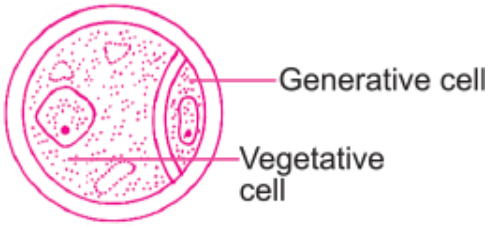
Very Short Answer Questions (PYQ)

[1 Mark]

Q.1. Draw a diagram of a matured microspore of an angiosperm. Label its cellular components only.

Ans.



Q.2. Give an example of a plant which came into India as a contaminant and is a cause of pollen allergy.

Ans. Parthenium or Carrot grass.

Q.3. The microscopic pollen grains of the past are obtained as fossils. Mention the characteristic of the pollen grains that makes it happen.

Ans. The exine of pollen grains have an outermost hard layer composed of a chemical, sporopollenin. It is highly resistant to high temperature, strong acids and alkali. So, pollen grains are obtained as fossils.

Q.4. State the function of filiform apparatus found in mature embryo sac of an angiosperm.

Ans. The filiform apparatus guides the pollen tube into the synergid.

Q.5. Why do pollen grains of some flowers trigger 'sneezing' in some people?

Ans. They result in an allergic reaction.

Q.6. Papaver and Michelia both have multicarpellary ovaries. How do they differ from each other?

Ans. Papaver has syncarpous gynoecium whereas Michelia has apocarpous gynoecium.

Q.7. An anther with malfunctioning tapetum often fails to produce viable male gametophytes. Give any one reason.

Ans. A malfunctioning tapetum does not provide enough nourishment to the developing male gametophytes and thus fail to produce viable male gametophytes.

Q.8. How is it possible in Oxalis and Viola plants to produce assured seed-sets even in the absence of pollinators?

Ans. By presence of cleistogamous flowers.

Q.9. An anther with malfunctioning tapetum often fails to produce viable male gametophytes. Give one reason.

Ans. A malfunctioning tapetum is not able to provide optimum nutrition for the production of viable male gametophytes.

Q.10. The meiocyte of rice has 24 chromosomes. How many chromosomes are present in its endosperm?

Ans. 36 chromosomes.

Q.11. A bilobed, dithecous anther has 100 microspore mother cells per microsporangium. How many male gametophytes this anther can produce?

Ans. The bilobed anther can produce 1600 male gametophytes.

Q.12. How many pollen grains and ovules are likely to be formed in the anther and the ovary of an angiosperm bearing 25 microspore mother cells and 25 megaspore mother cells respectively?

Ans. 100 pollen grains and 100 ovules.

Q.13. The flower of brinjal is referred to as chasmogamous while that of beans is cleistogamous. How are they different from each other?

Ans. Brinjal has chasmogamous flowers, as they are open with exposed stamen and stigma. Such flowers show cross-pollination as well as self-pollination. On the other hand, beans has cleistogamous flowers, as they never open at all, even at maturity, they also show self- pollination.

Q.14. Name the type of flower which favours cross pollination.

Ans. Chasmogamous flower.

Q.15. How do the pollen grains of Vallisneria protect themselves?

Ans. They have mucilaginous covering to prevent them from getting wet.

Q.16. The following statements (i), (ii) and (iii) seem to describe the water-pollinated submerged plants. Which one of these statements is incorrect?

(i) The flowers do not produce nectar.

(ii) The pollen grains have mucilaginous covering.

(iii) The brightly coloured female flowers have long stalk to reach the surface.

Ans. Statement-(iii).

Q.17. Mention the pollinating agent of an inflorescence of small dull coloured flowers with well exposed stamens and large feathery stigma. Give any one characteristic of pollen grains produced by such flowers.

Ans. Pollinating agent is wind. Pollen grains are light, dry and non-sticky.

Q.18. A male honeybee has 16 chromosomes whereas its female has 32 chromosomes. Give one reason.

Ans. Male honeybee develops from unfertilised female gamete (Parthenogenesis) and thus has 16 chromosomes whereas female develops by fertilisation and thus has 32 chromosomes.

Q.19. Name the type of pollination as a result of which genetically different types of pollen grains of the same species land on the stigma.

Ans. Xenogamy.

Q.20. How do flowers of Vallisneria get pollinated?

Ans. In Vallisneria, the female flower stalk is coiled to reach the water surface to receive the pollen grains carried by water currents.

Q.21. How many microspore mother cells would be required to produce one hundred pollen grains in a pollen sac? And why?

Ans. 1 microspore mother cell undergoes meiosis to form 4 pollen grains. In order to produce 100 pollen grains, 25 microspore mother cells must undergo meiosis.

Q.22. What is pollen–pistil interaction and how is it mediated?

Ans. The ability of the pistil to recognise the pollen followed by its acceptance or rejection is called pollen–pistil interaction. It is mediated by chemical components of pollen interacting with those of pistil.

Q.23. How many microsporangia are present in a typical anther of an angiosperm?

Ans. Four

Q.24. Why are non-albuminous seeds so called?

Ans. Non-albuminous seeds have no residual endosperm as it is completely consumed during embryo development. Example: seeds of pea and groundnut.

Q.25. Pea flowers produce assured seed sets. Give a reason.

Ans. Pea flowers are cleistogamous, i.e., anther and stigma lie close to each other in closed flowers. So when anthers dehisce in the flower buds, pollen grains come in contact with the stigma to effect pollination. Thus, assured seeds are produced in pea.

Q.26. Name the part of the flower which the tassels of the corn-cob represent.

Ans. Style and stigma.

Q.27. Write the function of coleoptile.

Ans. It protects the plumule of the monocot embryo.

Q.28. Write the function of scutellum.

Ans. It provides nourishment and protection to the developing embryo.

Q.29. Give an example of a plant which came into India as a contaminant and is a cause of pollen allergy.

Ans. Parthenium or Carrot grass.

Q.30.

(a) Mention the similarity between autogamy and geitonogamy.

(b) How does geitonogamy differ from xenogamy?

Ans.

(a) In both cases pollen grains come from the same plant.

(b) In geitonogamy pollen grains are transferred from the anther to the stigma of another flower of the same plant whereas in xenogamy pollen grains are transferred from the anther to the stigma of a different flower.

Very Short Answer Questions (OIQ)

[1 Mark]

Q.1. Name the process of formation of male gametes in flowering plants.

Ans. The process is called microsporogenesis. It is the mitosis of generative cell of microspore.

Q.2. How many nuclei are present in a fully developed male gametophyte of flowering plants?

Ans. Three (one vegetative nucleus and two male nuclei).

Q.3. Which nuclei fuse to give rise to endosperm?

Ans. Endosperm is usually triploid (3n) as it is formed by the fusion of three haploid nuclei, i.e., two polar nuclei of central cell which belong to the female gametophyte and the one male gametophyte.

Q.4. Name the part of gynoecium that determines the compatible nature of pollen grain.

Ans. Stigma

Q.5. What is shield-shaped single cotyledon of monocots called?

Ans. Scutellum

Q.6. Who discovered double fertilisation in angiosperms?

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

Q.7. Name a plant in which dichogamy is found.

Ans. Magnolia.

Q.8. Name the tissue present in the fertilised ovules of angiospermic plants that supplies food and nourishment to the developing embryo.

Ans. Endosperm.

Q.9. What is the site of microsporogenesis?

Ans. Microsporangium or pollen sac of anther.

Q.10. What is the site of megasporogenesis?

Ans. Nucellus tissue (megasporangium) present inside the ovule.

Q.11. Which cell of male gametophyte produces the male gamete?

Ans. Generative cell.

Q.12. How many cells are found in a typical embryo sac?

Ans. There are seven cells in a typical embryo sac. These are one egg cell, two synergids, three antipodal cells and a central cell.

Q.13. What is an anatropous ovule?

Ans. It is an ovule that is completely inverted through 180° such that the micropyle comes close to the base of the funiculus and nucellus remains straight.

Q.14. What is nucellus?

Ans. The body of the ovule consists of a mass of parenchymatous cells rich in reserve food material which is called nucellus.

Q.15. What is funiculus?

Ans. Funiculus is the stalk of ovule that attaches it to the placenta.

Q.16. What is the function of germ pore?

Ans. Germ pore is the exine lacking region of pollen grains through which the pollen tube or germ tube emerges soon after pollination.

Q.17. How many germ pores are there in the pollen grains of monocots and dicots?

Ans. There are three germ pores in dicots and one in monocots.

Q.18. In maximum angiosperms pollen grains are shed at the two-celled stage. Name the 2 cells.

Ans. Vegetative cell and generative cell are the two-celled stage in which pollen grains are shed.

Q.19. Name the component cells of the 'egg apparatus' in an embryo sac.

Ans. Two synergids and an egg.

Q.20. Name the common function that cotyledons and nucellus perform.

Ans. Cotyledons and nucellus provide nourishment.

Q.21. In the embryos of a typical dicot and a grass, which are the true homologous structures?

Ans. Cotyledons and scutellum.

Q.22. Name the 'landing' platform for pollen grains.

Ans. Stigma.

Q.23. Which are the three cells found in a pollen grain when it is shed at the three-celled stage?

Ans. One vegetative cell and two male gametes.

Q.24. Name the kind of pollination in maize.

Ans. Anemophily (wind pollination).

Q.25. What features of flowers facilitate pollination by birds?

Ans. Presence of a large quantity of nectar, bright colours of petal, fragrance and large flowers attract birds from long distances.

Q.26. If the stamens are well exposed, usually which mode of pollination the plant is expected to follow?

Ans. Wind pollination.

Q.27. Name the type of cross-pollination in silk-cotton tree and Vallisneria, respectively.

Ans. Silk cotton tree — Entomophily (by insect) Vallisneria — Hydrophily (by water)

Q.28. Name the type of pollination in self-incompatible plants.

