1 CHAPTER

Sexual Reproduction in Flowering Plants

Level - 1 CORE SUBJECTIVE QUESTIONS

MULTIPLE CHOICE QUESTIONS (MCQs) (1 Mark)

1. Option (B) is correct
   Explanation: Formation of one seed requires fertilsation between one pollen grain and one egg. To produce 1600 seeds, 1600 pollen grains and 1600 eggs will be required. Each microspore mother cell results in the formation of 4 pollen grains after one cycle of meiotic division. So, 400 meiotic divisions will result in the production of 1600 pollen grains. One megaspore mother cell after one cycle of meiotic division results in the formation of 1 egg; so, 1600 meiotic divisions will take place to form 1600 eggs. Thus, total number of meiotic divisions required for the formation of 1600 seeds will be 400 + 1600 = 2000.
2. Option (C) is correct
   Explanation: In maize, both male and female flowers are borne on the same plant, making it monoecious. The mode of pollination can be either geitonogamy (transfer of pollen between different flowers on the same plant) or xenogamy (cross-pollination between flowers of different plants).
3. Option (B) is correct
   Explanation: Bean is a dicot, Castor is a dicot with endospermic seeds while Maize is a monocot with endospermic seeds.
4. Option (C) is correct
   Explanation: The embryo sac is situated within the nucellus, which is part of the ovule.
5. Option (A) is correct
   Explanation: In angiosperms, the functional megaspore undergoes mitotic divisions to form the embryo sac, which is the female gametophyte.
6. Option (D) is correct
   Explanation: Bagging refers to covering the flower with a protective bag after emasculation to prevent any unwanted pollen from contaminating the flower, ensuring controlled cross-pollination.
   Rebagging refers to the process of covering the flower again after artificial pollination to prevent unwanted pollen contamination and ensure successful fertilisation.
   In case of a female parent producing unisexual flowers, emasculation is not needed since these are no male reproductive parts. Bagging is done before pollination to prevent contamination from unwanted pollen and rebagging is done after pollination to ensure fertilisation occurs under controlled conditions.
7. Option (D) is correct
   Explanation: Scutellum is the tissue in a grass or wheat or maize seed (monocot seeds) that lies between the embryo and the endosperm. It is the modified cotyledon, being specialised for the digestion and absorption of the endospserm.
8. Option (C) is correct
   Explanation: Each microspore mother cell undergoes meiosis to produce four pollen grains. So, for 325 microspore mother cells: 325 × 4 = 1300 pollen grains.
9. Option (B) is correct
   Explanation: The perisperm is a food reserve tissue derived from the nucellus in seeds, as seen in black pepper.
   The fleshy part of the strawberry that we eat is the enlarged thalamus, with the actual fruits being the small seed-like structures on its surface.
   The pericarp is the fruit wall of the mango, consisting of the skin (exocarp), the fleshy part (mesocarp), and the hard layer around the seed (endocarp).
   The endosperm in maize is the nutrient-rich tissue that surrounds the embryo and provides energy for the seedling.
10. Option (C) is correct
    Explanation: X represents suspensor. The suspensor is a structure in the embryo that anchors it to the surrounding tissues of the seed and helps in nutrient transfer. It is diploid (2n).
    Y represents Cotyledon (2n): The cotyledons are the first leaves that appear in the seedling.
    Z represents Radicle (2n): The radicle is the embryonic root that develops into the primary root of the plant. It is diploid (2n).
    U is Plumule (2n): The plumule is the part of the embryo that develops into the shoot system, including the stem and leaves.
11. Option (A) is correct
    Explanation: P corresponds to the thalamus. The thalamus is the flower part that enlarges to become the fleshy part of the apple, rather than the ovary alone. So it is known as false fruit.

