TEACHERS FORUM®

QUESTION BANK

(solved)

Based on CBSE Previous years' question papers

Class XII

BIOLOGY

SUBJECT EXPERTS

CONTENTS

1 SEXUAL REPRODUCTION IN FLOWERING PLANTS

1 MARK

1. The distribution of some plants is restricted because of the special need for water to complete their life cycle. Give a specific reason for this requirement along with an example. **(2019)**

Ans. Transport of gametes and fertilization, e.g. Algae / bryophytes / ferns / or any other correct example

2. State the reason why pollen grains lose their viability when the tapetum in the anther is malfunctioning. **(2019)**

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

3. Name the process of formation of male gametes in flowering plants. **(2018)**

Ans. Microsporogenesis.

4. Write one advantage and one disadvantage of cleistogamy to flowering plants. **(2018)**

Ans. Advantage - Assured seed set and maintain purelines

Disadvantage - No variation, only parental characters are preserved and it can lead to inbreeding depression.

5. In cleistogamous plants, growing on agricultural lands that are regularly sprayed with insecticides, fertilisation and seed formation goes on undisturbed. Give one reason.

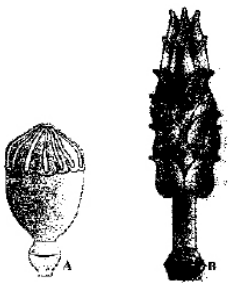
Ans. Here flowers do not open at all and are self- pollinating **(2017)**

6. Meiosis is an essential event in the sexual life cycle of any organism. Give two reasons.

Ans. (i) Meiosis helps in formation of gametes by reductional division & maintains number of chromosomes constant. **(2015)**

(ii) Recombination of genes in offsprings brings variation.

7. These pictures show the gynoecium of (A) Papaver and (B) Michellia flowers. Write the difference in the structure of their ovaries.**(2015)**



Ans. a. multicarpellary ovary showing fused/ syncarpous pistil

b. multicarpellary ovary showing free/ apocarpous pistil

8. What is a cistron ? **(2015)**

Ans. A segment of DNA and Coding for a polypeptide

9. Give an example of a plant which came into India as a contaminant and is a cause of

pollen allergy. **(2014)**

Ans. Parthenium.

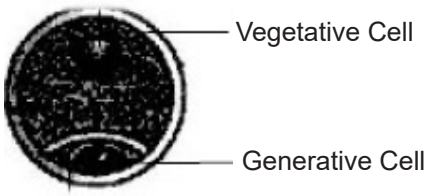
10. What is pollen –pistil interaction and how is it mediated? **(2014)**

Ans. It is the ability of the pistil to recognize the pollen followed by its acceptance or rejection.

It is mediated by chemical components of pollen interacting with those of pistil.

11. Draw a diagram of micropore of an angiosperm. Label its cellular components only.

Ans. **(2014)**



12. State the function of filiform apparatus found in mature embryo sac of an angiosperm.

Ans. Filiform apparatus helps to guide pollen tubes into synergid **(2014)**

13. Name the part of the flower which the tassels of the corn-cob represent. **(2014)**

Ans. Style and stigma

14. Why is banana considered a good example of parthenocarpy? **(2012)**

Ans. Banana forms fruit without fertilisation.

15. Name the type of cell division that takes place in the zygote of an organism exhibiting haplontic life cycle. **(2011)**

Ans. Meiosis

16. Normally one embryo develops in one seed but when an orange seed is squeezed many embryos of different shapes and sizes are seen. Mention how it has happened.

Ans. Some nucellar cells surrounding the embryo sac start dividing and protrude into the embryo sac and develop into embryos. In such species each ovule contains many embryos-polyembryony.

17. The meiocyte of an onion plant contains 32 chromosomes. Workout the number of chromosomes found in its endosperm. **(2010)**

Ans. Meiocyte has 32 chromosomes (2n)

So its gamete will have 32/2 = 16 chromosomes

Therefore endosperm will have 16 × 3 = 48 chromosomes (3n)

18. Pea flowers produce assured seed sets. Give a reason. **(2010)**

Ans. Pea flower is a cleistogamous flower

19. An anther with malfunctioning tapetum often fails to produce viable male gametophytes. Give one reason. **(2010)**

Ans. Tapetum nourishes the developing male gametophytes.

2 MARK

20. Name and explain the technique that can be used in developing improved crop varieties in plants bearing female flowers only. **(2020)**

Ans. Bagging method is used in developing improved crop varieties in plants bearing females flowers only.

In the bagging method, the buds of female flowers are bagged before opening. When the stigma matures and becomes receptive, the stigma is dusted with desired pollens and flower is re-bagged again.

21. When are the non-flowering plants said to be homothallic and monoecious; and heterothallic and dioecious? Give an example of each. **(2020)**

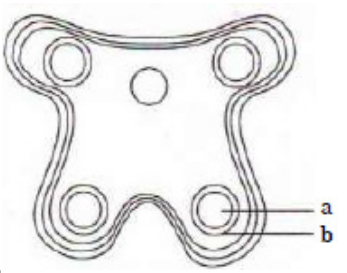
Ans. When both male and female reproductive parts are present on the same plant, the non-flowering plants are called homothallic and monoecious.

When both male and female reproductive parts are present on the different plants, the non-flowering plants are called heterothallic or dioecious.

22. A certain flower uses 'sexual deceit' for its pollination. Identify the flower and describe this adaptation. **(2019)**

Ans. *Ophrys*, one petal of the flower bears an uncanny resemblance to the female bee (in size colour and markings) the male bee gets attracted to what it perceives as a female bee, pseudocopulates with the flower and during that process is dusted with pollen from the flower, when the same bee pseudocopulates with another flowers it transfers pollen to it and thus pollinates the flower.

23. In the T.S. of a mature anther given below, identify ''a'' and ''b'' and mention their functions. **(2019, 2010)**



Ans. a - Sporogenous tissue / Microspore mother cells

Function : give rise to microspores or pollen grains

b - Tapetum

Function: provides nourishment to developing pollen grains.

24. What is cleistogamy ? Write one advantage and one disadvantage of it, to the plant.

Ans. Pollination occurring in closed flowers. **(2019)**

Advantage :

1. Ensures self pollination

2. Assured seed set formation in absence of pollinators

Disadvantage :

1. Does not allow cross pollination, genetic variation

2. Can cause inbreeding depression.

25. (a) List any two characteristic features of wheat flowers that make it a good example of wind pollination. **(2019)**

(b) It is observed that plant breeders carrying out wheat hybridisation often take pollen grains from the 'pollen banks'. Do you agree ?

Give one reason in support of your answer.

Ans. (a) 1. Light pollen grains 2. Pollen grains more in number

3. Exposed stamen, feathery stigma 4. single ovule

5. Numerous flowers packed into an inflorescence.

(b) • Yes

• Viability of wheat pollen grain is only 30 minutes and so it can be stored in pollen bank for a long period of time.

26. Mosses and frogs both need water as a medium for fertilisation. Where does syngamy occur and how is it ensured in both these organisms ? **(2019)**

Ans. Frog -External fertilization outside the body.

Large number of motile gametes are released/ synchronised maturation of ova and sperms.

Moss - Internal fertilization inside the body of organism.

Male gametes are motile and large number of gametes are released.

27. You are conducting artificial hybridization on papaya and potato. Which one of them would require the step of emasculation and why ? However for both you will use the process of bagging. Justify giving one reason. **(2019)**

Ans. Potato.

Flowers of potato have both male and female reproductive parts in same flower.

Bagging : To prevent unwanted pollens from coming on the stigma.

28. Write the basis of categorising animals as oviparous or viviparous, giving one example of each.

Ans. Oviparous : Egg laying (fertilised or unfertilised) e.g. reptiles and birds

Viviparous : Give birth to young ones. e.g. majority of mammals and humans.

