SaraS

# BIOLOGY

**NCERT / CBSE**

**Syllabus based**

*In text Questions and Answers*

**12**

*NCERT Questions and Answers 2011 to 2018*

**Only Book having Objective Questions framed line by line from the Text Book**

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# Preface

*A student who has just entered the portals of higher studies in schools finds it difficult to understand the subjects taught to him. This difficulty is mainly due to his poor standard of English. While preparing this Book the authors had in mind this particular difficulty of our students. This Book is written in a very simple and easy style. It is up-to-date and exhaustive in covering the syllabus.*

*We are immensely thankful to the authors for their kind co-operation in preparing the Book. We are immensely thankful to Saras Printers and Binders, Sivakasi for neatly printing the book. Suggestions for the improvement of the book are always welcome.*

*-Publisher*

# Why to Buy this Book

- *This Book is written solely for **Examination going Students**.*
- ***Examination** oriented.*
- ***Easy** to Answer the Questions.*
- *Very **Simple.***
- *Point by point description.*
- *Points are arranged **sequentially.***
- *Hence easy to **remember**.*
- ***High matter** content.*
- *Neat Diagrams.*
- *Helps in **NEET Preparations**.*
- *Helps in writing Observation Note Book.*
- *Helps in preparing **Competitive Exams**.*
- *Important topics are given as **Highlights**.*



**Every Life Science Student Must Buy and Keep One Copy of this Book**

# Contents

# 1 Reproduction in Organisms

Question Trends in Previous Years

| Question type | Number of Questions | | | | |
|---|---|---|---|---|---|
| | 2014 | 2015 | 2016 | 2017 | 2018 |
| 1 mark | 1 | | | | 1 |
| 2 marks | 2 | | | | |
| 3 marks | 1 | | | | |
| 4 marks | | 1 | | | |
| 5 marks | | 1 | 1 | | |



## NCERT Intext Questions

1. Why is reproduction essential for the organisms?

1. Reproduction results in the production of ***young ones***.
2. It helps in the ***multiplication*** of species.
3. It helps in the ***continuity*** of species.
4. It produces ***variations.*** Variation enables the ***survival advantage*** in organisms.
6. It is necessary for the ***process of evolution.***

2. Which is a better mode of reproduction, asexual or sexual? Why?

**Better Mode of Reproduction**

***Sexual reproduction*** is considered as a better mode of reproduction.

**Reason**

1. Sexual reproduction generates ***genetic variants*** in the population by the way of genetic ***recombination*** during gamete fusion.
2. The genetic variations provide ***better survival chances*** to the individuals to tide over the adverse environment.

3. Why is the offspring formed by asexual reproduction referred to as clone?

1. Clone means that the offspring are ***exact copies*** of their parent.
2. Offspring produced by asexual reproduction are ***morphologically*** and ***genetically identical*** to one another.
3. They are ***exact*** copies of their ***parent.***
4. They ***inherit all traits*** that are found in the parent.
5. So, they are referred to as ***clone.***

4. Offspring formed due to sexual reproduction have better chances of survival. Why? Is this statement always true.

**Reason**

1. ***Fusion*** of ***male*** and ***female*** gametes during sexual reproduction allows ***formation*** of ***new variants.***
2. Variations produced in the ***offspring*** will provide ***better adaptation*** to survive under ***unfavourable conditions.***
3. This results in ***better survival*** of the ***offspring.***

**Statement**

This statement is ***not always true*** due to the following reasons:
1. The offspring produced may be ***inferior*** than the parents.
2. Some ***inborn genetic disorders*** may be produced in offspring, which may be dangerous for its survival.

5. How does the progeny formed from asexual reproduction differ from those formed by sexual reproduction?

| Progeny Formed from Asexual Reproduction | Progeny Formed from Sexual Reproduction |
|---|---|
| 1. Progeny is formed from ***one parent.*** | 1. Progeny is formed by ***two parents.*** |
| 2. Individuals of progeny are ***morphologically*** and ***genetically identical*** to the ***parent.*** | 2. Individuals of progeny are ***not identical*** to the parents. |
| 3. They ***do not show*** variations because of the absence of genetic recombination | 3. They ***show*** variations because of the presence of genetic recombination |
| 4.They show ***less adaptation*** to changes in the environment | 4. They show ***more adaptation*** to changes in the environment. |

6. Distinguish between asexual reproduction and sexual reproduction. Why is vegetative reproduction also considered as a type of asexual reproduction?

Difference Between Asexual and Sexual Reproduction

| Asexual Reproduction | Sexual Reproduction |
|---|---|
| 1. Asexual reproduction ***does not*** involve ***gamete formation***. | 1. Sexual reproduction ***involves gamete formation*** and their fusion. |
| 2. It is always ***uniparental***. | 2. It is generally ***biparental***. |
| 3. It occurs in ***prokaryotic*** microorganisms and in some ***eukaryotic single-celled*** and ***multi-celled*** organsims. | 3. It occurs in ***multicellular*** organisms - humans, animals, insects etc. |
| 4. It involves only ***mitotic divisions*** | 4. It involves both ***meiosis*** and ***mitosis*** |
| 5. Young ones are ***morphologically*** and ***genetically identical*** to the parent. | 5. Young ones are ***genetically different*** from the parents. |
| 6. Population size ***increases rapidly*** | 6. Population size ***increases slowly*** |
| 7. Genetic recombination ***does not occur.*** | 7. Genetic recombination ***occurs.*** |
| 8. It ***does not*** produce ***variations*** in the offspring | 8. It ***produces variations*** in the offspring |
| 9. It does not contribute to evolution. | 9. It ***contributes*** to ***evolution*** through genetic recombination |
| 10. ***Special organs*** for reproduction are ***not required.*** | 10. ***Special organs*** for reproduction are ***required.*** |



**Vegetative Reproduction as Asexual Reproduction**

1. Vegetative reproduction is a ***uniparental*** reproduction.
2. Only ***mitotic division*** occurs in this type of reproduction.
3. ***Offspring*** produced are ***identical*** to ***one another*** and ***parent***.
4. There is ***no gamete formation*** and hence, ***no fusion*** of gametes.
5. ***Sex organs*** are ***not*** involved.
6. They ***do not*** produce ***variations*** in the offspring.

7. What is vegetative propagation? Give two suitable examples.

**Vegetative Propagation**

Vegetative propagation is a process by which ***vegetative parts*** of plants give rise to ***new offspring.***

**Examples**

1. ***Eye*** of potato tuber gives rise to ***new potato plants*** when the tuber is buried in the soil.

2. ***Adventitious buds*** in the notches on the leaf margin of ***Bryophyllum*** grow into ***new plantlets.***

8. Define
   (a) Juvenile phase,
   (b) Reproductive phase,
   (c) Senescent phase.

(a) Juvenile phase is the ***period of growth*** and ***maturity*** in an organism from the time of ***birth till*** they can ***reproduce*** sexually.

It is the ***initial stage*** of ***growth*** leading to ***maturity*** in their life. In plants, it is called ***vegetative phase.***

(b) Reproductive phase is a ***period*** when an organism is ***sexually mature,*** can produce ***gametes*** and undergo ***reproduction***.

It is the duration between the ***first gamete release*** and ***termination of gamete production***.

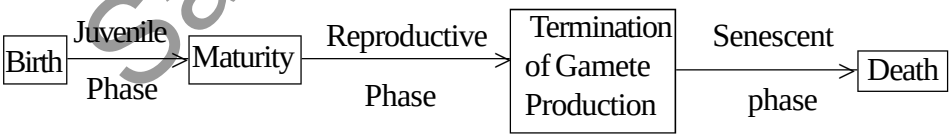
***In higher plants,*** this phase is marked by the ***production of flowers.***

(c) Senescent phase is the ***period*** from the ***termination of gamete production to end of the life*** of the organism.

It is marked by ***slow metabolism***, ***low body activity*** and ***no gamete production.***

In ***plants, leaves*** become ***yellow*** and fall off. This is due to ageing.

It leads to ***death.***




9. Higher organisms have resorted to sexual reproduction in spite of their complexity. Why?

Higher organisms have resorted to sexual reproduction in spite of its complexity because of the following reasons:

1. The ***body organisation*** of higher organisms favours ***sexual reproduction***.
2. Sexual reproduction provides chances for ***genetic recombination.***
3. This type of reproduction can introduce ***genetic variance*** through gametic fusion.

4. This helps them to tide over ***unfavourable conditions.***

5. It improves the ***genetic makeup*** of offspring for their ***better survival.***

6. These variations may lead to ***evolution.***

10. Explain why meiosis and gametogenesis are always interlinked?

1. Gametes are ***haploid cells,*** but gamete ***producing cells*** are ***diploid*** (2n).

2. The ***diploid cell*** (meiocyte) undergoes ***meiosis*** to form ***haploid gametes.***

3. The formation of gametes is called ***gametogenesis.***

4. Thus, ***both*** meiosis and gametogenesis are ***interlinked.***

11. Identify each part of a flowering plant and write whether it is haploid (n) or diploid (2n).

(i) Ovary (iv) Pollen
(ii) Anther (v) Male gamete
(iii) Egg (vi) Zygote

(i) Ovary - ***Diploid*** (2n) (iv) Pollen - ***Haploid (n)***
(ii) Anther - ***Diploid*** (2n) (v) Male gamete - ***Haploid (n)***
(iii) Egg - ***Haploid*** (n) (vi) Zygote - ***Diploid (2n)***

12. Define external fertilisation. Mention its disadvantages.

**External Fertilisation**

External fertilisation is a type of ***gametic fusion*** that occurs in the ***external medium*** like water.

It takes place ***outside the body*** of female organism.

Examples: Frog and bony fishes.

**Disadvantages of External Fertilisation**

1. The offspring are extremely ***vulnerable*** to ***predators*** and their ***survival*** up to adulthood is ***threatened.***

2. They are exposed to the ***environmental pressures*** such as ***high temperature*** and ***water scarcity*** in the habitat.

13. Differentiate between a zoospore and a zygote.

| ***Zoospore*** | ***Zygote*** |
|---|---|
| 1. Zoospore is produced by ***asexual reproduction*** | 1. Zygote is produced by ***sexual reproduction*** |

| | |
|---|---|
| 2. It is formed by the ***division*** of of ***vegetative cell.*** | 2. It is formed by the ***fusion of male*** and ***female gametes*** |
| 3. It is either ***haploid*** or ***diploid*** in nature. | 3. It is ***diploid*** in nature |
| 4. It is ***motile*** | 4. It is ***non-motile*** |

14. Differentiate between gametogenesis and embryogenesis.

| Gametogenesis | Embryogenesis |
|---|---|
| 1. Gametogenesis is a process of ***generation of gametes*** from meiocytes. | 1. Embryogenesis is the process of ***development*** of ***embryo*** from the zygote. |
| 2. Meiocyte undergoes ***meiosis*** to produce ***gametes.*** | 2. The zygote undergoes ***mitosis*** and ***cell differentiation*** to produce an embryo. |
| 3. Gametogenesis is ***internal*** | 3. Embryogenesis may be ***external*** or ***internal.*** |
| 4. Chromosome number is ***reduced*** to ***half.*** | 4. Chromosome number is ***retained*** as such. |
| 5. This is a pre-fertilisation event. | 5. This is a ***post-fertilisation*** event. |

15. Describe the post-fertilisation changes in a flower.

Changes that take place ***after*** the ***formation of zygote*** in a flower are called post-fertilisation changes.

1. The ***sepals, petals*** and ***stamens*** of the flower ***wither*** and ***fall off.***
2. ***Stigma*** of the flowers ***dries up*** and the ***pistil*** remains ***attached*** with the plant.
3. The ***zygote*** develops into an ***embryo***.
4. The ovules develop into ***seeds.***
5. ***Ovary*** develops into the ***fruit.***
6. The ovary wall develops into a ***thick wall*** called ***pericarp that*** protects the fruit.

16. What is a bisexual flower? Collect five bisexual flowers from your neighbourhood and with the help of your teacher find out their common and scientific names.

**Bisexual Flower**

Flower that bears ***both male*** (stamen) and ***female*** (ovary) reproductive structures is called a ***bisexual flower.***

**List of Bisexual Flowers**

| Sl.No | Scientific name | Common name |
|---|---|---|
| 1. | Sweet pea | *Lathyrus odoratus* |
| 2. | China rose | *Hibiscus rosa-sinensis* |
| 3. | Mustard | *Brassica campestris* |
| 4. | Pea | *Pisum sativum* |
| 5. | Petunia | *Petunia hybrida* |

17. Examine a few flowers of any cucurbit plant and try to identify the staminate and pistillate flowers. Do you know any other plant that bears unisexual flowers?

**Examination of Cucurbit Flowers**

1. Cucurbit plant bears ***male*** and ***female flowers*** in the ***same plant.***
2. ***Male*** flower is called ***staminate*** flower.
3. It consists of ***sepals, petals*** and ***stamens.***
4. Female flower is called ***pistillate*** flower.
5. It consists of ***sepals***, ***petals*** and ***pistil.***

**Other Plants Bearing Unisexual Flowers**

1. Papaya - ***Dioecious*** - Bears ***male*** and ***female*** flowers on ***different plants;*** Bears ***unisexual flowers.***

2. Palmyra - ***Dioecious*** - Bears ***male*** and ***female*** flowers on ***different plants;*** Bears ***unisexual*** flowers.

3. Coconut - ***Monoecious*** - Bears ***male*** and ***female*** flowers in the ***same plant;*** bears ***unisexual flowers.***

18. Why offspring of oviparous animals are at a greater risk as compared to the offspring of viviparous animals?

***Oviparous*** animals lay their ***fertilised eggs*** in the ***outer environment***.

After a period of ***incubation, young ones*** hatch out.

These eggs are under ***continuous threats*** from ***environmental factors*** and ***predators.***

But, in ***viviparous*** animals, the ***zygote*** develops into a ***young one inside the body*** of the female.

After attaining a certain stage of growth, the ***young ones*** are ***delivered*** out of the female organism.

Here, threats from environment and predators are ***low*** and the ***survival*** of young ones is ***high***.

Therefore, offspring of ***oviparous animals*** are at a ***greater risk*** compared to the risks of offspring of viviparous animals.

## NCERT Exam Solved Questions

1. Name the biological process that enables the continuity of species. (2012)

***Reproduction*** is the process that enables the continuity of species.

2. Name an organism, where cell division is itself a mode of reproduction. (2010, 2014)

Cell division is itself a mode of reproduction in ***Amoeba.***

Here, a parent cell divides into two halves by ***binary fission*** and ***each*** one directly grows into an ***adult.***

3. Mention a characteristic feature and function of zoospores in some algae. (2010)

### Characteristic Feature

Zoospores are ***microscopic motile*** structures of some ***algae*** and ***fungi.***

### Functions

1. Zoospores function as ***asexual reproductive structures***.
2. On germination, they give rise to ***new individuals.***

4. Offspring derived from asexual reproduction are called clone. Justify giving two reasons. (2010)

Refer. Q.No.3, Pg.No.1

5. In yeast and Amoeba, the parent cell divides to give rise to two individual cells. How does the cell division differ in these organisms? (2010)

| Cell Division in Yeast cells | Cell Division in Amoeba |
|---|---|
| 1. Cell division is by ***budding*** | 1. Cell division is by ***binary fission.*** |
| 2. Cell division is ***irregular*** | 2. Cell division is ***regular*** |
| 3. ***Cytoplasm*** divides ***first*** | 3. ***Nucleus*** divides ***first*** |
| 4.Daughter cells are ***dissimilar*** | 4.Daughter cells are ***similar*** |
| 5.Daughter cells are ***attached*** to the parent cell initially | 5. Daughter cells ***separate immediately*** |

6. Name the vegetative propagules in the following:
   (i) *Agave*
   (ii) *Bryophyllum* (2014)

   (i) Vegetative propagule in *Agave* is ***bulbils.***
   (ii) Vegetative propagule in *Bryophyllum* is ***leaf buds.***

7. Name an alga that reproduces asexually by zoospores. Why are these reproductive units so called? (2013)

**Name of the Alga**

***Chlamydomonas*** reproduces asexually through zoospores.

**Reason for its Name**

Zoospores are named so because they are ***microscopic motile*** structures.

8. Which one of the following statements is true for Yeasts?
   (i) The cell divides by binary fission. One of them develops into a bud.
   (ii) The cell divides unequally. The smaller cell develops into a bud.
   (iii) The cell produces conidia which develop into a bud. (2013)

***Ans: (ii) The cell divides unequally. The smaller cell develops into a bud.***

9. Name the common phenomenon with reference to reproduction in rotifers, honey bees and turkey. (2013)

***Parthenogenesis*** is the common phenomenon with reference to reproduction in rotifers, honey bees and turkey.

10. Name the phenomenon and one bird where the female gamete directly develops into a new organism. (2013)

**Name of the Phenomenon**

***Parthenogenesis*** is the phenomenon by which the gamete directly develops into a new organism.

**Name of the Bird**

In ***turkey,*** the female gamete directly develops into a new organism.

11. Which of the following statements is true for *Bryophyllum*? (2013)
   (i) Germinating bud appears from the eye of the stem tuber.
   (ii) Germinating bud appears from the node of the rhizome.
   (iii) Germinating bud appears from the notch at the leaf margin.

***Ans: (iii) Germinating bud appears from the notch at the leaf margin***.

12. Which of the following statements is true for Hydra?
(i) It produces asexual gemmules.
(ii) It produces unicellular bud.
(iii) It produces multi-cellular bud. (2013)

***Ans: (iii) It produces multi-cellular bud.***

13. Mention the unique flowering phenomenon exhibited by *Strobilanthes kunthiana* (Neelakurinji). (2012)

Unique flowering phenomenon of *Strobilanthes kunthiana* is that it ***flowers*** regularly ***once in 12 years***.

14. Cucurbits and papaya plants bear staminate and pistillate flowers. Mention the categories they are put under separately on the basis of the type of flowers they bear. (2012)

**Category of Cucurbits**

Cucurbits are put under ***monoecious plants.*** They bear both ***staminate*** flowers and ***pistillate*** flowers in the ***same plant.***

**Category of Papaya**

Papaya is put under ***dioecious plants.***

***Staminate*** and ***pistillate*** flowers are produced in ***separate*** plants.

15. How are Cucurbit plants different from papaya plants with reference to the flowers they bear? (2011)

In cucurbits, both ***staminate*** flowers and ***pistillate*** flowers are present on the ***same plant***. But, in ***papaya,*** the ***staminate*** and ***pistillate*** flowers are present on ***separate plants***.

16. Mention the unique feature with respect to flowering and fruiting in bamboo species. (2012)

1. Bamboo species produce ***flowers*** and ***fruits only once*** in their life time.
2. They flower ***once in 50-100 years.***
3. They produce numerous minute fruits (seeds).
4. They die after producing ***fruits***
5. It is called ***gregarious flowering.***

17. Name the mode of reproduction that ensures the creation of new variants. (2012)

Reproduction that ensures the creation of new variants is ***sexual reproduction***.

18. Name the mode of reproduction that helps in producing genetically identical offspring. (2012)

Reproduction that helps in producing genetically identical offspring is ***asexual reproduction***.

19. Which ones of the following organisms exhibit binary fission? Bacillus, Penicillium, Yeast, Amoeba (2012)

***Amoeba*** exhibits binary fission.

20. Name the respective asexual reproductive structures of yeast and sponges. (2012)

**Asexual Reproductive Structures of Yeast**

***Buds*** are the asexual reproductive structures of yeast.

**Asexual Reproductive Structures of Sponges**

***Gemmules*** are the asexual reproductive structure of sponges.

21. Name the type of cell division that takes place in the zygote of an organism exhibiting haplontic life cycle. (2011)

***Meiosis*** takes place in the ***zygote*** of an organism exhibiting haplontic life cycle.

22. Name the units of vegetative propagation in grasses and water hyacinth. (2012)

**Vegetative Propagation in Grasses**

***Runners*** are the vegetative propagation units in grasses.

**Vegetative Propagation in Water Hyacinth**

***Offset*** is the vegetative propagation unit in water hyacinth.

23. How does Penicillium reproduce asexually (2011)

1. Penicillium reproduces asexually by the formation of ***non-motile, asexual spores*** called ***conidiospores*** (conidia)

2. The ***spores*** are formed at the ***tip of special***, ***erect hyphae*** called ***conidiophore.***

3. The conidia ***detach*** from the ***conidiophore.***

4. They are ***carried*** by ***wind.***

5. Upon reaching a ***suitable substratum,*** they ***germinate*** by forming a ***germ tube.***

6. The germ tube ***elongates,*** becomes ***septate*** and forms ***a new hypha.***

7. The hypha then grows into a ***mycelium (Penicillium).***

24. Name the phenomenon and the cell responsible for the development of new individuals without fertilization in honey bees (2011)

**Name of the Phenomenon**

***Parthenogenesis*** is the phenomenon of asexual reproduction seen in honey bees.

**Cell Responsible for Development**

In honey bees, ***female gamete*** is responsible for the development of new individuals without fertilization.