ASSERTION-REASON QUESTIONS (1 Mark)

1. Option (C) is correct
   Explanation: Cells of tapetum are multi nucleated due to repetitive mitotic division (karyokinesis only) without cytokinesis.
2. Option (C) is correct
   Explanation: The nuclear type of endosperm is produced following free nuclear divisions in the primary endosperm mother cell. In this process, each mitotic division occurs without immediate cell wall formation. As a result, multiple nuclei are formed, which remain grouped together in a mass of protoplasm within the embryo sac. Coconut milk serves as an example of liquid endosperm, composed of free nuclear endosperm.
3. Option (C) is correct
   Explanation: In ex-albuminous seeds (also called non-endospermic seeds), the endosperm is completely consumed during the development of the embryo. The nutrients are stored in the cotyledons instead. Examples include pea and bean.
   While pea and beans are examples of ex-albuminous seeds, castor is an example of an albuminous seed (endospermic seed), where the endosperm is retained in the mature seed. So, assertion is false.
4. Option (B) is correct
   Explanation: Bananas are considered parthenocarpic fruits because they develop without fertilisation. In parthenocarpic fruit development, the fruit forms without the seeds that typically result from fertilisation.

VERY SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. Yes, apomixis can be compared to asexual reproduction because it involves the formation of seeds without fertilisation, similar to how asexual reproduction produces offspring without the need for gametes. In apomixis, plants like those in the Asteraceae family and certain grasses can produce seeds that develop from the maternal tissue rather than from a fertilised egg, leading to genetically identical offspring.
   It is beneficial for farmers as it significantly lowers the cost of hybrid production, allowing plant breeders to develop new seed varieties more quickly and affordably.
2. **Two outbreeding devices are:**
   (i) **Dioecism:** Plant has either the male flowers or the female flowers so that self-fertilisation never occurs.
   (ii) **Dichogamy:** It is the process of differential maturation of anther and stigma.
3. **(i)** In a *Hibiscus* flower, the pollen tube gain entry into the embryo sac from the microphyar end through the synergids. The synergids help guide the pollen tube towers the egg cell, where fertilisation occurs.
   (ii) One male nucleus fuses with two polar nuclei to form primary endosperm nucleus and termed triple fusion, other male nucleus fuses with egg cell nucleus to form zygote i.e. undergoes Syngamy.
4. **(i)** Cells of sporogenous tissue/Microspore mother cell/ Pollen mother cell (PMC) in anther undergoes meiotic division, to form microspore tetrad which mature and dissociate to form pollen grains or male gametophyte.
   (ii) Because its generative cell divides, to form two male gametes.
5. Features of male flowers: Well exposed stamen, so that pollens are easily dispersed into wind current / light and non-sticky pollen grains, so that they are easily transported in wind current.
   Features of female flowers: Large often feathery stigma and style wave in the wind, to easily trap air borne pollen grains/numerous flowers packed into an inflorescence, to easily trap air borne pollen grains.
6. Pollination in marine sea grasses like *Zostera* occurs through a specialised process called hydrophile, where water acts as the medium for pollen transfer. Here pollination occurs completely under water. The male flowers of *Zostera* release long ribbon-like pollen grains. These pollen grains are filamentous and light weight allowing them to float freely and carried away by water currents towards the female flowers. The pollen grains directly reach the stigma of the female flowers, facilitation fertilisation.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. **(i)** Seed X- 3 embryos; 1 embryo sac; 1 ovule;
   (ii) The nucellar cells grow mitotically and develop into the embryos by asexual reproduction. This process is called apomixis.
   (iii) The plants growing from seed X will have to share the resources/endosperm so there is a possibility of some plant being undernourished. Only one plant in seed Y will use the entire endosperm for its growth or as the plants of seed X are clones they will not show variation and may succumb to environmental stress. Plants from seed Y will have genetic variation and so can show greater adaptability.
2. **(i)**

Perisperm	Pericarp
Persistent nucellus in some seeds.	The wall of ovary develops into wall of fruit.

(ii)

Syncarpous	Apocarpous
Fused pistils.	Free pistils.

(iii)

Plumule	Radicle
Future stem/ terminal part of epicotyl / shoot tip of embryonal axis.	Future root/ terminal part of hypocotyl / root tip of embryonal axis.

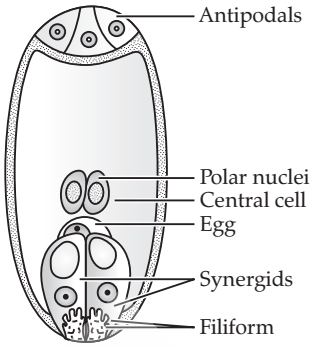
3. The steps involved in making sure that only the desired grain pollinate the stigma of a bisexual flower by a plant breeder are:

(i) **Emasculation:** Removal of the anther from the flower bud before the anther dehisces.