29. (a) You are given castor and bean seeds. Which one of the two would you select to observe the endosperm ? **(2019)**

(b) The development of endosperm precedes that of embryo in plants. Justify.

Ans. (a) Castor

(b) Endosperm stores reserve food materials and provides nutrition to the developing embryo.

30. Name the flowering plant which employs 'sexual deceit' to get pollinated by a species of bee. Write how pollination occurs in this flower ? **(2018)**

Ans. Ophrys

One of its petal resembles the female bee (in size marking and colour) attracting the

male bee, which pseudocopulates and gets dusted with pollen from the flower. When the same male bee pseudo- copulates with another flower pollination occurs.

31. Why are researchers the world over, trying to transfer 'apomictic' genes into hybrid seeds ? Give reasons. **(2017)**

Ans. Characters are preserved in hybrids.

1. There is no segregation of characters in hybrid progeny
2. Large number of individuals with same characters can be produced

32. A pollen grain in angiosperm at the time of dehiscence from an anther could be 2-celled or 3-celled. Explain. How are the cells placed within the pollen grain when shed at a 2-celled stage ? **(2017)**

Ans. • In 2-celled stage the mature pollen grain contains a generative and vegetative cell, whereas in 3- celled stage one vegetative cell and two male gametes are present

• The generative cell floats in the cytoplasm of vegetative cell

33. A single pea plant in your kitchen garden produces pods with viable seeds, but the individual papaya plant does not. Explain. **(2016)**

Ans. Pea- flowers of pea plants are bisexual or monoecious to produce pods with viable seeds

Papaya is a Dioecious plant bearing male and female flowers on seperate plants and are unable to produce viable seeds as there is no cross pollination

34. Explain the significance of meiocytes in a diploid organism. **(2016)**

Ans. Undergo meiosis and form haploid gametes, help to restore 2n (diploidy) through zygote formation or syngamy and help to restore chromosome number.

35. During an excavation assignment, scientists collected pollen grains of a plant preserved in deeper layers of soil. Analyse the properties of pollen grains which help in the fossilization. **(2016)**

Ans. Pollen has an outer layer called exine which is made of sporopollenin.

It can withstand high temperature, strong acids and alkali and no enzyme that degrades sporopollenin so far known.

36. State the evolutionary relationship giving reasons between the thorn of Bougainvillea and tendril of cucurbit. **(2015)**

Ans. Divergent evolution

They are similar in origin but perform different function

37. Suggest two advantages to a farmer for using apomictic seeds of hybrid varieties.

Ans. (i) No segregation of characters in hybrid progeny. **(2015)**

(ii) Apomictic hybrid seeds can be used to grow crop year after year.

(iii) Economical as ordinary hybrid seeds are not used to grow crop year after year

38. Banana fruit is said to be parthenocarpic where as turkey is said to be parthenogenetic.

Why? **(2015)**

Ans. Banana –the fruit develops without fertilisation from an unfertilised ovary.

Turkey- the ovum/ female gamete develop into a new chick without fertilisation.

39. Write the difference between the tender coconut water and the thick, white kernel of a mature coconut and their ploidy. **(2015)**

Ans. Coconut water from the tender coconut has free nuclear endosperm, kernel has the cellular endosperm. Ploidy of the endosperms- 3n/ Triploid.

40. List the post-fertilization events in angiosperms. **(2014)**

Ans. – Development of endosperm – Development of embryo

– Seed formation – Fruit formation

41. Name the organic materials the exine and intine of an angiosperm pollen grains are made up of. Explain the role of exine. **(2014)**

Ans. Exine - Sporopollenin Intine - Cellulose and pectin

Role - most resistant organic material and can withstand high temperature, acid and alkali.

42. Some angiosperm seeds are said to be albuminous, whereas few others are said to have a perisperm. Explain each with the help of an example.

Ans. When mature seeds retain a part of endosperm it is an albuminous seed,

Example : wheat, maize, sunflower etc.

When remnants of nucellus is retained in seeds it is said to have a perisperm.

Example : black pepper, beat etc.

43. State one advantage and one disadvantage of cleistogamy. **(2012)**

Ans. Advantage :- self pollination and seed production assured

Disadvantage :- Least variations and leading to inbreeding depression

44. Differentiate between albuminous and non-albuminous seeds, giving one example of each. **(2011)**

Ans. Albuminous -(with residual) endospermis not completely used up during embryonic development. eg, wheat, maize

Non albuminous - (without residual) endospermis completely consumed during embryonic development. eg. pea, groundnut.

45. How many haploid cells are present in a mature female gametophyte of a flowering plant? Name them. **(2010)**

Ans. At maturity there are two positions:

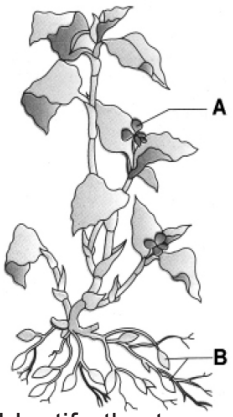
(i) If the two polar nuclei do not fuse then there are seven haploid cells in the embryo sac.

Name : Three antipodals, two synergids, one egg cell, one central cell.

(ii) If the two polar nuclei fuse to form a diploid secondary nucleus then there are six haploid cells in the embryo sac.

Name : Three antipodals, two synergids, one egg cell.

46.



Identify the type of flower shown in A and B. Which out of the two will produce an assured seed set. **(2010)**

Ans. A - Chasmogamous flower B - Cleistogamous flower

Cleistogamous flower produces an assured seed set.

47. If the chromosome number of a plant species is 16, what would be the chromosome number and the ploidy level of the (i) microspore mother cell and (ii) the endosperm cells? **(2010)**

Ans. (i) Microspore mother cell = 16; diploid/ 2n (ii) Endosperm cell = Triploid / 3n

48. Mention the reasons for difference in ploidy of zygote and primary endosperm nucleus in an angiosperm. **(2010)'**

Ans. Zygote formed by the fusion of male gamete (n) and egg cell (n) and hence it is diploid (2n)

Primary endosperm nucleus formed by the fusion of two polar nuclei nucleus (n + n) and male gamete (n), hence triploid (3n)

49. Even though each pollen grain has two male gametes, why are at least 10 pollen grains and not 5 pollen grains required to fertilise 10 ovules present in a particular carpel? **(2009)**

Ans. (i) Only one pollen tube enters an ovule.

(ii) Even if a pollen grain produces more than one pollen tube, only one of them carries male gametes, one is used in syngamy and other in triple fusion.

50. The flower of brinjal is referred to as chasmogamous while that of beans is cleistogamous. How are they different from each other? **(2008)**

Ans. Brinjal

(1) Exposed anther and stigma (2) Cross pollinated,

Bean

(1) Plants do not open and anthers and stigma lie close to each other

(2) Flowers self pollinated.

51. (a) Why are some seeds called albuminous and others non-albuminous? **(2016)**

(b) Which one of the following are albuminous or exalbuminous :

(i) Pea (ii) Wheat (iii) Groundnut (iv) Maize

Ans. (a) Non - albuminous : No residual endosperm after seed maturation

Albuminous : Retain a part of the endosperm after seed formation

(b) Exalbuminous - Pea, Groundnut

Albuminous - Maize, Wheat

3 MARK

52. Emasculation and bagging are the two important steps carried during artificial hybridisation to obtain superior varieties of desired plants. **(2019)**

Explain giving reasons, in which types of flowers and at what stages are the two processes carried out.

Ans. Emasculation is carried out only in bisexual flowers, bagging is done in unisexual female flower as well as bisexual flowers.

