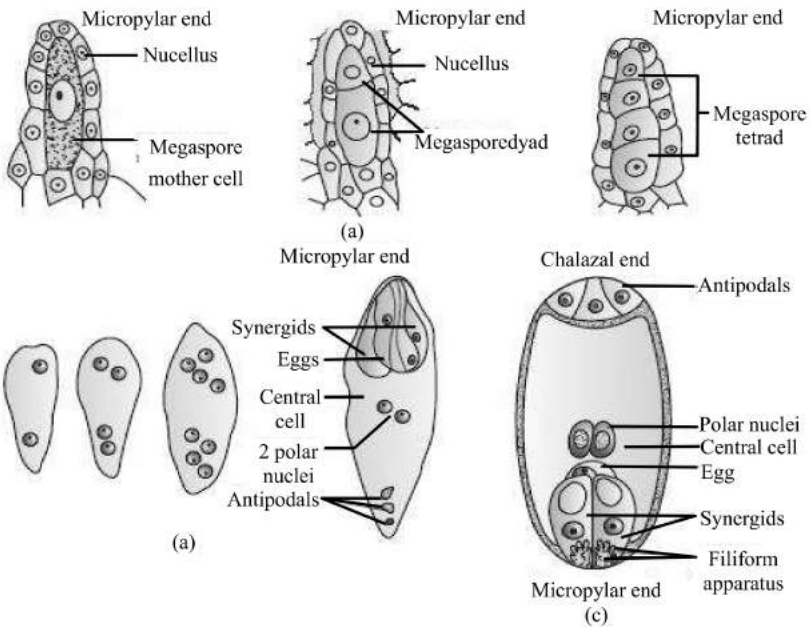
(d) 720 male gametes are involved. Each pollen grains carries two male gametes (which participate in double fertilization) **(360 × 2 = 720)**

(e) 90 MMC undergoes reduction division. Each microspore mother cells meiotically divided to form four pollen grains. **(360 / 4 = 90)**

4. Describe the process of megasporogenesis upto fully developed embryo sac formation in an angiosperm.

Ans. A single large cell of nucellus with dense cytoplasm and prominent nucleus differentiated as megaspore mother cell (MMC), in the micropylar region, the megaspore mother cell undergoes meiosis to form 4 megaspores, 3 cells degenerates and one is functional. Functional megaspore undergoes three successive mitotic divisions, to develop 8 nucleated (7 celled) embryo sac, (3 antipodals, one egg cell (female gamete), 2 synergids, two polar nuclei.)

For the above explanation the following diagram can be considered



(a) - Parts of the ovule showing a large megaspore mother cell to tetrad

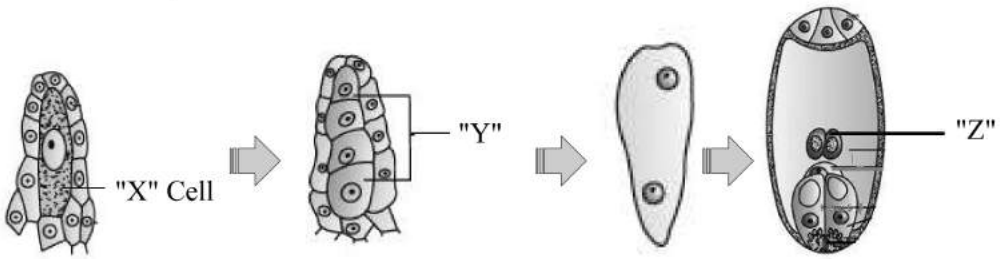
(b) - 2, 4 and 8 nucleate of embryo sac and mature embryo sac

(c) A diagrammatic representation of the mature embryo sac

(H) CASE STUDY BASED QUESTION

1. Study the following and answer the questions given below :

Study the given case carefully related to the gametogenesis in angiosperm plants and given the answer of asked questions.



(i) Out the right labelling for X, Y and Z into given process of gametogenesis.

Ans. (i) X - megaspore mother cell

Y - Megaspore tetrad

Z - Polar nuclei

(ii) How many meiotic and mitotic division are required for complete given gametogenesis process?