25. Name the group of organisms that produces non-motile male gametes. How do they reach the female gamete for fetilisation (2011)

**Group of Organisms**

***Seed plants*** produce non-motile male gametes.

**Process of Reaching Female Gametes**

Male gametes are carried to the female gametes by p***ollen tubes.***

26. All papaya plants bear flowers but fruit are seen only in some. Explain (2011)

Papaya is a ***dioecious*** plant that bears ***staminate*** and ***pistillate*** flowers on ***separate individuals.***

The plants with pistillate flowers can alone ***produce fruits.*** Hence ***female plants*** alone produce fruits.

Therefore, fruits are seen only in some plants.

27. All date palm plants bear flowers but fruits are seen in some. Explain (2011)

Date palm is a ***dioecious*** plant.

It bears ***staminate*** and ***pistillate*** flowers on ***separate individuals.***

The plant bearing ***pistillate flowers*** can alone ***produce fruits.***

Therefore, fruits are seen only in some plants.

28. A list of three flowering plants is given below:

Date palm, cucurbits and pea

Which one out of these are:

(i) monoecious

(ii) bearing pistillate flowers (2011)

(i) ***Cucurbits*** are monoecious plants.

They bear ***staminate*** and ***pistillate*** flowers on the same individual.

(ii) ***Cucurbits*** have pistillate flowers.

29. Mention the sites where syngamy occurs in amphibians and reptiles respectively. (2010)

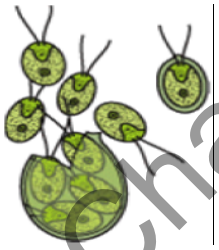
**Syngamy in Amphibians**

In amphibians, syngamy occurs in the ***external medium*** (water).

**Syngamy in Reptiles**

In reptiles, syngamy occurs ***inside the body.***

30. Identify the reproductive structure and name the organism they are being released from (2010)



**Reproductive Structure**

The reproductive structures are ***zoospores.***

**Name of the Organism**

The organism from which zoospores are released is the ***Chlamydomonas.***

31. A moss plant produces a large number of antherozoids but relatively only a few egg cells. Why? (2010)

In moss plants, the ***antherozoids*** (male gametes) are ***motile*** and the ***female gametes*** are ***immotile.***

The antherozoids require ***moisture*** or ***water*** for their ***transport*** and ***fertilization.***

To fertilise the eggs, these ***antherozoids*** need to be carried by ***water*** to the egg cells.

Only, a very ***few antherozoids reach*** the egg cells.

The ***rest*** of the antherozoids are ***carried away*** by water current and get ***wasted.***

So, large number of antherozoids are produced by moss plant.

32. Why are papaya and date palm plants said to be dioecious, whereas cucurbits and coconut are monoecious, in spite of all of them bearing unisexual flowers? (2010)

Papaya and date palm are dioecious plants as they bear ***staminate*** and ***pistillate*** flowers on ***separate*** individuals.

Cucurbits and coconut are monoecious plants as they bear ***staminate*** and ***pistillate*** flowers on the ***same*** individual.

33. Name the unisexual animal species that frequently visits our houses in nights.

***Cockroach*** is the unisexual animal species that visits our houses in night.

34. Give the name of male and female sex organs of Chara plant.

***Male sex organ*** of chara plant is called ***Antheridium.***

***Female sex organ*** of chara plant is called ***Oogonium.***

35. Give any two examples of animal species that possess both male and female reproductive organs in the same individual

* Earthworm
* Leeches
* Tapeworm
* Sponges

36. What is the name given to animals that possess both male and female reproductive organs in the same individual.

Name given to animals that possess both male and female reproductive organs in the same individual is ***hermaphrodites.***

37. How many chromosomes do drones of honey bee possess? Name the type of cell division involved in the production of sperms by them (2015)

**Number of Chromosomes**

Drones of honey bee possess ***16 chromosomes.***

**Type of Cell Division**

In drone honey bees, ***sperms*** are produced by ***mitosis.***

38. A haploid parent produces gametes by mitotic division. Does this mean that meiosis never occur in organisms that are haploid?

Yes, it means that ***meiosis never occur*** in parent organisms that are haploid.

But meiosis occurs at certain stage in the life cycle of sexually reproducing organisms.

**Key**

These organisms (eg. Chlamydomonas) ***produce gametes without meiosis.*** However, in the life cycle, the ***diploid zygote*** undergoes ***meiosis*** to form ***haploid organisms.***

39. Why do moss plants produce very large number of male gametes? Provide one reason. What are the gametes called? (2015)

**Large Number of Male Gametes**

Refer. Q. No. 31, Pg.No.13

**Name of the Gametes**

The male gametes are called ***antherozoids***

40. Name the two Kingdoms of living beings wherein all the organisms that can reproduce by cell division are included.

***Protista***
***Monera***

41. Higher plants that bear both male flowers and female flowers on the same individual are said to be monoecious and those that bear male and female flowers on separate individuals are said to be dioecious. The words equivalent for monoecious and dioecious to explain the same events in algae, fungi and bryophytes are:

The word equivalent for monoecious is ***homothallic.***
The word equivalent for dioecious is ***heterothallic.***

42. In yeast and Amoeba, the parent cell divides to give rise to two individual cells. How does the cell division differ in these two organisms? (2011)

Refer Q.No.5, Pg.No.8

43. Why is reproduction essential for the organisms? (2012)

Refer Q.No.1, Pg.No.1

44. Why do internodal segments of sugarcane fail to propagate vegetatively even when they are in contact with damp soil? (2010)

In ***sugarcane,*** new plants emerge from the ***buds of stem nodes*** when they are kept in contact with damp soil.

Internodal segments of sugarcane have ***no*** bud.

So, they ***fail to propagate vegetatively*** even when they are in contact with damp soil.

45. Name the units of vegetative propagation in water hyacinth. Explain giving reasons why it has become the most invasive aquatic weed? (2013)

**Units of Vegetative Propagation**

The units of vegetative propagation in water hyacinth are ***offsets***.

**Reason for Most Invasion**

* This plant was introduced in India because of its ***beautiful flowers*** and ***shape*** of leaves.

* It has become the most invasive aquatic weed because of the following reasons:

1. It can propagate vegetatively at a ***phenomenal rate*** and it ***spreads*** all over the water body in a ***short period*** of time.

2. It is very ***difficult*** to ***get rid*** off them.

46. Why vegetative reproduction is considered as a type of asexual reproduction?

Refer. Q.No.6, Pg. No. 3 ( Notes under 'Vegetative Reproduction as Asexual Reproduction')

47. Why do algae and fungi shift to sexual mode of reproduction just before the onset of adverse conditions? (2014)

1. Before the onset of adverse conditions, there appears a ***deficiency of nitrogen,*** and slight ***starvation.***

2. The ***low nitrogen*** content and ***starvation*** in the habitat ***induce*** algae and fungi to ***shift to sexual reproduction.***

3. Sexual reproduction brings about ***new combination*** of genes due to fusion of gametes. It ***prevents*** the ***loss of races*** of parents. It ***provides tolerance*** to adverse conditions.

4. The zygote formed by sexual reproduction develops ***thick wall*** and becomes a zygospore. The zygospore is ***dormant*** and ***resistant*** to ***desiccation, drought*** and ***mechanical injuries.***

5. The ***dormant zygospore*** starts ***germination*** at the advent of favourable season to ***produce*** a ***new individual.***

48. The cell division involved in gamete formation is not of the same type in different organisms. Justify. (2011)

1. In diploid organisms, the ***gametes*** are all ***haploid cells*** (n).

2. Meiocytes that produce the gametes are ***diploid*** cells (2n).

3. During gametogenesis, only ***half of the genetic material*** of the meiocyte is ***passed*** on to the ***gamete.*** It is achieved by ***meiotic division.***

4. In haploid organisms, the ***gametes*** and the ***reproductive*** cell that produces the gametes are ***haploid (n)***.

5. Therefore, there is ***no*** necessity for the ***reduction*** of ***chromosome number*** to half during gametogenesis.

6. The haploid parent produces gametes by ***mitotic*** division.

7. Thus, the cell division involved in gamete formation is ***not*** of the ***same type*** in different organisms.

49. Why are mosses and liverworts unable to complete their sexual mode of reproduction in dry conditions? Give reasons. (2013)

1. Mosses and liverworts show ***internal fertilization.***

2. The ***male gametes*** are ***motile*** and are released ***free,*** but the ***non-motile eggs*** remain ***inside*** the body of the organism.

3. ***Water*** is the medium for the ***transport*** of ***male gametes*** to the eggs.

4. In dry conditions, there is ***no water*** to ***carry*** the male ***gametes*** to the egg cells.

5. Hence, fertilisation ***fails*** to ***occur.***

6. So, sexual reproduction cannot be completed without fertilisation.

50. Unicellular organisms are immortal whereas multicellular organisms are not. Justify. (2011)

In unicellular organisms, ***cell division*** is by ***binary fission.***

A ***parent cell*** divides into ***two halves*** and each directly grows into an adult.

Therefore, the parent cell lives in the ***form*** of ***daughter cells, generation*** after ***generation***.

***So, death*** of ***one cell*** does ***not ensure*** the death of the parent cell.

Hence, ***unicellular organisms*** are ***immortal.***

In multicellular organisms the body is ***complex***.

All ***cells*** become ***inactive*** during the ***death*** of the organism.

The ***death*** of ***every individual*** organism is a certainty.

So, they are not believed to be ***immortal.***

51. Both coconut palm and date palm produce staminate flowers. One is monoecious and the other is dioecious. Write the difference. (2011)

Coconut palm is ***monoecious,*** as it bears both ***staminate flowers*** and ***pistillate flowers*** in the same plant.

Date palm is ***dioecious,*** as the staminate and pistillate flowers are produced in ***separate plants.***

52. Write two major adaptations in animals exhibiting external fertilisation. (2012)

(i) Great ***synchrony*** between the sexes in ***releasing*** the ***gametes.***

(ii) Release of a ***large number of gametes*** into the surrounding medium (water) in order to ***enhance*** the ***chances*** of syngamy.

53. (i) State the difference between the meiocyte and gamete with respect to chromosome number.

(ii) Why is the whiptail lizard referred to as parthenogenetic? (2012)

(i) Meiocytes are ***diploid*** cells having two sets of chromosomes (2n) but gamete is a ***haploid*** cell having a single set of chromosomes (n).

(ii) Whiptail lizard is referred to as parthenogenetic because the female gamete undergoes ***development*** to form a ***new organism without fertilisation***.

54. Why is it difficult to get rid off water hyacinth from a water body? Name one abiotic component and one biotic component of ecosystem that gets affected by its spread in the water body. (2011)

**Getting Rid of Water Hyacinth**

Water hyacinth is the most invasive weed growing in standing water.

It propagates vegetatively at a ***phenomenal rate*** and ***spreads*** all over the water body in a ***short period*** of time. So, it is difficult to get rid off water hyacinth from a water body.

**Biotic Components Affected**

- Fishes
- Aquatic plants.

**Abiotic Components Affected**

- Dissolved oxygen content of water
- Water level in aquatic system

55. (i) Name the organisms that reproduce through the following structures.
(a) Conidia (b) Zoospores
(ii) Mention one similarity and one difference between these two reproductive structures. (2011)

(i) (a) Organism that reproduce through Conidia is ***Penicillium***
(b) Organism that reproduce through Zoospores is ***Chlamydomonas***

**(ii) Similarities of Conidia and Zoospores**

1. Both, conidia and zoospores are ***asexual*** reproductive structures.
2. They are reproduced by ***large cells; fungi and algae*** respectively.
3. They are produced by ***mitosis***

(ii) Difference Between Conidia and Zoospores

| Conidia | Zoospores |
|---|---|
| 1. Conidia are ***non-motile*** spores | 1. Zoospores are ***motile*** spores |
| 2. They are either ***unicellular*** or ***multicellular*** | 2. They are ***always unicellular*** |
| 3. They are asexual ***spores*** produced by ***fungi.*** | 3. They are asexual spores produced by ***both fungi and algae.*** |
| 4. They are ***exogenous*** spores produced at the ***tip*** of ***conidiophores*** | 4. They are ***endogenous*** spores produced inside a ***sporangium.*** |
| 5. They are ***larger*** in size. | 5. They are comparatively ***small*** |
| 6. They are ***dispersed*** through ***wind*** | 6. They are dispersed through ***water*** |

56. Name and describe the process of syngamy in frog.

**Name of the Process in Frog**

The process of syngamy in frog is called ***external fertilisation***.

**Description**

External fertilisation is a type of ***gametic fusion*** that occurs in the ***external medium*** (water).

It takes place ***outside*** the ***body*** of female organism.

Both sexes produce ***gametes simultaneously*** to favour the gametic fusion.

57. (i) After fertilisation, the sepals, petals and stamens of the flower wither and fall off. Name a plant in which the sepals remain attached?
(ii) Ovary develops into a fruit which develops a pericarp that is protective in function. Name a group of plants wherein seeds are not covered by fruit.
(iii) Pericarp around the fruit is protective in function. Name a plant whose pericarp yields valuable fibres.

(i) In ***pomegranate***, sepals remain attached with the pistil during fruit development.

So, they are ***persistent*** in fruits.

(ii) In ***gymnosperms***, seeds are not covered by fruit and they remain naked.

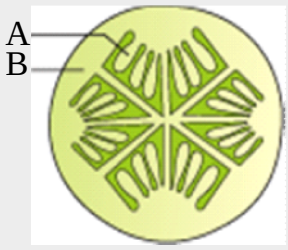
(iii) ***Coconut*** is the plant in which the pericarp of fruit is fibrous and yields valuable fibres for manufacturing coir.

58. Differentiate between oestrus cycle and menstrual cycle. Give examples for each type.

| Oestrus cycle | Menstrual cycle |
|---|---|
| 1. Bleeding ***does not occur*** in this cycle | 1. ***Bleeding occurs*** by the end of this cycle |
| 2. It is seen in ***non-primate*** mammals like cows, sheep, rats, dogs etc. | 2. It is seen in ***primate mammals*** like monkey, apes, humans etc. |
| 3. It is a ***21 - day*** cycle | 3. It is a ***28 - day*** cycle |
| 4. It has a ***period*** of ***heat*** | 4. There is ***no period*** of heat. |
| 5. It consists of a ***short*** period of ***oestrous*** or heat, followed by ***anoestrus*** or ***passive*** period. | 5. It consists of ***menstrual*** phase, ***proliferative*** phase and ***secretory*** phase. |
| 6. Broken ***endometrium*** is ***reabsorbed*** | 6. Broken endometrium ***passes out*** along with blood. |

| | |
|---|---|
| 7. Sexual urge is ***increased*** | 7. Sexual urge is ***not increased*** |
| 8. Female copulates ***only*** during oestrus period. | 8. Female does not ***couplate*** during menstrual cycle. |

59. Refer to the diagram given below and answer the questions that follow.




(i) Label the parts A and B.
(ii) Which parts of flower develops into seed and fruit?
(iii) What is the function of both the parts labelled A and B?

(i) A - Seed
B - Pericarp

(ii) ***Ovule*** develops into ***seed*** and ***ovary*** develops into ***fruit.***

**(iii) Functions of seed**

1. Seed ***germinates*** into a new plant.
2. It ***protects*** the ***embryo.***
3. It ***nourishes*** the germinating ***seedling.***
4. It helps in ***survival*** during ***unfavourable conditions*** by becoming dormant.

**(iii) Functions of Pericarp**

1. Pericarp provides ***protection*** to the seed.
2. It helps in the ***dispersal of seeds.***

# 2 Sexual Reproduction in Flowering Plants

Question Trends in Previous Years

| Question type | Number of questions | | | | |
|---|---|---|---|---|---|
| | 2014 | 2015 | 2016 | 2017 | 2018 |
| 1 mark | 1 | | | | |
| 2 marks | 2 | | | 1 | |
| 3 marks | 1 | | | 1 | 1 |
| 4 marks | | 1 | | | |
| 5 marks | | 1 | 1 | 1 | 1 |

## NCERT Intext Questions

1. Name the parts of an angiosperm flower in which the development of male and female gametophytes takes place.

The development of ***male gametophyte*** takes place in the ***pollen sac*** of anther.

The development of ***female gametophyte*** takes place in the ***nucellus*** of ovule.

2. Differentiate between microsporogenesis and megasporogeneis. Which type of cell division occurs during these events? Name the structures formed as a result of these two events.

**Differences Between Microsporogenesis and Megasporogenesis**

| Microsporogenesis | Megasporogenesis |
|---|---|
| 1. Microsporogenesis is the formation of ***microspores.*** | 1. Megasporogeneis is the formation of ***megaspores.*** |
| 2. It occurs inside the ***micro-sporangium*** of anther. | 2. It occurs inside the ***mega-sporangium*** (ovule). |
| 3. It takes place in ***many spore mother cells*** at a time. | 3. It takes place in ***only one*** spore mother cell in the nucellus. |

| | |
|---|---|
| 4. ***Four microspores*** are produced in ***tetrahedral*** form. | 4. ***Four megaspores*** are produced in a ***linear*** form. |
| 5. ***All*** of the microspores produced are ***functional.*** | 5. ***One*** of the megaspore produced is ***functional.*** |
| 6. Microspores produce ***male gametophyte.*** | 6. Megaspore produces ***embryo sac (female gametophyte).*** |

**Type of Cell Division**

Meiotic division takes place during microsporogenesis as well as during megasporogenesis

**Name of Structures Formed**

The ***structure*** formed as a result of ***microsporogenesis*** is called a pollen (***microspore***) ***tetrad***. ***Each*** pollen tetrad consists of ***four haploid pollen grains.***

The ***structure*** formed as a result of ***megasporogenesis*** is called a ***megaspore tetrad.*** The ***megaspore*** tetrad consists of ***linear row of*** four haploid ***megaspores.***

3. Arrange the following terms in the correct developmental sequence: Pollen grain, sporogenous tissue, microspore tetrad, pollen mother cell, male gametes

Sporogenous tissue, pollen mother cell, microspore tetrad, pollen grain, male gametes.

4. With a neat, labelled diagram, describe the parts of a typical angiosperm ovule.

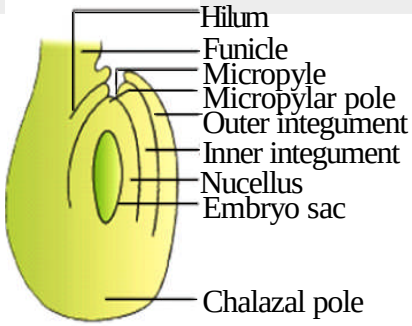



*Fig.2.1: An Angiosperm ovule*

Ovule of angiosperm is a ***megasporangium*** found in the ovary.

The ovule is a ***small spherical structure***. The parts of the ovule are as follows:

1. ***Funicle:*** It is a ***stalk like structure*** that attaches the ovule to the placenta.

2. ***Hilum:*** It is the ***junction between ovule*** and ***funicle***. The body of the ovule fuses with funicle in this region.

3. ***Integuments:*** They are protective ***envelops*** found around the ovule. Each ovule has ***one*** or ***two protective envelopes***.

4. ***Micropyle:*** It is a small ***opening*** in the surface ***of the ovule. The pollen tube*** penetrates through this ***opening.***

5. ***Chalaza:*** It is the ***basal part*** of the ***ovule,*** that is opposite to the ***micropylar end.***

6. ***Nucellus*** : It is the ***central part*** of the ***ovule,*** that contains the embryo sac.