Emasculation is done before the anther dehisces or matures, bagging is done before the stigma becomes receptive. It is done to prevent contamination of stigma with unwanted pollen, to allow the pollination to occur with desired pollens.

53. State what is apomixis. Write its significance. How can it be commercially used? **(2019)**

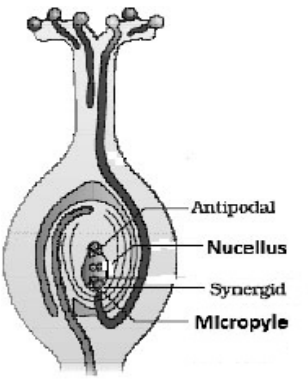
Ans. It is a special mechanism of asexual reproduction that mimics sexual reproduction to produce seeds without fertilization. There is no segregation of characters in the progeny and farmers can develop apomicts of hybrids and use them year after year to cut the cost.

54. (a) Draw an L.S. of pistil showing pollen tube entering into the embryo sac. Label the following : **(2019)**

(i) Nucellus (ii) Antipodals (iii) Synergids (iv) Micropyle

(b) Write the functions of the following : (i) Synergids (ii) Micropyle

Ans. (a)

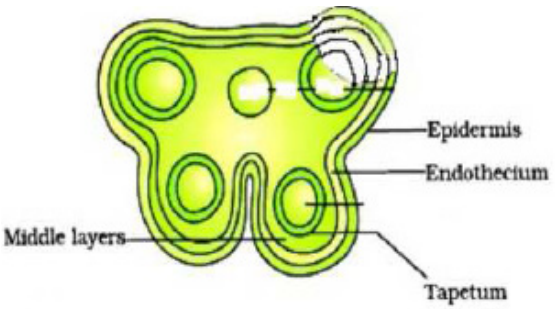


(b) (i) Synergids have Filiform apparatus which guides the entry of pollen tube to the embryo sac

(ii) Micropyle allows the entry of pollen tube to embryo sacs.

55. Draw a T.S. of a young anther of an angiosperm. Label the different layers of the wall and write their functions. **(2019)**

Ans.



Function :

Epidermis, Endothecium, Middle layers – protection and dehiscence

Tapetum – nourishment of developing pollen grains

56. (a) Differentiate between inbreeding and outbreeding. **(2019)**

(b) List any three advantages and one important disadvantage of inbreeding practice in animal husbandry.

Ans. (a) Inbreeding - Mating of more closely related individuals within the same breed for 4-6 generations.

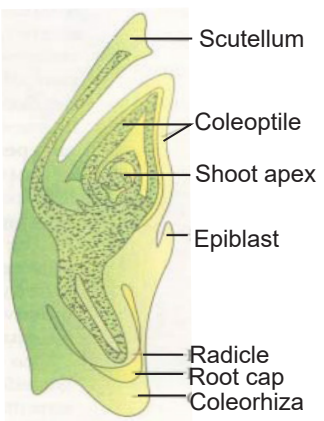
Outbreeding - Breeding of unrelated animals may be of the same breed, but having no common ancestors for 4-6 generations.

(b) Advantages - develops pureline, increase homozygosity, accumulation of superior genes, elimination of less desired genes.

Disadvantages- Reduces fertility, causes inbreeding depression.

57. Draw L.S. of an embryo of grass and label its parts. **(2019)**

Ans.



58. When and where do tapetum and synergids develop in flowering plants ? **(2019)**

Mention their functions.

Ans. Tapetum- Microsporogenesis, Microsporangium(Anther)

Function : nourishes the developing pollen grains.

Synergids -Megasporogenesis, Megasporangium(ovule).

Function : synergids have filiform apparatus to guide the pollen tube into it.

59. Where are the following structures present in a male gametophyte of an angiosperm ? Mention the function of each one of them. **(2019)**

(a) Germ pore (b) Sporopollenin (c) Generative cell

Ans. (a) Germ pore- Pollen grain exine

Function : site from where pollen tube emerges .

(b) Sporopollenin-Exine of pollengrains

Function : protects the pollen grains from high temperature, strong acids and alkali, enzymes and adverse condition.

(c) Generative Cells - Pollen grains.

Function : give rise to two male gametes.

60. Name the cell from which the endosperm develops in a coconut. Mention its ploidy. Explain the process of endosperm development in a coconut. **(2018)**

Ans. Primary Endosperm Cell.

3n /triploid . Free nuclear division (PEN) undergoes successive nuclear division forming free nuclear endosperm, followed by subsequent cell wall formation (on the periphery) and endosperm becomes cellular.

61. Pollen banks are playing a very important role in promoting plant breeding programme the world over. How are pollens preserved in the pollen banks ? Explain. How are such banks benefitting our farmer ? Write any two ways. **(2019)**

Ans. Cryopreservation / preserved in liquid nitrogen (-196^{O}C)

Availability of pollen of different genetic strains (for wider use)

Cryopreservation increases viability of pollens which can be used in crop breeding programmes and can be preserved and stored for longer duration.

It conserves large number of species and prevent complete extinction of any species to maintain biodiversity.

62. Apomixis resembles asexual reproduction, as well as mimics sexual reproduction in plants. Explain with the help of a suitable example. **(2017)**

Ans. Since there is no fertilisation in apomixis it resemble asexual reproduction, and development of embryo, seed or fruit formation is mimicing sexual reproduction,

In Citrus and Mango some of the nucellar cells surrounding the embryo sac, act as

diploid egg cell, which are formed without reduction division and develop into embryo without fertilisation

63. Write the differences between wind pollinated and insect pollinated flowers. Give one example for each type of pollination. **(2017, 2014)**

Ans.

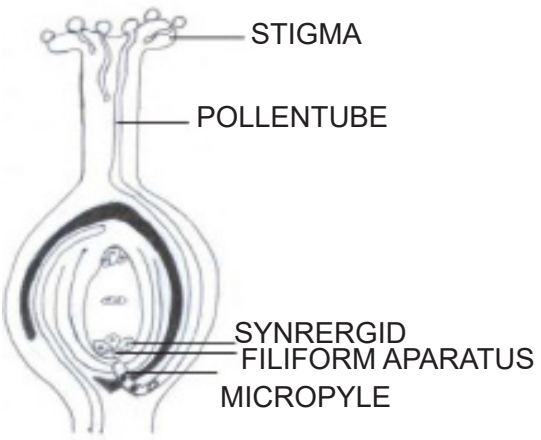
Wind Pollinated	Insect Pollinated
(i) Pollen grains non sticky	sticky pollen
(ii) Profuse amount of pollens produced	Fewer pollen grains are produced
(iii) Flowers are odourless or mostly inconspicuous	Flower have strong odour and produce nectar
(iv) not very colourful	large colorful fragrant flowers
(v) Do not offer floral rewards	Offer floral rewards
e.g. wheat, Grasses and Maize	e.g. Pansy, Tulsi and Mustard

64. (a) Can a plant flowering in Mumbai be pollinated by pollen grains of the same species growing in New Delhi ? Provide explanations to your answer. **(2017)**

(b) Draw the diagram of a pistil where pollination has successfully occurred. Label the parts involved in reaching the male gametes to its desired destination.

Ans. (a) Yes, By artificial means

(b)



65. Explain three outbreeding devices. **(2016)**

Ans. (i) Pollen release and stigma receptivity is not synchronised

(ii) Anther and stigma are placed at different position

(iii) Self Incompatibility

(iv) Production of unisexual flowers

66. Name the following that form the parts of a typical angiosperm ovule :

(i) The stalk that attaches it to the placenta in the ovary.

(ii) The layers that protect it. The mass of tissue enclosed by these layers.