Ans. Xenogamy.

Q.29. Mention any two characteristics of pollen grains of plants such as maize and Cannabis.

Ans.

(i) Pollen grains are small, dry and light in weight.

(ii) Pollen grains have air sacs or wings.

Q.30. Define parthenocarpy.

Ans. Parthenocarpy is an economically important process in which seedless fruit is formed without fertilisation, for example, banana.

Q.31. What is polyembryony? Give two examples.

Ans. Presence of more than one embryo in a seed is called polyembryony. Example, lemon, groundnut, etc.

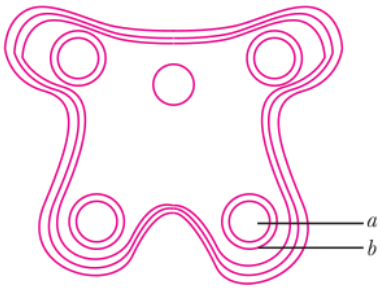
Q.32. In a case of polyembryony, if an embryo develops from the synergid and another from the nucellus, which is haploid and which is diploid?

Ans. Synergid embryo is haploid and nucellar embryo is diploid.

Short Answer Questions-I (PYQ)

[2 Marks]

Q.1. In the T.S. of a mature anther given below, identify "a" and "b" and mention their function.



Ans.

(a) Sporogenous tissue: It forms pollen grains.

(b) Tapetum: It provides nourishment to the developing pollen grains.

Q.2. In a flowering plant a microspore mother cell produce four male gametophytes while a megaspore mother cell form only one female gametophyte. Explain.

Ans. Male gametophytes are formed by meiosis of single microspore mother cell whereas female gametophytes are formed by meiosis of single megaspores mother cell to produce 4 megaspores, out of which 3 degenerate and only one survives. The surviving megaspore undergoes mitotic division to form the female gametophyte.

Q.3. Explain giving two reasons why pollen grains can be best preserved as fossils.

Ans.

(i) Pollens are produced in large numbers.

(ii) The sporopollenin in exine protects the pollen from harsh conditions.

Q.4. Name the organic materials the exine and intine of an angiosperm pollen grains are made up of. Explain the role of exine.

Ans. Exine is made up of sporopollenin and intine is made up of cellulose and pectin.

Exine is the most resistant organic material and can withstand high temperature, acidic and alkali environment.

Q.5. Differentiate between the two cells enclosed in a mature male gametophyte of an angiosperm.

Ans.

S.No.	Vegetative cell	Generative cell
1.	It is bigger in size.	It is smaller and floats in the cytoplasm of vegetative cell.
2.	It has food reserves.	It gives rise to two male gametes.

Q.6. "Pollen grains in wheat are shed at 3-celled stage while in peas they are shed at 2-celled stage." Explain. Where are germ pores present in a pollen grain?

Ans. At the time of shedding wheat pollen consists of one vegetative and two male gametes, which is the 3-celled stage. While pea pollen consists of one vegetative and one generative cell which is the 2-celled stage. Germ pores are present on the exine where sporpollenin is absent.

Q.7. Where is sporopollenin present in plants? State its significance with reference to its chemical nature.

Ans. Sporopollenin is present in the exine of pollen grains. It is the most resistant organic material in nature. It provides protection to the pollen/gamete/gametophyte from unfavourable conditions or chemicals (acids, enzymes and high temperature).

Q.8. Gynoecium of a flower may be apocarpous or syncarpous. Explain with the help of an example each.

Ans. The gynoecium represents the female reproductive part of the flower. When there are more than one pistil, if the pistils are fused together, the flower is said to be syncarpous and if the pistils are free, it is said to be apocarpous. For example, pistil of Papaver is syncarpous and that of Michelia is apocarpous.

Q.9. Name all the haploid cells present in an unfertilised mature embryo sac of a flowering plant. Write the total number of cells in it.

Ans. The haploid cells in an unfertilised mature embryo sac are: egg cell, synergids, antipodals. There are 7 cells in total.

Q.10. Mention the ploidy of the different types of cells present in the female gametophyte of an angiosperm.

Ans.

Cells in female gametophyte	Their ploidy
1. Synergids	Haploid
2. Egg	Haploid
3. Polar nuclei	Haploid
4. Antipodals	Haploid

Q.11. Explain any two devices by which autogamy is prevented in flowering plants.

Ans.

(i) Male and female flowers are present on different plants.

(ii) The stamens and stigma of a bisexual flower mature at different times.

(a) Anthers mature earlier than the stigma and release pollens.

(b) The stigma matures earlier than the anther.

(iii) Flowers are self-sterile or self-incompatible.

(iv) Chasmogamous flowers are present with exposed stamens and stigma which facilitate cross-pollination.

Q.12.

(a) Mention the similarity between autogamy and geitonogamy.

(b) How does geitonogamy differ from xenogamy?

Ans.

(a) In both cases pollen grains come from the same plant. So they are genetically similar.

(b) In geitonogamy pollen grains are transferred from the anther to the stigma of another flower, of the same plant whereas in xenogamy pollen grains are transferred from the anther, to the stigma of a different flower.

Q.13. List the two steps that are essential for carrying out artificial hybridisation in crop plants and why.

Ans.

(a) Selection of parents: Only those plants should be selected which have desired traits.

(b) Crossing over: Pollen grains from selected male plant is collected and transferred to the female plant after which it is bagged.

Q.14. Explain the steps that ensure cross pollination in an autogamous flower.

Ans. A bisexual flower is emasculated at unopened stage to prevent self-pollination in the flower and it is bagged after emasculation to prevent contact of unwanted pollen grain with the stigma of the flower. Artificial pollination is then performed when the stigma is ready and the flower is rebagged.

Q.15. Geitonogamous flowering plants are genetically autogamous but functionally cross-pollinated. Justify.

Ans. Geitonogamous flowers are genetically autogamous because both male and female flowers are borne on the same flower. They are functionally cross-pollinated because the pollen from one flower is transferred to the stigma of a different flower.

Q.16. Why should a bisexual flower be emasculated and bagged prior to artificial pollination?

Ans. A bisexual flower is emasculated to prevent self-pollination in the flower and it is bagged after emasculation to prevent contact of unwanted pollen grain with the stigma of the flower.

Q.17. Write the cellular contents carried by the pollen tube. How does the pollen tube gain its entry into the embryo sac?

Ans. Pollen tube carries two male gametes.

Pollen tube, after reaching the ovary, enters the ovule through the micropyle and then enters one of the synergids through the filiform apparatus which guides the entry of pollen tube into egg cell.

Q.18. 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?

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

The generative cell being small floats in the cytoplasm of the vegetative cell. The pollen grains are shed at this 2-celled stage.

Q.19. State one advantage and one disadvantage of cleistogamy.

Ans. Advantage: Self-pollination is assured/Seed production is assured.

Disadvantage: Least variations observed/Leads to inbreeding depression.

Q.20. Name the product of fertilisation that forms the kernel of coconut. How does the kernel differ from coconut water?

Ans. Endosperm forms the kernel of coconut.

The coconut water is free-nuclear endosperm whereas kernel is cellular endosperm.

Q.21. List the post-fertilisation events in angiosperms.

Ans.

(i) Development of endosperm

(ii) Embryogeny/development of embryo

(iii) Seed formation

(iv) Fruit formation

Q.22. Mention the function of each of the following:

Q. tassels of corn cob.

Ans. These are the stigma and style which wave in the wind to trap pollen grains.

Q. tapetum in the microsporangium.

Ans. Provides nourishment to the developing pollen grains.

Q.23. Describe the development of endosperm after double fertilization in an angiosperm. Why does endosperm development proceeds that of zygote?

Ans.

Endosperm Development

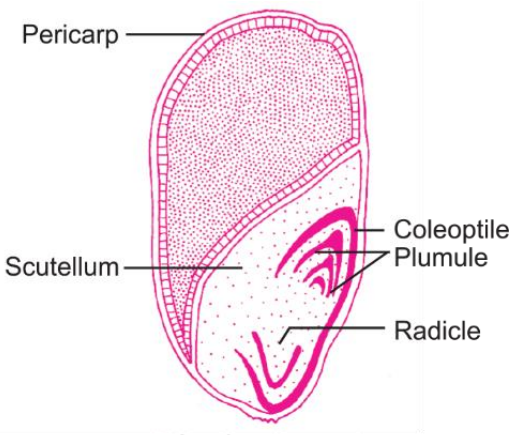
- Endosperm develops first followed by an embryo.
- Endosperm develops from PEN.
- The PEN undergoes successive nuclear divisions to give rise to free nuclei and this stage of endosperm development is called free nuclear endosperm.
- Subsequently, cell wall is formed on the periphery and endosperm becomes cellular.
- This division is followed by cytokinesis and thus endosperm becomes cellular. It is now called cellular endosperm.

Functions

- The cells of endosperm tissue are triploid and filled with reserve food material to nourish the developing embryo.
- The water of tender coconut in the centre is free-nuclear endosperm and white kernel in the outer part is the multicellular endosperm.
- The endosperm may be completely consumed by the developing embryo, e.g., pea, beans, or it may persist in mature seed, e.g., coconut.

Q.24. Draw a vertical section of a maize grain and label (i) pericarp, (ii) scutellum, (iii) coleoptile and (iv) radicle.

Ans.



V.S. of maize grain

Q.25. Explain the function of each of the following:

Q. Coleorhiza

Ans. Coleorhiza protects the radical of (monocot) embryo.

Q. Germ pores

Ans. Germ pores allow germination of pollen grain and formation of pollen tubes.

Q.26. Differentiate between albuminous and non-albuminous seeds, giving one example of each.

Ans. Albuminous seeds have residual endosperm in them. For example, maize.

Non-albuminous seeds do not have any residual endosperm. For example, pea.

Q.27. Mention the reasons for difference in ploidy of zygote and primary endosperm nucleus in an angiosperm.