(ii) **Bagging:** Covering the emasculated flower with a bag of suitable size to prevent contamination of its stigma with unwanted pollen.

(iii) Dusting of desired pollen on the stigma and re-bagging.

4. (i)



(ii) Filiform apparatus Guide pollen tube into synergids.

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. (i) (a) In rose – bay plant, the time of maturation of stamen and pistil is not same, so, the pollen will not be able to germinate on the stigma of same flower. This prevents autogamy in rose-bay.

(b) Different position and incompatible placement of the reproductive structure (Heterostyly) prevent successful pollination and thus autogamy in primrose.

(c) Pollen pistil interaction for same species is not possible; this is a genetic mechanism which prevent the pollen grain from forming pollen tube on the pistil of the same flower.

(ii) The male and female flowers are present in the same plant but are not in proximity preventing self-fertilisation in castor. In papaya, the male flower and female flowers are in different plants, it prevents autogamy.

2. (i) The development of male gametophytes in angiosperms begins with microsporogenesis in the anther of the flower, a component of the stamen that produces pollen grains.

(1) Inside the anther, specialised cells called microspore mother cells (or pollen mother cells) exist. These diploid (2n) cells can undergo meiosis.

(2) The pollen mother cells undergo meiosis, a reduction division that produces four haploid microspores from each diploid cell.

(3) These four haploid microspores usually remain clustered together as a microspore tetrad, which is a distinguishing feature of microsporogenesis.

(4) As the anther matures, the microspore tetrads break apart, and the individual microspores separate.

(5) Each haploid microspore then further develops into a pollen grain, which serves as the male gametophyte. The pollen grain contains two cells: the generative cell and the tube cell.

(6) Once matured, the pollen grains are released from the anther during pollination, making them ready to fertilise the ovule in the female reproductive structure.

(ii) Diagram of 3-celled male gametophyte:

3. (i) *Oxalis* and *Viola* produce cleistogamous flowers, in which anthers and stigma lie close to each other and flowers do not open at all. When anthers dehisce in the flower buds, the pollen grains fall on the stigma and fertilisation is effected leading to assured seed set.

Orange has polyembryonic seeds. The nucellar cells surrounding the embryo sac starts dividing and protrudes into the embryo sac and develops into many embryos. That is why, when a seed of an orange is squeezed, many embryos, instead of one are observed.

(ii) Advantages of seed formation to angiosperms:

(1) Less dependent on water compared to fertilisation.

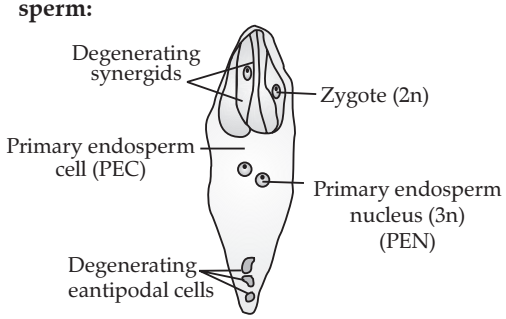
(2) Adaptive strategies for spreading to new habitats.

(3) Seed reserves support young seedlings until photosynthesis.

(4) Seeds create new genetic combinations.

(5) Seeds can be stored long-term due to dormancy and dehydration. (Any four)

(iii) Diagram of fertilised embryo sac of an angiosperm:



Fertilised embryo sac showing zygote and primary endosperm nucleus.

4. (i) Event that occurs during double fertilisation are:

(1) When the pollen grain falls on the stigma, it germinate and gives rise to the pollen tube that passes through the style and enter into the ovule.

(2) After this, the pollen tube enters one of the synergids and releases two male gametes.

(3) Out of the two male gametes one gametes fuses with the nucleus of the egg cell and forms the zygote. The process is known as syngamy.

(4) The other male gamete fuses with the two polar nuclei located in the central cell to form a triploid primary endosperm nucleus (PEN). Since the process involves the fusion of three haploid nuclei it is known as triple fusion.

(5) Since two kinds of fusions syngamy and triple fusion take place in an embryo sac it is known as double fertilisation.

Ploidy of End Products:

- The zygote is diploid (2n), which will develop into the embryo.
- The endosperm is triploid (3n), which provides nourishment for the developing embryo and will be critical for its growth.