(iii) The different types of cells present in its mature embryo sac. **(2016)**

Ans. (i) Funicle

(ii) Layers : Integuments

The mass of tissue enclosed: nucellus

(iii) Egg cell, synergids, antipodals and central cell

67. List the different parts of a typical dicotyledonous embryo along with their functions.

Ans. Cotyledons : stores food / protection **(2016)**

Hypocotyl / Radicle : forms root

Epicotyl / Plumule : forms stem / shoot

68. (a) Name the organic material exine of the pollen grain is made up of. How is this material advantageous to pollen grain ?

(b) Still it is observed that it does not form a continuous layer around the pollen grain. Give reason.

(c) How are 'pollen banks' useful ? **(2016)**

Ans. (a) Sporopollenin

These are most resistant to high temperature and no enzymes can degrade it

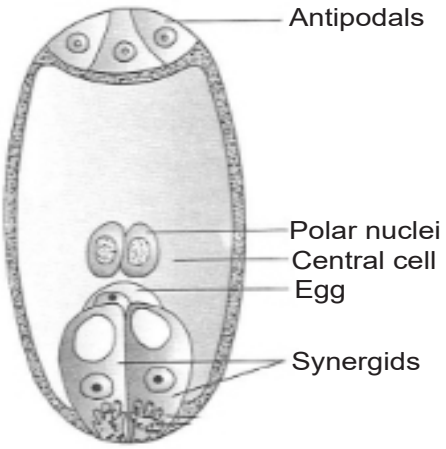
(b) (Germs pores) to allow pollen tube to emerge out

(c) Helps in storing pollen grains for years for crop breeding programmes

69. (a) Draw a labelled sketch of a mature 7-celled, 8-nucleate embryo-sac.

(b) Which one of the cell in an embryo-sac produce endosperm after double fertilization? **(2016)**

Ans. (a)



(b) Central cell

70. A non biology person is quite shocked to know that apple is a false fruit, mango is a true fruit and banana is a seedless fruit. As a biology student how would you satisfy this person ? **(2015)**

Ans. Apple - Thalamus (along with ovary) contribute to fruit

Mango - Develops only from the ovary

Banana - Develops from ovary but without fertlization

71. Describe the development of endosperm after double fertilization in an angiosperm. Why does endosperm development precedes that of zygote ? **(2015)**

Ans. Following fertilisation, the PEN (primary endosperm nucleus) divides repeatedly to give rise to free nuclei, subsequent cell wall formation leading to formation of endosperm.

Cells of endosperm are filled with reserved food materials to be used for nutrition of the developing embryo for providing food to the developing embryo.

72. State what is apomixis. Comment on its significance. How can it be commercially used? **(2015)**

Ans. It is a type of asexual reproduction that mimics sexual reproduction to form seeds without fertilisation.

Parental characters are maintained in the offspring.

If desired hybrid seeds are made apomictics the farmers can keep on using the hybrid seeds to raise new crops year after year

73. Explain any three advantages the seeds offer to angiosperms. **(2014)**

Ans. - Since reproductive process such as pollination and fertilisation are independent of water, seed formation is more dependable.

- Seeds have better adaptive strategies for dispersal to new habitats and help the species to colonise in other areas.

- As they have sufficient food reserves young seedlings are nourished until they are capable of photosynthesis on their own.

- The hard seed coat provides protection to the young embryo.

- Being products of sexual reproduction, they generate new genetic combinations or variations.

- Dehydration and dormancy of mature seeds are crucial for survival under adverse conditions.

74. Why are angiosperm anthers called dithecous? Describe the structure of its microsporangium. **(2014)**

Ans. • Anther is bilobed and each lobe of anther has two theca.

• Microsporangium surrounded by four wall layers named as epidermis, endothecium, middle layer and tapetum.

• In young anther a group of compactly arranged homogenous cells called sporogenous tissue occupies the centre of each microsporangium which produce microspores.

75. (a) How is apomixes different from parthenocarpy?

(b) Describe any two modes by which apomictic seeds can be produced. **(2013)**

Ans. (a) Parthenocarpy-fruits develop without fertilization and fruits are without seeds.

Apomixis-Development of seeds without fertilization and diploid egg cell formed without meiotic division

(b) Diploid egg cell formed without meiotic division and nucellar cells

76. (a) Highlight the role of thymus as a lymphoid organ.

(b) Name the cells that are released from the above mentioned gland.

Mention how they help in immunity. **(2012)**

Ans. (a) Immature lymphocyte differentiate into, mature lymphocyte in thymus

(b) T-lymphocyte

These T-cells help B-cells to produce antibodies / takes part in immunity

77. Explain the function of each of the following :

(a) Coleorhiza (b) Umbilical cord (c) Germ pores **(2012)**

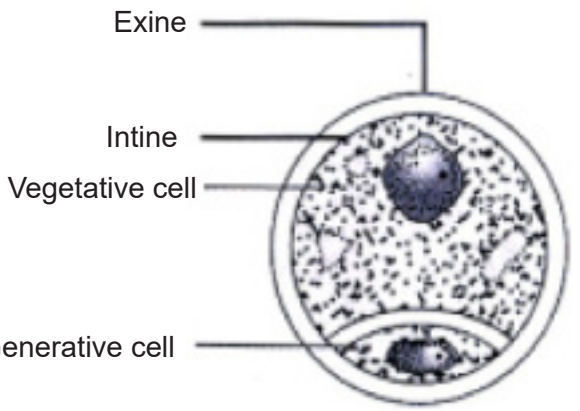
Ans. (a) It protects, the radicle of (monocot) embryo

(b) It transports nutrients and respiratory gases and metabolic wastes to and from mother and foetus

(c) Allow germination of pollen grain

78. Draw a labelled diagram of the sectional view of a mature pollen grain of angiosperms. Explain the function of any two of its parts. **(2010, 2008)**

Ans.



Exine - It can withstand high temperature, strong acids and alkali

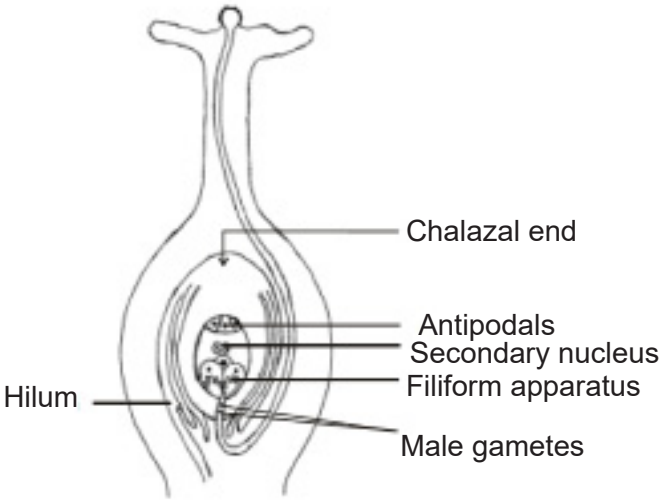
Intine - It is a thin and continuous layer made up of cellulose and pectin

Vegetative Cell - It is bigger, has abundant food reserve.

Generative Cell - It divides mitotically to give rise to two male gametes.

79. Draw a longitudinal section of a post - pollinated pistil showing entry of pollen tube into a mature embryo-sac. Label filiform apparatus, chalazal end, Hilum, antipodals, male gametes and secondary nucleus. **(2010)**

Ans.



80. (i) Write the characteristic features of anther, pollen and stigma of wind pollinated flowers.