OR

In angiosperms, zygote is diploid while primary endosperm cell is triploid. Explain.

Ans. A zygote is formed by the fusion of haploid male gamete with the haploid egg to form a diploid cell; whereas, primary endosperm nucleus (PEN) is formed by the fusion of haploid male gamete with two haploid polar nuclei, forming a triploid nucleus.

Q.28. 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. Albuminous seeds are those which retain a part of endosperm as it is not completely used up during embryo development. For example, in wheat and maize. In some seeds remnants of nucellus are also persistent. This residual, persistent nucellus is the perisperm. For example, in black pepper and beet.

Q.29. Double fertilisation is reported in plants of both, castor and groundnut. However, the mature seeds of groundnut are non-albuminous and castor are albuminous. Explain the post fertilisation events that are responsible for it.

Ans. The development of endosperm (preceding the embryo) takes place from primary endosperm nucleus (PEN) in both, castor and groundnut.

The developing embryo derives nutrition from endosperm.

PEN undergoes repeated division to give free nuclei. Subsequently cell wall is formed and endosperm becomes cellular. At this stage endosperm is retained in castor or is not fully consumed but in groundnut endosperm is consumed by growing embryo.

Q.30. 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?

Ans. In apple only the thalamus (along with ovary) portion contributes to fruit. Therefore, it is a false fruit. Mango develops only from the ovary, therefore it is a true fruit.

Banana develops from ovary but without fertilisation. The method is known as parthenocarpy. Since there is no fertilisation, no seeds are formed in banana.

Q.31. Why are some seeds referred to as apomictic seeds? Mention one advantage and one disadvantage to a farmer who uses them.

Ans. Seeds that are produced without fertilisation are referred to as apomictic.

Advantage: Desired characters are retained in offspring (progeny) as there is no segregation of characters in offspring (progeny). Seed production is assured even in absence of pollinators. Apomictic seeds are economical as they can be used to grow crops year after year.

Disadvantage: Cannot control accumulation of deleterious genetic mutation. These are usually restricted to narrow ecological niches and lack ability to adapt to changing environment.

Q.32. Why is an apple called a false fruit and a banana a parthenocarpic fruit? Explain.

Ans. In normal conditions, the fruit develops from the ovary. However, in apple the thalamus also contributes to fruit formation. That is why it is called a false fruit.

Banana is called a parthenocarpic fruit because it develops without fertilisation and is thus seedless.

Q.33. Explain any two ways by which apomictic seeds get developed.

Ans. Ways by which apomictic seeds develop are:

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

(ii) Some cells of the nucellus, which are diploid in nature, start dividing and without fertilisation develop into embryo.

Q.34. If you squeeze a seed of orange you might observe many embryos of different sizes? How is it possible? Explain.

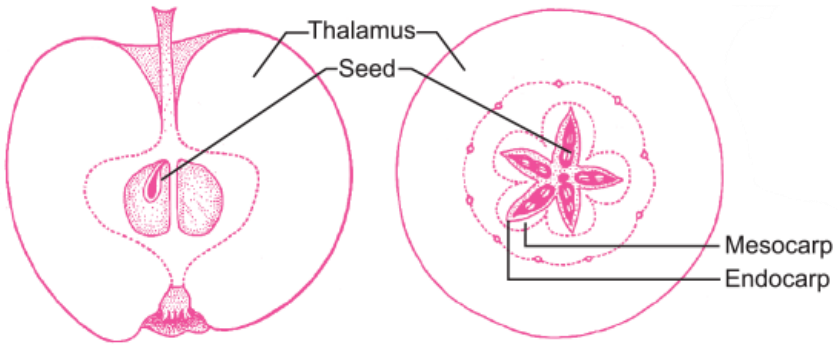
Ans. In orange, the nucellar cells surrounding the embryo sac start dividing, protrude into the embryo sac and develop into a number of embryos of different sizes.

Q.35. Banana is a parthenocarpic fruit whereas oranges show polyembryony. How are they different from each other with respect to seeds?

Ans. Banana develops from an ovary without fertilisation having non-viable seeds so it is called parthenocarpic fruit. An orange contain seeds with more than one embryo thus, it shows polyembryony

Q.36. Draw a sectional view of an apple and label the different parts of an ovary in it. Fruits develop from an ovary. Then why is apple referred to as a false fruit?

Ans.



(a)

In apple, the thalamus also contributes to fruit formation. Therefore, it is called a false fruit.

Q.37. How does the Mediterranean orchid Ophrys ensures its pollination by bees?

Ans. The petals of the Ophrys resemble the female of a bee species in size, colour and odour. Male bee mistakes the Ophrys for female bee and tries to copulate. Few pollen grains adhered to the body of the male bee fall over stigma of the flower thereby leading to pollination showing sexual deceit.

Q.38. Answer the following questions -

Q. Mature seeds of legumes are non-albuminous. Then, can it be assumed that double fertilisation does not occur in legumes? Explain your answer.

Ans. No it cannot be assumed so because fertilisation does takes place but the endosperm is consumed during development.

Q. List the differences between the embryos of dicot (pea) and monocot (grass family).

Ans.

S. No.	**Dicot embryo**	**Monocot embryo**
(*i*)	It has two cotyledons.	It has one cotyledon.
(*ii*)	Radicle and plumule are not covered with sheath.	Radicle is covered with coleorhiza and plumule is covered by coleoptile.

Q.39. Answer the following questions -

Q. How are parthenocarpic fruits produced by some plants and apomictic seeds by some others? Explain.

Ans. Parthenocarpic fruits are formed when ovary develops into fruit without fertilisation. Apomictic seeds are formed when formation of seeds take place without fertilisation.

Q. When do farmers prefer using apomictic seeds?

Ans. To maintain hybrid characters (year after year in a desired plant) and to avoid buying hybrid seeds every year (expensive seeds) farmers prefer using apomictic seeds.

Short Answer Questions-I (OIQ)

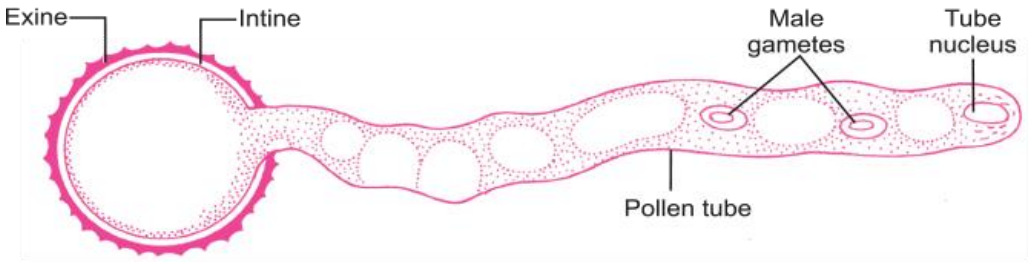
[2 Mark]

Q.1. Write briefly the role of pollination in the growth and development in an angiosperm.

Ans. Pollination is transfer of pollen grains from anthers to the stigma of a flower. Pollination is prerequisite for fertilisation, events after fertilisation like endosperm development, seed setting and fruit formation. Thus, pollination plays an important role in the growth and development of angiosperms.

Q.2. Draw a diagram of pollen grain with germ tube and two male gametes.

Ans.



Q.3. What is filiform apparatus? What is its function?

Ans. The synergids have special cellular thickenings at the micropylar tip called filiform apparatus. They guide the entry of pollen tubes into the synergids.

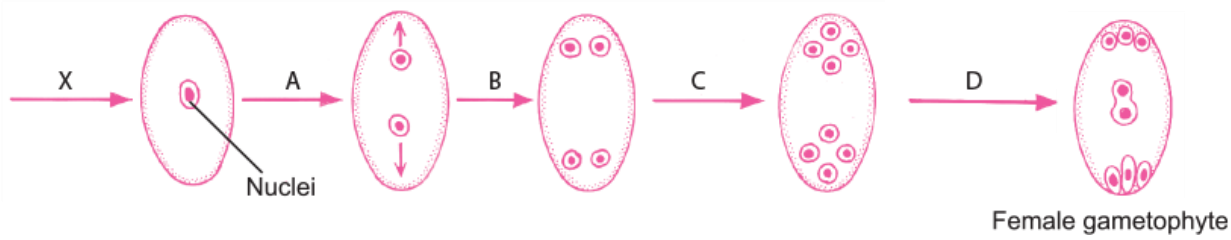
Q.4. Why does the zygote begin to divide only after the division of primary endosperm cell?

Ans. The zygote needs nourishment during its development. As the mature, fertilised embryo sac offers very little nourishment to the zygote, the primary endosperm cell (PEC) divides and generates the endosperm tissue which nourishes the zygote. Hence, the zygote always divides after division of PEC.

Q.5. Which is the triploid tissue in a fertilised ovule? How is the triploid condition achieved?

Ans. The triploid tissue in the ovule is the endosperm. Its triploid condition is achieved by the fusion of two polar nuclei and one nucleus of male gamete, referred to as triple fusion.

Q.6. Fill in the following labels with the type of cell function.



Ans. X—Meiosis (Reduction division); A—Mitosis; B—Mitosis; C—Mitosis; D—Cells reorganised as polar nuclei, antipodals and egg apparatus.

Q.7. What is pericarp? Mention its functions.

Ans. The wall of the ovary that develops into wall of the fruit is called pericarp.

Functions:

(i) Protects the seed till its maturity.

(ii) Helps in dispersal.

Q.8. What is agamospermy? How is agamospermy different from parthenogenesis and parthenocarpy?