7. ***Embryo sac:*** It is located in the ***nucellus.*** An ovule generally has a ***single embryo sac*** formed from a ***megaspore*** through reduction division.

5. What is meant by monosporic development of female gametophyte?

Out of the four megaspores formed, only ***a single functional megaspore*** develops into a ***female gametophyte.***

Other three megaspores ***degenerate.***

This is called ***monosporic*** development.

6. With a neat diagram, explain the 7-celled, 8-nucleate nature of the female gametophyte.

1. The female gametophyte is the ***embryo sac***. It has the following parts -

| | |
|---|---|
| * An egg apparatus | * 3 antipodal cells |
| * A central cell | * A vacuole |

2. The egg apparatus lies at the ***micropylar*** end.

3. It consists of ***an egg cell*** and ***2 synergids.***

4. The central cell is present in the ***centre of the embryo sac***. It is the ***endosperm mother cell***. It contains ***two haploid*** polar ***nuclei.***

5. Antipodals are a set of ***3 cells.*** They are located at the ***chalazal*** end of the ***embryo sac.***

6. ***Large vacuole*** is present at the ***chalazal*** end.

7. The ***embryo sac*** has the following cells and nuclei:

| | | |
|---|---|---|
| 1 Egg | Nucleus | -1 |
| 2 Synergids | Nucleus | -2 |

| | | |
|---|---|---|
| 3 Antipodals | Nucleus | -3 |
| 1 Central cell | Polar nuclei | -2 |
| 7 Cells | | 8 Nuclei |

8. At the base of synergids, there are finger like projections called filiform apparatus. It guides the pollen tube towards the egg.

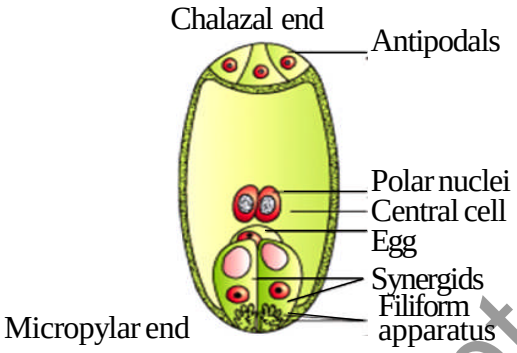



*Fig.2.2: A diagrammatic representation of the mature embryo sac*

7. What are chasmogamous flowers? Can cross-pollination occur in cleistogamous flowers? Give reasons for your answer

**Chasmogamous Flowers**

Flowers that ***open to expose anthers*** and ***stigma,*** are called chasmogamous flowers.

**Cross-pollination in Cleistogamous**

***No,*** cross-pollination ***cannot occur*** in Cleistogamous flowers.

**Reason**

1. Cleistogamous flowers ***do not open*** at all.
2. The ***anthers*** and ***stigma*** lie ***close*** to each other.
3. So, when ***anthers burst, pollen*** grains come in contact with ***stigma.***
4. Thus, only ***self-pollination*** takes place.
5. There is ***no chance*** for ***pollen*** of other flowers to ***reach*** the ***stigma.***

8. Mention two strategies evolved to prevent self-pollination in flowers.

1. ***Pollen release*** and ***stigma receptivity*** are not synchronised.

* The ***pollen*** is ***released before*** the ***stigma*** becomes ***receptive.***

*The ***stigma*** becomes ***receptive*** much ***before*** the ***release*** of pollen.

2. The ***anther*** and ***stigma*** are placed at ***different positions.*** So, pollen ***cannot come*** in ***contact*** with the ***stigma*** of the same flower.

3. Closed flower - Cleistogamous flower.
4. In some plants, flowers are ***unisexual.***

9. What is self- incompatibility? Why does self-pollination not lead to seed formation in self-incompatible species?

**Self - incompatibility**

Self- incompatibility is a genetic mechanism that prevents the self-pollen (pollen of the same flower or other flowers of the same plant) from fertilizing the ovules.

In self-incompatible species, the ***pistil rejects*** the pollen of the same plant by either of the following two ways:

* ***Preventing pollen germination*** on the stigma
* ***Preventing pollen tube growth*** in the style.

**No Seed formation in Self-incompatible species**

1. The ***pollens*** are ***unable*** to fertilise the ovule.
2. Formation of ***embryo*** and further development into ***seed*** do not occur.
3. So, there is ***no seed formation*** in self-incompatible species.

10. What is bagging? How is it useful in a plant breeding program?

**Bagging**

The process of ***wrapping the emasculated flowers with a bag of suitable size*** is called ***bagging***.

Generally, bag made up of butter paper is used.

**Use in Plant Breeding Programme**

Bagging is used in ***artificial hybridisation*** of plants for the following purposes:

1. To ensure pollination by the ***desired pollen*** grains.
2. To prevent pollination by ***unwanted*** pollen.

11. What is triple fusion? Where and how does it take place? Name the nuclei involved in triple fusion.

**Triple fusion**

Triple fusion is the ***fusion of three haploid cells*** in the central cell.

A ***male gamete*** fuses with ***two polar nuclei*** located in the central cell, producing ***triploid primary endosperm nucleus.***

It is called so because ***fusion*** of ***three haploid nuclei*** takes place.

**Location of Triple Fusion**

Triple fusion takes place in the ***central cell*** of ***embryo sac.***

**Event of Triple fusion**

1. One of ***male gametes moves*** towards the two ***polar nuclei,*** present in the central cell.

2. It ***fuses*** with them and ***produces*** a ***triploid*** primary endosperm nucleus ***(PEM).***

3. It involves the ***fusion*** of ***three haploid*** nuclei.

**Name of the Nuclei**

The nuclei involved in triple fusion are:

* Two polar nuclei
* One ***nucleus*** of ***male gamete.***

12 . Why do you think the zygote is dormant for sometime in the fertilised ovule?

1. In ovules, both ***syngamy*** and ***triple fusion*** take place simultaneously.

2. The syngamy results in the formation of a ***zygote*** and ***triple fusion*** results in the formation of a ***primary endosperm nucleus*** (PEN).

3. After triple fusion, the ***primary endosperm nucleus*** develops into a triploid ***endosperm***.

4. Endosperm is a ***nutritive tissue*** for the developing embryo.

5. Without endosperm, embryo development cannot take place.

6. So, the zygote remains ***dormant*** till the development of endosperm.

7. After the formation of endosperm, embryo development from zygote takes place.

13. Differentiate between:

(a) hypocotyl and epicotyl; (b) coleoptile and coleorhiza;
(c) integument and testa; (d) perisperm and pericarp.

**(a) Difference Between Hypocotyl and Epicotyl**

| Hypocotyl | Epicotyl |
|---|---|
| 1. Hypocotyl is the portion of ***embryonal axis below the*** level of cotyledons. | 1. Epicotyl is the portion of ***embryonal axis above*** the level of cotyledons. |
| 2. It forms the ***root system***. | 2. It forms the ***shoot system***. |
| 3. It terminates in the ***radicle*** or root tip. | 3. It terminates with ***plumule*** or stem tip. |

**(b) Difference Between Coleoptile and Coleorhiza**

| Coleoptile | Coleorhiza |
|---|---|
| 1. Coleoptile is a ***hollow foliar structure.*** | 1. Coleorhiza is an undifferentiated ***sheath-like structure.*** |
| 2. It encloses the ***shoot apex and leaf primordia*** in a monocot embryo. | 2. It encloses the ***radicle and root cap*** in a monocot embryo. |
| 3. It protects the ***shoot system***. | 3. It protects the ***root system***. |

**(c) Difference Between Integument and Testa**

| Integument | Testa |
|---|---|
| 1. Integument is the ***protective envelope*** of ***ovule.*** | 1. Testa is the ***protective*** covering of the ***seed*** |
| 2. It arises from ***chalazal*** end of ovule | 2. It arises from ***outer integument*** of ovule |
| 3. It is ***thin*** | 3. It is ***thicker*** than integument. |
| 4. It is ***one*** or ***two layered.*** | 4. It is ***single layered.*** |
| 5. The cells are ***live.*** | 5. The cells are ***dead*** |
| 6. The cells are ***devoid*** of ***sclereids.*** | 6. The cells are ***rich in sclereids*** |
| 7. Integument is a part of ***pre-fertilisation tissue.*** | 7. It is a result of ***post-fertilisation changes*** in gynoecium |

**(d) Difference Between Perisperm and Pericarp**

| Perisperm | Pericarp |
|---|---|
| 1. Perisperm is a ***residual part of nucellus*** in the seeds of some plants. | 1. Pericarp is the ***outer wall of fruit.*** |
| 2. It develops ***within the seed.*** | 2. It develops from the ***ovary wall.*** |
| 3. It is used as ***nutrition*** for developing embryo. | 3. It is ***protective*** in function. |
| 4. It is ***usually dry.*** | 4. It may be ***fleshy*** or ***dry*** |

14. Why is apple called a false fruit? Which part of the flower forms the fruit?

**Reason**

In apple, fruit is developed from ***ovary*** and other ***accessory floral parts.*** So, apple is called ***false fruit***.

In apple, the ***thalamus*** also contributes to fruit formation.

**Part of the Flower**

The ***fleshly receptacle*** (thalamus) forms the edible part of apple.

15. What is emasculation? When and why does a plant breeder employ this technique?

**Emasculation**

***Removal*** *of* ***anthers*** *from the flower bud before the anther dehisces is called* ***emasculation.***

It is usually done in bisexual flowers to perform ***cross pollination*** and prevent ***self-pollination.***

It is usually ***done*** using a ***pair of forceps.***

**Time of Employing this Technique**

A plant breeder employs this technique **prior** to ***dehiscence*** of the ***anther*** of bisexual flowers.

**Reason for Employing this Technique**

1. To ***prevent self-pollination.***
2. To pollinate using ***desired pollen grains.***
3. To perform ***cross-pollination.***
4. To produce ***superior varieties*** of plants.

16. If one can induce parthenocarpy through the application of growth substances, which fruits would you select to induce parthenocarpy and why?

**Fruit Selection**

***Fruits that contain plenty of seeds with hard seed coat*** are usually selected for inducing parthenocarpy.

Grapes, guava, oranges, lemon, water melon, etc. will be selected.

**Reason**

1. These fleshy fruits contain ***numerous seeds.***
2. These seeds interfere with ***eating*** and ***preparation of jam*** and ***jellies***.
3. Inducing parthenocarpy produces ***seedless*** fruits.
4. It can be used in fruit crops that may be ***difficult*** to ***pollinate*** or fertilise naturally.
5. It ***increases*** fruit ***production.***
6. Production of seedless fruits improves the ***fruit quality.***
7. This will ***increase*** the ***shelf life*** of the fruits
   Eg. Watermelon.

17. Explain the role of tapetum in the formation of pollen grain wall.

***Exine*** of pollen grain develops first on the side of pollen grain that lies close to tapetum.

***Sporopollenin*** in the exine is ***secreted by tapetum***.

18. What is apomixis and what is its importance?

**Apomixis**

Apomixis is the process of ***seed production without fertilisation***.

It is a form of ***asexual reproduction.***

It is seen in plants belonging to ***Asteraceae*** and ***grasses***.

***Embryo development*** occurs within the ***seeds.***

**Importance of Apomixis**

1. Apomixis is important for ***seed production*** in hybrid plants.
2. The ***loss*** of ***specific characters*** of the hybrid can be prevented.
3. It helps to produce ***enormous*** amount of ***seeds.***
4. It is a ***cost effective*** method for producing seeds.
5. Individuals produced from apomictic seeds are ***identical*** with the parents, both ***morphologically*** and ***genetically***. They are said to be a ***clone***.
6. They are used as ***breeding stocks*** in plant breeding programs.

## NCERT Exam Solved Questions

1. Mention the chief characteristics of flowers that help the plants to reproduce sexually.

***Attractive colour***

***Scent of flowers.***

2. Name the two parts in a flower in which the two most important units of sexual reproduction develop.

***Stamens*** and ***ovary*** are the two parts in which the two most important units of sexual reproduction develop.

3. Flowers do not exist only for us to be used for our own selfishness. Justify.

1. Flowers are ***reproductive parts*** of plants.
2. Plants produce flowers only for ***their own reproduction*** that helps in the ***continuity*** of plants on the earth.
3. When we pick up flowers, ***multiplication*** of plants is disturbed.

4. So, it is justified that flowers do not exist for us to be used for our own selfishness.

4. Which of the following statements is true for sexual reproduction of higher plants?
(i) The end products of sexual reproduction are seedlings.
(ii) The end products of sexual reproduction are fruits and seeds.
(iii) The end products of sexual reproduction are haploid gametophytes.

***Ans: (ii) The end products of sexual reproduction are fruits and seeds.***

5. The inflorescences, flowers and floral parts show an amazing range of adaptations. Why?

1. To achieve pollination
2. To ensure the formation of ***fruits*** and ***seeds.***

6. Name the part of flower which the tassels of corn cob represent. (2014)

The tassels of corn cob represent the ***style*** and ***stigma*** of corn flower.

7. Give an example of a plant, which came to India as a contaminant and is a cause of pollen allergy. (2014)

***Parthenium*** or **carrot grass** is a plant that came into India as a contaminant with ***imported wheat*** and is a cause of pollen allergy.

8. Why do corn cobs have long tassels? (2010)

Corn cobs have long tassels to wave in the wind for ***trapping pollens*** from the wind.

9. How many microsporangia are present in a typical anther of an organism? (2013)

***Four microsporangia*** are present in a typical anther of an organism.

10. Mention any one application of pollen bank. (2011)

1. Pollen banks are used to ***store pollen grains*** of various species.
2. It helps to ***retain*** the ***viability*** of pollen grains.
3. Stored pollen grains can be used for ***artificial pollination*** during plant breeding.
4. It helps to ***preserve*** valuable ***genetic resources.***
5. It ensures preservation of ***biodiversity.***

6. It helps to ***store*** the ***pollen grains*** of plant that are in the ***verge*** of ***extinction.***

11. Mention any two environmental factors that affect pollen viability. (2011)

Viability of pollen grains is affected by the following factors:

* ***Temperature***
* ***Relative humidity*** of the atmosphere.

12. In cereals such as rice and wheat, pollen grains lose viability within 30 minutes of their release, but in some other plants, the pollen grains maintain viability for months. Give the names of families in which such plants are included.

Plant families in which pollen grains maintain viability for months are the following:

* ***Rosaceae***
* ***Leguminosae***
* ***Solanaceae***

13. Mention the pollinating agents for aquatic plants, *Vallisneria* and water lily respectively. (2010)

**Pollinating agents for Vallisneria**

***Water*** acts as the pollinating agent in *Vallisneria.*

**Pollinating Agents in water lily**

***Insects*** are the pollinating agents in Water Lily

14. How do flowers of *Vallisneri*a get pollinated? (2013)

1. In *vallisneria*, ***female*** flowers have ***long stalk.***
2. The female flowers ***reach*** the water ***surface.***
3. The ***male*** flowers ***detach*** from the stalk and ***float*** on the surface of water.

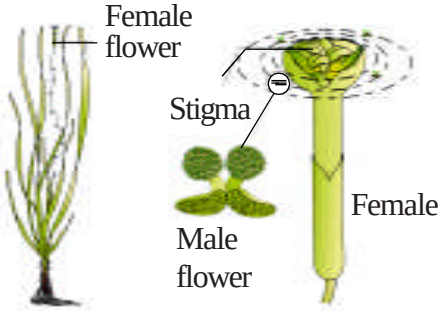



*Fig.2.3: Pollination by water in Vallisneria*

4. ***Female*** flowers float in a ***slanting*** position.
5. It causes ***slight depression*** on the water surface.
6. The floating ***male flowers*** move into the depression.
7. The ***male flowers*** come in contact with female flowers.
8. Thus, ***pollination*** occurs.

15. Why do pollen grains of *Vallisneria* have a mucilaginous covering? (2008, 2011)

Mucilaginous covering of pollen grains of *Vallisneria* prevents the ***pollen grains*** from ***getting wet***. So, pollen grains ***float*** on the ***surface*** of water for ***pollination*** to occur.

16. How do pollen grains of *Vallisneria* protect themselves? (2012)

Pollen grains of *Vallisneria* have ***mucilaginous covering***.
This mucilage ***protects*** the ***pollen grains*** from getting ***wet.***

17. Pea flowers produce assured seed set. Give one reason. (2010)

1. Pea flowers are ***cliestogamous*** flowers (closed flowers).
2. The anthers and stigma lie close to each other.
3. As soon as the anthers dehisce, ***pollen grains*** come in ***contact*** with the ***stigma*** to effect pollination.
5. Hence, pea flowers produce ***assured seed set.***
4. So, there is ***hundred percent possibility*** for fertilisation of ovules.

18. Name the type of flower which favours cross pollination. (2009)

***Chasmogamous flowers*** favour cross pollination.

19. Cliestogamous flowers favour self-pollination. Give two proper reasons.

1. Cliestogamous flowers ***do not open at all***.
2. ***Anthers and stigma*** lie ***close*** to each other.
3. When ***anthers*** dehisce in the flower buds, ***pollen*** grains directly come in ***contact*** with the ***stigma***. This brings about self pollination.

20. Why do chasmogamous flowers facilitate cross pollination?

Chasmogamous flowers have ***exposed anthers*** and ***stigma***.
So, pollinators can transfer the ***pollen of one flower*** to ***stigma*** of ***another flower*** to effect cross pollination.

21. Name the type of pollination as a result of which genetically different types of pollen grains of the same species land on the stigma. (2009)

In ***Xenogamy*** or ***allogamy*** pollination, genetically different types of pollen grains of the same species land on the stigma.

22. The meiocyte of rice plant has 24 chromosomes. Write the number of chromosomes in its endosperm. (2009; 2013)

The number of chromosomes in the endosperm is ***36.***

**Key**

Endosperm is formed by ***triple fusion*** - fusion of a haploid ***male gamete*** with ***2 haploid polar nuclei.***

A haploid nucleus has 12 chromosome.

Thus endosperm will have 36 chromosomes.

Male gamete (12 chromosomes) +1st polar nucleus (12 chromosomes) +2nd polar nucleus (12 chromosomes) → Endosperm (36 chromosomes)

23. How many microspore mother cells would be required to produce one hundred pollen grains in a pollen sac? And why? (2013)

1. ***25 microspore mother cells*** would be required to produce 100 pollen grains.

2. ***Each microspore*** mother cell gives rise to ***four pollen grains.***

24. How many pollen grains and ovules are likely to be formed in the anther and ovary of an angiosperm bearing 25 microspore mother cells and 25 megaspore mother cells? (2014)

**Number of Pollen Grains**

***100 pollen*** grains are produced from 25 microspore mother cell.

**Key:**

1. ***One microspore*** mother cell undergoes meiosis to form ***4 cells.***

2. So, ***25*** microspore mother cells produce 100 cells (pollen grains)

**Number of Ovules**

***25*** ovules are produced from 25 megaspore mother cells.

**Key:**

1. ***One*** megaspore mother cell undergoes ***meiosis*** to produce ***4 megaspores.***

2. Only ***one megaspore*** is ***functional.***

3. The ***functional megaspore*** will develop to produce ***1 ovule*** (embryosac)

4. Thus, ***25 Ovules*** are produced from 25 megaspore mother cells.

25. How is it possible in *Oxalis* and *Viola* plants to produce assured seed sets even in the absence of pollinators? (2012)

*1. Oxalis* and *Viola* plants produce ***cleistogamous flowers***

2. In these plants, anthers and stigma lie ***close to each other.***

3. As soon as the anthers dehisce, ***pollen grains*** come in ***contact*** with the ***stigma*** to effect pollination.

26. Is there any possibility for ***Oxalis*** and ***Viola*** to effect cross pollination naturally? Explain.

**Possibility for Cross Pollination**

***Yes,*** there is possibility for *Oxalis* and *Viola* to effect cross pollination naturally.

**Explanation**

1. Both of these plants produce ***chasmogamous*** and ***cleistogamous*** flowers.

2. ***Chasmogamous*** flowers are ***open*** and have ***exposed anthers*** and ***stigma.***

3. So, they effect ***cross pollination*** naturally.

27. Typical anther is said to be dithecous. Why?

1. Typical anther is ***bilobed***.

2. Each lobe has ***two thecae***.

3. So, a typical anther is said to be ***dithecous***.

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

This anther can produce ***1600 male gametophytes***.