(ii) How do flowers reward their insect pollinators ? Explain. **(2010)**

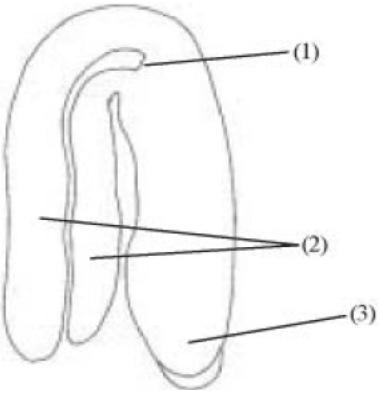
Ans. (i) Pollen - light, large in number and non sticky,

Anther – well exposed

Stigma - large, feathery, open and sticky

(ii) Flowers provides nectar, food for the larvae, pollen grains and safe place to lay eggs

81. In the adjacent figure of a typical dicot embryo, label the parts (1), (2) and (3). State the function of each of the labelled part. **(2010, 2009)**



Ans. Label 1 : Origin of plumule; plumule grows into shoot

Label 2 : Cotyledons; food storage

Label 3 : Origin of radicle ; radicle grows into root

82. (a) Mention any four strategies adopted by flowering plants to prevent self-pollination.

(b) Why is geitonogamy also referred to as genetical autogamy? **(2010)**

Ans. (a) 1.Pollen release and stigma receptivity are at different times.

2. Anther and stigma are placed at different positions.

3. Self incompatibility / prevents pollen from fertilising the ovule of the same plant.

4. Production of unisexual flowers.

(b) Pollen grains come from the same plant.

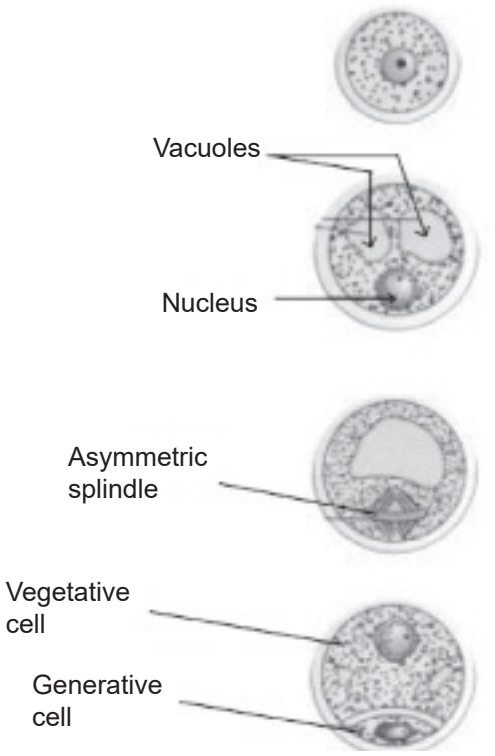
83. Explain the process of artificial hybridisation to get improved crop variety in (i) plants bearing bisexual flowers (ii) female parent producing unisexual flowers. **(2010)**

Ans. (i) Removal of anthers from the flower bud before the anther dehisces using a pair of forceps (emasculation). Then covering them with a bag of butter paper, to screen unwanted pollen. When the stigma is receptive, mature pollen is dusted on the stigma and bagged again.

(ii) The female flower buds are bagged before the flowers open. When the stigma becomes receptive pollination is carried out using the desired pollen and the flower is rebagged.

84. With the help of labelled diagrams, depict the stages of a microspore maturing into a pollen grain. **(2009)**

Ans.



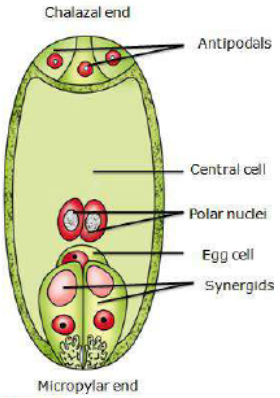
5 MARK

85. (a) Draw a diagram of a fully developed embryo sac of an angiosperm. Label its chalazal end and any other five parts within the embryo sac. **(2020)**

(b) Why does the development of an endosperm precede that of the embryo in angiosperm?

(c) Number of chromosomes in an onion plant cell is 16. Name the cells of the embryo sac having 16 and 24 chromosomes formed after fertilisation.

Ans. (a)



Fully Developed Embryo Sac

(b) In angiosperms, the development of an endosperm precedes embryo development. This is because the developing embryo requires nutrition for its growth and development. This nutrition is provided by the endosperm.

(c) Number of chromosomes in an onion plant cell (2n) is 16. This implies that the number of chromosomes in the gametes (n) is 8.

Zygote is formed by the fusion of a male gamete and an egg cell, so it will have 2n number of chromosomes.

2n = 2 x 8 = 16

An endosperm is formed by triple fusion, that is, the fusion of a male gamete and polar nuclei.

Therefore, an endosperm has 3n number of chromosomes.

3n = 3 x 8 = 24

Thus after fertilization, the zygote and endosperm will have 16 and 24 chromosomes, respectively.

86. (a) Describe any four devices which have been observed in plants to achieve cross-pollination and discourage self-pollination. **(2019)**

(b) State what would continued self-pollination result in.

Ans. (a) • Pollen release and stigma receptivity not synchronised

• Anther and stigma are placed at different positions so that pollen cannot come in contact with stigma of same plant

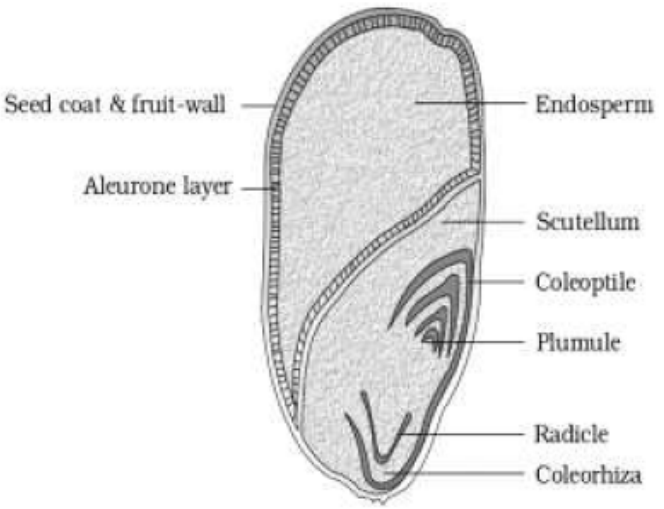
• Self - incompatability is a genetic mechanism which prevents self-pollen (from the same flower or other flowers of the same plant) fertilising the ovules by inhibiting pollen germination or pollen tube growth in pistil

• Production of unisexual flowers so that male and female flowers are present on different plants

(b) Inbreeding depression

87. Draw a diagram of LS of Maize grain and label its any six parts. **(2019)**

Ans.



88. (a) Explain the role of stigma in pollen-pistil interactions. **(2019)**

(b) Describe the post-pollination events leading to double fertilization in angiosperms, starting with a two-celled pollen grain.

Ans. (a) **Role of Stigma :**

1. Landing platform for the pollen grain

2. Enables continuous chemical dialogue between pollen and pistil

3. Rejects incompatiable pollen grain

4. Promotes the growth of pollen tube of the compatible pollen grain leading to fertilization.

(b) **Post Pollination Changes :**

• Vegetative cell of pollen grain helps in the growth of pollen tube.

• Nucleus of generative cell divides into two male gametes.

• One male gamete fuses with the egg cell resulting in a zygote and the process is called syngamy.

• other male gamete fuses with the two polar nuclei to form primary endosperm nucleus and the process is called triple fusion.

89. (a) Explain any two ways by which apomictic seed can develop. **(2019)**

(b) List one advantage and one disadvantage of a apomictic crop.

(c) Why do farmers find production of hybrid seeds costly?

Ans. (a) (i) A diploid egg is formed without reduction division which develops into embryo without fertilization

(ii) Some cells of the nucellus (which are diploid in nature) start dividing and develop into embryo

(b) Advantage :

1. No segregation of characters in hybrid progeny

2. Apomictic hybrid can be used to grow crop year after year

3. Economical as ordinary hybrid seeds are costly

Disadvantage :

1. Can not control deleterious genetic mutation

2. It reduces genetic diversity from parents to offspring plants due to lack of variations (in asexual reproduction)

3. Lack ability to adapt to changing environment

(c) Hybrid seeds are costly as farmers have to purchase seeds year after year. Production of hybrid seeds is a technical and expensive method to be done under controlled conditions.