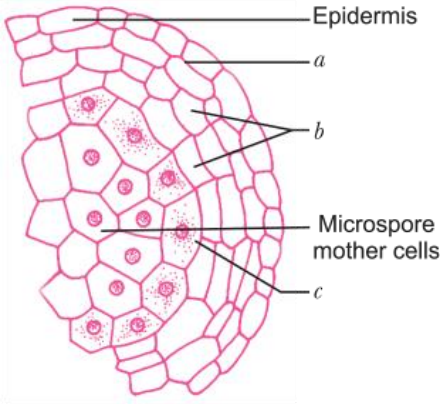
Ans. The phenomenon of asexual reproduction that mimics sexual reproduction as it forms seed without fertilisation is called agamospermy.

Parthenogenesis refers to the development of unfertilised ovule into an adult individual. On the other hand, parthenocarpy is the phenomenon of formation of fruits without fertilisation of an ovary.

Q.9. Given alongside is an enlarged view of one microsporangium of a mature anther.

(i) Name ‘a’, ‘b’ and ‘c’ wall layers.

(ii) Mention the characteristics and function of the cells forming wall layer ‘c’.



Ans.

(i)

= Endothecium,

= Middle layers,

= Tapetum

(ii) Tapetum provides nourishment to the developing pollen grains. The tapetal cells also secrete Ubisch granules that provide sporopollenin and other materials for exine formation.

Short Answer Questions-II (PYQ)

[3 Marks]

Q.1. How does the study of different parts of a flower help in identifying in wind as its pollinating agent?

Ans. The adaptive floral characteristics of a wind pollinated plant are:

(i) The flowers are small and inconspicuous.

(ii) The pollen grains are light and non-sticky so that they can be easily transported by wind.

(iii) They have well-exposed stamens so that pollens get easily dispersed.

(iv) They often have feathery stigma to catch the pollens grains.

(v) The pollen grains are dry and unwettable to prevent pollens from gaining moisture from air.

(vi) The pistil usually has single ovule in each ovary.

Q.2. Write the functions of:

Q. Coleoptile

Ans. Coleoptile: It protects the plumule of the monocot embryo.

Q. Tapetum

Ans. Tapetum: It provides nourishment to developing pollen.

Q.3. Make a list of any three outbreeding devices that flowering plants have developed and explain how they help to encourage cross-pollination.

Ans.

(i) Time of pollen release and stigma receptivity are different (not synchronised). This prevents self-pollination.

(ii) Anther and stigma are placed at different positions, so the pollens cannot come in contact with the stigma of the same flower.

(iii) Self incompatibility, which is a genetic mechanism to prevent the pollen germination on the stigma of the same flower.

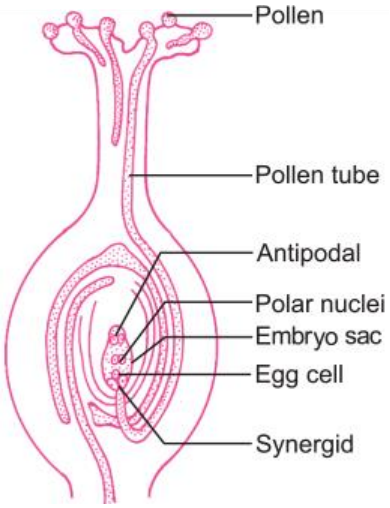
Q.4. Why are angiosperm anthers called dithecous? Describe the structure of its microsporangium.

Ans. The anthers of angiosperms are called dithecous because they are bilobed and each lobe of anther has two theca.

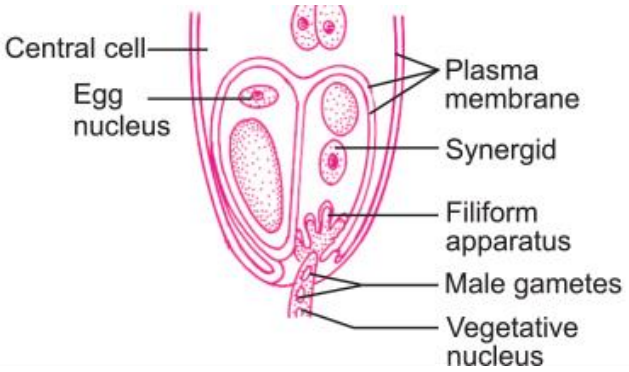
Microsporangium is surrounded by four wall layers named as epidermis, endothecium, middle layer and tapetum. In young anther, a group of compactly arranged homogenous cells called sporogenous tissue occupies the centre of each microsporangium which produce microspores or pollen grains.

Q.5. 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.

Ans.



L.S. of pistil showing path of pollen tube growth;



Enlarged view of an egg apparatus showing entry of pollen tube into a synergid;

Q.6. Explain the process of artificial hybridisation to get improved crop variety in (i) plants bearing bisexual flowers (ii) female parent producing unisexual flowers.

Ans. (i) In plants bearing bisexual flowers, the anthers are removed from the flower before they dehisce. This is called emasculation. The emasculated flowers are covered with a bag of butter paper to prevent contamination of stigma with unwanted pollen. This

process is called bagging. When this stigma attains receptivity, mature pollen grains are dusted on the stigma and the flowers are rebagged to allow the fruits to develop.

(ii) If the female parent produces unisexual flowers, emasculation is not done. The flower buds are bagged before the flowers open. When the stigma becomes receptive, pollen is dusted on stigma and the flower is rebagged.

Q.7. Differentiate between geitonogamy and xenogamy in plants. Which one between the two will lead to inbreeding depression and why?

Ans.

S. No.	**Geitonogamy**	**Xenogamy**
(*i*)	It is transfer of pollen grains from the anther to the stigma of another flower of same plant.	It is transfer of pollen grains from the anther to the stigma of a different plant.
(*ii*)	The pollen grains are genetically similar to the plant.	The pollen grains are genetically different from the plant.

Geitonogamy will lead to inbreeding depression because the pollen grains are genetically similar, which results in inbreeding. Continued inbreeding will thus reduce fertility and productivity.

Q.8. Write the differences between wind-pollinated and insect-pollinated flowers. Give an example of each type.

Ans.

S. No.	**Wind-pollinated flowers**	**Insect-pollinated flowers**
(*i*)	These produce large numbers of pollen grains.	These produce less number of pollen grains.
(*ii*)	These are dull, nectarless and scentless.	These are bright, scented and have nectar.
(*iii*)	Stamens are long and protrude above petals.	Stamens lie within the corolla tube.
(*iv*)	The pollen grains are dry, light, small and smooth. For example, ragweed.	The pollen grains are larger, heavier with appendages like hooks and barbs. For example, rose, sweet pea.

Q.9. Where does triple fusion take place in a flowering plant? Why is it so called? Mention its significance.

Ans. Triple fusion involves 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.

Three nuclei are involved in triple fusion, i.e., one male nucleus and two polar nuclei in the central cell, therefore, the process is termed triple fusion.

Q.10.

(a) Identify the figure given alongside.

(b) Name the initial cell from which this structure has developed.

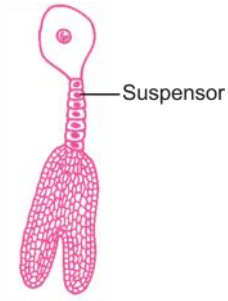
(c) Draw the next mature stage and label the parts.

Ans.

a. It is a globular embryo of a dicot plant.

b. Zygote

c.



Heart-shaped embryo

Q.11. Differentiate between perisperm and endosperm by giving one example of each.

Ans.

S. No.	Perisperm	Endosperm
(i)	It is persistent nucellus.	It is the nutritive tissue for embryo.
(ii)	It is diploid.	It is triploid.
(iii)	Example: black pepper, beet.	Example: maize, rice, wheat, castor.

Q.12. Fertilisation is essential for production of seed, but in some angiosperms, seeds develop without fertilisation.

Q. Give an example of an angiosperm that produces seeds without fertilisation. Name the process.

Ans. In the members of family Asteraceae, seeds develop without fertilisation. This process is called apomixis.

Q. Explain the two ways by which seeds develop without fertilisation.

Ans. Two ways by which seeds develop without fertilisation are:

(a) In some species, the diploid (2n) egg cell is formed without reduction division and develops into embryo without fertilisation.

(b) In many varieties of Citrus and mango fruits, some of the nucellar cells surrounding the embryo sac start dividing, protrude into the embryo sac and then develop into embryos.

Q.13. Explain any three advantages the seeds offer to angiosperms.

Ans.

(i) Since reproductive process such as pollination and fertilisation are independent of water, seed formation is more dependable.

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

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

(iv) The hard seed coat provides protection to the young embryo.

(v) Being products of sexual reproduction, they generate new genetic combinations or variations.

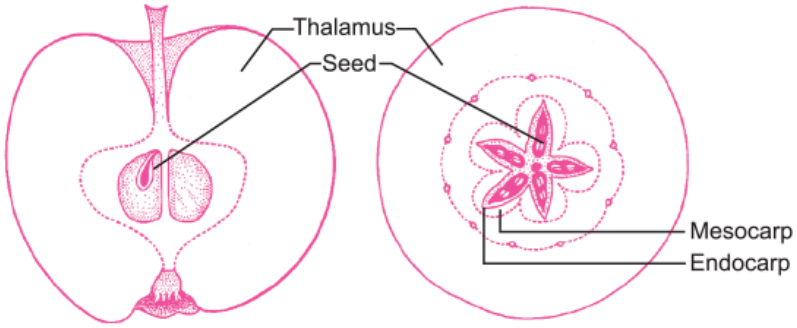
Q.14. Draw a transverse sectional view of an apple and label the following parts along with their technical names:

(i) edible part

(ii) encloses the embryo

(iii) forms the fruit wall

Ans.



Q.15. State what is apomixis. Comment on its significance. How can it be commercially used?

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 raise new crops year after year.

Q.16. Differentiate between an annual and a biennial plant. Provide one example of each.

Ans.

S. No.	**Annual Plants**	**Biennial Plants**
(i)	These plants require a single season to complete their whole life cycle.	These plants require two seasons to complete their whole life cycle.
(ii)	They grow, set seeds and die within one year.	In the first year, they grow a healthy root system and short stem, and become dormant in winters. In second year, they grow quickly, flower, set seeds and die.
(iii)	For example, rice, wheat, etc.	For example, onion, carrot, etc.

