

Solution
Class 12 - Biology
sexual reproduction in flowering plants

Section A

1. **(b) Exine**
Explanation: The outer layer of the pollen grain is called exine, which is made of sporopollenin. It is a very hard natural substance having no effect on the enzyme. It helps the pollen grain to survive in adverse environmental conditions.
2. **(c) Cleistogamous**
Explanation: Some flowers do not open at all. Self-pollination is the only means of pollination in these flowers. These flowers are called Cleistogamous flower. The other flowers that open for pollination are called Chasmogomous flowers.
3. **(a) Ovary, style, and stigma**
Explanation: The pistil is a flash shaped structure having basal swollen ovary, stalk-like style, and a terminal receptive part called stigma. Ovules are formed inside the ovary of the pistil. Hence option A is correct.
4. **(c) Microspore mother cells**
Explanation: During microsporogenesis, Microspore mother cells undergo meiosis to form microspore tetrad which later differentiate in pollen grains.
5. **(a) Pistil**
Explanation: Bisexual flowers have four main parts. Pistil or carpel is located at the center followed by stamen, carpel, and sepals. Pistil contains stigma, style, and ovary.
6. **(a) Lotus**
Explanation: Lotus is an aquatic plant and has a bisexual flower. The cross-pollination occurs in Lotus by means of insects i.e. beetles.
7. **(a) Both pollen and ovules mature simultaneously**
Explanation: A chasmogamous flowers is with exposed anthers and stigma and autogamy can occur in such flowers if both pollen and ovules mature simultaneously.
8. **(d) Microsporangia**
Explanation: The anther is a bilobed structure at the tips of the stamen. Each lobe consists of two thecae. Each theca change into microsporangium. Anther forms a four-sided structure having four microsporangia in which pollen grains are formed.
9. **(d) Only (a) is correct.**
Explanation: Actinomorphic flowers have radial symmetry. It is regular in the arrangement and two equal halves are formed by any vertical division passing through the center. Hence, only the statement (a) is correct.
10. **(a) 800**
Explanation: Each microspore mother produces 4 pollen grains by reduction division. Bilobed dioecious have four microsporangia. Therefore, $50 \times 4 = 800$ male gametes are formed.
11. **(d) Nucellus**
Explanation: The ovule is surrounded by parenchymatous tissues called nucellus. The nucellus is diploid cells as it does not undergo a reduction division.
12. **(a) Synergids and antipodals**
Explanation: After entering one of the synergids, the pollen tube releases the two male gametes into the cytoplasm of the synergid. One of the male gametes moves towards the egg cell and fuses with its nucleus thus completing the syngamy. This results in the formation of a diploid cell, the zygote. The other male gamete moves towards the two polar nuclei located in the central cell and fuses with them to produce a triploid primary endosperm nucleus (PEN). As this involves the fusion of three haploid nuclei it is termed triple fusion. Since two types of fusions, syngamy and triple fusion take place in an embryo sac the

phenomenon is termed double fertilization, an event unique to flowering plants. The central cell after triple fusion becomes the primary endosperm cell (PEC) and develops into the endosperm while the zygote develops into an embryo. Synergids and antipodals get degenerate after double fertilization.

13. **(b)** Same flower

Explanation: The transfer of pollen grain from the anther to the stigma of the same flower is called self-pollination. Both anther and stigma must be ready at the same time for this kind of pollination.

14. **(d)** Anther

Explanation: Pollen grains are formed inside the anther. Stamen contains filament and anther. Inside the anther, the microsporogenesis process takes place to produce haploid pollen grains that form male gametes.

15. **(c)** Microspore mother cell and Tapetum

Explanation: The mature anther consists of four microsporangia which contain four layers. The innermost layer is called tapetum that provides nutrient to growing microspores and tissues inside it is called microspore mother cell that produces pollen grain.

16. **(d)** Epidermis and tapetum

Explanation: A microsporangium is surrounded by four wall layers - the epidermis, endothecium, middle layers, and tapetum. The innermost layer is tapetum and the outermost layer is the epidermis.

17. **(c)** 16

Explanation: Each microspore mother cell produces four pollen grains by reduction division. Hence to produce 64 pollen grains 16 meiotic or reduction division is required.

18. **(c)** Wind

Explanation: The wind is the most common means of pollination in flowering plants. The pollen grain must be light and dry and in large numbers to facilitate pollination. Flowers with one or a few ovules are pollinated by the wind to ensure fertilization.