90. (a) Describe any two devices in a flowering plant which prevent both autogamy and geitonogamy. **(2018)**

(b) Explain the events upto double fertilisation after the pollen tube enters one of the synergids in an ovule of an angiosperm.

Ans. (a) - Dioecy / production of unisexual flowers (in different plants)

- Self incompatibility

(b) Pollen tube releases 2 male gametes in the cytoplasm of synergid

One male gamete fuses with egg cell resulting in diploid zygote

Other male gamete fuses with polar nuclei to form triploid PEN (Primary Endosperm Nucleus) or PEC (Primary Endosperm Cell)

91. (a) Seeds offer several advantages to angiosperms. Describe any three such advantages. **(2018)**

(b) Why is banana called a parthenocarpic fruit ? Would you call banana a true fruit ? Give reason in support of your answer.

Ans. (a) 1) Reproductive process such as pollination and fertilisation are independent of water.

2) Better adaptive strategies for dispersal to new habitats.

3) Hard seed coat provides protection to young embryo.

4) Sufficient food reserves for the seedling.

5) Basis of agricluture -Storage of seeds can occur due to seed habit-dehydration and dormancy

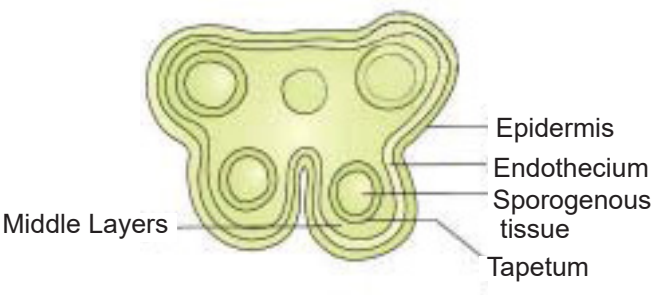
(b) Banana fruit develops without fertilisation. Yes. It develops from ovary

92. (a) Draw a diagrammatic sketch of a transverse section of an anther of an angiosperm. Label its different walls and the tissue forming microspore mother cells. **(2018)**

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

(c) Write the function of 'germ pore' in a pollen grain of an angiosperm.

Ans.



(b) Sporogenous tissue $\xrightarrow{\text{Mitosis}}$ Microspore mother cell $\xrightarrow{\text{Meiosis}}$ microspore tetrad.

(c) Germ pores allow the germinating or growing pollen tube with contents of the pollen grain to come out of the pollen grains.

93. Read the following statement and answer the questions that follow :

"A guava fruit has 200 viable seeds."

(a) What are viable seeds ?

(b) Write the total number of:

(i) Pollen grains (ii) Gametes in producing 200 viable guava seeds.

(c) Prepare a flow-chart to depict the post-pollination events leading to viable-seed production in a flowering plant. **(2017)**

Ans. (a) Seeds that gives rise to new plant

(b) (i) 200 (ii) 600 gametes

(c) Pollen grain germinates on stigma, pollen tube carrying the male gametes reach the ovule, discharge male gametes near the egg,/ fusion of male gamete with egg occurs to form zygote, fusion of male gamete with two polar nuclei to form PEN (Primary Endosperm Nucleus) , ovule develops into seed.

94. (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. **(2017)**

Ans. (a) Polyembryony

nucellar cells surrounding embryosac start dividing , protrude into the embryo sac and develop into many embryos

(b) These embryos are genetically similar, as produced from nucellar cells by mitotic division or formed without fertilisation (but different from the embryo formed by fertilization)

95. Explain the events upto fertilization that occur in a flower after the pollen grain has landed on its compatible stigma. **(2016)**

Ans. The pollen grain germinates on the stigma to produce a pollen tube through one of the germ pores and the content of the pollen grain move into the pollen tube. The pollen

tube grows through the tissues of the stigma and style and reaches the ovary. The generative cell divides and forms two male gametes during the growth of pollen tube (in the stigma). The pollen tube enters the ovule through micropyle and then enters one of the synergids (through filiform apparatus). The pollen tube releases the two male gametes (in the cytoplasm of synergids) , one of the male gamete fuses with egg cell to form zygote. The other male gamete fuses with two polar nuclei (in central cell) to form primary endosperm nucleus

96. Write the special adaptations that are found in plants pollinated by wind. Give an example of an aquatic plant pollinated by wind and a land plant pollinated by wind.

Ans. Special adaptation **(2016)**

1. Pollen grains are light
2. Pollen grain are non-sticky
3. Well exposed stamens
4. Large feathery stigma
5. Single ovule in each ovary
6. Numerous flowers in an inflorescence
7. Flowers do not produce nectar
8. Flower are non colourful
9. Flower produces enormous amount of pollen

Aquatic plant pollinated by wind : e.g. water hyacinth and water lily

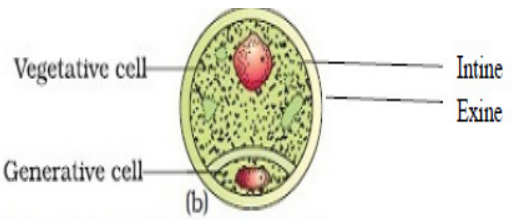
Land plant pollinated by wind : e.g. grasses and maize

97. (a) Describe in sequence the process of microsporogenesis in angiosperms.

(b) Draw a labelled diagram of a two celled final structure formed. **(2015)**

Ans. (a) Microsporogenesis- Each microspore mother cell divides meiotically, to form 4 haploid cells or tetrad, each microspore divides into two unequal cells- large vegetative cell and smaller generative cell; at this 2- celled stage the pollen grains are shed. Sometimes the generative cell divides mitotically to give rise to two haploid male gametes, that are shed at 3 - celled stage.

(b)



98. (a) Explain the events after pollination leading to the formation of a seed in angiosperms. **(2015)**

(b) Mention the ploidy levels of the cells of different parts of an albuminous seed.

Ans. (a) (i) Pistil accepts right type pollen, pollen grain germinates to produce pollen tube that grows and reaches the ovary. Male gametes enter the ovule through micropyle and one male gamete fuses with nucleus of egg cell to form diploid zygote. The other male gamete fuses with two polar nuclei forming primary endosperm cell which develops into endosperm. Diploid zygote develops into embryo, followed by development of ovule into seed.

(b) Embryo - 2n / diploid

Endosperm - 3n / triploid

99. A flower of brinjal plant following the process of sexual reproduction produces 360 viable seeds.

Answer the following questions giving reasons :

(a) How many ovules are 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 involved in the above case ?

(e) How many microspore mother cells must have undergone reduction division prior to dehiscence of anther in the above case ? **(2015)**

Ans. (a) 360, one ovule after fertilisation forms one seed

(b) 360, each MMC forms four megaspores out of which only one remains functional

(c) 360, one pollen grain participates in fertilisation of one ovule

(d) 720, each pollen grain carries two male gametes (which participate in double fertilisation) (360 × 2 = 720)

(e) 90, each microspore mother cell meiotically divides to form four pollen grains.

100. A flower of tomato plant following the process of sexual reproduction produces 240 viable seeds.

Answer the following questions giving reasons :

(a) What is the minimum number of pollen grains that must have been involved in the pollination of its pistil ?

(b) What would have been the minimum number of ovules present in the ovary ?

(c) How many megaspore mother cells were involved ?

(d) What is the minimum number of microspore mother cells involved in the above case ?