**Key:**

1. ***Each microspore*** mother cell produces ***4 microspores***

2. Each microspore produces ***a pollen tube***

3. Anther has ***four microsporangia***

4. So, $4 \times 100 \times 4 = 1600$

29. Rearrange the following terms in the correct developmental sequence: Embryo sac, nucellus, ovule, megaspore mother cell, egg (2014)

***Ovule, nucellus, megaspore mother cell, embryo sac, egg***.

30. Explain giving two reasons why pollen grains can be best preserved as fossils. (2010)

Pollen grains are best preserved as fossils due to the following reasons:

1. Presence of ***hard outer layer.***
2. Presence of ***sporopollenin*** in the hard outer layer.
3. ***Sporopollenin*** is ***resistant*** to ***high temperatures, strong acids*** and ***alkali.***
4. ***No enzyme*** can ***degrade*** sporopollenin in the pollen grains.

31. The microscopic pollen grains of the past are obtained as fossils. Mention the characteristics of pollen grains that make it happen. (2009)

The following characteristics of pollen make them exist as fossils:

1. The ***hard outer layer*** of pollen grain is made up of ***sporopollenin*** that is ***resistant*** to ***high temperatures***, ***strong acids*** and ***alkali.***
2. ***No enzyme can degrade*** sporopollenin in the pollen grains.

32. Explain any two devices by which autogamy is prevented in flowering plants. (2008)

Refer. Q.No.8 , Pg.No.4

33. Mention any two devices by which allogamy is prevented in flowering plants. (2004)

Allogamy is ***fertilization*** of a flower by ***pollen*** from ***another flower.***

Allogamy is prevented by the following two devices:

1. In some plants, flowers ***do not open*** to expose their stamens and stigma. Hence, they ***do not*** come in ***contact*** with ***pollen grains*** of ***other plants.*** So, allogamy is prevented.
2. In some plants, there is a ***synchrony*** between ***pollen release*** and ***stigma*** receptivity. So, ***chance*** for cross pollination is ***low.***

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

**Flower of Brinjal**

- Flowers ***open*** to ***expose stamens and stigma.***
- So, ***cross-pollination*** occurs.

**Flower of Beans**

- Flowers ***never open*** to expose stamens and stigma.
- So, ***self-pollination*** occurs.

35. Banana is a true fruit, but is also a parthenocarpic fruit. Give reason. (2010)

Banana is a true fruit because it ***develops*** only ***from ovary***.

But, it is considered as a parthenocarpic fruit as it develops ***without fertilisation*** of ovules.

36. Banana produces fruits, but is propagated only by vegetative means. Why is it so? (2012)

1. Banana is a ***parthenocarpic fruit.***
2. It does not produce ***viable seeds***.
3. This is because banana is developed ***without fertilisation.***
4. So, it reproduces only by ***vegetative means.***

37. Why is banana considered as a good example of parthenocarpy? (2012) Or

Why is banana referred to as a parthenocarpic fruit? (2013)

In banana, ***fruit development*** takes place ***without fertilisation of ovules.***

So, it is considered as a ***parthenocarpic*** fruit.

38. Define self-incompatibility.

Or

What is self-incompatibility?

Self-incompatibility is a ***genetic mechanism*** that ***prevents self-pollen (pollen*** of the ***same flower*** or ***other flowers*** of the same plant) ***from fertilising the ovules.*** This is achieved by ***pollen germination*** or ***pollen tube growth*** in the pistil.

39. What is the function of germ pore in pollen grain? What would be the result if there is no germ pore in the pollen grain?

**Function of Germ Pore in Pollen Grain**

1. ***Pollen tube grows*** out only ***through*** the germ pore.
2. So, germ pore is essential for pollen ***germination***.

**Result if there is no Germ Pore**

Pollen grains remain ***non-viable,*** if there is no germ pore.

40. Give the technical term that refers to the functional autogamy in monoecious plants.

***Geitonogamy*** is the technical term that refers to the functional autogamy in monoecious plants.

41. How are monoecious plants best adopted for geitonogamy?

1. Geitonogamy is the transfer of pollen of the male flower to the ***pistil of female flower of the same plant.***
2. Monoecious plants bear ***male*** and ***female flowers.***
3. Male and female flowers are present as ***separate structures.***
4. So, ***pollination*** within the ***same flower*** (autogamy) ***is not possible.***
5. Hence, monoecious plants are best adapted for geitonogamy.

42. Even though each pollen grain has two male gametes, why are at least 10 pollen grains and not 5 pollen grains required to fertilize 10 ovules present in a particular carpel? (2009)

1. Although two male gametes are produced from a pollen grain, they are ***released*** by the ***pollen tube*** after entering into an embryo sac of an ovule.
2. Further, ***double fertilisation*** is the rule in angiosperm.
3. ***One male gamete*** fuses with the ***egg,*** the ***other*** male gamete ***fuses*** with ***two polar nuclei.***
4. 10 ovules have ***10 eggs.***
5. ***5 pollen grains*** can release male gametes only into ***5 ovules.***
6. So, ***10 pollen*** grains are required to fertilise ***10 ovules.***

43. Which of the following statements is true for male gametes of higher plants?

(i) A pollen tube releases two male gametes just outside the embryo sac.

(ii) A pollen tube releases one male gamete inside the egg cell.
(iii) A pollen tube releases two male gametes inside the synergids.

***Ans:*** *(iii) A pollen tube releases two male gametes inside the synergids.*

44. How many haploid cells are present in a mature female gametophyte of a flowering plant? Name them. (2010; 2013)

Mature female gametophyte of flowering plant has ***six haploid cells***. They are the following:

- ***3 antipodal cells*** at the opposite end of the embryo sac.
- ***2 synergid*** cells located at the micropylar end of ***embryo sa***c
- ***1 egg cell*** .

45. Give the ploidy level of central cell and endosperm mother cell of female gametophyte of angiosperm flowers.

**Ploidy Level of Central Cell**

The ploidy level of central cell is ***diploid (2n)***

**Ploidy Level of Endosperm Mother cell**

The ploidy level of endosperm mother cell is ***triploid*** (3n).

46. Central cell of embryo sac is diploid (2n). Why does the endosperm mother cell that develops from the same central cell remain triploid (3n)?

1. One of the ***male gametes*** from a pollen grain fuses with the diploid ***central cell*** (2n)
2. It forms ***endosperm mother cell.***
3. Since it is a fusion of ***three haploid nuclei,*** the resulting endosperm mother cell is ***triploid*** (3n).

47. What is the function of filiform apparatus in fertilization?

It ***guides*** the ***pollen tube*** into the ***synergids*** to release male gametes.

48. How does the pistil of flowers reject the pollen tube of wrong type pollen grains from falling on the stigma?

The pistil rejects the pollen grains by the following ways:

- ***Preventing*** pollen ***germination*** on the stigma.
- ***Inhibiting*** the ***growth*** of ***pollen tube*** in the style.

49. Which of the following statements is true for angiosperm embryo sac?

(i) Typical angiosperm embryo sac, at maturity, is 8-nucleate and 8-celled.
(ii) Typical angiosperm embryo sac, at maturity, is 6-nucleate and 7-celled.
(iii) Typical angiosperm embryo sac, at maturity, is 8-nucleate and 7-celled.

***Ans:*** *(iii) Typical angiosperm embryo sac, at maturity, is 8-nucleate and 7-celled.*

50. Anther with malfunctioning tapetum often fails to produce viable male gametophytes. Give one reason. (2010)

Tapetum, normally ***nourishes*** the ***developing pollen grain.***
So, a ***malfunctioning*** tapetum ***cannot*** supply ***enough nourishment*** to the developing male gametophytes.
Hence, viable male gametophyte cannot be produced.

51. Why should a bisexual flower be emasculated and bagged prior to artificial pollination? (2010)

1. Prior to artificial pollination, emasculation and bagging is done to prevent ***self-pollination.***
2. It is done to perform ***cross-pollination.***
3. It is done to ***pollinate*** using ***desired pollen grains.***
4. It is done to produce ***superior variety plants.***

52. What is double fertilisation?

Out of two gametes produced from a pollen grain, ***one fuses*** with ***egg nucleus*** to form a ***zygote.***
***Another*** one fuses with ***polar nuclei*** to form ***endosperm mother cell.***
This type of gametic fusion is called ***double fertilisation***.

53. What will be the fate of the pollen of cucumber plant if it falls on the stigma of brinjal?

The ***pollen*** of cucumber plant will be ***rejected*** by the ***pistil*** of brinjal because of ***incompatibility***.

54. Which of the following statements is true for the product/s of triple fusion in angiosperms?
(i) The product of triple fusion is a triploid endosperm mother cell.
(ii) The products of triple fusion are a triploid endosperm mother cell and a diploid zygote.
(iii) The product of triple fusion is a diploid zygote.

***Ans:*** *(i) The product of triple fusion is a triploid endosperm mother cell.*

55. In angiosperms, triple fusion and syngamy take place simultaneously. Whether embryo development and endosperm formation take place side by side or at different times? Explain.

In angiosperms, endosperm development ***precedes the embryo development***.

The endosperm develops ***first*** and ***nourishes*** the ***developing embryo*** during the seed formation.

56. *Papaver* and *Michelia* both have multicarpellary ovaries. How do they differ from each other? (2012)

In *Papaver*, ovary is ***syncarpous,*** but in *Michelia* it is ***apocarpous***.

57. Why is endosperm of angiospermic ovule more efficient?

1. Endosperm of angiospermic ovule is ***triploid*** (3n).
2. The triploid cells are ***metabolically very active*** in the synthesis of ***nutritional components*** required for the developing embryo.
3. It contains ***carbohydrates, lipids*** and ***proteins.***
4. The substances are ***utilised*** by the ***embryo*** to grow into a new plant.
5. Therefore, endosperm of angiospermic ovule is more efficient.

58. Seeds of monocot plants have a single cotyledon. Name the single cotyledon of seeds of the grass family.

The name of single cotyledon in the seeds of grass family is ***Scutellum***.

59. What will be the fate of ovule if triple fusion fails?

If triple fusion fails, there is ***no endosperm development*** in the ovule.
There will be ***no embryo development*** from the zygote.
There will be ***no seed development*** from the ovule.

60. Seeds of some plants are albuminous while those of some others are non-albuminous. Why?

Seeds of some plants are albuminous, since the developed ***endosperm is not completely utilised*** for the development of embryo.

The seeds have endosperm.

Seeds of some other plants are non-albuminous since ***endosperm is completely consumed*** by the developing embryo.

No ***residual endosperm*** is found.

61. Name the mechanism responsible for formation of seeds without fertilisation. Give an example of species of flowering plant with such seed formation. (2010)

**Seed Formation Without Fertilisation**

The ***mechanism*** responsible for formation of seeds without fertilisation is ***apomixis***.

**Example of Species**

The apomictic mode of seed formation is seen in ***citrus*** and ***mango*** varieties.

62. Normally one embryo develops in one seed, but when an orange seed is squeezed, many embryos of different shapes and sizes are seen. Mention how it happens. (2011)

1. In orange, some ***nucellar cells*** surrounding the embryo sac form ***globular masses of cells***.
2. These cell masses ***protrude into the embryo sac*** and ***develop into embryos***.
3. Each ovule will thus contain many embryos.
4. So, this seed has ***many embryos*** of different shapes and sizes.

63. Why is apple referred to as a false fruit? (2010)

Apple is referred to as a false fruit because the fruit is developed from the ***thalamus, along with the ovary.***

64. Name the organic material of which exine and intine of angiosperm pollen grains are made of. Explain the role of exine. (2014)

**Name of the Organic Material**

***Exine*** of pollen grains is made up of ***sporopollenin.***

***Intine*** of pollen grain is made up of ***cellulose*** and ***pectin.***

**Role of Exine**

1. Exine enables the pollen grains to ***withstand high temperature***.
2. It protects the pollen by resisting ***adverse environmental conditions***.

65. Where is sporopollenin present in plants? State its significance with reference to its chemical nature. (2012)

**Location of Sporopollenin**

Sporopollenin is present in the ***exine of the pollen grains*** of plants.

**Significance of Sporopollenin**

1. Sporopollenin enables the pollen grains to ***withstand high temperature***.
2. It protects the pollen by resisting the ***adverse environmental conditions***.
3. It is a ***more resistant organic*** material that helps the ***preservation*** of pollens as ***fossils***.

66. Differentiate between the two cells enclosed in a mature male gametophyte of angiosperms. (2013)

| Vegetative cell | Generative cell |
|---|---|
| 1. Vegetative cell is ***larger*** in size. | 1. Generative cell is ***smaller*** in size. |
| 2. It is ***irregular*** in shape. | 2. It is ***spindle-shaped***. |
| 3. It has ***abundant food reserve***. | 3. It has ***low amount of*** food reserve. |
| 4. It contains a ***large nucleus***. | 4. It has a ***small nucleus***. |
| 5. It occupies the ***whole part*** of male gametophyte. | 5. It is ***floating in the cytoplasm*** of the vegetative cell. |
| 6. It involves in the growth of ***pollen tubes.*** | 6. It involves in the production of ***two haploid male gametes***. |

67. Where does triple fusion take place in a flowering plant? Why is it so called? Mention its significance. (2013)

**Location of Triple Fusion**

Triple fusion takes place in the ***central cell of embryo sac***.

**Reason for its Name**

Nucleus of male gamete fuses with the ***two haploid polar nuclei*** in the central cell.

Since ***three haploid nuclei fuse together***, it is called triple fusion.

**Significance of Triple Fusion**

1. Triple fusion gives rise to ***primary endosperm cell*** which develops into triploid ***endosperm***.
2. This endosperm ***nourishes*** the ***developing embryo***.

68. Why is the process of fertilisation in flowering plants referred to as double fertilisation?

1. *Fusion of two male gametes, one with egg (syngamy) and another with polar nuclei (triple fusion), inside an embryo sac is called* ***double fertilisation.***

2. A pollen tube discharges ***two non-motile male gametes*** into an embryo sac.

3. One male gamete fuses with the ***egg nucleus*** to form a diploid ***zygote*** (2n). This is called ***syngamy***.

4. The zygote later develops into an ***embryo***.

5. The ***second male gamete*** fuses with ***two haploid polar nuclei*** to form a triploid ***primary endosperm nucleus*** (3n) in the central cell.

6. This is called ***triple fusion***.

7. The central cell then develops into a ***primary endosperm cell*** that gives rise to a ***triploid endosperm*** (3n).

8. Because of the ***occurrence*** of these ***two events (syngamy and triple fusion)*** in flowering plants, it is referred as double fertilisation.

69. Why should a bisexual flower be emasculated and bagged prior to artificial pollination? (2010)

Refer Q.No. 51, Pg.No. 19

70. Explain giving two reasons why pollen grains can be best preserved as fossils. (2010)

Refer Q.No. 30, Pg.No. 15

71. Differentiate between albuminous seeds and non-albuminous seeds giving one example of each. (2011)

| Albuminous seeds | Non-albuminous seeds |
|---|---|
| 1. These seeds contain ***endosperm*** around the embryo. | 1. These seeds have ***no remnants of endosperm*** around the embryo. |
| 2. Endosperm is ***not completely used*** during the embryo development. | 2. Endosperm is ***completely used*** during the embryo development. |
| 3. During germination, ***endosperm*** provides ***nutrition*** to the embryo. | 3. During germination, ***cotyledons*** provide ***nutrition*** to the embryo. |
| 4. Examples: ***Wheat, maize, castor, barley.*** | 4. Examples: ***pea***, ***groundnut, sunflower.*** |

72. Name the cell from which endosperm of coconut develops. Give the characteristic features of endosperm of coconut. (2009)

**Name of the Cell**

Endosperm of coconut develops from the ***central cell of embryo sac.***

**Characteristic Features of Endosperm**

The endosperm of coconut shows the following features:

1. Coconut water from tender coconut is a ***liquid, free nuclear endosperm*** containing ***thousands of triploid free nuclei***.
2. White kernel of coconut is the ***cellular endosperm.***
3. It contains a ***triploid nucleus in each cell***.
4. Endosperm ***persists*** in the ***mature seed.***
5. It is used up for ***seed germination.***

73. Where would you look for coleoptile and coleorhizae? What function do they perform? (2009)

**Coleoptile**

We should look for coleoptile in the ***embryonal axis above the level of cotyledons.***

**Function of Coleoptile**

Coleoptile is a ***foliar structure*** that encloses shoot apex to ***protect*** the ***plumule***.

**Coleorhizae**

***We should*** look at for coleorhizae in the ***embryonal axis below the level of cotyledons.***

**Function of Coleorhizae**

Coleorhiza is an ***undifferentiated*** sheath around the radicle and root cap. It protects the ***radicle***.

74. Differentiate between parthenogenesis and parthenocarpy. Give an example for each.

| Parthenogenesis | Parthenocarpy |
|---|---|
| 1. Parthenogenesis is the development of ***new individuals without fertilisation.*** | 1. Parthenocarpy is the development of ***fruits without fertilisation*** of ovule. |
| 2. Embryo development takes place from diploid megaspore mother cell. | 2. Embryo development does not occur in the ovule. |

| | |
|---|---|
| 3. ***Seed production*** occurs. | 3. ***No seed*** production. |
| 4. It ***cannot be induced*** artificially by spraying hormones. | 4. It can be ***induced artificially*** by spraying some hormones at the flowering stage. |
| 5. Example: ***Antennaria*** | 5. Example: ***Banana*** |

75. What is parthenocarpy? Explain its significance in the production of parthenocarpic fruits.

**Parthenocarpy**

1. Parthenocarpy is the process of development of ***fruits without fertilisation***.

2. Normally, fruit development does not occur if fertilisation fails to happen in the ovules enclosed in the ovary.

3. But, in parthenocarpic fruits, its formation takes place without fertilisation.

4. It is a natural phenomenon in ***banana***.

5. It can be induced ***artificially*** by spraying the hormone ***auxin*** at the flowering stage. Eg. Grapes.

**Significance of Parthenocarpy**

1. Parthenocarpy gives ***seedless fruits*** since the ovules containing unfertilised eggs fail to develop into ***seeds***.

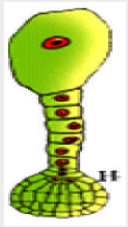
2. It improves the ***quality*** of ***fruits.***

3. It ***increases productivity*** of fruits.

4. It improves ***shelf life*** of fruits like watermelon.

5. Seedless fruits are ***desired for consumption.***

76. (a) Identify the figure

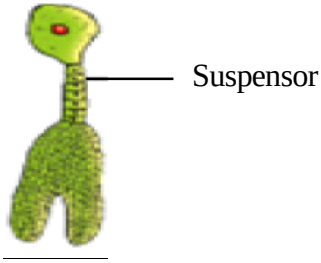


(b) Name the initial cell from which this structure has developed.
(c) Draw the next mature stage and label the parts. (2009)

(a) The figure shows the ***globular stage of dicot embryo***.

(b) The initial cell that gives rise to this structure is a diploid ***zygote***.