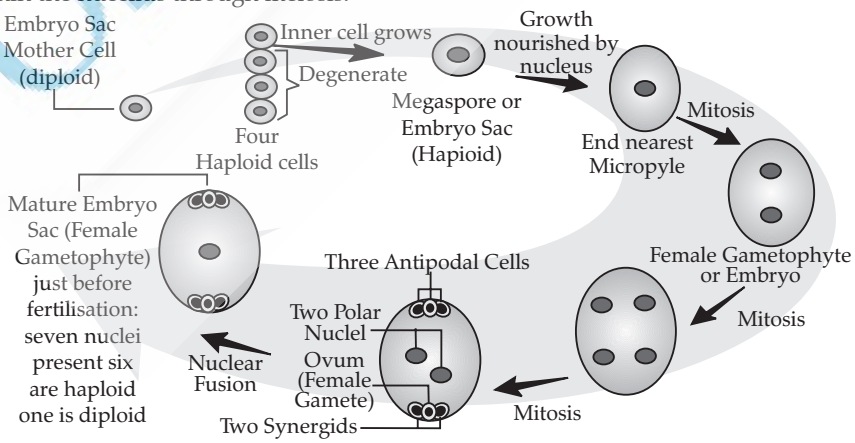
Role of synergids: To attract the pollen tube and bear its shock during fertilisation.

(ii) Endosperm develops before the embryo because the cells of the endosperm provide nutrition to the developing embryo.

5. Megasporogenesis is the process by which four megaspores are formed from the megaspore mother cell (MMC) within the nucellus through meiosis.

Process of Megasporogenesis:

- Ovules typically develop a single megaspore mother cell located in the micropylar region of the nucellus. This large cell contains dense cytoplasm and a prominent nucleus. The MMC undergoes meiotic division, resulting in the production of four megaspores.
- The female gametophyte originates from one functional megaspore, which undergoes three successive mitotic divisions to form an 8-nucleated embryo sac.
- The first mitotic division of the functional megaspore's nucleus creates two nuclei. One nucleus moves toward the micropylar end, while the other migrates toward the chalazal end, resulting in a 2-nucleate embryo sac.
- Two additional sequential mitotic divisions occur at both the micropylar and chalazal ends of the embryo sac, leading to the formation of the 4-nucleate and subsequently the 8-nucleate stages of the embryo sac.
- These divisions are entirely free nuclear, meaning that nuclear divisions occur without immediate cell wall formation.
- After reaching the 8-nucleate stage, cell walls are formed, organising the typical female gametophyte or embryo sac.
- Out of the eight nuclei, six are surrounded by cell walls, while the remaining two nuclei, known as polar nuclei, are located below the egg apparatus in the central cell.
- At the micropylar end, three of the four nuclei differentiate into two synergids and one egg cell, collectively referred to as the egg apparatus.
- The synergids have specialised cellular thickenings at their micropylar tips, known as the filiform apparatus, which helps guide pollen tubes into the synergids.
- At the chalazal end, three of the four nuclei differentiate into antipodal cells.
- The two remaining cells (from the micropylar and chalazal ends) move toward the center to become the polar nuclei, located in the large central cell.
- Consequently, at maturity, a typical mature angiosperm embryo sac (the female gametophyte) is structured as a 7-celled entity, despite having eight nuclei.



6. (i) **(1)** Autogamy
(2) Geitonogamy
(3) Xenogamy

(ii) **(A)** **Water lily:** pollinated by insects/wind.
(B) ***Vallisneria:*** Female flowers on long stalks reach water surface, male flowers or pollen released on water and carried by water current to female flowers to achieve pollination.

(iii) **Genetic:** Self-incompatibility / prevents self-pollen (same flower or other flowers of same plant) from fertilising the ovules by inhibiting pollen germination, pollen tube growth in pistil.
Physiological: Pollen release and stigma receptivity are not synchronised, either pollen matures earlier and stigma later or pollen matures later than stigma.

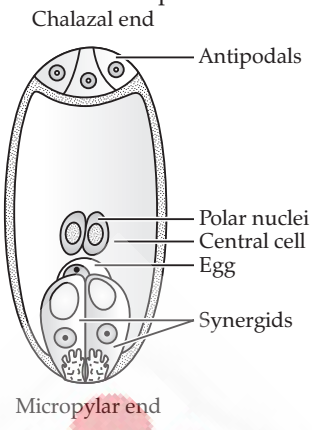
7. (i)
- Pollen- light / non-sticky, to travel easily through air produce in enormous amount, to compensate the wastage during pollination.
- Anther –well exposed, pollen easily dispersed into wind current.
- Stigma –Large / often feathery, to easily trap air-borne pollen grains.