Q.17. Answer the following questions -

Q. Name the organic material exine of the pollen grain is made up of. How is this material advantageous to pollen grain?

Ans. Sporopollenin.

It is most resistant material to high temperature, strong acids on alkali and no enzymes can degrade it.

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

Ans. Germs pores are present to allow pollen tube to emerge out for pollen germination.

Q.18. Answer the following questions :

Q. How does cleistogamy ensure autogamy?

Ans. Cleistogamous flowers do not open. Therefore, the pollens have to land on the stigma of the same flower. This ensures autogamy.

Q. State one advantage and one disadvantage of cleistogamy to the plant.

Ans. Advantage: Self-pollination is assured, thus ensuring seed formation.

Disadvantage: Least variations observed and it leads to inbreeding depression.

Q.19. Answer the following questions :

Q. Describe the endosperm development in coconut.

Ans. The primary endosperm nucleus (PEN) undergoes successive nuclear divisions to give rise to free nuclei. Subsequently, cell wall is formed towards the periphery and endosperm becomes cellular, leaving free nuclear endosperm in the central part. This division is followed by cytokinesis and thus endosperm becomes cellular and is called cellular endosperm.

Q. Why is tender coconut considered a healthy source of nutrition?

Ans. It is rich in many nutrients like fats, proteins, carbohydrates, minerals, vitamins. Hence, tender coconut is considered a healthy source of nutrition.

Q. How are pea seeds different from castor seeds with respect to endosperm?

Ans. In peas, the endosperm is used up and there is no endosperm present in the mature seed. In castor, the endosperm remains intact in the mature seed.

Q.20. Answer the following questions :

Q. How does a farmer use the dormancy of seeds to his advantage?

Ans. Dormancy of mature seeds are important for storage of seeds which can be used as food throughout the year and also to raise crop in the next season.

Q. What advantages a seed provides to a plant?

Ans. Seeds offer several advantages to angiosperms. Firstly, since reproductive processes such as pollination and fertilisation are independent of water, seed formation is more dependable. Also 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 leading to variations.

Q.21. Answer the following questions:

Q. Write the characteristic features of anther, pollen and stigma of wind pollinated flowers.

Ans. The characteristics of wind pollinated flowers are:

(a) Pollen grains are light in weight, non-sticky, dry and winged.

(b) Well-exposed stamens for easy dispersal of pollen grains in the wind.

(c) The stigma is sticky, large, feathery to trap pollen grains in air.

Q. How do flowers reward their insect pollinators? Explain.

Ans. Insect pollinators are rewarded in following ways:

(a) The flowers offer floral reward like nectar and pollen grain.

(b) In some species floral reward provides safe place to lay eggs.

Q.22. Answer the following questions:

Q. Mention any four strategies adopted by flowering plants to prevent self-pollination.

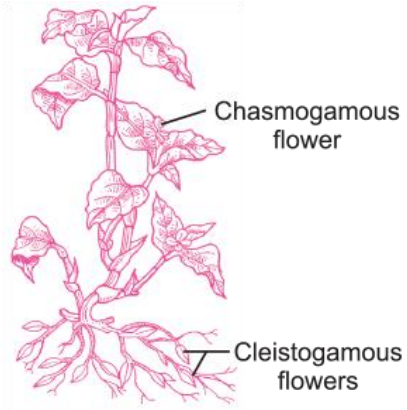
Ans. Contrivances or Devices forSelf-pollination (Autogamy)

Cross-pollination can be prevented by exhibiting

(i) Cleistogamous flowers: These are bisexual closed flowers which never open and the anthers dehisce inside these closed flowers, e.g., Commelina.

(ii) Homogamy: It is the condition of the maturity of anther and stigma at the same time, e.g., Catharanthus (Vinca).

(iii) Close association between anther and stigma, e.g., Mirabilis.



Chasmogamous and cleistogamous flowers

Q. Why is geitonogamy also referred to as genetical autogamy?

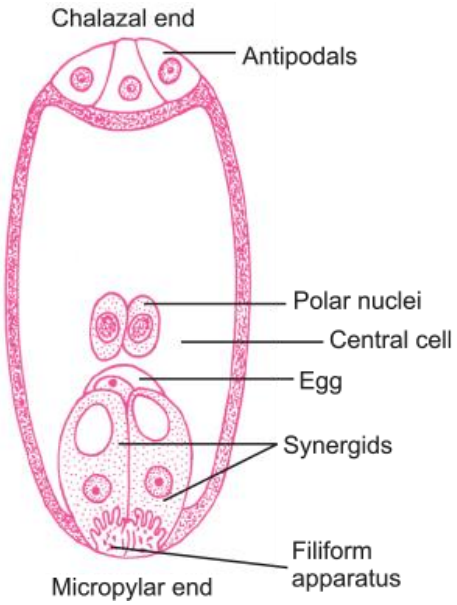
Ans. Geitonogamy is the transfer of pollen grains from the anther to the stigma of another flower of the same plant. Although geitonogamy is functionally cross-pollination involving a pollinating agent, genetically it is similar to autogamy, since the pollen grains come from the same plant.

Q.23.

(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 fertilisation?

Ans.



A diagrammatic representation of the mature embryo sac

Short Answer Questions-II (OIQ)

[3 Marks]

Q.1. List three strategies that a bisexual flower can evolve to prevent self-pollination.

Ans.

(a) Dichogamy: The condition in which the maturation of stigma and anther takes place at different times so as to prevent self-fertilisation.

(b) Heterostyly: In this, anther and stigma are placed at different positions, so the pollens can not come in contact with stigma of the same flower.

(c) Herkogamy: It is the non-transferred of pollen from anther to stigma of the same flower due to a mechanical barrier between anther and stigma.

Q.2. Draw a diagram of L.S. of an anatropous ovule of an angiosperm and label the following parts.

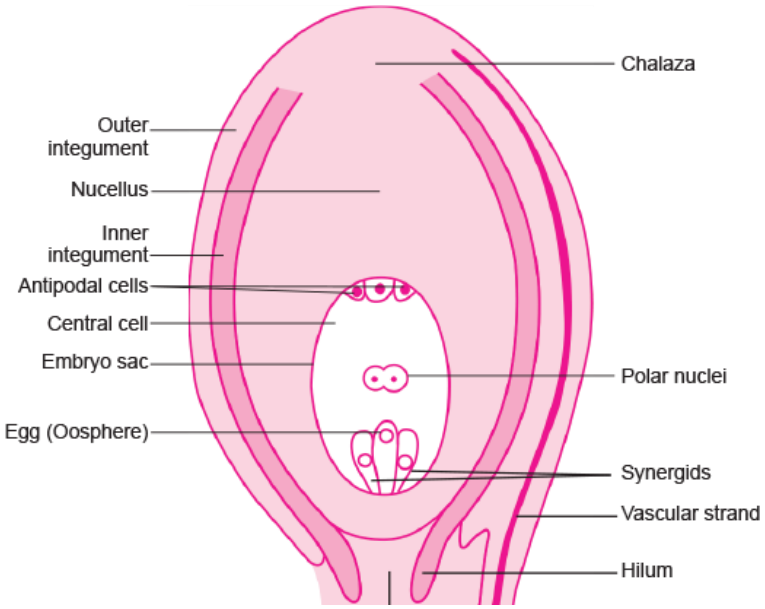
(i) Nucellus

(ii) Integument

(iii) Antipodal cells

(iv) Secondary nucleus.

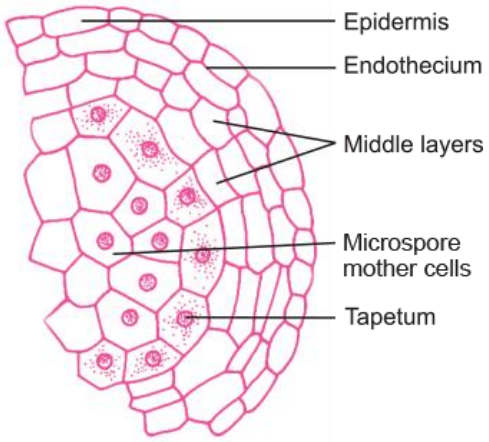
Ans.



A diagrammatic view of a typical anatropous ovule

Q.3. Draw and label the enlarged view of microsporangium of an Angiosperm. State the function of its innermost wall layer.

Ans.



Enlarged view of one microsporangium showing wall layers

Tapetum, the innermost wall layer provides nourishment to the developing pollen grains.

Q.4. Why do you think the exine should be hard? What is the function of germ pore?

Ans. Exine is the outermost layer of pollen grain which is made up of a highly resistant organic material called sporopollenin. Exine should be hard to withstand high temperature, strong acids and alkali. Germ pores are prominent apertures where sporopollenin is absent which later on protrudes out as pollen tube.

Q.5. “Pollen grains has some harmful effects”. Discuss.

Ans.

(i) Pollen grains cause severe allergies, bronchial respiratory disorders, asthma, bronchitis, etc.

(ii) Parthenium (or carrot grass) came into India as contaminant with imported wheat and causes pollen allergy.

Q.6. Trace the development of female gametophyte (embryo sac) from megaspore mother cell in a flower. Give a labelled diagram of the final stage of female gametophyte.

Ans.

(i) Megaspore is the first cell of the female gametophyte.

(ii) The megaspore increases in size and its nucleus divides mitotically into two nuclei which move apart to opposite poles. Thus, a 2-nucleate embryo sac is formed.

(iii) The two daughter nuclei undergo another mitotic division giving rise to the 4-nucleate stage.