(c)




77. Draw a diagrammatic sketch of dicot embryo and label any four parts including the reduced suspensor.

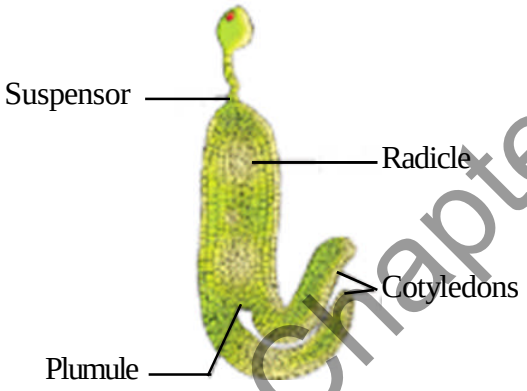



*Fig.2.4: A Dicot Embryo*

78. State what is apomixis. Comment on its significance? How can it be commercially used? (2015)

**For Apomixis and Significance**

Refer.Q.No. 18, Pg.No. 9

**Commercial Uses of Apomixis**

1. Apomixis can be used for ***crop improvement.***
2. It ***simplifies*** the ***processes*** of commercial hybrid.
3. It can be used to produce hybrid varieties in ***lesser time.***
4. There is possibility to ***select*** individual with ***desirable*** gene ***combinations.***
5. These genes can be propagated a***s clones.***

79. If you squeeze a seed of orange you might observe many embryos of different sizes. How is it possible? (2010, 2011)

Refer. Q.No. 62, Pg.No. 21

80. Banana is a parthenocarpic fruit, whereas oranges show polyembryony. How are they different from each other with the respect of seed? (2009)

| Parthenocarpy in Banana | Polyembryony in Oranges |
|---|---|
| 1. Banana ***does not produce seeds***. | 1. Oranges ***produce many viable seeds***. |
| 2. ***No embryo*** in the seed. | 2. ***More than one embryo*** in the seed. |
| 3. Sexual embryo absent. | 3. Sexual embryo present. |
| 4. Apomictic embryo absent. | 4. Apomictic embryo present. |

81. Name the blank spaces *a*, *b*, *c* and *d* from the table given below:

| Item | What it represents in the plant |
|---|---|
| 1. Pericarp | *a* |
| 2. *b* | Cotyledon in the seed of grass family. |
| 3. Embryonal axis | *c* |
| 4. *d* | Remains of nucellus in the seed. |

*a* - Fruit wall
*b* - Scutellum
*c* - Epicotyl and hypocotyl
*d* - Perisperm

82. Fill up the blank spaces *a*, *b*, *c* and *d* from the table given below:

| Item | What it represents in the plant |
|---|---|
| Coleoptile | *a* |
| *b* | Small pore in the seed coat. |
| Tip of epicotyl | *c* |
| *d* | Tip of hypocotyl |

*a* - Protective foliar sheath of shoot tip.
*b* - Micropyle
*c* - Plumule
*d* - Radicle

83. What is micropyle in the seed? Give its importance to the seed.

**Micropyle**

Micropyle is a ***small opening of seed coat*** at one end of the seed.

**Importance of Micropyle to the Seed**

1. Micropyle facilitates the ***entry of water*** and ***oxygen*** into the seed during the seed germination.

2. During germination, ***root emerges*** out through the micropyle.

84. Name and explain the mechanism by which seeds from hybrid plants are developed that are able to retain the desired hybrid character in the progeny. (2011)

**Name of Mechanism**

* The mechanism by which ***seeds*** from ***hybrid plant***s are developed is ***apomixis.***

* ***Desired hybrid*** character is ***retained*** in the progeny.

**Explanation**

***** If ***seeds*** are produced from hybrid plants by ***apomixis,*** there is ***no segregation*** of ***character*** in the progeny.

* These ***seeds*** will ***maintain hybrid characters.***

* There is ***no need*** to produce ***hybrid seeds every year.***

* ***Apomictic seeds*** can be used by farmers to ***raise new crops year after year.***

85. Mention the location and function of tapetum in the microsporangium of angiosperms. State the characteristic features of cells forming this layer. (2011)

**Location of Tapetum**

***Tapetum*** is located in the innermost wall layer of microsporangium**.**

It is found ***inner to the third wall*** layer of the microsporangium.

**Functions of Tapetum**

1. Tapetum ***nourishes the developing pollen grains***.
2. It serves as a ***tissue for meiocyte/spore*** nutrition
3. It produces the following substances:
    * Enzyme callase
    * Lipid rich ubisch granules

**Characteristic Features of Cells Forming Tapetum**

Cells of the tapetum possess ***dense cytoplasm.***

Generally, they have ***more than one nucleus***.

86. State one advantage and one disadvantage of cleistogamy. (2012)

**Advantages of Cleistogamy**

1. Cleistogamy helps in ***self-pollination*** of the flowers.
2. It ***produces*** assured ***seed-set,*** even in the absence of pollinators.
3. It does not ***require external*** agents for pollination.

4. It helps in producing ***genetically pure line seeds.***

**Disadvantages of Cleistogamy**

1. Continued self-pollination may lead to ***inbreeding depression.***
2. There is ***no /minimal chance*** for production of ***variations.***

87. List the post-fertilisation events in angiosperms. (2014)

1. ***Petals, sepals*** and ***stamens*** of the flower wither off.
2. ***Endosperm*** develops from the primary endosperm nucleus (PEN).
3. Zygote develops into an embryo.
4. ***Ovule***(s) develop into seed(s).
5. Ovary develop into fruit.

88. Name all the haploid cells present in unfertilised mature embryo sac of a flowering plant. Write the total number of cells in it. (2013)

**Name of Haploid Cells**

Haploid cells present in unfertilised mature embryo sac are the following:

- ***Antipodal cells***
- ***Egg cell***
- ***Synergids***

**Total Number of Cells**

There is a total of ***seven cells*** in the unfertilised mature female gametophyte.

Antipodal cells - 3
Synergids - 2
Egg cell - 1
Central cell - 1
7

89. Mention the reasons for difference in ploidy of zygote and primary endosperm nucleus in an angiosperm. (2010) Or
Angiosperm zygote is diploid while primary endosperm cell is triploid. Explain (2013)

1. In angiosperm plants, two types of gametic fusions namely ***syngamy*** and ***triple fusion*** take place in each embryo sac.
2. Occurrence of ***syngamy*** during ***zygote formation*** and ***triple fusion*** during the formation of primary endosperm nucleus are the reasons for the difference.
3. A pollen tube discharges ***two non-motile male gametes*** into an embryo sac.

4. One male gamete fuses with the ***egg nucleus*** to form a diploid ***zygote*** (2n). This is called ***syngamy***.

5. The second male gamete fuses with ***two haploid polar nuclei*** to form a triploid ***primary endosperm nucleus*** (3n) in the central cell. This is called ***triple fusion***.

6. ***Ploidy*** of ***zygote*** is thus ***diploid,*** whereas the ***ploidy*** of ***endosperm*** nucleus is ***triploid.***

90. Name the product of fertilisation that forms the kernel of coconut. How does the kernel differ from coconut water? (2012)

**Product of Fertilisation**

***Primary endosperm nucleus*** (PEN) is the product of fertilisation that forms the kernel of coconut. It is triploid(3n).

**Differences Between Coconut Kernel and Coconut Water.**

| Coconut Kernel | Coconut Water |
|---|---|
| 1. Coconut kernel is ***solid*** in nature. | 1. Coconut water is ***liquid*** in nature. |
| 2. It is present in the ***periphery of embryo sac***. | 2. It is present in the ***centre of the embryo sac***. |
| 3. Formed as a result of ***cellularisation*** of liquid endosperms. | 3. Formed directly from the ***primary endosperm nucleus*** by free nuclear division. |
| 4. It is ***cellular endosperm.*** | 4. It is free ***nuclear endosperm*** |

91. Geitanogamous flowering plants are genetically autogamous, but functionally cross-pollinated. Justify. (2013)

1. In geitanogamous flowers, ***pollen grains*** from the ***anther*** are transferred to the ***stigma*** of ***another flower of the same plant***.

2. Since the pollen grains come from the same plant, all the offspring are ***genetically identical*** as obtained from autogamy.

3. There is ***no chance*** for ***genetic variation*** in the offspring during this pollination.

4. But, they are functionally ***cross-pollinated*** because ***pollens*** are ***transferred*** to ***pistil*** of ***another flower.***

92. Write the cellular contents carried by the pollen tube. How does the pollen tube gain entry into the embryo sac? (2012)

**Cellular Contents**

1. Pollen tube carries ***two male gametes.***

2. The cytoplasm contains mitochondria, endoplasmic reticulum, golgi bodies, lipid granules, RNA and polysaccharides.

**Entry of Pollen Tube into the Embryo Sac**

1. On reaching a suitable stigma, the pollen grain germinates to produce a ***pollen tube*** through one of the ***germ pores***.

2. The ***contents*** of the pollen grain ***move into*** the ***pollen tube.***

***3. The generative*** cell divides into ***two male gametes*** during the growth of pollen tube in the style or stigma.

4. Pollen tube, ***after reaching*** the ***ovary,*** enters the ***ovule*** through the ***micropyle.***

5. It then enters one of the ***synergids*** through the filiform apparatus.

6. The filiform apparatus present at the synergids ***guides the entry of pollen tube*** into the embryo sac.

93. How do plants produce seeds through apomixis? Explain with the help of an example. (2013) Or
Explain any two ways by which apomictic seeds get developed. (2013)

**Apomixis**

Apomixis is the process of ***seed formation***, without ***fertilisation.***

It is a form of ***asexual reproduction*** that ***mimics sexual reproduction***.

There are several ways of development of apomictic seeds.

* In some species, a ***haploid cell*** in the gametophyte develops into the ***embryo without*** fertilisation. Example: ***Nicotiana tabacum.***

* In some plants, the ***megaspore mother cell*** undergoes mitosis or a semi-meiosis.

* It does ***not involve chromosomal*** segregation to form embryo sac. This embryo sac contains a diploid egg cell.

* The ***egg*** directly develops into ***embryo without gametic*** fusion. Example: ***Eupatorium.***

* In some plants, ***nucellar cells*** surrounding the embryo sac start dividing.

* They protrude into the embryo sac and develop into the embryos.
* It leads to the formation of more than one embryo.
* It is referred to as ***polyembryony*** or ***adventive embryony.***
  Examples: *Citrus* and ***Mango.***

94. List the adaptive features of water pollinated plants like *Vallisneria*. (2013)

In *Vallisneria,* the ***female flowers reach*** the ***surface*** of water by the long stalk.

The male flowers ***release pollen grains*** on to the ***surface*** of ***water***.

The pollen grains are ***weightless*** and hence carried passively by ***water currents***.

Some of them ***eventually reach*** the ***stigma*** of the female flowers.

95. Why is emasculation of bisexual flower necessary in the crop improvement programmes? (2013)

Emasculation is the ***removal of stamens*** from a bisexual flower without affecting the pistil.

It is necessary in crop improvement programmes because of the following reasons:

1. It ***avoids*** pollination by ***pollen*** of ***that flower***.
2. It ensures ***pollination*** of the flower only by ***pollens of desired variety***.

96. Why should a breeder need to emasculate a bisexual flower? Mention a condition in a flower where emasculation is not necessary. (2011)

**Need to Emasculate a Bisexual Flower**

Bisexual flowers need to be emasculated because of the following reasons:

To ***avoid*** pollination by ***pollen*** of that ***flower***.

To ensure the ***pollination*** of the flower ***only*** by ***pollen*** of ***desired variety***.

**Conditions When Emasculation is not Necessary**

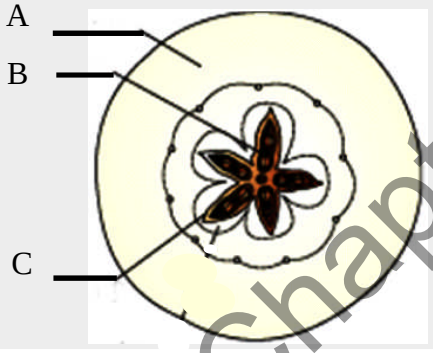
1. When there is ***no synchrony*** between ***pollen maturation and stigma receptivity***.
2. When the ***pollen has self-incompatibility***.
3. If the ***female*** parent produces ***unisexual*** flowers.

97. Write the importance of bagging of unisexual flowers in a crop improvement programme. (2013)

Bagging is used in ***artificial hybridisation*** of plants for the following purposes:

1. To ensure pollination by the ***desired pollen*** grains.
2. To prevent pollination by ***unwanted*** pollen.

98. (i) Given below is a T.S of an apple. Identify A, B and C.
(ii) Why is an apple categorised as a false fruit? (2010)




(i) A - Thalamus
B - Seed
C - Endocarp

(ii) Apple is categorised as a false fruit because ***it develops from ovary*** and other ***accessory floral parts*** such as ***thalamus***.

99. How is parthenocarpy different from parthenogenesis? Give an example of each. (2013)

Refer. Q.No.74, Pg.No. 24

100. Why are some seeds of citrus referred to as polyembryonic? How are they formed? (2013)

**Seeds of Citrus are Polyembryonic**

Seeds of Citrus are referred to as polyembryonic as they contain ***more than one embryo in a seed***.

**Formation of Polyembryonic Seeds**

1. In Citrus, ***nucellar cells*** surrounding the embryo sac start ***dividing.***
2. They protrude into the embryo sac and develop into the embryos.
3. These ***embryos*** are of ***different sizes*** and ***stages*** of maturation.

4. Occurrence of ***more than one embryo*** in a ***seed*** is referred as ***polyembryony***. This method is called ***adventive embryony.***

Example: ***Citrus*** and ***Mango varieties.***

101. List the importance of seeds to mankind.

1. Seed is the ***basis of our agriculture***.

2. As the seeds store plenty of reserve foods, they can be ***consumed as food***.

3. It is used as ***raw material*** for ***industrial production*** of substances like, ***vegetable*** oil, ***biofuel*** etc.

4. Since mature seeds are ***dormant*** for some time, they can be ***stored to raise the next season crop***.

5. Seeds can be used in ***crop improvement***, because ***genetic variability*** can be induced by sexual reproduction.

6. Seeds are ideal for ***germplasm storage*** through ***seed banks.***

102. (a) Mention any four strategies adopted by flowering plants to prevent self-pollination.
(b) Why is geitonogamy also referred to as genetical autogamy? (2010)

**(a) Strategies Adopted to Prevent Self-pollination**

Refer. Q.No.8 , Pg.No. 4

**(b) Geitonogamy Referred as Genetical Autogamy**

***1. Pistil of one flower*** receives the ***pollen grains*** from ***other flowers*** of the ***same plant***.

2. The pollen grains are genetically similar because they come from the same plant. Therefore, this fusion is a ***genetical autogamy***.

103. Write the characteristic features of anther, pollen and stigma of wind pollinated flowers. (2010)

**Characteristic Features of Anther**

1. Anthers are ***well exposed*** to air.
2. Anthers are ***loosely attached*** to the filament.

**Characteristic Features of Pollen**

1. Pollens are ***light*** in weight, dry and small.
2. They are ***non-sticky.***

**Characteristic Features of Stigma**

1. Stigma is ***large*** and ***feathery.***
2. They hang ***outside*** the flower.

3. They can ***easily trap*** air-borne ***pollen grains.***

104. (i) Write the characteristic features of anther, pollen and stigma of wind pollinated flowers.
(ii) How do flowers reward their insect pollinator? Explain (2010)

**(i) Characteristic Features**

Refer Q.No. 103, Pg.No. 34

**(ii) Floral rewards**

To ***sustain insects' visit,*** the flowers provide the following rewards to the insects.

* ***Nectar***
* ***Pollen grains***

Nectar and pollen grains help the ***survival*** of the pollinators.

105. Draw a Longitudinal Section (LS) 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. (2010)

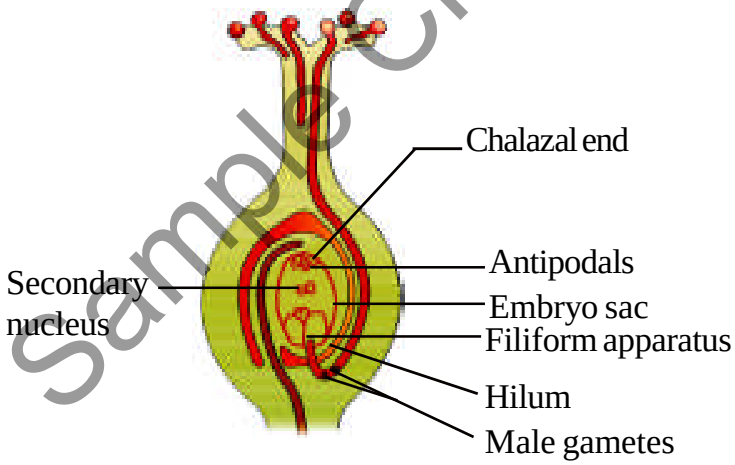



*Fig.2.5: L.S of Post Pollinated Pistil*

106. Explain the characteristic features of flowers that facilitate wind pollination. (2011)

1. Flowers are ***small, colourless*** and ***inconspicuous***. They have ***no nectar*** to attract insects.
2. They are arranged ***compactly*** in inflorescence.
3. They have ***well-exposed stamens***. So, the pollens can be ***easily dispersed*** by wind.

4. The pollen grains are ***light*** in weight and ***non-sticky*** so that they can be ***transported*** in wind currents.

5. The stigma is ***large*** and ***feathery*** to easily ***trap air-borne pollen*** grains.

6. In corn, ***tassels*** are nothing but ***stigma and style*** which wave in the wind to ***trap pollen grains***.

7. ***Rice, sugarcane, bamboo***, etc. are examples of wind pollinated flowers.

107. Differentiate between geitonogamy and xenogamy in plants. Which one between the two will lead to inbreeding depression and why? (2011)

**Differences Between Geitonogamy and Xenogamy**

| Geitonogamy | Xenogamy |
|---|---|
| 1. Geitonogamy is transfer of pollen grains from the ***anther*** to the ***stigma*** of ***another flower*** of the ***same plant***. | 1. Xenogamy is the transfer of ***pollen grains*** from ***anther to the stigma of a different plant***. |
| 2. ***No genetic recombination. takes place.*** | 2. ***Genetic recombination always takes place.*** |
| 3. Produces ***genetically similar individuals***. | 3. Produces ***genetically*** and ***morphologically different individuals***. |

**Cause of Inbreeding Depression**

Of these two types of pollination, ***geitonogamy*** leads to ***inbreeding depression.***

**Reason**

1. ***Continuous self-pollination*** causes some kind of ***sterility*** in the plants. This is called ***inbreeding depression.***

2. Inbreeding depression causes ***reduced biological fitness*** in a given population.

108. Draw a diagram of a vertical section of an anatropous ovule of an angiosperm. Label the following parts.
(i) Hilum
(ii) Micropyle

(iii) Outer integument
(iv) Nucellus
(v) Embryo sac
(vi) Antipodals (2013)

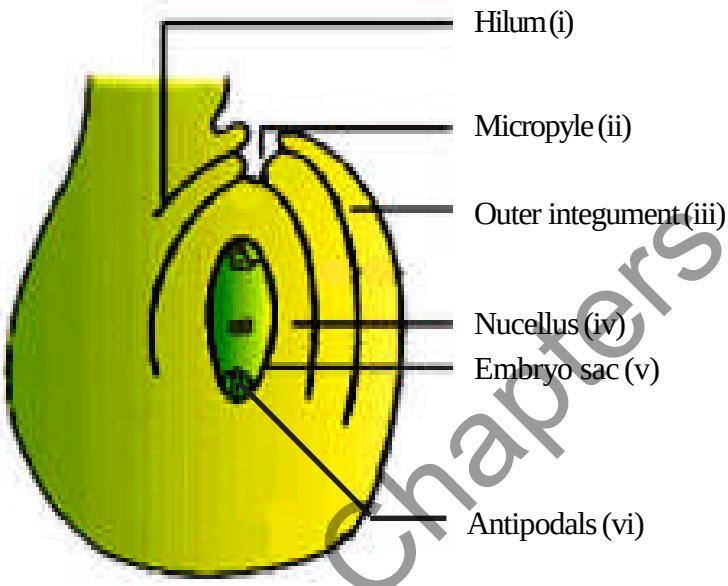



*Fig.2.6: Vertical Section of an Anatropous Ovule*

109.(i) Mention the exact location or site in a flowering plant, where the following developments take place.
(a) Deposition of sporopollenin
(b) Triple fusion
(c) Release of male gametes
(d) Microsporogenesis
(ii) Draw a labelled diagram of a male gametophyte of an angiosperm. (2011)

**(i) Sites of Developments**

(a) Deposition of sporopollenin takes place in the ***outer wall (exine) of pollen grains***.

(b) Triple fusion takes place in the central cell of ***embryo sac.***

(c) Release of male gametes takes place in the ***synergids of embryo sac***.

(d) Microsporogenesis takes place in the ***microsporangium of anther lobes***.

