

Board – ICSE

Class – 9

Topic – Pollination and Fertilisation

1. Define pollination. How does it differ from fertilization?

**Ans:** Pollination is the transfer of pollen grains from the anthers to the stigma. Fertilization follows successful pollination and is the fusion of the nuclei of two dissimilar sexual units called the male and female gametes. While pollination results in germination of pollen grains, formation of pollen tubes and the entry of pollen tube inside the ovary up to the ovules, fertilization results in the formation of zygote and subsequently seeds.

2. Give two advantages and two disadvantages each of self and cross-pollination.

**Ans:** Advantages of Self-pollination

- (i) Self-pollination being almost certain in bisexual flowers ensures continuity of the race.
- (ii) Self-pollination helps to preserve the parental characters as the gametes from the same flower are involved.
- (iii) It is economical as the plants do not have to produce pollen grains in large quantity.
- (iv) Flowers need not be showy, nor they need to produce nectar or scent.

#### **Disadvantages of Self-pollination**

- (i) New varieties cannot be obtained by self-pollination.
- (ii) The genetic defects of the breed cannot be removed.
- (iii) Repeated self-pollination leads to loss of vigor and vitality of the species. Seeds produced are smaller and weaker.

#### **Advantages of Cross-pollination**

- (i) Cross-pollination results in healthier off springs.
- (ii) Seeds produced by cross-pollination have much better germinating capacity.
- (iii) More abundant and viable seeds are produced.
- (iv) Variations are introduced by cross-pollination.

#### **Disadvantages of Cross-pollination**

- (i) Plants have to depend on external agencies for pollination, which may or may not be available at the proper time.
- (ii) The pollen grains have to be produced in large quantity to ensure pollination. Thus, lot of pollen is wasted.
- (iii) The process is less economical as various devices have to be adopted by the flowers to attract pollinating agents like the flowers have to be large, coloured, showy, scented and nectar producing.

3. State four differences between insect and wind-pollinated flowers.

**Ans.** Differences between Insect-and Wind-pollinated Flowers

Insect-pollinated flowers	Wind-pollinated flowers
1. Flowers have large and brightly coloured petals	Flowers are small and do not have showy petals.
2. Produce scent and nectar.	Do not produce scent and nectar.
3. Pollen grains are rough and sticky	Pollen grains are light and dry.
4. Pollen grains are produced in small quantities.	Produced in large quantities.
5. Filaments are short.	Filaments long to expose anthers in the air.
6. Stigmas are sticky, flat or knob like	Stigmas are large and feathery.
7. Essential whorls are not much exposed.	Male and female parts are exposed to wind
8. Nectar guides are present on the petals.	Nectar guides generally absent.
Examples - Salvia, pea, petunia.	Examples - Maize, wheat, pine.

4. Give two examples each of wind, water and insect pollinated flowers.

**Ans.** Wind-pollinated flowers - Maize, pine. Water-pollinated flowers - Hydrilla, Vallisneria.

Insect- pollinated flowers - Sweet pea, Salvia.

5. Normally, sepals fall after fertilization. Name two fruits in which the sepals persist.

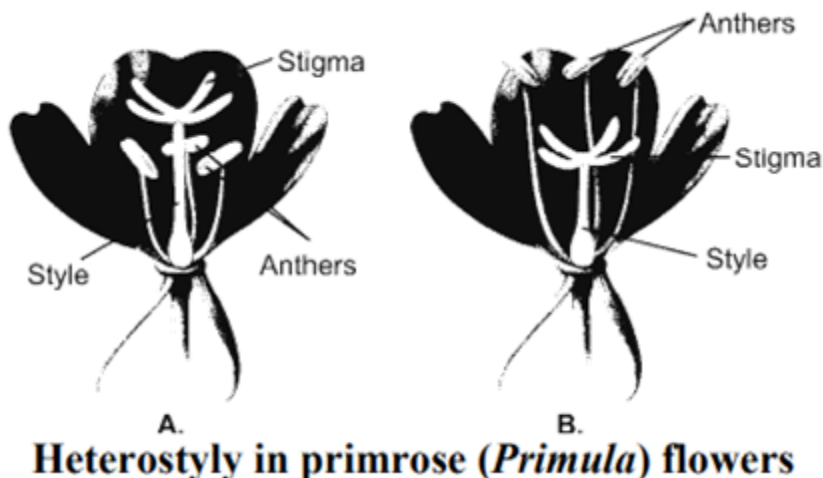
**Ans.** Brinjal, tomato.

