THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

AIM HIGH, TOGETHER WE FLY

Grade 12 Biology

Chapter 2: Sexual Reproduction in flowering plants

Question bank 3

Q. 1. (a) Where is microsporangium located in an angiosperm ? State the functions of tapetum and the other three layers of microsporangium? (b) Describe the structure of the male gametophyte produced as a result of microsporogenesis. (c) State the functions of each part of the male gametophyte.

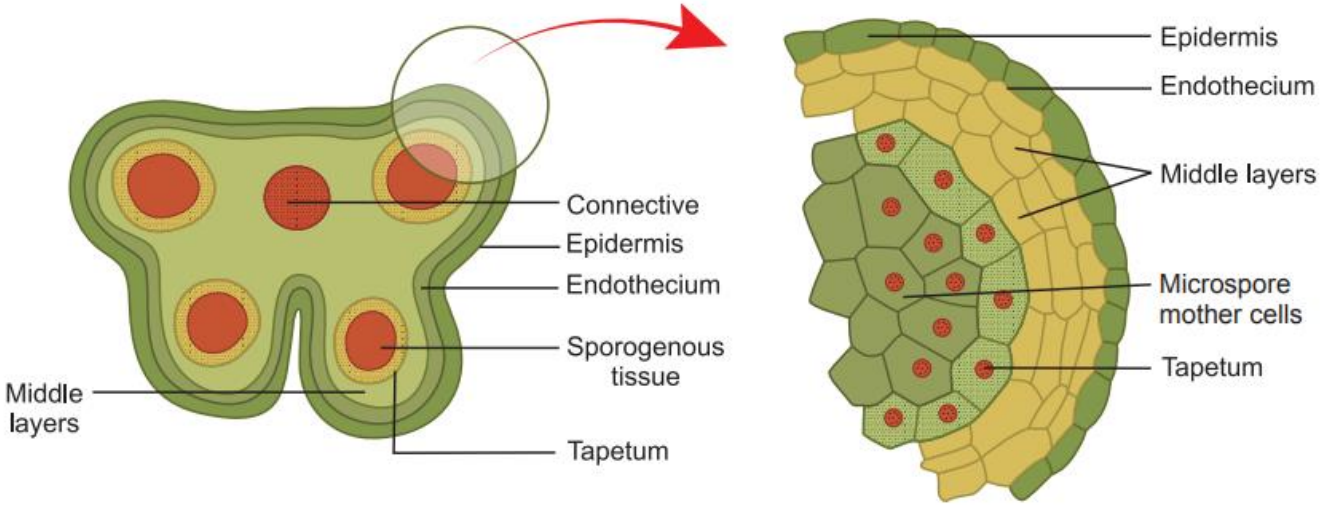
Ans. (a) Microsporangium is located in the anther lobe. Tapetum nourishes the developing pollen grain. The other three layers of microsporangium, i.e., epidermis, endothecium and middle layers protect and dehisce the microsporangium. (b) Structure of Pollen grain/male gemetophyte. (i) Outer wall layer of the male gametophyte is called exine. It is a hard layer, made of sporopollenin. It protects the pollen grain. (ii) Inner wall layer is called as intine. It is made up of cellulose and pectin. (iii) Vegetative cell is rich in food reserve. It helps in formation of pollen tube. (iv) Generative cell is smaller and has dense cytoplasm and a nucleus. It forms the two male gametes.

Q.2. (a) Draw a diagram of an enlarged view of T.S. of one microsporangium of an angiosperm and label the following parts: (i) Tapetum (ii) Middle layer (iii) Endothecium (iv) Microspore mother cells

(b) Mention the characteristic features and function of tapetum.

(c) Explain the following giving reasons: (i) Pollen grains are well preserved as fossils. (ii) Pollen tablets are in use by people these days.

Ans. (a)



(b) Tapetum is the innermost wall layer of the microsporangium. It nourishes the developing pollen grains. Cells of the tapetum possess dense cytoplasm and generally have more than one nucleus.