(ii) **(A)** Pollen grains have hard outer layer exine made up of sporopollenin, which is one of the most resistant organic material known. Also no enzyme can degrade sporopollenin.
(B) It allows the entry of water, oxygen into the seed at the time of germination.

8. (i)
- Double fertilisation is the occurrence of two types of fusion syngamy and triple fusion in an embryo sac of the angiosperm.
- Syngamy- Fusion of one of the male gamete and the egg cell resulting in formation of a zygote (diploid).
- Triple fusion - Fusion of another male gamete with two haploid polar nuclei to produce a (triploid) primary endosperm nucleus.

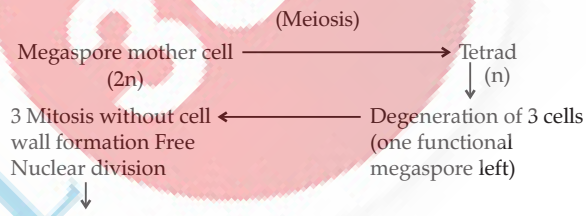
(ii) **(A)** Some of the nuclear cells surrounding the embryo start dividing and protrude into the embryo sac to form embryos.
(B) In case of Cashew, thalamus also contribute in fruit formation along with ovary /development of fruit after fertilisation from the part other than ovary while Guava fruit develops only from the ovary after fertilisation.

9. (i) A typical angiospermic embryo sac is 7 celled and 8 nucleated. Three cells are grouped together at the micropylar end to constitute the egg apparatus. Egg apparatus has two synergids, and one egg cell, three cells are at the chalazal end and are called antipodals. The seventh cell is the large central cell with two polar nuclei.

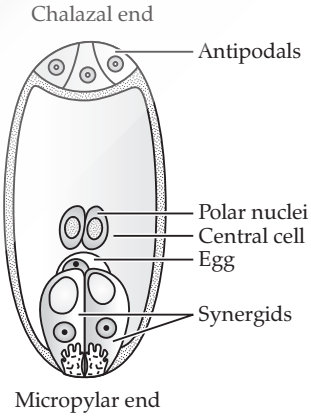


(ii) (1) Male and Female flowers are present on different plants (dioecy)/ Self incompatibility.
(2) Production of unisexual flowers by the plant/ both male and female flowers are present on the same plant/Monoecious / non synchronization of pollen release and stigma receptivity/ Anther and stigma are placed at different positions (Heterostyly).

10. (i)



(ii)



Level - 2 ADVANCED COMPETENCY FOCUSED QUESTIONS

MULTIPLE CHOICE QUESTIONS (MCQs) (1 Mark)

1. Option (A) is correct
Explanation: After fertilisation, the ovary develops into fruit, ovules develop into seeds, and the ovary wall becomes pericarp.

2. Option (C) is correct
Explanation: The tapetal cells of a microsporangium become multinucleate primarily because they do not undergo cytokinesis. Instead, these cells undergo

several rounds of nuclear division without dividing the cytoplasm, leading to a multinucleate condition.

3. Option (D) is correct

Explanation: Nitya is not correct. While low temperatures can help preserve pollen grains, –40°C might not be sufficient to ensure long-term viability, as pollen grains typically need to be stored at even lower temperatures to remain viable for extended periods.

4. Option (D) is correct

Explanation: In false fruits, such as apples, the thalamus enlarges and contributes significantly to the fruit's flesh, while the ovary itself is not the primary structure forming the fruit.

5. Option (C) is correct

Explanation: Autogamy (self-pollination) and geitonogamy (pollen transfer between different flowers on the same plant) are likely to show less genetic variation in the offspring. Xenogamy (cross-pollination between different plants) introduces the most genetic variation by combining pollen from different plants.

ASSERTION-REASON QUESTIONS (1 Mark)

1. Option (C) is correct

Explanation: Pollen-pistil compatibility chemicals do not dissolve sporopollenin. Instead, these chemicals help in recognising whether the pollen is compatible or incompatible and influence the growth of the pollen tube. Sporopollenin is highly resistant and is not usually dissolved; instead, pollen tubes grow through the germ pores.