**(ii) Male Gametophyte of an Angiosperm**

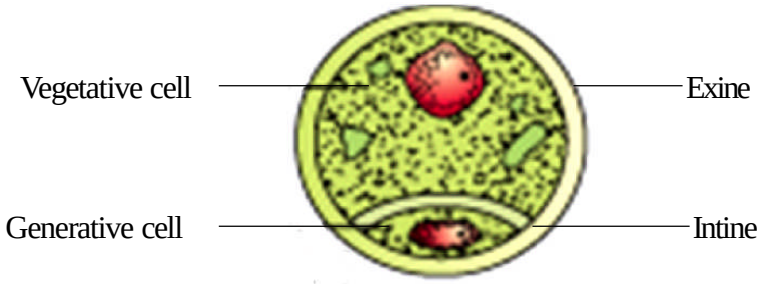



*Fig.2.7: Male Gametophyte of an Angiosperm*

110. (i) Give one example each of albuminous seeds and non-albuminous seeds.
(ii) Name the parts of ovule and embryo sac of an angiosperm that develop into:
(a) Perisperm
(b) Seed coat
(c) Endosperm
(d) Embryonal axis (2010)

**(i) Examples of Albuminous Seeds**

***Maize*** and ***rice*** are examples of albuminous seeds. They contain ***plenty of endosperm*** in the mature seeds.

**(ii) Examples Non-albuminous Seeds**

***Groundnut*** and ***pea*** are examples of non-albuminous seeds. They contain ***no endosperm*** in the mature seeds.

(ii) ***(a) Nucellus*** of ovule develops into perisperm
***(b) Integument*** of ovule develops into seed coat
***(c) Central cell*** of embryo sac develops into endosperm
***(d) Fertilised egg*** of the embryo sac develops into embryonal axis.

111. Why are angiosperm anthers called dithecous? Describe the structure of its microsporangium. (2014)

**Angiosperm Anthers**

Angiosperm anther is bilobed and each lobe has ***two thecae*** (pollen sacs). So, typical anther is said to be ***dithecous***.

**Structure of Microsporangium**

1. Microsporangium is generally surrounded by ***four wall layers.*** They are the following:
**** Epidermis***
**** Endothecium***

**** Middle layers***

**** Tapetum***.

2. The ***outer three wall*** layers are ***protective*** and help in ***dehiscence of anther*** to release the pollen.

3. The ***innermost*** wall layer is the ***tapetum.*** It ***nourishes*** the developing pollen grains.

4. Cells of the tapetum possess ***dense cytoplasm*** and generally have ***more than one nucleus***.

5. ***Inner*** to the ***tapetum,*** there is a mass of ***sporogenous tissue***.

6. The cells of sporogenous tissue undergo ***meiotic division*** to form ***pollen tetrads***.

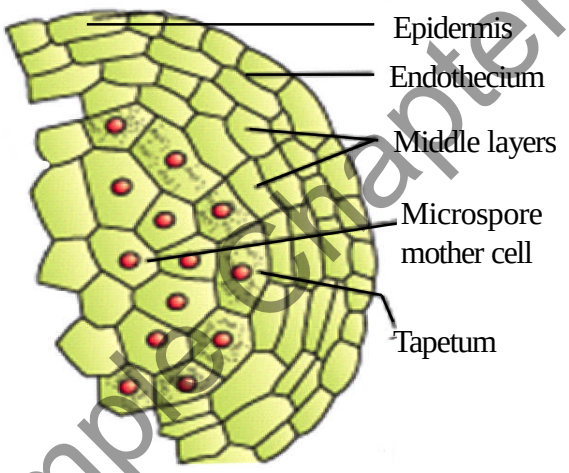



*Fig. 2.8: A Portion of Microsporangium*

112. Make a list of any three out breeding devices that flowering plants have developed and explain how they help to encourage cross-pollination. (2014)

**List of Out Breeding Devices**

1. In some plants, ***pollen release*** and ***stigma receptivity*** are ***not synchronised***.

2. In some plant species, the ***anther*** and ***stigma*** are placed at ***different positions.***

3. Pollen self-incompatibility

**Encouragement of Cross-pollination.**

1. When pollen release and stigma receptivity are not ***synchronised,*** either the ***pollen*** is ***released before*** the ***stigma***

becomes ***receptive*** or ***stigma becomes receptive*** much ***before*** the ***release*** of ***pollen***.

2. When ***anther*** and ***stigma*** are placed at ***different positions***, the ***pollen cannot come in contact with the stigma*** of the same flower. It prevents self pollination.

3. ***Self incompatibility*** is a genetic mechanism that ***prevents self-pollen*** from ***fertilising*** the ovules. It is done by ***inhibiting pollen germination*** or ***pollen tube growth*** in the pistil.

113. Explain any three advantages that seeds offer to angiosperms. ( 2014)

1. Seed production enables the plants to ***tolerate climatic stresses*** in the form of ***dormant seeds***.

2. Seeds have ***better adaptive strategies*** for dispersal to new habitats and help the species to ***colonise*** in ***other areas.***

3. As they have sufficient food reserves, ***young seedlings are nourished*** until they are capable of photosynthesis on their own.

4. The ***hard seed coat*** provides ***protection*** to the young embryo.

5. Being products of sexual reproduction, they generate ***new genetic combinations*** leading to variations.

114. (i) Explain triple fusion in angiosperms.
(ii) Write the fate of the product of triple fusion in mature coconut fruit. (2013)

(i) Triple fusion is the ***fusion of three haploid nuclei*** in the central cell of the female gametophyte.

It involves the following events:

1. In flowering plants, the pollen tube enters one of the synergids.

2. The pollen tube discharges ***two male gametes*** into the cytoplasm of the synergid.

3. One male gamete fuses with the egg nucleus to form a diploid ***zygote*** (2n).

4. The second male gamete takes part in triple fusion. It fuses with ***two haploid polar nuclei*** located in the central cell.

5. It forms a ***triploid primary endosperm nucleus*** (3n) in the central cell.

6. The central cell develops into a ***primary endosperm cell*** that gives rise to a triploid ***endosperm*** (3n).

(ii) The ***primary endosperm*** cell divides repeatedly and forms a ***triploid endosperm*** tissue.

It involves the following events:

1. The ***primary endosperm nucleus*** (PEN) undergoes successive ***nuclear divisions*** to give rise to thousands of free nuclei.

2. This ***stage of endosperm*** development is called ***free-nuclear endosperm***.

3. ***Coconut water*** is a ***free-nuclear endosperm*** consisting of thousands of free nuclei.

4. Subsequently, ***cell wall formation*** occurs and the ***endosperm*** becomes ***cellular***.

5. As a result of cellularisation, a ***celluar endosperm*** called ***white kernel*** is formed along the ***periphery*** of the embryo sac.

6. In mature coconut fruit, ***liquid endosperm*** is much ***reduced*** but ***cellular endosperm is bulky***.

115.(i) Describe endosperm development in coconut.
(ii) Why is tender coconut considered a healthy source of nutrition?
(iii) How are peas different from castor seeds with respect to endosperm? (2013)

(i) Endosperm Development in Coconut:

Refer Q.No. 114 (ii), Pg.No. 41

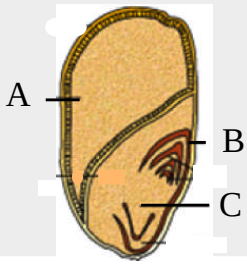
(ii) Tender coconut is considered a healthy source of nutrition as it contains many ***soluble sugars, amino acids, fatty acids, vitamins*** and ***minerals***.

It is ***easily digestible*** and ***absorbable*** by human intestine.

**(iii) Difference Between Pea Seeds and Castor Seeds**

| Pea Seeds | Castor Seeds |
|---|---|
| 1. Pea seeds are ***non-albuminous*** seeds | 1. Castor seeds are ***albuminous*** seeds. |
| 2. Endosperm is ***completely consumed*** during embryo development. | 2. Endosperm is ***not completely*** consumed during embryo development |
| 3. These seeds have ***no residual endosperm.*** | 3. These seeds have ***residual endosperm.*** |

116. L.S of maize grain is given below. Label the parts A, B and C in it. (2012).




A - Scutellum
B - Coleoptile
C - Radicle

117. Differentiate between perisperm and endosperm giving one example of each. (2012)

| Perisperm | Endosperm |
|---|---|
| 1. Perisperm is the ***residual part of nucellus*** of some plants. | 1. Endosperm is the ***nutritive tissue that feeds*** the developing embryo. |
| 2. It is present ***outside the embryo sac***. | 2. It is present ***inside the embryo sac***. |
| 3. It is always ***diploid***. | 3. It is ***triploid***. |
| 4. It is formed ***before fertilisation***. | 4. It is formed ***after fertilisation***. |
| 5. It is formed from ***ground tissue***. | 5. It is formed from ***primary endosperm nucleus***. |
| 6. It serves as ***additional nutritive tissue***. | 6. It is the ***main nutritive tissue***. |
| 7. It is usually hard<br>Example - ***Pepper*** | 7. It is usually ***soft***<br>Example - ***Coconut kernel*** |

118. Write the mode of pollination in *Vallisneria* and water lily. Explain the mechanism of pollination in *Vallisneria*. (2013)

**Mode of Pollination in Vallisneria**

Mode of pollination in *Vallisneria* is ***hydrophily*** or ***water pollination***.

**Mode of Pollination in Water Lily**

Mode of pollination in water lily is ***entomophily*** or ***insect pollination***.

**Mechanism of Pollination in Vallisneria**

Refer. Q.No.14, Pg.No.11

119. Explain the process of artificial hybridisation to get improved crop variety in:
(i) plants bearing bisexual flowers
(ii) female parent bearing unisexual flowers. (2010)

**(i) Plant Bearing Bisexual Flower**

Bisexual flowers have both ***anther*** and ***pistil*** in the ***same flower***.

***Emasculation*** is done to ***remove stamens*** from the bisexual flower without affecting the pistil.

It is done before the ***anthers dehisce***.

Emasculated flowers are ***bagged*** to ***prevent contamination.***

Pollen grains from desired variety are ***collected and dusted over the pistil*** of the emasculated flowers.

After dusting the pollen, the flowers are wrapped in ***polythene bag***.

It ensures the pollination of the flower only by ***pollen of desired variety***.

**(ii) Female Parent Bearing Unisexual Flowers.**

For artificial hybridisation in plants bearing unisexual flowers, ***emasculation*** is not necessary.

***Bagging*** has to be done ***before*** the ***flower opens.***

When the ***stigma*** becomes ***receptive,*** pollination is carried out.

Pollen grains from desired variety are ***collected and dusted over the pistil*** of the female flowers.

***After dusting*** the pollen, the ***flowers*** are ***wrapped*** in polythene bag.

120. Explain the process of emasculation and bagging of flowers. State their importance in breeding experiment. (2012)

**Process of Emasculation and Bagging of flowers**

Refer Q.No. 119 (i) , Pg.No . 43

**Importance of Emasculation**

Refer Q.No. 95, Pg.No .32

**Importance of Bagging**

Refer Q.No. 10 , Pg.No . 5 (Notes under 'Use in plant Breeding Programme'.

121.(i) In plant breeding experiment, pistilate flowers are not emasculated, but still bagged. Explain.
(ii) Why are out breeding devices developed by some flowering plants? (2012)

(i) Emasculation is the ***removal of stamens*** from a flower without affecting the pistil.

Pistilate flowers have ***no stamen***. So, there is ***no necessity*** for emasculation.

But, these flowers have to be bagged to ***prevent*** the ***entry*** of ***unwanted pollens.***

Pollen grains from desired variety are then ***collected and dusted over the pistil*** of these flowers.

After dusting the pollen, the flowers are again bagged using ***polythene bag***.

❍ It ensures the ***pollination*** of the flowers only with the ***desired pollen***.

(ii) Out breeding devices are developed by some flowering plants to ***prevent self-pollination***.

Majority of flowering plants produce ***hermaphrodite flowers.***

***Pollen grains*** are likely to come in ***contact*** with the ***stigma*** of the ***same flower.***

***Continued*** self-pollination results in ***inbreeding depression***.

So, flowering plants have developed many mechanisms to ***discourage self-pollination*** and to ***encourage cross-pollination***.

122. With the help of an example each, explain the following: Apomixis, parthenocarpy, polyembryony. (2012)

**Apomixis**

Refer Q.No.93, Pg.No.31

**Parthenocarpy**

Parthenocarpy is the development of ***fruits without fertilisation***. Example- ***seedless grapes.***

***Embryo development does not occur*** in the ovule.

***No seed production*** occurs in such fruits.

It can be induced artificially by spraying some ***hormones*** (2, 4 - D) at the flowering stage.

**Polyembryony**

Occurrence of more than one embryo in a seed is referred as ***polyembryony***. This method is also called ***adventive embryony.***

Example- ***Citrus*** and ***mango*** varieties.

Here, ***nucellar cells*** surrounding the embryo sac start ***dividing, protrude*** into the embryo sac and ***develop*** into the ***embryos.***

Therefore, many embryos of ***different sizes*** and ***shapes*** are found when a seed is squeezed.

123. Explain how false, true and parthenocarpic fruits are different from each other. Give one example of each. (2012)

| False fruits | True fruits | Parthenocarpic fruits |
|---|---|---|
| 1. False fruits are formed ***after fertilisation*** | 1. True fruits are formed ***after fertilisation*** | 1. Parthenocarpic fruits are formed ***without fertilisation*** |
| 2. Fruits are developed from the ***ovary*** and ***other parts*** of the flower. | 2. Fruits are developed from the ***ovary*** alone. | 2. Fruits are developed from the ***ovary*** without fertilisation of ovules. |
| 3.These fruits have ***seeds.*** Example: Apple | 3. These fruits have ***seeds.*** Example: Mango | 3. These fruits are ***seedless.*** Example: Banana |

124. Draw a transverse sectional view of an apple and label the following parts along with the technical names.
(i) Edible part
(ii) Encloses the embryo
(iii) Forms the fruit wall (2013)

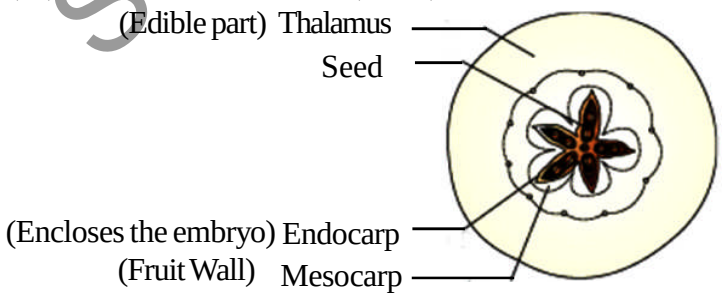



*Fig.2.9: T.S View of an Apple*

125. Double fertilisation is reported both in the plants of castor and groundnut. However, mature seeds of groundnut are non-

albuminous and castor are albuminous. Explain the post fertilisation events responsible for it. (2015)

Mature seeds of groundnut are non-albuminous and castor are albuminous because of ***difference in their post fertilisation events***.

**Post-fertilisation Events in Groundnut**

1. In non-albuminous seeds, ***primary endosperm nucleus*** is formed as a result of ***triple fusion***.
2. The primary endosperm nucleus remains in the ***central cell***.
3. The nucleus undergoes ***free mitotic divisions*** to produce thousands of free nuclei.
4. After free nuclear division, ***cytokinesis*** takes place between the nuclei.
5. Cellularisation takes place at the ***micropylar end*** or ***chalazal end*** alone. As a result, ***triploid endosperm*** (3n) is formed.
6. The endosperm ***does not grow*** around the ***embryo***.
7. It seems to be a ***small piece of tissue*** at these poles.
8. In the mean time, embryo develops from the ***zygote***.
9. The ***endosperm is completely used*** by the developing embryo before attaining seed maturity.
10. ***No remnant of the endosperm*** is retained in the mature seeds.
11. So, seeds of groundnut are ***non-albuminous***.

**Post-fertilisation Events in Castor**

1. In albuminous seeds, ***primary endosperm nucleus*** is formed as a result of ***triple fusion.***
2. The primary endosperm nucleus remains in the central cell.
3. The nucleus undergoes ***free mitotic division***s to produce ***thousands of free nuclei***.
4. After free nuclear division, ***cytokinesis*** takes place between the nuclei.
5. Cellularisation takes place from the ***periphery*** to the centre.
6. As a result, ***triploid endosperm*** (3n) is formed.
7. The endosperm then ***grows*** and occupies a ***large part of the ovule***.
8. In the mean time, ***embryo*** develops from the ***zygote***.
9. A part of endosperm is consumed for embryo development and the ***rest is retained*** in the mature seeds.

10. So, seeds of castor are ***albuminous.***

126. (a) Draw a labelled diagram of L.S of flower to show the growth of pollen tube reaching the egg apparatus.
(b) Pistil of a flower does not accept pollen from any plant other than its own kind. How does it happen? Explain:
(c) What is syngamy? (2009)

**(a) L.S. of Flower**

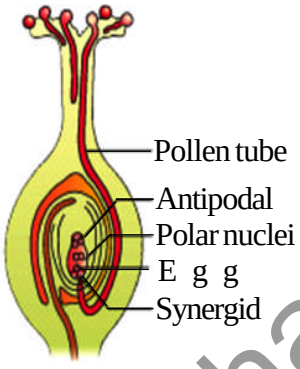



*Fig.2.10: L.S of Flower*

**(b) Prevention of Pollen from Other Plant**

Pistil of flower ***does not accept*** pollen from plants other than its own kind due to pollen self incompatibility.

**(b) Explanation**

1. After pollination, some kind of ***interactions*** take place between the ***pollens*** and ***pistil.***

2. The ***pistil*** has the ability to ***recognise*** the ***pollen,*** whether it is of the ***right type*** (compatible) or of the ***wrong type*** (incompatible).

3. The ***ability*** of the pistil to ***recognise*** the pollen and accepting or rejecting it, is the result of an ***interaction*** between the ***chemical components of pollen grain and the pistil***.

4. If it is of the right type, the pistil ***accepts the pollen.***

5. It ***promotes post-pollination events*** that lead to fertilisation.

6. If the ***pollen*** is of the ***wrong type,*** the ***pistil rejects*** the ***pollen***

7. This is done by preventing ***pollen germination on the stigma*** or the ***pollen tube growth*** in the style.

**(c) Syngamy**

The fusion of a male gamete with the female gamete (egg) is called ***syngamy***.

As a result of syngamy, a ***diploid zygote*** is formed.

The zygote develops into an ***embryo.***

127.(i) Coconut palm is monoecious, while date palm is dioecious. Why are they called so?

(ii) Draw a labelled diagram of sectional view of a mature embryo sac of an angiosperm. (2014)

(i) Coconut palm is called monoecious because both ***male and female flowers*** are ***borne*** on the ***same plant***. This plant bears ***bisexual*** flowers.

Date palm is called dioecious because ***male flowers*** are ***borne*** on ***male plant*** and ***female flowers*** are ***borne on female plants***. This plant bears ***unisexual*** flowers.

(ii)

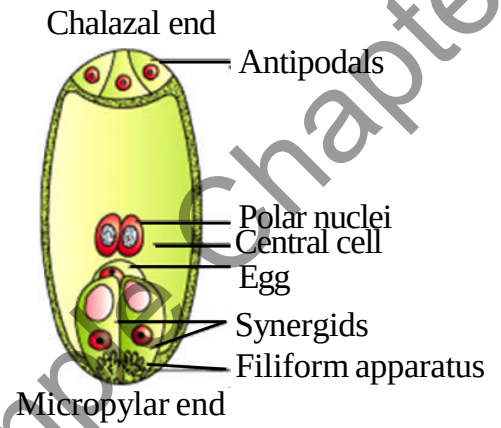



*Fig.2.11: Mature Embryo Sac of Angiosperm*

128.(i) Why do endosperm development precede the embryo development in angiosperm seeds? State the role of endosperm in albuminous seeds.

(ii) Describe with the help of three labelled diagrams the different embryonic stages that include the mature embryo of dicot plants. (2014)

**(i) Embryo Development in Angiosperm Seeds**

In angiosperm ovules, endosperm development ***precedes the embryo development.***

This is because fully or partially developed ***endosperm*** is required ***to nourish the developing embryo***.

In the ovule, both ***syngamy*** and ***triple fusion*** take place simultaneously.

The ***syngamy*** results in the formation of a ***zygote*** and ***triple fusion*** results in the formation of a ***primary endosperm cell*** (PEC).