(c) (i) Pollen grains have thick outer exine which is composed of sporopollenin. Sporopollenin can withstand high temperatures and strong acids and alkalis and are not degraded by any enzymes. Therefore, they are well preserved as fossils. (ii) Pollen tablets are used by people because pollens are rich in nutrients so used to increase performance of athletes and race horses.

Q. 3. (a) Explain the characteristic features of wind-pollinated flowers. How are insect-pollinated flowers different from them?

(b) Explain the mutually rewarding relationship between Yucca plant and a species of moth.

Ans. (a) Wind-pollinated flowers have light-weight, non-sticky, dry and winged pollens. The wellexposed stamens help in easy dispersal of pollen grains. The stigma is sticky, large and feathery to trap pollen grains floating in the air. Numerous flowers are packed together to form inflorescence. Insect-pollinated flowers are large, sticky and brightly coloured with honey and nectar glands to attract insects. They are highly fragrant and the stigma is sticky.

(b) Both Yucca plant and the moth cannot complete their life cycles without each other. The moth deposits its eggs in the locule of the ovary and the flower in turn, gets pollinated by the moth. The larvae of the moth come out of the eggs as the seeds start developing.

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) Plan an experiment and prepare a flow chart of the steps that you would follow to ensure that the seeds are formed only from the desired sets of pollen grains. Name the type of experiment that you carried out. (b) Write the importance of such experiments.

Ans. (a) Selection of flowers from desired plants → emasculation → bagging → dusting of the pollens on the stigma of the flowers that were bagged (pollination) → rebagging of flower → fruit formed The name of the experiment is Artificial hybridisation.

(b) (i) Production of superior or improved varieties of plants. (ii) Improves crop yield.

Q. 6. (a) Explain the different ways apomictic seeds can develop. Give an example of each.

(b) Mention one advantage of apomictic seeds to farmers.

Ans. (a) (i) Diploid egg cell is formed without reduction division and develops into embryo without fertilisation, e.g., Asteraceae/grasses. (ii) In citrus/mango, some of the diploid nucellar cells surrounding the embryo sac start dividing, protrude into embryo sac and develop into a embryo.

(b) No segregation of character in hybrid seeds, economically beneficial and desired varieties are cultivated.

Q. 7. Explain the events upto fertilisation that occur in a flower after the pollen grain has landed on its compatible stigma.

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

Ans. The following steps would be followed: (i) Emasculation or removal of anthers from the flower bud, before the anther dehisce, to avoid self pollination. (ii) Bagging, to prevent contamination of its stigma with unwanted pollen grains. (iii) Rebagging, the stigma of the mature ovary are dusted with desired pollen grains and rebagged to allow the fruit to develop.

Q. 9. Give reasons why:

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

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

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

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

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

Ans. (i) To obtain nutrition from the endosperm for the developing embryo, zygotes, divide after its formation.

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

(iii) Micropyle remain as a small pore in the seed coat of a seed for the entry of water and oxygen required for germination.

(iv) To protect the embryo and keep the seed viable, until favourable conditions return for germination.

(v) In apple and cashew, apart from ovary, thalamus also contributes to fruit formation so they are not true fruits.

Q 10. A flower of tomato plant following the process of sexual reproduction produce 240 viable seeds. Answer the following questions giving reasons:

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

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

(c) How many megaspore mother cells were involved?

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

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

Ans. (a) 240 pollen grains. One pollen grain participates in fertilisation of one ovule. (b) 240 ovules. One ovule after fertilisation forms one seed (c) 240 MMC were involved. Each MMC forms four megaspores out of which only one remains functional. (d) 60 MMCs (240/4 = 60). Each microspore mother cell meiotically divides to form four pollen grains. (e) 480 male gametes (240 × 2 = 480). Each pollen grain carries two male gametes (which participate in double fertilisation)

Q.11. 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. (d) There may be internal barriers for pollen tube growth and/or fertilisation.

Q. 12. (a) Seeds offer several advantages to angiosperms. Describe any three such advantages.

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

Ans. (a) 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. (Any three)

(b) Banana fruit develops without fertilisation therefore, it is called parthenocarpic fruit. Yes, it is a true fruit because it develops from ovary.