2. Option (A) is correct

Explanation: In flowering plants, the endosperm forms after double fertilisation and provides nourishment to the developing embryo during seed development.

3. Option (A) is correct

Explanation: Assertion is true. Double fertilisation — involving the fusion of one male gamete with the egg and another with the central cell — is indeed unique to angiosperms (flowering plants). It leads to the formation of both zygote and endosperm.

Reason is also true. This is the correct explanation of what happens during double fertilisation — one male gamete fuses with the egg (syngamy), and the other with two polar nuclei in the central cell (triple fusion).

VERY SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. The pollen tube releases the two male gametes into the cytoplasm of the synergid. One of the male gametes fuses with the nucleus of the egg cell, forming the zygote. This process is called syngamy. The other male gamete fuses with two polar nuclei to produce a triploid primary endosperm nucleus (PEN). This involves the fusion of three haploid nuclei. It is termed "triple fusion."

   As it involves two types of fusion—syngamy and triple fusion—in an embryo sac, the phenomenon is termed "double fertilisation."

2. **(i)** No, Because pollen grains cannot remain viable for such a long time as that taken for fossilisation.

   (ii) In liquid nitrogen at very low temperature conditions.

3. **(i)** Pollen grain

   (ii) Ovule

4. • Compulsory for bisexual flowers
   • Not required in case of unisexual flowers

5. • The embryo is represented by the entire pea seed.
   • The endosperm is consumed by the developing embryo and cannot be identified as such.

6. • **Banana:** parthenocarpy
   • **Citrus fruits:** apomixis

7. To collect nectar

8. (1) The humming bird aids in pollination.

   (2) Pollen grains stick to the beak of the bird when it inserts its beak into the flower.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. **(i)** The vegetative cell of the two or three-celled pollen grains provide nutrition.

   (ii) • Microspore mother cells undergoes meiotic division to form the microspores.
   • Microspores undergo mitotic division to form the three-celled stage.

2. **(i)** Pollen-pistil interaction:

   The ability of a pollen grain to germinate its pollen tube on the stigma of a flower is controlled by certain chemical interactions. This chemical compatibility is termed as pollen-pistil interaction.

   (ii) By the technique of bagging or covering the stigma of the flower with a bag made of butter paper.

3. **(i)** **P:** endosperm

   Q: embryo

   (ii) The coconut water would have been consumed by the developing embryo.

   (iii) The ploidy of the coconut water is 3n as it is formed by triple fusion of 2 polar nuclei with 1 male gamete nuclei. It is free-nuclear endosperm.

CASE BASED QUESTIONS (4 Mark)

1. (i) Option (D) is correct.

Explanation: Number 5, 2 and 4 are respectively egg, integument and micropyle of ovule. They form embryo, testa and micropyle.

(ii) Option (B) is correct.

Explanation: At the time of fertilisation, the female gametophyte (also known as the embryo sac) in a typical dicot is 7-celled, consisting of one egg cell, two synergids, three antipodal cells, and one central cell.

(iii) Option (A) is correct

Explanation: In mesogamy, pollen tube penetrates laterally through integuments (*Cucurbita*) and funiculus (e.g., *Pistacia*).

(iv) Option (D) is correct

Explanation: In double fertilisation, a total of five nuclei are involved: two sperm nuclei (from the pollen tube) and three nuclei in the embryo sac (one egg nucleus and two polar nuclei). One sperm nucleus fuses with the egg nucleus to form the zygote, and the other fuses with the two polar nuclei to form the endosperm.

2. (i) It is an unisexual /staminate flower

(ii) Cross-pollination because all flowers on the plant are unisexual.

(iii) (a) The plant will not bear fruits because it is a staminate flower.

OR

(b) (1) Bees: Bees are strongly attracted to bright yellow flowers and are efficient at pollination due to their role in collecting nectar and pollen.

(2) Humming birds: Humming birds are drawn to brightly coloured flowers, especially yellow ones, and are effective pollinators as they feed on the nectar with their long beaks.

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. (i) Steps involved in artificial hybridisation:

(1) Selection of Parents: Two plants with desirable traits are selected – one as the female parent and the other as the male.