6. State any three devices found in flowers which favor crosspollination.

**Ans.** Devices which favor cross-pollination:

- (i) Unisexuality: The unisexual flowers (male or female) may be borne on the same plant (as in maize, castor, cucumber) or on two separate plants (as in palm, mulberry, papaya).
- (ii) Self-Sterility: In this condition, the pollen grains of a flower do not germinate on the stigma of the same flower but germinate on the stigma of a flower borne by another plant of the same species. Examples - Apple, grape, rye.
- (iii) Dichogamy: The flowers are bisexual, but stamens and carpels mature at different times. This condition is known as dichogamy which stands as a barrier to self-pollination. There are two states of dichogamy.
  - a) Protogyny (Protos = first; gyne = female): In this case, gynoecium matures earlier than the anthers of the same flower and the stigma receives the pollen grains brought from another flower. Examples - Peepal, custard apple.

- b) Protoandry (Protos = first; andros = male): When the stamens mature earlier than the gynoecium of the same flower, the pollen grains are carried over to the stigma of another flower, as in pea, sunflower, salvia.
- (iv) Herkogamy (Herkos = barrier): In some bisexual flowers, some sort of barrier develops between stamens and the pistil of the same flower, thereby preventing self-pollination. For example, a hood covering the stigma acts as a barrier in pansy flowers. In *Gloriosa*, the stamens liberate the pollen grains on the outside, so that they are not able to land on the stigma of the same flower.
- (v) Heterostyly (Heteros = different): Some plants bear flowers of different forms. One form bears long stamens and short style, and the other form bears short stamens and long style. This condition favors cross-pollination. Dimorphic heterostyly is shown by primrose and oxalis.



7. Mention whether the following statements are True (T) or False (F) :
- Fertilization is fusion of anther and stigma.
  - Cross-pollination always occurs in unisexual flowers.
  - The generative nucleus in the pollen grain develops into two male gametes.
  - In maize, the pollination is brought about by insects.
  - Anemophilous flowers are large and bright.
  - Vallisneria* flowers are pollinated by wind.
- Ans.** (i) F (ii) F (iii) T (iv) F (v) F (vi) F
8. Name the floral parts which develop into following structures:
- Seed
  - Pericarp
  - Seed coat

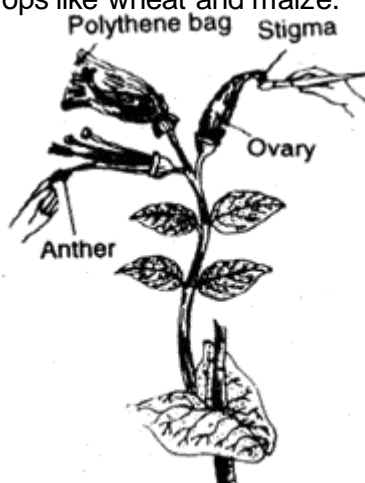
(iv) fruit.

**Ans.** (i) Seed from ovule (ii) Pericarp from ovary wall (iii) Seed coat from Integuments of ovule

(iv) Fruit from ovary

9. Write a short note on artificial-pollination.

**Ans.** Man plays an important role in bringing about pollination artificially. For this, better yielding and better-quality flowers are selected. Pollen grains from the ripe anthers are carefully removed and are dropped on the mature stigma of other plant of the same or related species. These pollinated flowers are now covered with polythene bags till fruits and seeds are produced. The seeds when sown in next season produce offsprings with slight variations. If this process is repeated for some generations, new varieties could be produced. This method is very commonly practiced in garden plants such as pansy and stock or in crops like wheat and maize.

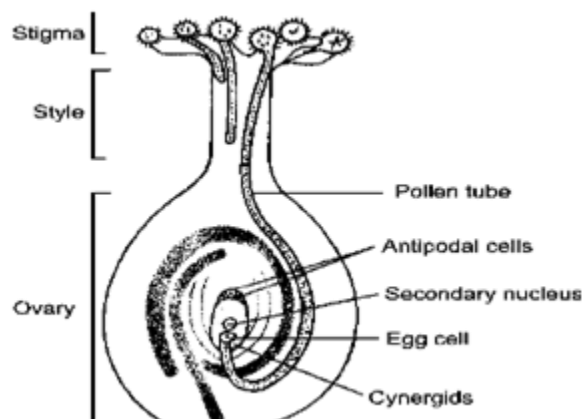


**Showing artificial pollination in pea**

10. What is the function of pollen tube? Trace its path from stigma to the female gamete by means of a diagram.

**Ans.** Functions of the pollen tube

- (i) To carry the male gametes upto the embryo sac (inside the ovule) where female gamete is present.
- (ii) To produce enzymes which dissolve the tissues of the style so that the pollen tube can travel the whole length of the style and reach the ovule.



11. Explain the following terms:

1. Anemophilous flower
2. Double fertilization
3. Gametes
4. Oospore
5. Nectar guides
6. Triple fusion

**Ans.**

1. Anemophilous flower: Wind-pollinated flower; wind brings about cross-pollination; flowers are usually small, inconspicuous and unattractive; pollen grains are produced in large number.
2. Double fertilization: In flowering plants, each pollen grain produces two male gametes. One male gamete fuse with the female gamete, and the other fuses with the secondary nucleus. Since there are two fertilizations, it is called double fertilization.
3. Gametes: A haploid cell taking part in sexual reproduction; two gamete nuclei (male and female) fuse during fertilization, to initiate the development of a new individual.
4. Oospore: The product of fusion of male gamete with the female gamete, i.e. fertilization, is called oospore.
5. Nectar guides: Some flowers bear markings on the petals which lead to the nectaries present in the flower. These markings guide the insects towards the nectaries, and hence, are called nectar guides. The nectar guides help in pollination.