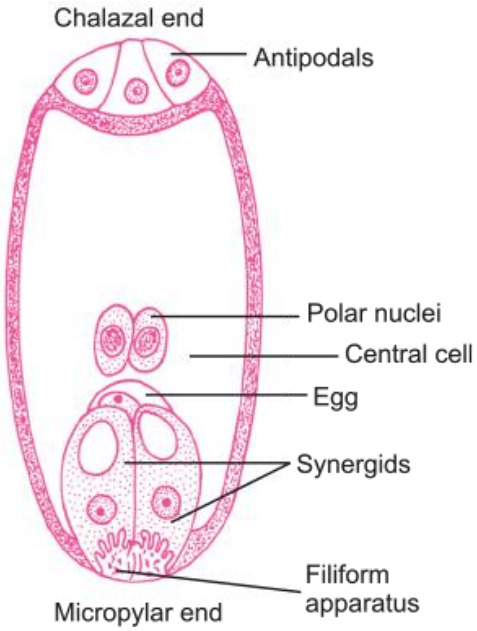
(iv) The third mitotic division gives rise to 8-nucleate 7-celled embryo sac.

(v) The central cell contains 2 nuclei known as polar nuclei.

(vi) The three nuclei at the micropylar region form the egg apparatus.

(vii) In the egg apparatus, the middle cell is the largest and is called oosphere/egg/ovum, while other two naked cells adjoining the egg cell are called synergids.

(viii) The three nuclei at the chalazal end are surrounded by cytoplasm and cellular wall. These are called antipodal cells.



A diagrammatic representation of the mature embryo sac

Q.7. Explain three outbreeding devices.

Ans.

(i) Unisexuality: Male and female flowers are present on different plants.

(ii) Dichogamy: The condition in which the stamens and stigma of a bisexual flower mature at different times.

(iii) Protandry: This is the condition where anthers mature earlier than the stigma and release pollens.

Q.8. What is geitonogamy? Give its one similarity to autogamy and xenogamy.

Ans. Geitonogamy is a type of pollination in which pollen grains of a flower are transferred to the stigma of another flower of the same plant.

Similarity to autogamy: Geitonogamy is genetically similar to autogamy in the respect that pollen grains are transferred to stigma of the flower, but on the same plant so both are genetically similar whereas autogamy occurs in bisexual flower.

Similarity to xenogamy: Geitonogamy is similar to xenogamy in the respect that pollen grains are transferred to stigma of different flower.

Q.9. Give two examples of each:

Q. Wind pollinated (anemophilous) plants

Ans. Cannabis, Coconut

Q. Water pollinated (hydrophilous) plants

Ans. Vallisneria, Hydrilla

Q.10. State the significance of pollination. List any four differences between wind pollinated and animal pollinated flowers.

Ans. Pollination is the phenomena of transfer of pollen grains from anthers to the stigma of a pistil. Pollination is prerequisite for the beginning of fertilisation.

S. No.	**Wind-pollinated flowers**	**Animal pollinated flowers**
(*i*)	This kind of flower is pollinated by abiotic pollinating agent.	This kind of flower is pollinated by biotic pollinating agent.
(*ii*)	They are small and inconspicuous.	They are large, colourful, fragrant and rich in nectar.
(*iii*)	The pollen grains are dry, light and non-sticky so that they can be easily transported by wind.	The pollen gains are generally sticky in animal pollinated flowers.
(*iv*)	The flowers are often clustered so as to carry out pollination.	The flowers are grouped to become more conspicuous.

Q.11. What will be the ploidy of the cells of the nucellus, microspore mother cell, the functional megaspore and female gametophyte?

Ans. Nucellus: Diploid

Microspore mother cell: Diploid

The functional megaspore: Haploid

Female gametophyte: Haploid

Q.12. Given below are the events that are observed in artificial hybridisation programme. Arrange them in the correct sequential order in which they are followed in the hybridisation programme. (a) re-bagging; (b) selection of parents;

(c) bagging; (d) dusting the pollen on stigma; (e) emasculation; (f) collection of pollen from male parent.

Ans. (b); (e); (c); (f); (d); (a).

Q.13. The generative cell of a 2-celled pollen divides in the pollen tube but not in a 3-celled pollen. Give reasons.

Ans. In a 3-celled pollen, the generative cell has already divided and formed 2 male gametes. Hence, it will not divide again in the pollen tube. As the generative cell has not divided in a 2-celled pollen, it divides in the pollen tube.

Q.14. Cleistogamy can favour only autogamy. Justify.

Ans. In cleistogamy, flowers never open at all. Hence, foreign pollen will not land on the stigma of such flowers. So, cleistogamy can favour only self-pollination.

Q.15. Name the cell from which the endosperm develops in a coconut. Mention its ploidy. Explain the process of endosperm development in a coconut.

Ans. Endosperm develops from the primary endosperm cell. It is triploid (3n) in nature.

The endosperm develops from primary endosperm nucleus (PEN). The PEN undergoes successive nuclear divisions to give rise to free nuclei. This stage is called free nuclear endosperm. Subsequently, cell wall is formed on the periphery and endosperm becomes cellular.

Q.16. 'Fertilisation is not an obligatory event for fruit production in certain plants'. Explain the statement.

Ans. This can be observed in parthenocarpic fruits. The 'seedless fruits' that are available in the market, such as pomegranate, grapes, etc., are good examples. Flowers of these plants are sprayed by a growth hormone that induces fruit development even though fertilisation has not occurred. The ovules of such fruits, however, fail to develop into seeds.

Q.17. Is pollination and fertilisation necessary in apomixis? Give reasons.

Ans. No, they are not necessary. Apomixis is actually an alternative to sexual reproduction, although the female sexual apparatus is used in the process. In apomicts, embryos can develop directly from the nucellus or synergid or egg. Therefore, there is no need for either pollination or fertilisation.

Q.18. Embryo sacs of some apomictic species appear normal but contain diploid cells. Suggest a suitable explanation for the condition.

Ans. Many apomictic species have been seen to have normal looking embryo sacs. The only possibility of the embryo sac possessing diploid cells will be due to failure of meiotic division at the megaspore mother cell stage. Since the megaspore mother cell

has a diploid nucleus, if it undergoes mitosis instead of meiosis, all the resulting nuclei and cells will be diploid in nature.

Q.19. 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.

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

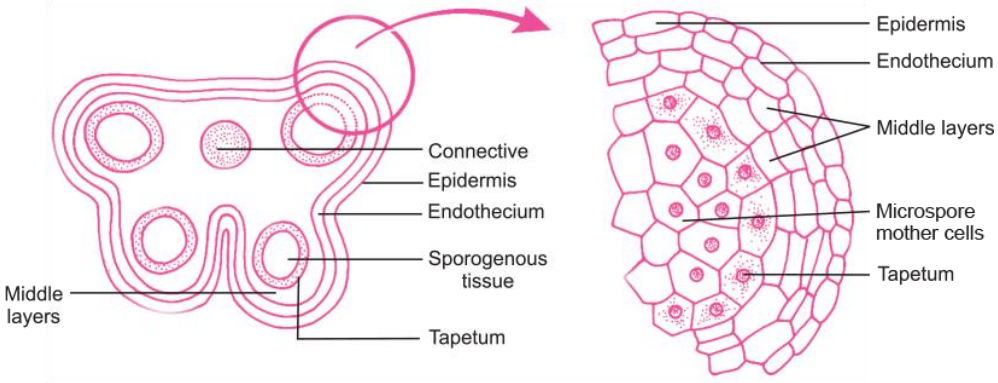
It is the most resistant organic material known. It can withstand high temperature, strong acids and alkali as well. No enzyme that degrades sporopollenin is so far known.

Long Answer Questions (PYQ)

[5 Marks]

Q.1. Draw a labelled diagram of an anther lobe at microspore mother cell stage. Mention the role of different wall layers of anther.

Ans.



(a) Transverse section of a young anther;

(b) Enlarged view of one microsporangium showing wall layers

Roles of different wall layers of anther:

(i) Epidermis, endothecium and middle layers perform the function of protection and help in dehiscence of anther to release the pollen.

(ii) Tapetum is the innermost wall layer and it provides nourishment to the developing pollen grains.

Q.2. Describe in sequence the events that lead to the development of a 3-celled pollen grain from microspore mother cell in angiosperms.

Ans.

● Each cell of the sporogenous tissue in a microsporangium acts as a potential pollen mother cell (PMC) or microspore mother cell.

● PMC undergoes 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.

● The newly differentiated pollen grain has a central nucleus and dense cytoplasm.

● The protoplast mitotically divides into two unequal cells—bigger vegetative cell which is rich in food reserve and smaller spindle-shaped generative cell with dense cytoplasm and a nucleus. This is called 2-celled stage.

● In majority angiosperms, pollens are released in this 2-celled stage, whereas in other species, the generative cell divides into 2 male gametes and thus pollen is said to be in 3-celled stage.

Q.3. Explain the events upto fertilisation that occur in a flower after the pollen grain has landed on its compatible stigma.

Ans. Pollen−Pistil Interaction

● All the events from pollen deposition on the stigma until the entry of the pollen tubes into the ovule are together called pollen–pistil interactions.