Immediately after triple fusion, the ***primary endosperm cell*** develops into a triploid ***endosperm***.

***Endosperm*** is a ***nutritive tissue*** for the developing embryo.

Without endosperm, there is ***no embryo development.***

So, the zygote remains ***dormant*** and waits for the ***development*** of ***endosperm.***

After the formation of endosperm, ***zygote*** develops into ***embryo.***

**(i) Role of Endosperm in Albuminous Seeds**

- In albuminous seeds, ***endosperm*** stores ***starch*** and ***fats***.
- It serves as ***nutritive tissue*** for ***embryo development*** from the diploid zygote.
- It also provides ***nutrition*** to embryo during ***seed germination***.

**(ii) Stages of Embryo Development**

The zygote undergoes repeated mitotic divisions and gives rise to a ***proembryo.***

The proembryo develops into a ***globular embryo***.

The globular embryo then develops into a ***heart-shaped embryo.***

It finally develops into a ***mature embryo*** with cotyledons.

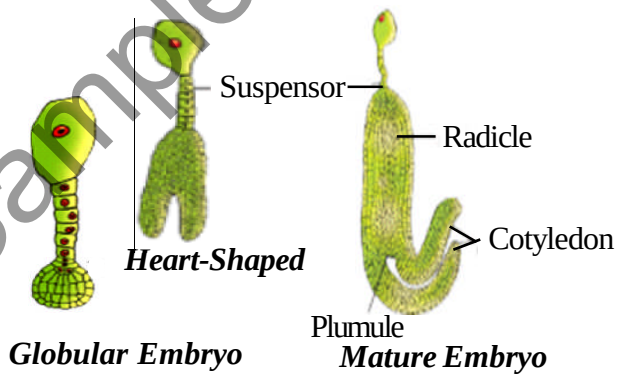



*Fig.2.12: Stages in Embryo Development*

129. (i) Explain the phenomenon of double fertilisation.
(ii) Draw a labelled diagram of a typical anatropous ovule. (2014)

(i) In angiosperm plants, two types of gametic fusions take place. They are ***syngamy*** and ***triple fusion.***

***So,*** this type of gametic fusion is called ***double fertilisation***.

A pollen tube discharges ***two non-motile male gametes*** into an embryo sac.

***One male gamete*** fuses with the ***egg nucleus*** to form a ***diploid zygote*** (2n). This is called ***syngamy***.

The ***zygote*** later develops into an ***embryo***.

The ***second male gamete*** fuses with ***two haploid polar nuclei*** to form a triploid ***primary endosperm nucleus*** (3n) in the central cell.

This is called ***triple fusion***. This involves the ***fusion of three haploid nuclei.***

The ***central cell*** then develops into a ***primary endosperm cell.***

This gives rise to a ***triploid endosperm*** (3n).

(ii)

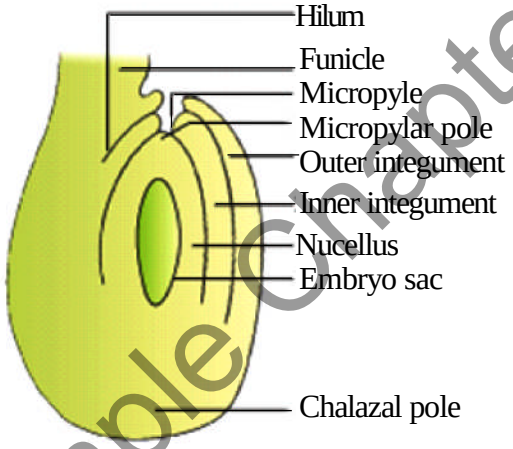



*Fig.2.13: A typical anatropous ovule*

130. (i) Explain the different ways by which apomictic seeds can develop.
(ii) Draw a labelled mature stage of a dicotyledonous embryo
(iii) Mention one advantage of apomictic seeds to farmers.(2014)

**(i) Development of Apomictic Seeds**

Refer.Q.No. 93, Pg.No.31

**(ii)**

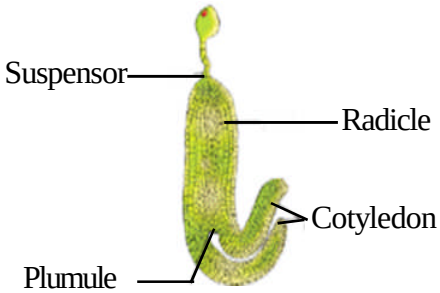



*Fig.2.14: Mature Stage of Dicotyledonous Embryo*

**(iii) Advantage of Apomictic Seeds to Formers**

Refer.Q.No. 18 , Pg.No.9 (Notes under ' Importance of Apomixis')

131. Explain with the help of labeled diagram the development of mature embryo sac from a megaspore mother cell in angiosperm (2009, 2010, 2012) Or

(i) Describe in sequence the process of megsporogenesis in angiosperms.

(ii) Draw the 7-celled structure formed and label the different cells.

Or

How does the megaspore mother cell develop into 7-celled 8-nucleate embryo sac in angiosperms? Draw a labeled diagram of mature embryo sac. (2012) Or

(i) Describe the process of megasporogenesis in angiosperm, until 8-nucleate stage.

(ii) Draw the labelled structure of mature embryo sac. (2014)

**Megasporogenesis**

The process of formation of megaspores from the ***megaspore mother cell*** is called ***megasporogenesis***.

A ***single megaspore mother cell*** (MMC) develops in the nucellus at the ***micropylar*** region of ovule.

The MMC undergoes meiosis I to form ***2 haploid cells***. These 2 haploid cells undergo ***meiosis II*** to form ***4 haploid megaspores*** in a ***linear row***.

Three megaspores degenerate and one remains as the ***functional megaspore***.

The ***nucleus*** of the functional megaspore divides ***mitotically.***

It forms ***two nuclei*** which move to the opposite poles, forming a ***2- nucleate*** embryo sac.

Two more sequential ***mitotic nuclear divisions*** take place. It results in the formation of the ***4-nucleate*** and later, the ***8-nucleate*** stages of the embryo sac.

These mitotic divisions are ***free nuclear***.

After the 8-nucleate stage, cell walls are laid down leading to the organisation of the typical ***female gametophyte*** or ***embryo sac***.

Six of the eight nuclei are surrounded by cell walls and organised into ***6 cells***.

The remaining cytoplasm forms a large ***central cell.***

Three cells are grouped together at the micropylar end and constitute the ***egg apparatus***. The egg apparatus consists of two ***synergids*** and one ***egg cell***.

The synergids have special cellular thickenings called ***filiform apparatus*** at the micropylar tip.

Filiform apparatus guides the pollen tubes into the synergid.

***Three cells*** are at the ***chalazal end*** and are called the ***antipodals***.

The ***remaining two nuclei,*** called ***polar nuclei,*** are situated below the egg apparatus in the large ***central cell.***

Thus, a typical angiosperm embryo sac is ***8-nucleate*** and ***7-celled***.

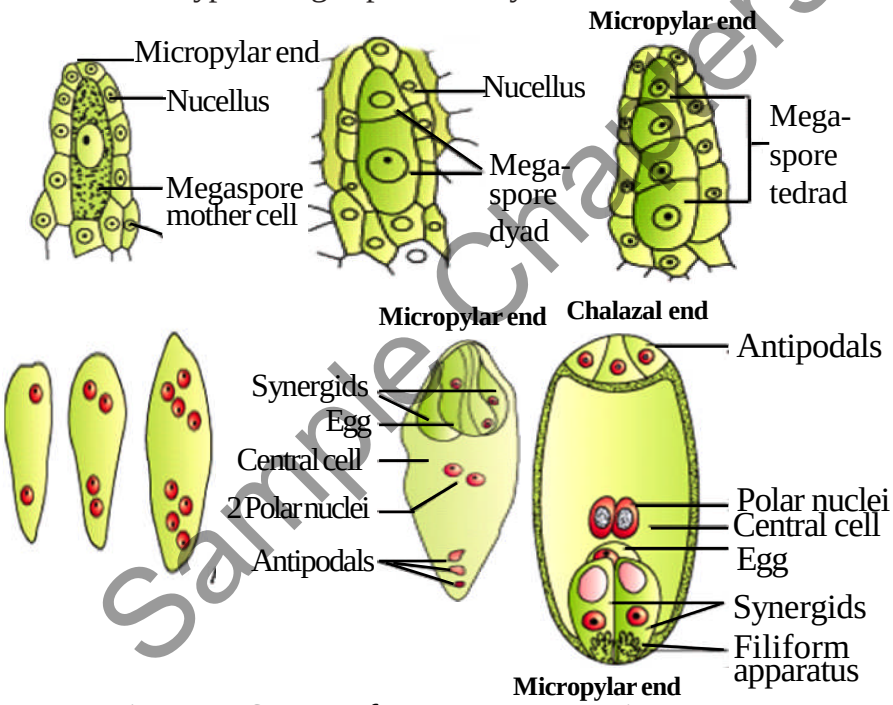



*Fig.2.14: Stages of Megasporogenesis*

132. (i) Describe the process of syngamy and triple fusion in angiosperm.
(ii) Explain the development of fertilised egg up to mature embryo in a dicot plant. Draw a mature dicot embryo. (2011)

**(i) Syngamy**

A pollen tube discharges ***two non-motile male gametes*** into an embryo sac.

Syngamy is the ***union*** of a ***male gamete*** with ***egg*** to ***produce a zygote.*** The product of syngamy is ***diploid (2n).***

The zygote develops into an ***embryo.***

**(i) Triple Fusion**

The fusion of a male gamete with two polar nuclei is called ***triple fusion.***

The product of triple fusion is a ***primary endosperm nucleus*** (PEN). It is ***triploid.***

It is present inside the ***central cell.***

The ***central cell*** then develops into a ***primary endosperm cell*** that gives rise to a triploid ***endosperm*** (3n).

**(ii) Embryo Development**

The fertilised egg is called ***zygote***.

The zygote undergoes ***repeated mitotic division*** and gives rise to a ***proembryo***.

The ***proembryo*** develops into a ***globular embryo***.

The globular embryo then develops into a ***heart-shaped embryo.***

The heart-shaped embryo finally develops into a ***mature embryo*** with cotyledons.

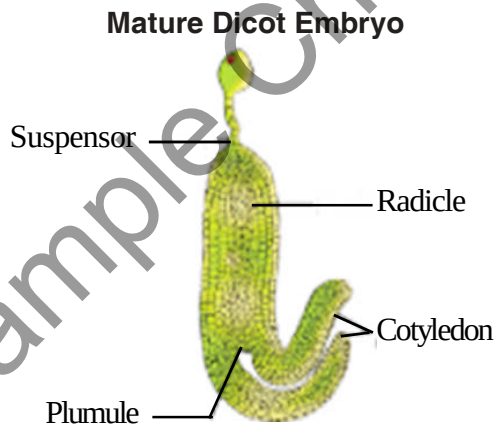



*Fig.2.15: Mature Dicot Embryo*

133. (i) Draw diagrammatic sectional view of a mature anatropous ovule and label the following parts in it. (2013)
(a) That develops into seed coat.
(b) That develops into embryo after fertilisation
(c) That develops into endosperm in albuminous seed
(d) Through which the pollen tube gains entry into the embryo sac.
(e) That attaches the ovule to placenta.
(ii) Describe the characteristic feature of wind-pollinated flowers.

**(i)**

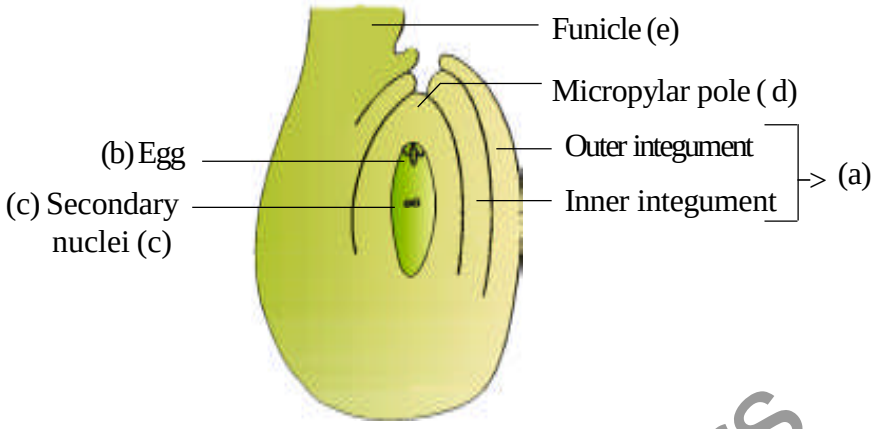



*Fig.2.16: Mature Anatropous Ovule*

**(ii) Characters of Wind Pollinated Flowers**

Refer Q.No.106, Pg.No.35

134. (i) Draw a labelled schematic diagram of the transverse section of a mature anther of an angiosperm plant.
(ii) Describe the characteristic features of insect pollinated flowers. (2013)

**(i)**

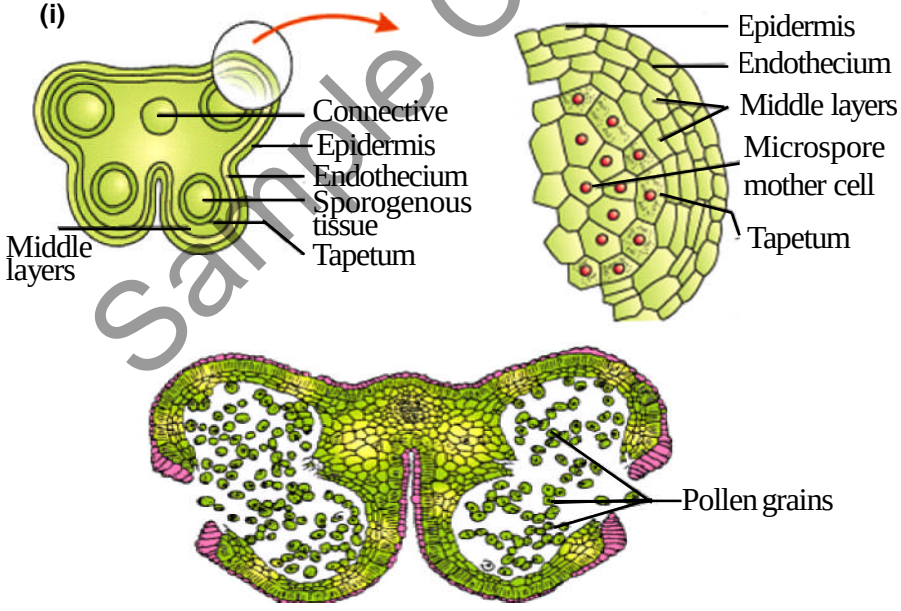



*Fig.2.17: Mature anther of an angiosperm plant.*

**(ii) Characteristic Features of Insect Pollinated Flowers:**

1. Majority of insect-pollinated flowers are ***large*** and ***showy.***

2. If the flowers are ***small,*** a number of flowers are ***clustered into an inflorescence*** to make them conspicuous.

3. Insects are attracted to flowers by ***colour*** and/or ***fragrance***.

4. The flowers pollinated by flies and beetles secrete ***foul odours*** to attract them.

5. ***Nectar*** and ***pollen grains*** are present in the flowers.

6. Pollen grains have ***sticky surface*** due to exine and ***stigma*** is sticky due to ***mucilage***.

7. The body of the insect gets a ***coating*** of pollen grains when it visits the flowers.

8. When the insect carrying ***pollen*** on its body comes in ***contact*** with the ***stigma*** of another flower, it brings about ***pollination.***

135. (i) Draw a diagram of a mature embryo sac of an angiosperm and label the following parts in it. (2013)

(a) filiform apparatus (b) synergids
(c) central cell (d) egg cell
(e) polar nuclei (f) antipodals

(ii) Write the fate of egg cell and polar nuclei after fertilisation.

**(i)**

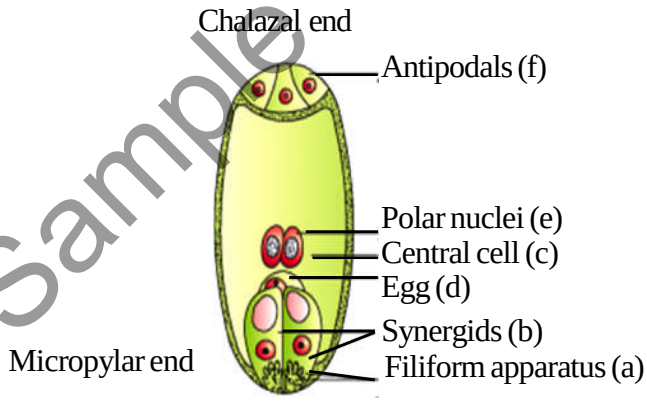



*Fig.2.18: Mature Embryo Sac of Angiosperm*

**(ii) Fate of Egg and Polar Nuclei**

One ***male gamete*** fuses with the ***egg nucleus*** to form a ***diploid zygote*** (2n).

The zygote later develops into an ***embryo***.

The ***second male gamete*** fuses with the ***polar nuclei*** to form a ***primary endosperm nucleus*** (PEN) inside the central cell.

The central cell carrying the primary endosperm nucleus gives rise to a triploid ***endosperm*** (3n).

136.(i) How does microspore mother cell develop into pollen grains in angiosperms? Or
(ii) Describe the structure of a mature pollen grain and draw a labelled diagram of its 2-celled stage. (2013)

(i)1. As the anther develops, the cells of the sporogenous tissue directly function as ***microspore mother cells*** or ***pollen mother cells*** (PMC).

2. The PMCs have ***protoplasmic connections*** with other PMCs and with ***tapetal cells.***

3. Each pollen mother cell undergoes ***meiotic division.***

4. As a result each PMC gives rise to a ***cluster of four haploid cells*** in the form of a ***microspore tetrad***.

5. In the microspore tetrad, all the pollen grains are ***independent*** from one another. They are ***not surrounded by callose wall***.

6. The process of ***formation of microspores*** from a pollen mother cell through meiosis is called ***microsporogenesis.***

7. As the anthers mature and dehydrate, the ***microspores dissociate*** from one another and develop into ***pollen grains.***

**(ii) Structure of pollen grains**

1. Pollen grains are generally ***spherical*** measuring about ***25-50 micrometers*** in diameter.

2. It has a ***two-layered wall***.

3. The hard outer layer called the ***exine*** is made up of ***sporopollenin.***

4. Sporopollenin is one of the most ***resistant*** organic materials.

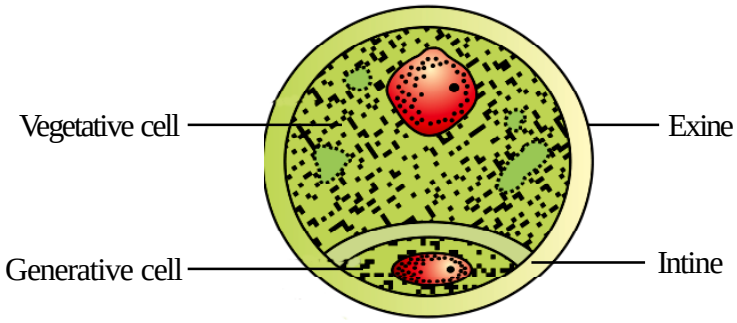
5. The exine exhibits a fascinating array of ***patterns*** and ***designs.***

6. ***Exine*** of pollen grains has prominent apertures called ***germ pores*** where sporopollenin is absent.

7. The inner wall of the pollen grain is called the ***intine.*** It is a ***thin*** and ***continuous layer*** made up of cellulose and pectin.

8. The cytoplasm of pollen grain is surrounded by a ***plasma membrane***.

9. When the ***pollen grain matures,*** it contains ***two cells,*** the ***vegetative cell*** and ***generative cell.***




10. The vegetative cell is ***bigger***. It has ***abundant food reserve*** and a ***large irregularly shaped nucleus***.

11. The ***generative cell*** is ***small*** and ***floats*** in the ***cytoplasm*** of the vegetative cell. It is ***spindle shaped*** with ***dense cytoplasm*** and a ***nucleus***.

12. The ***generative cell*** divides mitotically into ***two non-motile male gametes***. So, there are ***three cells*** in the pollen grain.