(e) How many male gametes were involved in this case ? **(2015)**

Ans. (a) 240, one pollen grain participates in fertilisation of one ovule

(b) 240, one ovule after fertilisation forms one seed

(c) 240, each MMC forms four megaspores out of which only one remain functional

(d) 60, each microspore mother cell meiotically divides to form four pollen grains

(e) 480, each pollen grain carries two male gametes which participate in double fertilisation

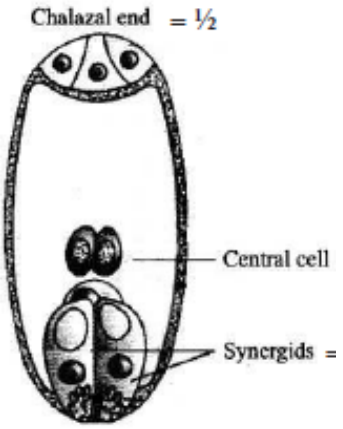
101. (a) Draw the embryo sac of a flowering plant and label the following : **(2019)**

(i) Central cell (ii) Chalazal end (iii) Synergids

(b) Name the cell and explain the process it undergoes to develop into an embryo sac.

(c) Explain the development of endosperm in coconut.

Ans. (a)



(b) Functional Megaspore

Nucleus of functional megaspore divides mitotically three times to form 8 free nucleate stage of embryo sac, after this cell walls are laid down leading to 7 celled embryo sac

(c) the two polar nucleii fuses with one male gamete, to produce triploid primary endosperm nucleus (PEN) , which divides repeatedly forming free nuclei, subsequently cell wall formation occurs

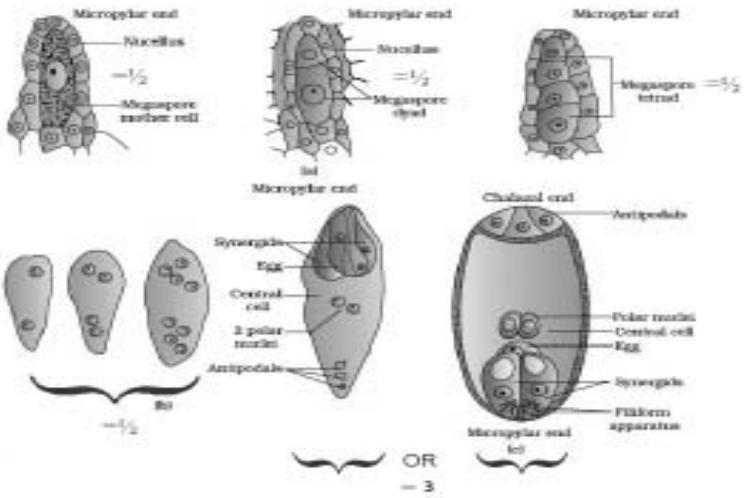
102. Describe the process of megasporogenesis upto fully developed embryo sac formation in an angiosperm. **(2019)**

Ans. 1. A single large cell of nucellus with dense cytoplasm and prominent nucleus differentiated as megaspore other cell (MMC).

2. In the micropylar region, the megaspore mother cell undergoes meiosis to form 4 megaspores.

3. Three cells degenerates and one is functional

4. The functional megaspore undergoes three successive mitotic divisions, to develop 8 nuleated (7 celled) embryo sac, with 3 antipodals, one egg cell (female gamete), 2 synergids and two polar nuclei.

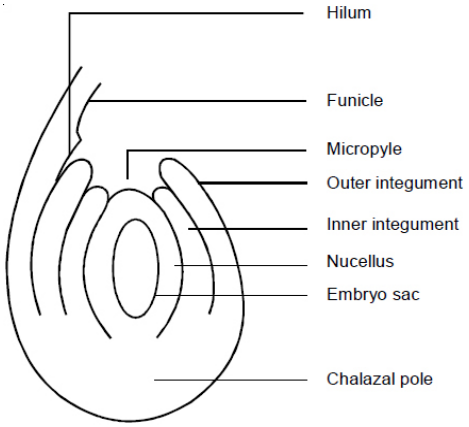


103. (a) Explain the phenomenon of double fertilization.

(b) Draw a labelled diagram of a typical anatropous ovule. **(2014)**

Ans. (a) It includes syngamy where one of the male gametes fuses with egg cell to form zygote. Triple fusion which includes fusion of second male gamete with two polar nuclei to form primary endospermic nucleus

(b)



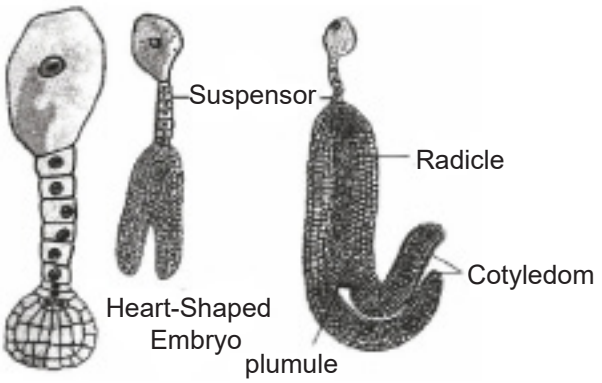
104. (a) Why does endosperm development precede embryo development in angiosperm seeds? State the role of endosperm in mature albuminous seeds.

(b) Describe with the help of three labelled diagrams the different embryonic stages that include mature embryo of dicot plants. **(2014)**

Ans. (a) It is an adaptation to provide assured nutrition to the developing embryo

Provides nutrition during seed germination.

(b) The zygote (in the embryo sac) divides to give rise to pro embryo and subsequently to the globular, heart shaped and mature embryo as shown in the diagram.

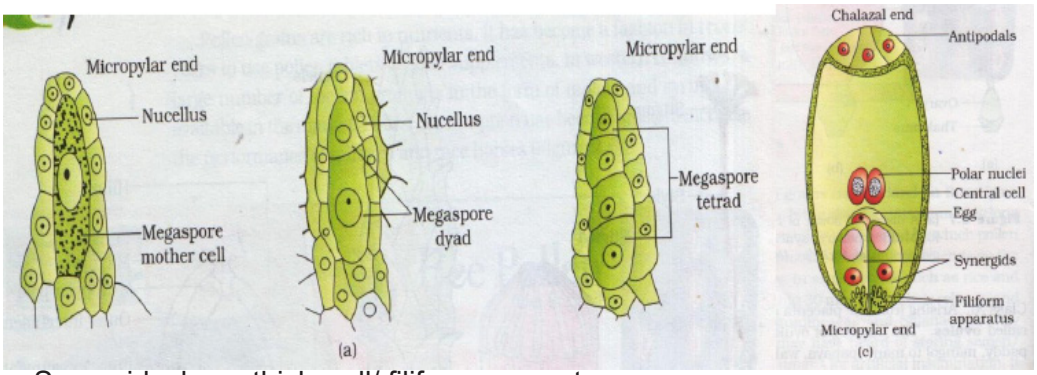


Globular Embryo

105. (a) Describe the formation of mature female gametophyte within an ovule in angiosperms.

(b) Describe the structure of cell(s) that guide(s) the pollen tube to enter the embryo-sac. **(2013)**

Ans. (a)



(b) Synergids, have thick wall/ filiform apparatus

106. " Incompatibility is a natural barrier in the fusion of gametes". Justify the statement.

Ans. • Incompatibility is considered as the most widespread & effective device to prevent inbreeding and outbreeding. **(2010)**

• Pollen pistil interaction is a dynamic process involving pollen recognition followed by promotion or inhibition of the pollen.