Ans. Meiotic and 3 Mitotic division

(iii) How many nucleus and cells are present in a typical mature angiosperm endosperm?

Ans. 8 nucleus, 7 cells

(iv) State the function of filiform apparatus found in mature embryo sac of an angiosperm.

Ans. Guiding the entry of pollen tubes up to the synergids.

2. Study the following and answer the questions given below:

The given below are types of pollination, study it and given the answer of asked question.

Subject-1

Subject-2

(i) What are appropriate terms for method X and Y of subject-1 and subject-2 re

Ans. (i) X → Geitonogamy, Y → Xenogamy,

(ii) Differentiate between geitonogamy and xenogamy.

Ans.

Geitonogamy	Xenogamy
Transfer of pollen grains from anther of one flower to the stigma of another flower on **"Same Plant".**	Transfer of pollen grains from anther of one flower to stigma of another flower of **a. different plant**.

(iii) Out of many Papaya plants growing in your garden, any a few bear fruits. Give reason.

Ans. The individual papaya plant is prevented from both autogamy and geitonogamy. In this plants male and female flowers are present on different plants, eg., → each plants is either male or female.

(iv) If the plant - A and plant - B are belong from the grass family, than which of the following will be work as pollination agent?

Ans. Wind

3. Read the following and answer the questions given below:

The gynoecium represents the female reproductive part of the flower. The gynoecium may consist of a single or more than one pistil. They may be fused or may be free. The placenta is located inside the ovarian cavity. Megasporangium (ovule) consists of a small structure attached to the placenta by a stalk called a funicle. The body of the ovules fuses with a funicle in the region called hilum. The nucleus is located in the embryo sac. The process of formation of, megaspore from the megaspore mother cell is called Megasporogenesis. Meiosis result in the formation of four megaspore.

(i) Define the term monocarpellary and Multicarpellary.

Ans. Monocarpellary - Occurrence of single pistil.
Multicarpellary - Occurrence of more than one pistil

(ii) Write the appropriate term for fused and free conditions of pistil.

Ans. Fused Pistil- Syncarpous, Free Pistil- Apocarpous

(iii) Write the name of parts of pistil.

Ans. Stigma, Style and Ovary

(iv) How many microspore mother cells must have undergone reductional division to produce 400 microspore.

Ans. 100 Microspore Mother Cells

(v) What do you means by monosporic development of female gametophytes?

Ans. Out of megaspore tetrad, one of the megaspore is functional while the other three degenerated. The functional megaspore develops into female gametophyte this is called as monosporic development.

4. Read the following and answer the questions given below:-

In angiosperm, the seed is the final product of sexual reproduction. It is described as a fertilized ovule. The seeds are formed inside the fruit. The seed consists of a seed coat, cotyledon, and the embryo axis. A mature seed is usually non - albuminous or albuminous. Integument of ovules harder as tough protective seed coat. Sometimes due to reduced water content, the general metabolic activity of the seed slows down and the seed enters a state of inactivity. In the mature plant, the fruit develops from the ovary they are called true fruit. The fruit is the result of fertilization. There are a few species in which fruit develop without fertilization banana is such an example.

(i) What are non-albuminous and albuminous seeds?

Ans. Non- albuminous- Do not have residual endosperm as it is completely consumed during embryo development. Albuminous- The seeds retains a part of endosperm as it is not completely used up during embryo development.

(ii) What is perisperm ?

Ans. In some seeds such as black pepper and beet, remnants of nucellus are persistent called as perisperm.

(iii) What is the fate of integument of ovule ?

Ans. After fertilization the integuments of ovule converted into seeds coat testa and tagmen.

(iv) What are false and parthenocarpic fruits?

Ans. False fruit- The fruits which develops rather than ovary.e.g.; Apple

Parthenocarpic fruit- The fruits which develops without fertilization.e.g.; Banana

(v) Write the appropriate term for condition of seeds where water content reduced, metabolic activity slow down and seeds enters a state of inactivity.

Ans. Dormancy