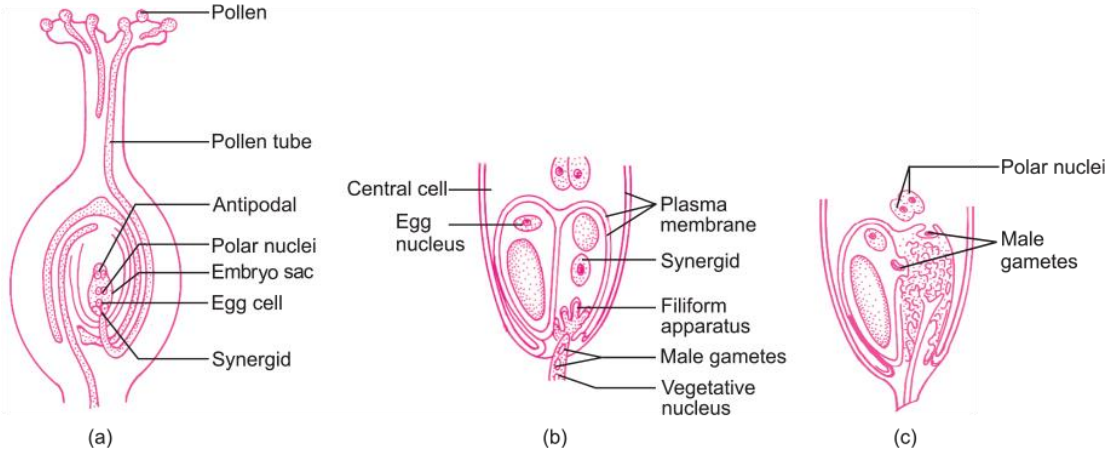
● It is a dynamic process involving pollen recognition by stigma/pistil for compatible pollen.

● Incompatible pollens or sterile pollens are rejected by the pistil and do not allow growth of pollen tube.

● Compatible pollens are encouraged by pistil for growth and development of pollen tubes.

● The pollen tube grows through stigma and style to reach the ovary.

● It then enters the ovule through micropyle and reaches the synergids, guided by filiform apparatus.



(a) L.S. of pistil showing path of pollen tube growth;

(b) Enlarged view of an egg apparatus showing entry of pollen tube into a synergid;

(c) Discharge of male gametes into a synergid and the movements of the sperms, one into the egg and the other into the central cell.

Double Fertilisation/Triple Fusion

● On reaching synergid, pollen tube releases the two male gametes into cytoplasm of synergid.

● One of the male gamete fuses with egg nucleus to form a diploid cell called zygote. This event is called **syngamy**.

● Other male gamete fuses with polar nuclei at the centre to produce a triploid primary endosperm nucleus **(PEN).** This is termed as **triple fusion**.

● As syngamy and triple fusion take place simultaneously in the embryo sac, it is termed as double fertilisation.

Q.4. Make a list of any three outbreeding devices that flowering plants have developed and explain how they help to encourage cross-pollination.

Ans.

(i) Production of unisexual flowers/dioecious plants, cross pollination ensured.

(ii) Self incompatibility, genetic mechanism prevent the pollen germination on the stigma of the same flower.

(iii) Anther and stigma are placed at different positions, so the pollen can not come in contact with the stigma of the same flower.

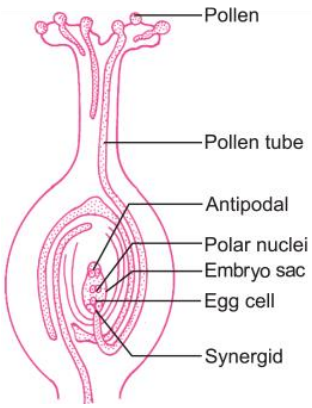
Q.5.

(a) Draw a labelled diagram of L.S. of a flower to show the growth of pollen tube reaching egg apparatus.

(b) Pistil of a flower does not accept pollen from any plant other than from its own kind. How does it happen? Explain.

Ans.

a.



b. The pistil has the ability to recognise pollen, whether it is of right type (compatible) or of the wrong type (incompatible). It is mediated by chemical components of the pollen interacting with those of the pistil.

Q.6. Explain double fertilisation and trace the post-fertilisation events in sequential order leading to seed formation in a typical dicotyledonous plant.

Ans. Double fertilisation:

- On reaching synergid, pollen tube releases the two male gametes into cytoplasm of synergid.
- One of the male gamete fuses with egg nucleus to form a diploid cell called zygote. This event is called **syngamy**.
- Other male gamete fuses with polar nuclei at the centre to produce a triploid **primary endosperm nucleus (PEN)**. This is termed as **triple fusion**.
- As syngamy and triple fusion take place simultaneously in the embryo sac, it is termed as double fertilisation.
- The central cell after triple fusion forms **primary endosperm cell (PEC)** which later develops into endosperm.
- The zygote later develops into an embryo.

Following are the post-fertilisation events:

i. **Development of embryo:** Embryo develops in fertilised ovule, from the zygote. The early stages of embryo development from a zygote is known as embryogeny. The formation of embryo starts only after certain amount of endosperm formation to assure the nutrition supply, for development and growth of embryo.

ii. **Development of seeds:** Refer to Basic Concepts Point 10 (Embryogeny in Dicots).
As a result of double fertilisation number of changes takes place in an ovule due to which ovule is converted into seeds.

Q.7. Give reasons why:

Q. most zygotes in angiosperms divide only after certain amount of endosperm is formed.

Ans. To obtain nutrition from the endosperm for the developing embryo, zygotes, divide after itsformation.

Q. groundnut seeds are exalbuminous and castor seeds are albuminous.

Ans. The groundnut seeds are exalbuminous because the endosperm is completely consumed during embryo den. Whereas, castor seeds are albuminous because the endosperm persists and is used up during seed germination.

Q.8. A flower of tomato plant following the process of sexual reproduction produce 240 viable seeds.

Answer the following questions giving reasons:

Q. What is the minimum number of pollen grains that must have been involved in the pollination of its pistil?

Ans. 240 pollen grains. One pollen grain participates in fertilisation of one ovule.

Q. What would have been the minimum number of ovules present in the ovary?

Ans. 240 ovules. One ovule after fertilisation forms one seed

Q. How many megaspore mother cells were involved?

Ans. 240 MMC were involved. Each MMC forms four megaspores out of which only one remains functional.

Q. What is the minimum number of microspore mother cells involved in the above case?

Ans. 60 MMCs (240/4 = 60). Each microspore mother cell meiotically divides to form four pollen grains.

Q. How many male gametes were involved in this case?

Ans. 480 male gametes (240 × 2 = 480). Each pollen grain carries two male gametes (which participate in double fertilisation)

Q.9. A flower of brinjal plant following the process of sexual reproduction produces 360 viable seeds.

Answer the following questions giving reasons:

Q. How many ovules are minimally involved?

Ans. 360 ovules are involved. One ovule after fertilisation forms one seed.

Q. How many megaspore mother cells are involved?

Ans. 360 MMC are involved. Each MMC forms four megaspores out of which only one remains functional.

Q. What is the minimum number of pollen grains that must land on stigma for pollination?

Ans. 360 pollen grains. One pollen grains participates in fertilisation of one ovule.

Q. How many male gametes are involved in the above case?

Ans. 720 male gametes are involved. Each pollen grain carries two male gametes (which participate in double fertilisation) (360 × 2 = 720).

Q. How many microspore mother cells must have undergone reduction division prior to dehiscence of another in the above case?

Ans. 90 MMC undergo reduction division. Each microspore mother cell meiotically divides to form four pollen grains. (360/4 = 90).

Long Answer Questions (OIQ)

[5 Marks]

Q.1.

a. Draw a diagrammatic sketch of the sectional view of a typical anatropous ovule.

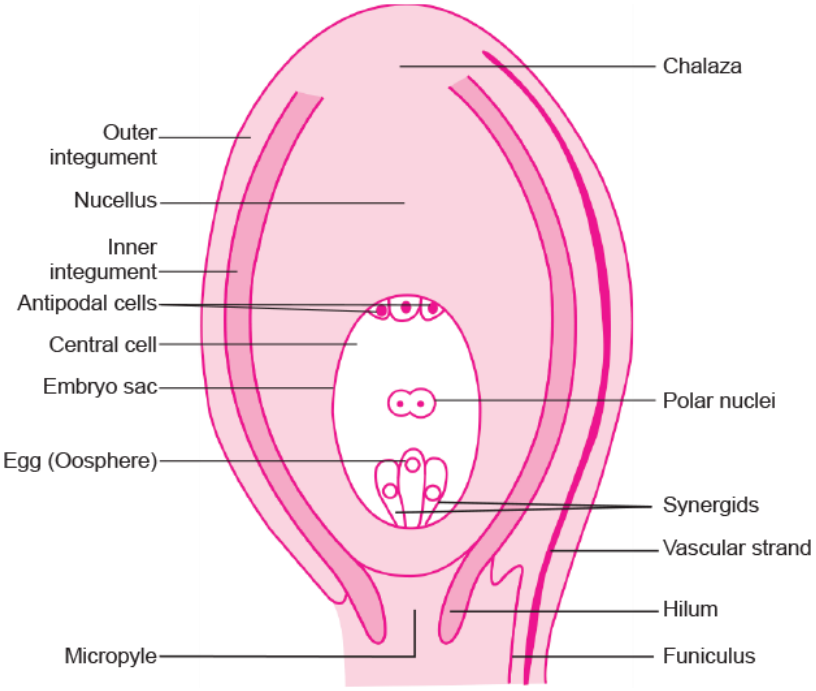
b. List the components of the embryo sac and mention their fate on fertilisation.

OR

a. Draw a labelled diagram of the sectional view of a typical anatropous ovule.

b. Mention the fate of all the components of the embryo sac after fertilisation.

Ans. (a)



(b) Components of embryo sac: 2 polar nuclei, 1 egg cell, 2 synergids and 3 antipodal cells.

— After positive pollen−pistil interaction, the pollen tube develops and enters the ovule through synergids guided by filiform apparatus.