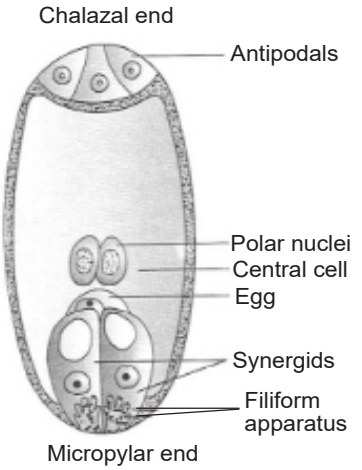
• It acts as a natural barrier by the interaction of chemical substances produced by the style.

• Normally the pollen belonging to right mating type germinate on stigma, develop pollen tube & bring about fertilization.

• The pollen grains belonging to other mating type are discarded

107. How does the megaspore mother cell develop into 7-celled, 8 nucleate embryo sac in an angiosperm ? Draw a labelled diagram of a mature embryo sac. **(2012)**

Ans. Megaspore mother cell undergoes meiosis producing one functional or viable megaspore , The functional megaspore divides mitotically to produce two nuclei which move to the opposite poles. Each nucleus now divides twice forming four nuclei at each pole of which one nucleus from each pole moves to the centre forming two polar nuclei, walls are formed around 6 nuclei forming 3 antipodals at the chalazal end, and a 3 celled egg apparatus (having one egg cell and two synergids) at the micropylar end. The polar nuclei are present in the large central cell.



108. Give reasons why :

(i) most zygotes in angiosperms divide only after certain amount of endospermis formed.

(ii) groundnut seeds are exalbuminous and castor seeds are albuminous.

(iii) Micropyle remains as a small pore in the seed coat of a seed.

(iv) integuments of an ovule harden and the water content is highly reduced, as the seed matures.

(v) apple and cashew are not called true fruits. **(2011)**

Ans. (i) To obtain nutrition from the endosperm for the developing embryo

(ii) ground nut - endosperm completely consumed castor - endosperm persists

(iii) for the entry of water / oxygen and for germination

(iv) It is to protect the embryo and keep the seed viable , until favourable conditions return for germination

(v) Since ovary is not taking part in fruit formation and thalamus contributes to fruit formation.

ADDITIONAL QUESTIONS AND ANSWERS

1. In a young anther, a group of compactly arranged homogenous cells were observed in the centre of each microsporangium. What is the name given to these cells?

Ans. Sporogenous tissue

2. Pollen grains of water pollinated species have a special characteristics for protection from water. What is that?

Ans. Presence of mucilagenous covering

3. Why are pollen grains produced in enormous quantity in Maize?

Ans. To ensure pollination because Maize is pollinated by wind.

4. Arrange the following in correct developmental sequence : Male gamete, Potential pollen mother cell, sporogenous tissue, Pollen grains, Microspore tetrad.

Ans. Sporogenous tissue - Potential pollen mother cell - microspore tetrad - Pollen grain - male gamete.

5. If the diploid number of chromosomes in an angiospermic plant is 16. Mention number of chromosomes in the endosperm and antipodal cell.

Ans. 24 Chromosomes in endosperm and 16 chromosomes in antipodal cell.

6. In angiospermic plant before formation of microspore sporogenous tissue undergo cell division

(a) Name the type of cell division.(b) What would be the ploidy of the cells of tetrad?

Ans. (a) meiosis division (b) haploid

7. Fruits generally develops from ovary, but in few species thalamus contributes to fruit formation.

(a) Name the two categories of fruits. (b) Give one example of each.

Ans. Two categories of fruits are :

(i) True fruits e.g., Mango (ii) False fruit e.g., Apple

8. Among the animals insects particularly bees are the dominant pollinating agents. List any four characteristic features of the insect pollinated flower.

Ans. 1. Flowers are large. 2. Colorful petals of flower.

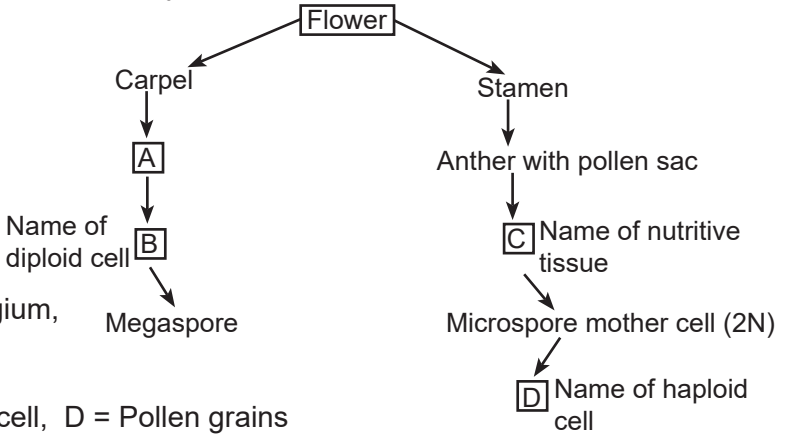
3. Presence of fragrance. 4. Rich in nectar.

9. Differentiate between geitonogamy and xenogamy.

Ans.

Geitonogamy	Xenogamy
Transfer of pollen grains from the another to stigma of anther flower of the same plant	Transfer of Pollen grains from anther to stigma of different plant.
Does not provide opportunity for gametic recombination.	Provide opportunity for gametic recombination.

10. Given below is an incomplete flow chart showing formation of gamete in angiospermic plant. Observe the flow chart carefully and fill in the blank A, B, C and D.



Ans. A = Ovule/megasporangium,

C = Tapetum

B = Megaspore mother cell, D = Pollen grains

11. Name the blank spaces a, b, c and d is the table given below :

Item	What it represents in the plant
(i) Pericarp	a
(ii) b	Cotyledon in seeds of grass family
(iii) Embryonal axis	c
(iv) d	Remains of nucellus in a seed.

Ans. a = wall of fruit, b = scutellum, c = shoot and root tip, d = perisperm

12. Even though each pollen grain has two male gametes. Why are at least 10 pollen grains and not 5 pollen grains required to fertilise 10 ovules present in a particular carpel?

Ans. Because only one male gamete is involved in syngamy. ie fusion of male gamete with egg cell.

ENTRANCE CORNER

1. Pollen tablets are available in the market for

(a) *in vitro* fertilisation (b) breedind programmes

(c) supplementing food (d) *ex situ* conversations **(2014)**

2. Megasporangium is equivalent to

(a) embryo sac (b) fruit (c) nucellus (d) ovule **(2013)**

3. Even in absence of pollinating agents seed-setting is assured in

(a) Commelina (b) zostera (c) Salvia (d) fig **(2012)**

4. Unisexuality of flowers prevents **(2008)**

(a) autogamy, but not geitonogamy (b) both geitonogamy and xenogamy

(c) geitonogamy, but not xenogamy (d) autogamy and geitonogamy

5. The arrangements of the nuclei in a normal embryo sac in the dicot plants is

(a) 3+2+3 (b) 2+3+3 (c) 3+3+2 (d) 2+4+2 **(2006)**

6. An ovule which becomes curved so that the nucellus and embryo sac lie at right angles to the funicle is

(a) hemitropous (b) campylotropous (c) anatropous (d) orthotropous **(2004)**

7. What is the direction of micropyle in anatropous ovule?

(a) Upward (b) Downward (c) Right (d) Left **(2002)**

8. Eight nucleate embryo sacs are **(2000)**

(a) always tetrasporic (b) always monosporic (c) always bisporic

(d) sometimes monosporic,sometimes bisporic and sometimes tetrasporic

9. Double fertilisation is characteristic of

(a) angiosperms (b) pteridophytes (c) gymnosperms (d) microsporocytes **(1993)**

10. Point out the odd one

(a) nucellus (b) embryo sac (c) micropyle (d) pollen grain **(1991)**

ANSWERS

1. (c)	2. (d)	3. (a)	4. (a)	5. (a)
6. (a)	7. (b)	8. (d)	9. (a)	10. (d)

✧✧✧✧✧