19. **(a)** i and ii

Explanation:

- A typical angiosperm embryo sac, at maturity, though 8-nucleate is 7-celled.
- The nucleus of the functional megaspore divides mitotically to form two nuclei which move to the opposite poles, forming the 2-nucleate embryo sac. Two more sequential mitotic nuclear divisions result in the formation of the 4-nucleate and later the 8-nucleate stages of the embryo sac. It is of interest to note that these mitotic divisions are strictly free nuclear, that is, nuclear divisions are not followed immediately by cell wall formation.
- The embryo sac is located inside the nucellus.
- Three cells are at the chalazal end and are called the antipodals.

20. **(c)** Embryo sac

Explanation: The female gametophyte in angiosperms is called the Embryo sac. It contains the egg apparatus, antipodal cells, and polar nuclei. After fertilization embryo sac changes into a seed.

21. **(b)** Cleistogamous flowers always exhibit autogamy.

Explanation: Cleistogamous flowers do not open at all. In such flowers, the anther and stigma lie close to each other. As these flowers are closed at all, a foreign pollen cannot pollinate the flower, and hence they always exhibit autogamy.

22. **(d)** Secondary or polar nuclei

Explanation: The endosperm is the product of the fusion of two polar nuclei with one male gamete. The endosperm provides nourishment to the growing embryo.

23. **(a)** Tapetum

Explanation: Microsporangium is covered by a number of layers. The outer layer or integuments surround the tapetum. The tapetum provides nutrients to growing microspores that leads to pollen grains.

24. **(d)** Parthenocarpy

Explanation: When fruits develop without fertilisation, the fruits are called parthenocarpic fruits, and the process is known as parthenocarpy.

25. **(c)** Synergid, zygote, and primary endosperm nucleus
Explanation: During fertilization, egg fuses with male gamete to form a diploid zygote and two male polar nuclei fuse with another male gamete to form a triploid primary endosperm nucleus. Synergids and antipodals remain haploid and degenerate later.
26. **(c)** Intine
Explanation: Pollen grains are covered with two layers outer hard coating is called exine and the inner coating is called intine. The pollen tube is formed by intine, through which male gametes reaches to embryo sac for fertilization.
27. **(c)** Perianth
Explanation: In some flowers, there is no distinction between sepals and petals. In these flowers, these non-essential organs are together called as perianth. The individual parts of the perianth are called tepals.
28. **(d)** Diploid
Explanation: Generally, megaspore mother cell undergoes meiosis to form haploid megaspore which later develops into an embryo sac with haploid nuclei. If megaspore mother cell will not undergo meiosis then nuclei of embryo sac will be diploid.
29. **(c)** Egg and antipodal cells
Explanation: Egg and antipodal cells are haploid structure as they are formed by meiosis cell divisions in which the number of chromosomes reduce to half. This kind of division occurs only during gamete formation.
30. **(c)** Ovule
Explanation: The embryo sac is located inside the ovule that acts as female gametes. Egg fertilization and subsequent embryo development occur inside the embryo sac. The endosperm is triploid and provides nutrition to embryo.
31. **(b)** Produce pure line
Explanation: Self-pollination involves the transfer of pollen grain from the anther to the stigma of the same flower. The two fusing gametes are genetically similar to each other as they are produced by the same plant. Continued self – pollination results in pure line and breeding depression.
32. **(a)** Homozygous for its characters
Explanation: Self-pollination involves the transfer of pollen grain from the anther to the stigma of the same flower. As both gametes have similar genetic makeup, the plant becomes homozygous for its characters due to continued self-pollination.
33. **(d)** Sporopollenin
Explanation: A large amount of fossilized pollen grain is found during the excavation process of older parts due to the tough covering of Sporopollenin that makes the outer wall of the pollen grain, exine. This substance cannot be hydrolyzed by an enzyme known.
34. **(b)** Sexual reproduction
Explanation: Sexual reproduction in flowering plants centres around the flower. Within a flower, there are usually structures that produce both male gametes and female gametes.
35. **(a)** Antipodal cells
Explanation: The embryo sac is 8 nucleate, 7 celled structure. The three at micropylar ends are called egg Synergids and three at the chalazal end are called antipodal cells. The remaining two at center forms the polar bodies.
36. **(a)** Stigma, ovule, embryo sac, placenta
Explanation: Each pistil has three parts, the stigma, style, and ovary. The stigma serves as a landing platform for pollen grains. The style is the elongated slender part beneath the stigma. The basal bulged part of the pistil is the ovary. Inside the ovary is the ovarian cavity (locule). The placenta is located inside the ovarian cavity. are The megasporangia arising from the placenta, commonly called ovules.
37. **(a)** Provide nourishment to the young microspore mother cell
Explanation: Tapetum is the cells surrounding the microspore mother cells. These cells provide nourishment to the young microspore mother cells.

