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.

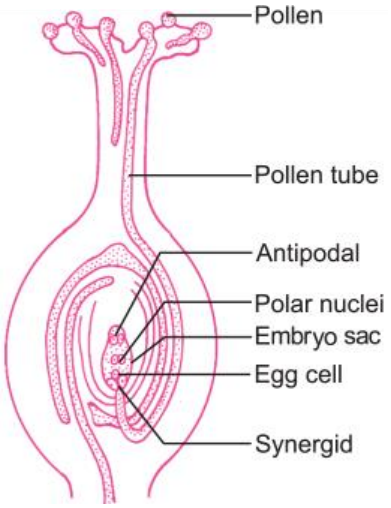
Q.4. Why are angiosperm anthers called dithecous? Describe the structure of its microsporangium.

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

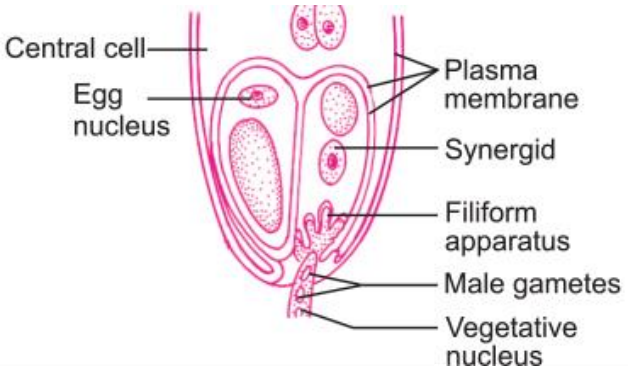
Microsporangium is surrounded by four wall layers named as epidermis, endothecium, middle layer and tapetum. In young anther, a group of compactly arranged homogenous cells called sporogenous tissue occupies the centre of each microsporangium which produce microspores or pollen grains.

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.

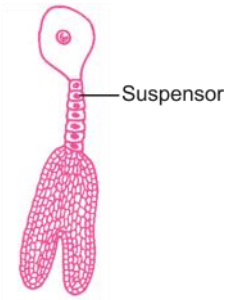
(c) Draw the next mature stage and label the parts.

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.

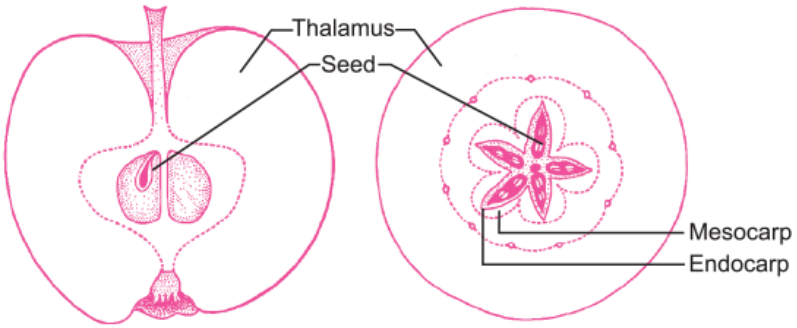
Q.14. Draw a transverse sectional view of an apple and label the following parts along with their technical names:

(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.

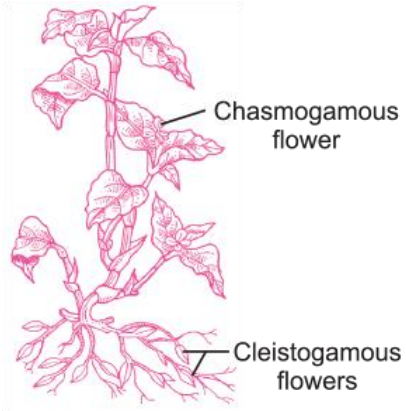
Ans. Contrivances or Devices forSelf-pollination (Autogamy)

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?