6. Triple Fusion: The fusion of one of the male gametes with secondary nucleus is termed as triple fusion, as it involves the fusion of three nuclei.

12. Distinguish between the following:

1. Protandry and Protogyny
2. Self-pollination and Cross-pollination
3. Fruit and Seed

Ans. (i) Differences between Protandry and Protogyny

Protandry	Protogyny
The stamens in a bisexual flower mature earlier than the gynoecium of the same flower, so the pollen grains are carried over to the stigma of another flower.	The gynoecium in a bisexual flower matures earlier than the stamens of the same flower, so the stigma receives the pollen grains brought from another flower.

(ii) Differences between Self-pollination and Cross-pollination.

Self-pollination	Cross-pollination
1. Self-pollination occurs within a flower or between two flowers of the same plant.	1. Cross-pollination occurs between two flowers borne on different plants of the same species
2. Flowers do not depend on other agents for pollination.	2. Agents such as insects, water and wind are required for pollination.
3. Pollen grains are produced in small number.	3. Produced in large numbers.
4. No wastage of pollen grains occurs and thus economical.	4. Wastage of pollen grains occurs, hence, uneconomical.
5. Flowers are not attractive, nor do they produce nectar.	5. Flowers attract insects by various means like coloured petals, scent and nectar.
6. The offsprings produced are of the same genetic makeup, so purity of the race is maintained.	6. The offsprings produced may show variations and differ in genetic makeup.

(iii) Differences between Fruit and Seed

Fruit is the structure developing from the complete ovary, while a seed develops from the ovule.

13. Distinguish between the following:

- a. Tube nucleus and Generative nucleus
- b. Ovule and Seed.

- Ans.** (i) Differences between Tube nucleus and Generative nucleus (Both are nuclei present inside the pollen grain)
- (ii) The generative nucleus after germination of pollen grains divides into two male gametes inside the pollen tube, whereas the tube nucleus does not divide.
- (iii) In angiosperms, the two male gametes take part in the two fertilizations (double fertilization) while tube nucleus is not involved in fertilization.

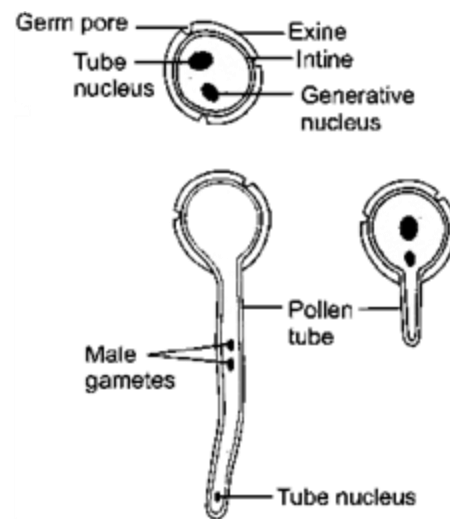
b) Differences between Ovule and Seed

Ovule	Seed
1. Ovule is a structure contained in the ovary.	1. Seed is present inside the fruit in angiosperms.
2. Inside the ovule, embryo sac containing the female gamete (or egg) is present.	2. It develops after fertilisation of the female gamete with the male gamete.
3. It is a pre-fertilisation female reproductive structure.	3. It is a post-fertilisation product.

**14.** Describe the events taking place between pollination and fertilisation.

**Ans.** Events between Pollination and Fertilisation- After the pollen grains are deposited on the stigma, the pollen grains absorb water and sugar from the surface of stigma and swell up.

From one of the germ pores, the intine comes out into a fine tube called pollen tube. This tube produces enzymes at the tip and dissolves the tissues of the style as it grows. Eventually, it travels down the whole length of the style into ovary. In the meantime, inside the pollen tube, the generative nucleus divides into two male gametes. The pollen tube carrying the two male gametes enters the embryo sac through the micropyle and its tip dissolves. The two male gametes are liberated inside the embryo sac. One male gamete fuse with the egg to form zygote which grows into an embryo and finally into a new plant. The other male gamete fuses with the secondary nucleus to form the endosperm, which provides nourishment to the growing embryo. The fusion of the male gamete with the female gamete is called fertilisation. The process, in fact, involves



**Showing Pollen germination**

two fertilisations — one between male and female gametes and the other between the male gamete and the secondary nucleus. It is, therefore, also termed double fertilisation.

15. Draw a labelled diagram of ovule as seen in a section.

Ans.