38. **(b)** Papaya
Explanation: The flower which contains either male or female reproductive part is called unisexual flower. Papaya plants produce either male or female flowers in separate plants.
39. **(d)** Dioecious plant bearing only male or female flowers.
Explanation: Autogamy is a fusion of male and female gamete from the same flower and geitonogamy is the fusion of male and female gamete from the same plant but different flowers. Thus if a plant produces only male or female types of flowers then it will prevent both autogamy and geitonogamy.
40. **(c)** Both assertion and reason are correct.
Explanation: Pollination by winds is more common among the abiotic pollinations. Wind pollination requires that the pollen grains are light and non-sticky so that they can be transported in wind currents.
41. **(c)** 8 nucleate
Explanation: The angiosperms embryo sac is 8-nucleate but 7-celled at maturity. This includes 3- celled egg Synergids, 3 antipodal cells, and 2 polar nuclei.
42. **(b)** egg, embryo sac, nucellus, integument
Explanation: Each ovule has one or two protective envelopes called integuments. Integuments encircle the nucellus except at the tip where a small opening called the micropyle is organized. Cells of the nucellus have abundant reserve food materials. Located in the nucellus is the embryo sac or female gametophyte. Egg is present inside the embryo sac.
43. **(a)** Tapetum
Explanation: The microsporangium is covered by four-layered walled the outer three layers or integuments are protective in nature. The innermost layer has cells having more than one nucleus, called a tapetum. It provides nutrients to growing megaspores.
44. **(c)** Anther
Explanation: Anther produces pollen grains by the process of meiosis in which four microspores are produced by a single microspore mother cell. The number of chromosomes reduces to half.
45. **(b)** Liquid nitrogen
Explanation: Pollen grain consists of hard covering of exine but their viability may be lost with time. For Hybridization, pollen grains are collected and stored in liquid nitrogen below -196°C temperature.
46. **(b)** Megasporogenesis
Explanation: The process of formation of female gametophyte inside the ovary by meiotic and mitotic division is called megasporogenesis.
47. **(a)** Cleistogamous flower
Explanation: Cleistogamy or automatic self-pollination describes the trait of certain plants to propagate by using non-opening, self-pollinating flowers. Especially well known in peanuts, peas, and beans, this behavior is most widespread in the grass family.
48. **(c)** Sepals
Explanation: The outermost whorl of the flower is a green leafy structure, called sepals. Sepals protect the flower in the buds stage. It is generally attached to the thalamus of the flower.
49. **(b)** 2-celled stage
Explanation: About 60% of angiosperms, pollen grains are shed at a two-celled stage. The larger cell is called the vegetative cells and the smaller one is called a generative cell. Each generative cell produces two male gametes.
50. **(a)** Calyx, corolla, androecium, and gynoecium
Explanation: In a typical bisexual flower, the arrangement of floral whorls on the thalamus from the outermost to the innermost is always as calyx, corolla, androecium, and gynoecium.

Section B

51. i. (b) groundnut
 ii. (a) micropyle
 iii. (b) dormancy
 iv. (b) pericarp

- v. (d) false fruit of strawberry
52. i. (a) two theca
ii. (b) tapetum
iii. (c) sporogenous tissue
iv. (b) microsporogenesis
v. (b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion
53. i. (b) Coleorhiza
ii. (c) Primary endosperm nucleus
iii. (a) Hypocotyl
iv. (b) Scutellum
v. (c) (D) stage in embryo development in dicot
54. i. (a) Autogamy
ii. (d) Both (a) and (b)
iii. (a) Non-sticky and light pollen grain
iv. (c) Grasses
v. (c) The Assertion is true and the reason is false
55. i. monocarpellary
ii. Stamen
iii. integuments
iv. Mango
v. Only (I)

Section C

56. Fill in the blanks:
- a) 1. ovule
b) 1. male
c) 1. microsporangium
d) 1. microspores
e) 1. cellulose