(2) Emasculation: In bisexual flowers of the female parent, anthers are removed before they mature, to prevent self-pollination.

(3) Bagging: The emasculated flowers are covered with a bag (usually butter paper or polythene) to prevent contamination by unwanted pollen.

(4) Pollination: When the male parent's pollen grains are mature, they are collected and dusted onto the stigma of the emasculated flower.

(5) Re-bagging: The pollinated flower is again covered and labelled for identification until fertilisation is complete.

(ii) Emasculation is essential in bisexual flowers to prevent self-pollination, which would otherwise interfere with the desired cross between selected parents. It ensures that only pollen from the chosen male parent fertilises the ovule.

(iii) If the female parent has unisexual flowers (i.e., it produces only pistillate flowers), emasculation is not required. In such cases, bagging is sufficient to prevent unwanted pollen from reaching the stigma.

2. (i) The phenomenon where seeds develop without fertilisation is called Apomixis.

(ii)

Apomixis	Parthenocarpy
Formation of seeds without fertilisation	Formation of fruit without fertilisation
Produces viable seeds	Produces seedless fruits
Citrus, mango	Banana, seedless watermelon
Maintains hybrid vigour in seed production	Useful in producing seedless edible fruits

(iii) Role of apomixis in agriculture:

(1) Hybrid seeds often show hybrid vigour (heterosis), but this is lost in the next generation due to segregation during meiosis.

(2) If apomixis is induced in hybrid plants, the seeds formed are genetically identical to the parent hybrid.

(3) Thus, farmers can reuse hybrid seeds year after year without losing the desired traits, saving cost and preserving yield.

(4) Biotechnological efforts are underway to induce or identify genes controlling apomixis in major crops.

3. (i)

Self-pollination	Cross-pollination
Pollen from anther to stigma of same flower or another flower on same plant	Pollen from anther of one plant to stigma of a different plant
Offsprings are genetically identical	Offsprings show genetic variation

(ii) Two devices that ensure cross-pollination:

(1) **Dichogamy:** Anthers and stigmas mature at different times, preventing self-pollination.

Types: Protandry: Anthers mature first (e.g., sunflower), **Protogyny:** Stigmas mature first (e.g., pearl millet).

(2) **Herkogamy:** Physical barrier (like spatial separation) prevents pollen of the same flower from reaching its stigma. Example: In Commelina, a flap covers the stigma.

(iii) Pollination and Double Fertilisation in Angiosperms:

(1) Pollination delivers pollen grains to the stigma.

(2) A pollen tube grows through the style and enters the ovule.

(3) Each pollen grain carries two male gametes.

(4) One gamete fuses with the egg cell → syngamy (forms zygote).

(5) Other gamete fuses with two polar nuclei → triple fusion (forms endosperm).

(6) This process of two fertilisation events is called double fertilisation – unique to angiosperms.

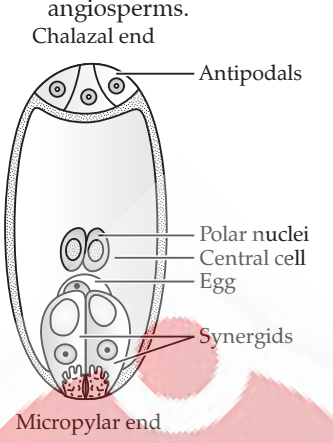
4. **(i)** Double fertilisation occurs inside the embryo sac of angiosperms and involves two male gametes from the pollen tube:

(1) **Syngamy:** One male gamete fuses with the egg cell to form a diploid (2n) zygote.

(2) **Triple Fusion:** The other male gamete fuses with the two haploid polar nuclei in the central cell to form a triploid (3n) endosperm nucleus.

This unique event, where two fertilisation events occur in a single embryo sac, is called double fertilisation — a defining feature of angiosperms.

(ii)



(iii) A single cell of the nucellus called the megaspore mother cell (MMC) undergoes meiosis to form 4 haploid megaspores. Typically, only one megaspore is functional; the other three degenerate. The functional megaspore undergoes three mitotic divisions:

1st → 2 nuclei

2nd → 4 nuclei

3rd → 8 nuclei

These are arranged into 3 Antipodal cells, 2 Polar nuclei in central cell, 2 Synergids and 1 Egg cell forming the egg apparatus.