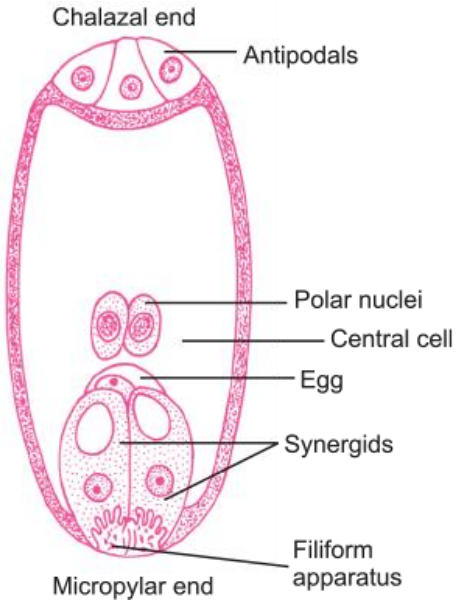
Ans. Geitonogamy is the transfer of pollen grains from the anther to the stigma of another flower of the same plant. Although geitonogamy is functionally cross-pollination involving a pollinating agent, genetically it is similar to autogamy, since the pollen grains come from the same plant.

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.

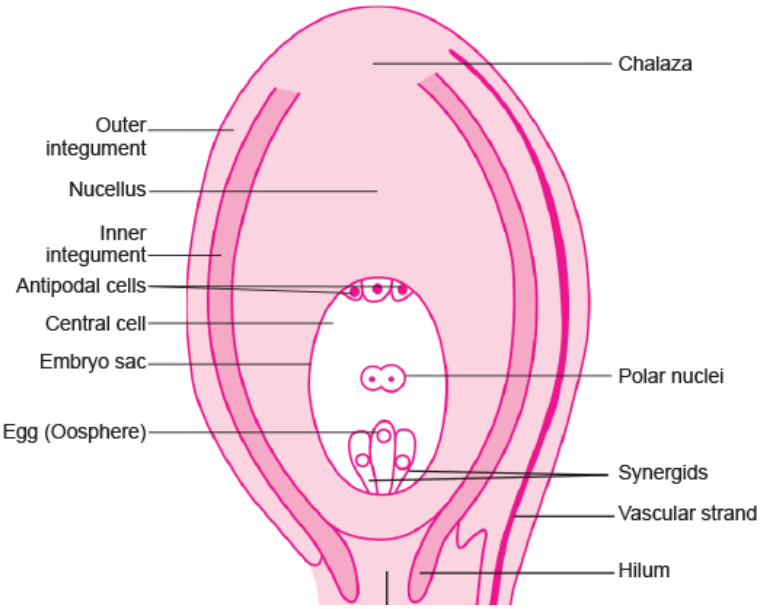
(i) Nucellus

(ii) Integument

(iii) Antipodal cells

(iv) Secondary nucleus.

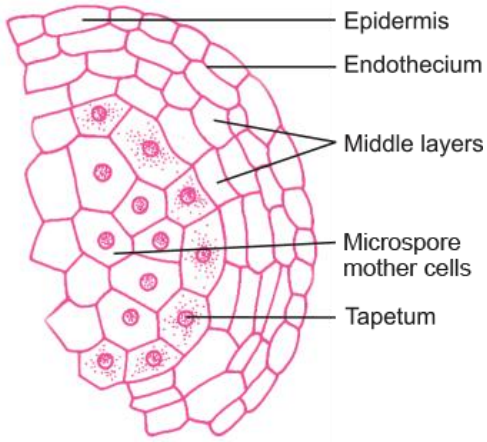
Ans.



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.

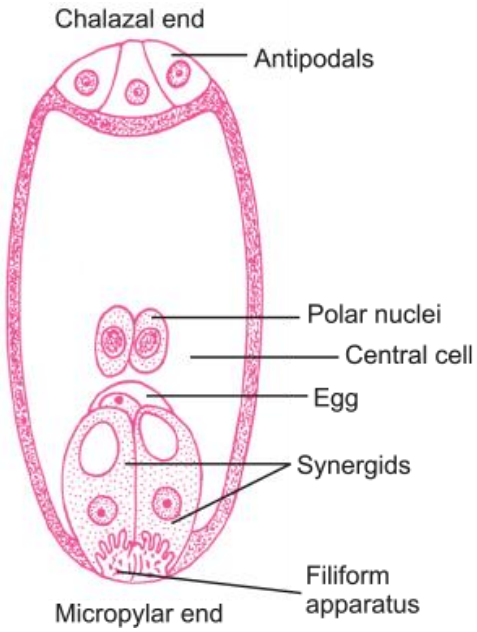
(iv) The third mitotic division gives rise to 8-nucleate 7-celled embryo sac.

(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.