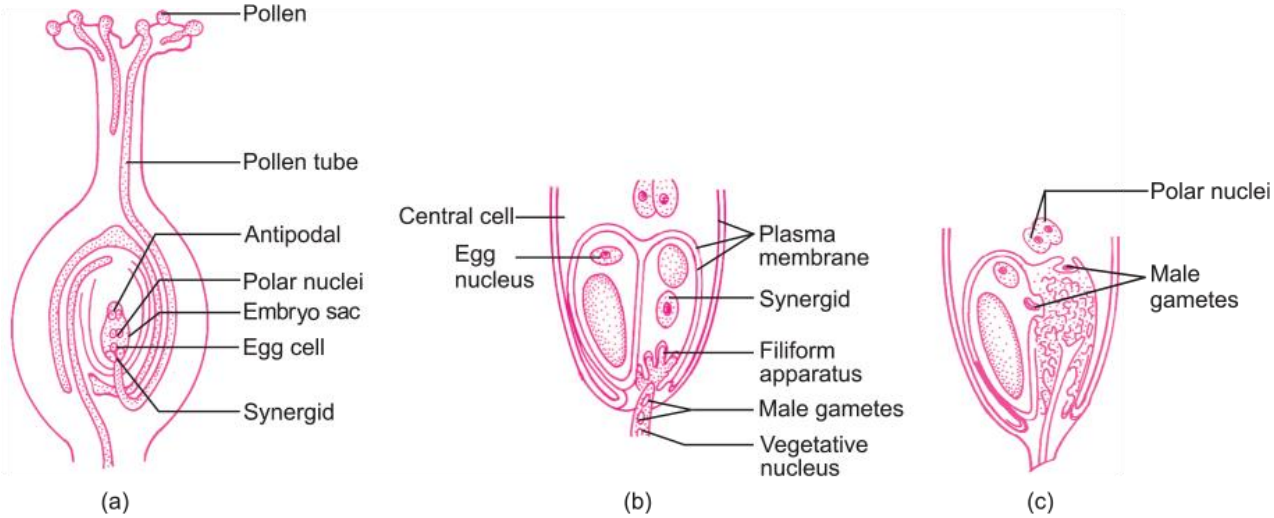
— One of the male gamete fertilises the female gamete to form diploid zygote.

— The other male gamete fuses with the secondary nucleus (polar nuclei if they are already fused) to form a triploid primary endosperm nucleus (PEN) that develops into endosperm.

— The three antipodals at chalazal end and synergids at micropylar end start degenerating.

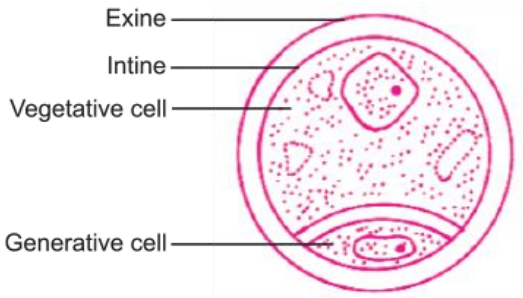
Q.2. Trace the events that would take place in a flower from the time the pollen grain of the same species falls on the stigma up to the completion of fertilisation.

Ans. When pollen grain lands over the stigma, it starts germinating and produces a pollen tube through a germ pore. Pollen tube passes through style and reaches the ovule. The generative cell divides and forms two male gametes. Finally the pollen tube enters the embryo sac through micropyle. Now the pollen tube enters the egg apparatus through one of the synergids with the help of filiform apparatus. The vegetative nucleus degenerates while pollen tube leaves two male gametes in embryo sac. Now one of the male gamete fuses with the egg cell to form diploid zygote known as syngamy. The other male gamete fuses with the two already fused polar nuclei (called secondary nucleus) and forms triploid primary endosperm nucleus (PEN) which later gives rise to endosperm. This is called triple fusion. Hence syngamy and triple fusion together are known as double fertilisation.



Q.3. Draw a labelled diagram of the sectional view of a mature pollen grain in angiosperms. Explain the functions of its different parts.

Ans.

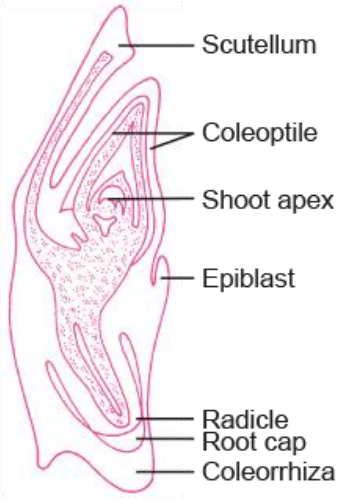


Functions:

i. Pollen grains are generally spherical with a prominent two-layered wall. The hard outer layer is called exine made up of sporopollenin, which is a resistant organic material.
ii. Exine can withstand high temperature, strong acids and alkali, thus provide protection.
iii. It has prominent aperture called germ pore, through which pollen tube comes out.
iv. Vegetative cell has abundant food reserve.
v. Generative cell divides mitotically giving rise to two male gametes, before pollen grains are shed (3-celled stage).

Q.4. Draw a labelled diagram of the L.S. of embryo of grasses. How does it differ from that of bean?

Ans.



L.S. of an embryo of grass (monocot)

Differences:

S. No.	Embryo of grass	Embryo of bean

(*i*)	The seed has a single cotyledon (scutellum), *i.e.*, it is monocotyledonous.	The seed has two cotyledons, *i.e.*, it is dicotyledonous.
(*ii*)	The plumule is protected by a foliaceoussheath called coleoptile.	There is no such protection for the plumule in bean
(*iii*)	The radicle is protected by coleorhiza.	There is no such protective covering for theradicle.

Q.5. Rose plants produce large, attractive bisexual flowers but they seldom produce fruit. On the other hand, Lady's finger produces plenty of fruits. Analyse the reasons for failure of fruit formation in rose.

Ans. Failure of fruit formation in rose may be due to several reasons. Some of them are:

(a) Inability to produce viable pollens.

(b) Absence of functional egg.

(c) Presence of abortive ovules.

(d) Being hybrids, the meiotic process may be abnormal resulting in non-viable gametes.

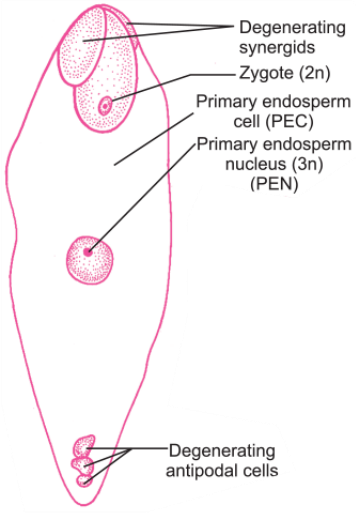
(e) There may be self-incompatibility.

(f) There may be internal barriers for pollen tube growth and/or fertilisation.

Q.6. Answer the following questions:

Q. Draw a schematic labelled diagram of a fertilised embryo sac of an angiosperm.

Ans.



Fertilised Embryo Sac of an Angiosperm

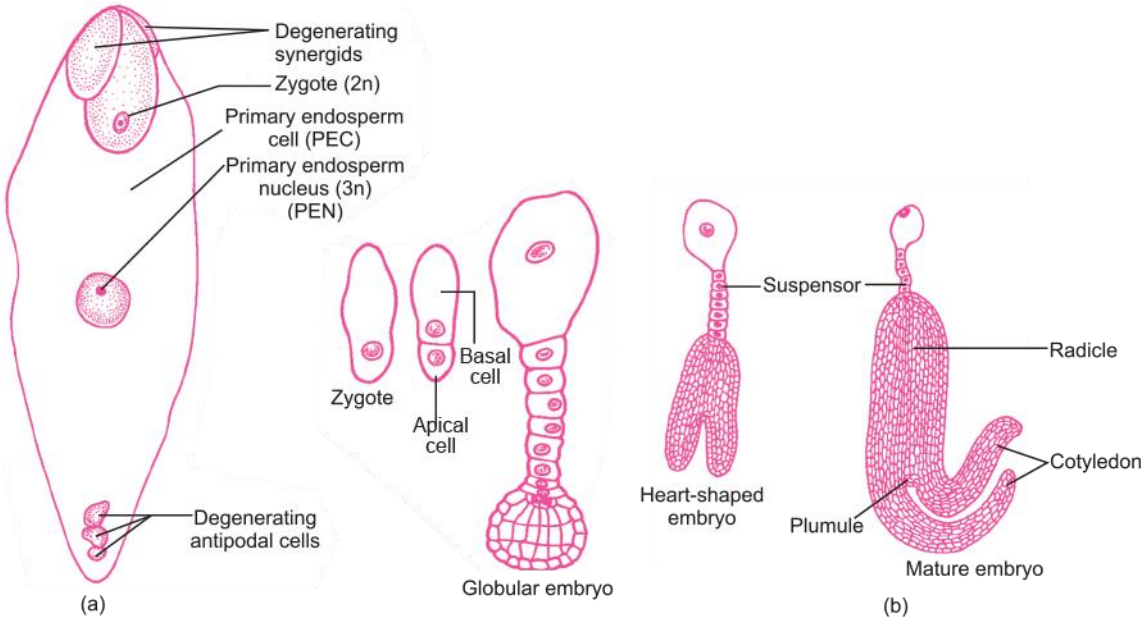
Q. Describe the stages in embryo development in a dicot plant.

Ans. For explanation refer to Basic Concepts Point 10 (Embryogeny in Dicots).

Q.7. Answer the following questions:

Q. With labelled diagrams, depict stages in embryo development in a dicotyledenous plant.

Ans.



Q. Endosperm development precedes embryo development. Why?

Ans. Endosperm is filled with reserve food materials which are used for nutrition of the developing embryo.

Q.8. Answer the following questions:

Q. Seeds offer several advantages to angiosperms. Describe any three such advantages.

Ans. Reproductive processes such as pollination and fertilisation are independent of water.

Following are their advantages:

- **i.** Better adaptive strategies for dispersal to new habitats.
- **ii.** Hard seed coat provides protection to young embryo .
- **iii.** Sexual reproduction—new genetic combinations.
- **iv.** Sufficient food reserves for the seedling.
- **v.** Basis of agriculture–storage of seeds can occur due to seed habit-dehydration and dormancy.

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

Ans.

Banana fruit develops without fertilisation therefore, it is called parthenocarpic fruit.

Yes, it is a true fruit because it develops from ovary.