137. Why is fertilisation in angiosperms referred to as double fertilisation? Mention the ploidy of cells involved. (2012)

**Fertilisation in Angiosperms**

Refer Q.No.68, Pg.No.23

**Ploidy of Cells Involved**

***Male gametes are haploid*** (n).

Egg cell is ***haploid (n)***.

Polar nuclei are ***haploid (n)***

Central cell carrying the polar nuclei is diploid (2n). Zygote is ***diploid (2n)***

Primary endosperm nucleus is ***triploid (3n).***

138. (i) Why is the process of fertilisation in angiosperms referred to as a double fertilisation?. Explain.

(ii) Draw a diagram of angiospermic embryo sac where fertilisation is just completed. Label the following parts:

(a) Micropylar end of embryo sac

(b) The part that develops into embryo

(c) The part that develops into endosperm

(d) The degenerating cell at the chalazal end.

(iii) Draw a labelled diagram of globular embryonic stage of an angiosperm. (2011)

**(i) Double fertilisation**

Refer. Q.No.68, Pg.No.23

**(ii)**

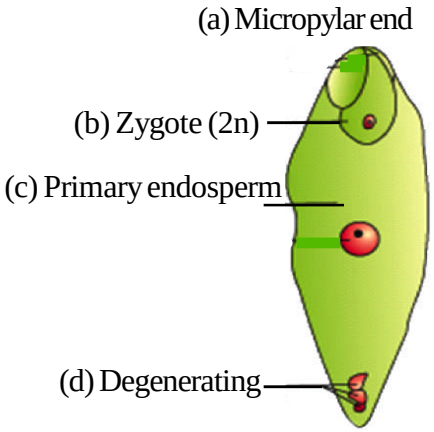



*Fig.2.19: Angiospermic Embryo Sac*

**(iii)**

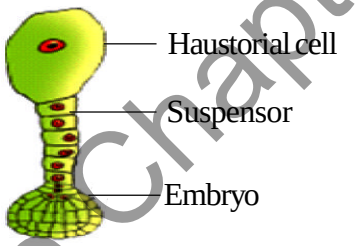
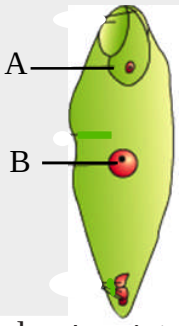



*Fig.2.20: Globular Embryonic stage of an Angiosperm*

139. (i) Name the structures which the parts "A" and "B" shown in the diagram below respectively develop into.
(ii) Explain the process of development which "B" undergoes in albuminous and exalbuminous seeds. Give one example of each of these seeds. (2011)




(i) Part A is ***zygote*** that develops into ***embryo*** and part B is ***primary endosperm nucleus*** which develops into ***endosperm***.

**(ii) Endosperm Development**

Refer.Q.No.125, Pg.No.46

140.(i) Draw a diagram of an enlarged view of T.S of one microsporangium of an angiosperm and label the following parts.
(a) Tapetum (b) Middle layer
(c) Endothecium (d) Microspore mother cell
(ii) Mention the characteristic features and functions of tapetum.
(iii) Explain the following, giving reasons:
(a) Pollen grains are well preserved as fossils.
(b) Pollen tablets are in use by people these days. (2011)

**(i)**

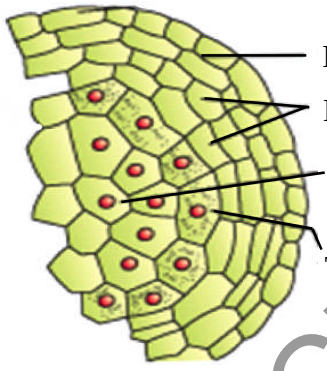



*Fig.2.21: T.S of Microsporangium of an Angiosperm*

**(ii) Characteristic Features of Tapetum**

- Tapetum is the ***innermost wall layer*** of microsporangium.
- Cells of the tapetum possess ***dense cytoplasm***.
- They contain ***more than one nucleus***.

**(ii) Functions of Tapetum**

1. Tapetum ***nourishes*** the ***developing pollen grains***.
2. It secretes ***enzymes*** and ***hormones.***
3. It secretes ***special proteins*** for pollen to recognise compatibility.

(iii)(a) Pollen grains as well Preserved Fossils

Refer Q.No. 30, Pg. No.15

(b) Pollen tablets are in use by people these days because of the following reasons:

1. Pollen grains are ***rich in nutrients***.
2. They are used as ***food supplements***.
3. Pollen consumption has been claimed to ***increase*** the ***performance of athletes***.
4. They boost the ***immune system.***

5. They act as ***antioxidant.***

141. (i) Differentiate between autogamy, geitonogamy and xenogamy.
(ii) Explain the events that occur during pollen-pistil interaction. (2011)

**(i) Differences between Antogamy, Geitogamy and Xenogamy**

| Autogamy | Geitonogamy | Xenogamy |
|---|---|---|
| 1.Transfer of pollen grains from the ***anther*** to the ***stigma*** of the ***same flower***. | 1. Transfer of pollen grains from the ***anther*** to the ***stigma*** of ***another flower*** of the ***same plant***. | 1. Transfer of pollen grains from ***anther*** to the ***stigma*** of a ***different plant***. |
| 2. Flowers ***require synchrony*** in ***pollen release*** and ***stigma receptivity.*** | 2. Flowers ***do not require synchrony*** in pollen release and stigma receptivity. | 2. Flowers ***do not require synchrony*** in pollen release and stigma receptivity. |
| 3. Flowers ***do not open***. | 3. Flowers ***open*** to ***expose*** stamens and stigma. | 3.Flowers ***open*** to ***expose*** stamens and stigma. |
| 4. ***No*** need for ***pollinating agency***. | 4. ***Pollinating agency*** is ***required.*** | 4. ***Pollinating agency*** is ***required.*** |
| 5. ***It produces a assured seed set.*** | 5. ***No assured seed set.*** | 5. ***No assured seed*** set |
| 6. ***No genetic recombination.*** | 6. ***No genetic recombination.*** | 6.***Genetic recombination*** is always present. |
| 7. Produce ***genetically*** and ***morphologically similar*** individuals. | 7. Produce ***genetically*** and ***morphologically similar*** individuals. | 7.Produce ***genetically*** and ***morphologically different*** individuals. |

**(ii) Events that occur during pollen-pistil interaction:**

Refer Q.No. 126(b), Pg. No.47 (Notes under 'Explanation')

142. (i) Explain the characteristic features of wind pollinated flowers. How are insect pollinated flowers different from them?
(ii) Explain the mutually rewarding relationship between Yucca plant and species of moth. (2011)

**(i) Characteristics of Wind Pollinated Flowers**

Refer. Q.No. 106, Pg.No. 35

**Difference Between Insect Pollinated and Wind Pollinated Flowers**

| Insect Pollinated Flowers | Wind Pollinated Flowers |
|---|---|
| 1. They have ***bright coloured, large petals.*** | 1. They have ***dull coloured, small petals.*** |
| 2. Nectar and scent are ***present*** to ***attract insects.*** | 2. Nectar and scent are ***absent.*** |
| 3. Pollen grains are often ***sticky*** to bind to insects. | 3. Pollen grains are ***not sticky*** and ***light in weight.*** |
| 4. Anthers are ***firm*** and lie ***inside flower.*** | 4. Anthers are ***loosely attached*** and ***dangle out.*** |
| 5. Stigma is ***not feathery.*** | 5. Stigma is ***feathery*** to trap atmospheric pollens. |
| 6. Stigma lies ***inside*** the flower. | 6. Stigma hangs ***outside.*** |

**(ii) Relationship between Yucca plant and Species of Moth**

1. ***Yucca*** plant rewards the ***moth*** by providing ***safe place to lay eggs***.

2. The moth deposits its ***eggs in the locule*** of the ovary.

3. The flower, in turn, gets ***pollinated*** by the moth.

4. The larvae of the ***moth come out of the eggs*** as the ***seeds start developing***.

5. Thus, there is a ***mutually rewarding*** relationship between Yucca plant and the moth.

6. Both species (moth and the plant) ***cannot complete their life cycles*** without each other.

143. Explain double fertilisation and trace the post-fertilisation events in sequential order leading to seed formation in typical dicotyledonous plant. (2010)

**Double Fertilisation**

Refer. Q.No.68, Pg.No.23

**Post-fertilisation Events**

After double fertilisation, post fertilisation events occur in the following order:

Endosperm development → Embryo development → Seed formation

1. Endosperm development ***precedes embryo development.***

2. The ***primary endosperm*** cell ***divides*** repeatedly and forms a ***triploid endosperm*** tissue.

3. The ***cells*** of this tissue are filled with ***reserve food materials*** and are used for the ***nutrition*** of the developing embryo.

4. The ***zygote*** undergoes repeated ***mitotic divisions*** and gives rise to a ***proembryo.***

5. The proembryo develops into a ***globular embryo***

6. The globular embryo then develops into a ***heart-shaped embryo.***

7. This finally develops into a ***mature embryo*** with cotyledons.

8. As the embryo develops, the ovule becomes ***a seed*** and ovary becomes ***a fruit***.

144. Explain the development of zygote into an embryo and of primary endospermic nucleus into an endosperm on a fertilized embryo sac of a dicot plant. (2011)

**Embryo Development**

1. The ***zygote*** undergoes ***mitotic division*** to form ***two unequal cells***.

2. The ***cell*** situated near the ***micropyle*** is larger in size and is called ***basal cell***.

3. The ***basal cell*** develops into a ***suspensor***.

4. The ***cell away*** from the micropyle is small in size and is called ***terminal cell***.

5. The ***terminal cell*** undergoes repeated ***mitotic divisions*** and gives rise to a ***proembryo.***

6. The proembryo develops into a ***globular embryo***.

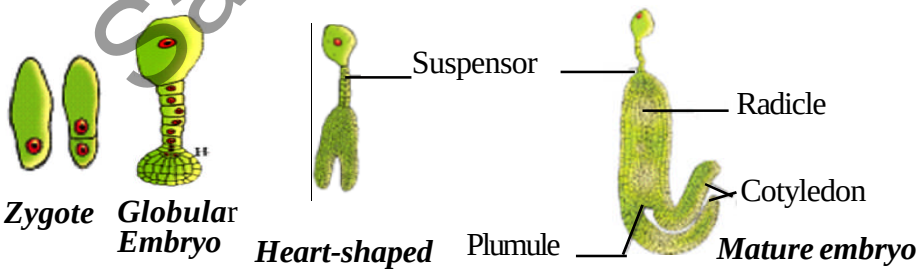



*Fig.2.22: Development of an Embryo*

7. The globular embryo then develops into a ***heart-shaped embryo.***

8. The heart-shaped embryo finally develops into a ***mature embryo*** with two cotyledons.

9. A typical dicotyledonous embryo consists of an ***embryonal axis*** and two ***cotyledons*.**

10. The portion of embryonal axis above the level of cotyledons is the ***epicotyl*.** It terminates with the ***plumule***.

11. The cylindrical portion below the level of cotyledons is ***hypocotyl.***

12. The hypocotyl terminates at its lower end in the ***radicle*.**

**Endosperm Development**

Endosperm development ***precedes embryo development***.

The ***primary endosperm nucleus*** undergoes successive nuclear divisions to give rise to ***thousands of free nuclei***.

The ***number*** of ***free nuclei*** formed before cellularisation varies greatly.

This stage of endosperm development is called ***free-nuclear endosperm***.

Subsequently, ***cell wall*** formation occurs and the ***endosperm*** becomes ***cellular.***

As a result, a ***triploid endosperm*** develops in the ***embryo sac.***

The ***cells*** of this tissue are filled with ***reserve food materials*** and are used for the ***nutrition*** of the developing embryo.

145. (i) Draw a labelled longitudinal view of an albuminous seed
(ii) How are seeds advantageous to the flowering plants? (2010)

**(i) Sectional View of Albuminous Seed**

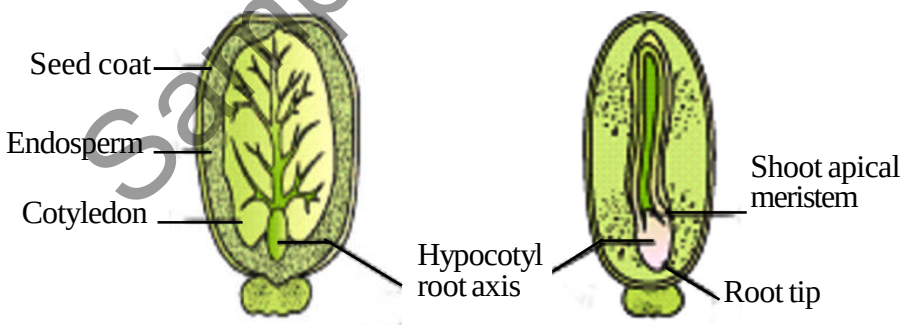



*Fig. 2.23: Longitudinal section of Castor seed (Albuminous Seed)*

**(ii) Advantages of Seeds**

Ref.Q.No. 113, Pg.No. 40

146. (i) Geitonogamy is functionally a cross pollination, but genetically similar to autogamy. Explain.

(ii) Why do flowering plants develop out breeding devices? Explain any three such devices developed by flowering plants. (2010)

**(i) Geitonogamy is Functionally Cross Pollination**

Ref.Q.No. 91, Pg.No. 30

**(ii) Reasons for Developing Out Breeding Devices**

Majority of flowering plants produce ***hermaphrodite flowers.***

So, pollen grains are likely to come in contact with the ***stigma of the same flower***.

Continued self-pollination results in ***inbreeding depression***.

So, flowering plants have developed many mechanisms (devices) to ***discourage self-pollination*** and to ***encourage cross-pollination***.

**(ii) Out breeding devices**

1. In some plants, pollen release and stigma receptivity are ***not synchronised***.

The ***pollen is released before*** the stigma becomes receptive or the ***stigma becomes receptive*** much before the release of pollen.

2. In some other species, the anther and stigma are placed at ***different positions***. So, the ***pollen cannot*** come in ***contact*** with the ***stigma*** of the ***same flower.***

3. The third device to prevent inbreeding is ***self-incompatibility***. This is a genetic mechanism that prevents self-pollen (from the same flower or other flowers of the same plant) from fertilising the ovules.

This is done by inhibiting pollen germination or pollen tube growth in the pistil.

4. Another ***device*** to prevent self-pollination is the ***production of unisexual flowers***.

If both male and female flowers are present on the ***same plant*** (monoecious), it prevents ***autogamy*** but not geitonogamy.

If male and female flowers are present on ***different plants*** (dioecy), it prevents both ***autogamy*** and ***geitonogamy.***

147. Give reasons, why?

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

(ii) Groundnut seeds are exalbuminous and castor seed 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) Apples and cashew nuts are not called true fruits. (2011)

(i) Endosperm is a ***nutritive tissue*** for the developing embryo. Without endosperm, there is no embryo development.

So, most zygotes in angiosperms divide ***only after certain amount of endosperm is formed***.

(ii) Groundnut seeds are exalbuminous and castor seeds are albuminous because in ***groundnut,*** the ***endosperm*** is ***completely used*** during the embryo development in the seed.

But, in castor seeds, a ***part of endosperm*** is ***left unused*** in the mature seeds.

(iii) ***Micropyle*** remains as a small pore in the seed coat of a seed because it facilitates the ***entry of water and oxygen*** into the seed during seed germination.

(iv) ***Integuments*** of ***ovules harden*** and ***water*** content is ***reduced*** as the seed matures because the hard seed coat ***protects the embryo inside*** and the ***reduced water content*** helps the seed to have ***slow rate of metabolic activities.***

This forces the embryo to enter a state of ***dormancy.***

(v) Apples and cashew nuts are not called true fruits because in both the cases, the ***edible portion*** develops from ***thalamus***, in addition to the ovary.

148. A flower of tomato plant following the process of sexual reproduction produces 240 viable seeds. Answer the following questions giving reasons:

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

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

(iii) How many megaspore mother cells were involved?

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

(v) How many male gametes were involved in the case? (2015)

(i) As 240 viable seeds are produced from a fruit, the minimum number of pollen grains that must have been involved in the pollination of its pistil are ***240***.

***Each pollen grain can fertilise one ovule*** that in turn develops into a seed. So, a minimum of 240 pollen grains are required to fertilise 240 ovules.

***Each*** pollen grain produces ***two male gametes***, of which one fuses with the ***egg*** to form zygote and the ***other*** fuses with ***secondary nucleus*** to form endosperm mother cell. Hence, one pollen is a must to fertilise an ovule.

(ii) The ***minimum number*** of ovules present in the ovary would have been 240 since the fruit had produced 240 viable seeds.

***Each ovule after fertilisation becomes a viable seed***. So, a minimum of 240 ovules is a must.

(iii) ***240 megaspore mother*** cells were involved in the pistil.

Each megaspore mother cell undergoes meiosis to give rise to ***four megaspores***. Of these, ***only one megaspore is functional*** and the other three megaspores degenerate. Only the functional megaspore gives rise to ***an embryo sac***.

(iv) The minimum number of ***microspore mother cells*** involved in the above case would be ***60***.

Each microspore mother cell undergoes ***meiosis*** and gives rise to ***four pollen grains***. ***Each pollen grain can fertilise an ovule***.

Hence, to fertilise 240 pollen grains, 60 microspore mother cells are required.

(v) The number of ***male gametes*** involved in this case would be ***480***.

Tomato is an angiosperm where ***double fertilisation*** is the rule during sexual reproduction.

Each pollen grain produces a ***pollen tube*** that grows and enters the ***embryo sac***.

Inside the embryo sac, the pollen tube releases ***two male gametes***.

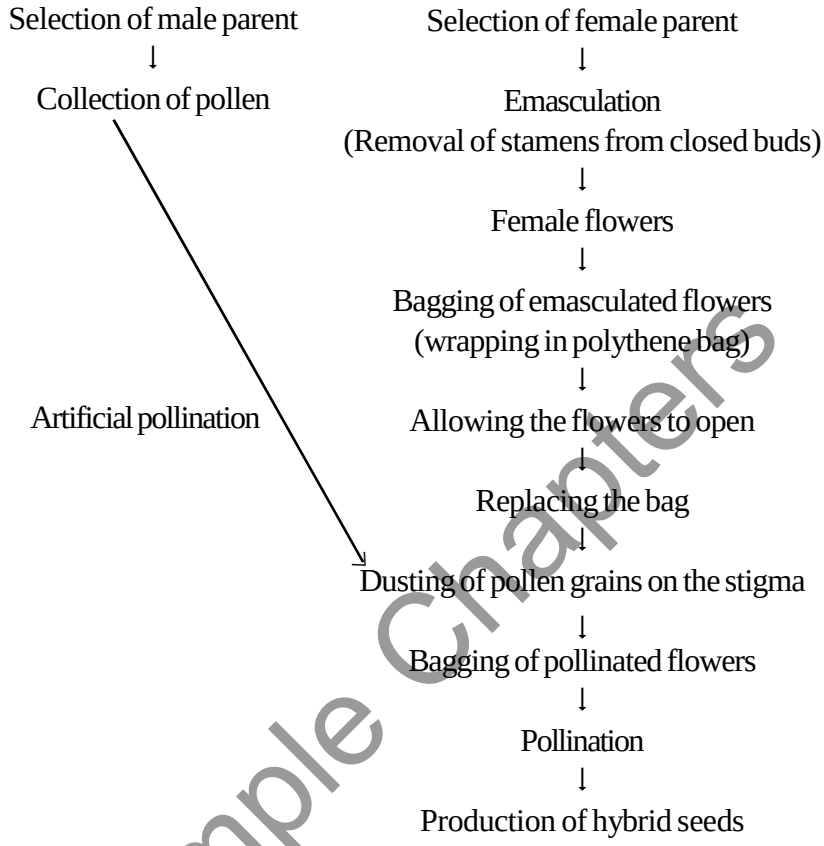
***One male*** gamete fuses with the ***egg*** to form zygote and the ***other male gamete*** fuses with ***secondary nucleus*** to form endosperm mother cell.

Since two male gametes are required to fertilise an ovule, ***480 male gametes*** are required to fertilise 240 ovules.

149. (i) 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 set of pollen grains. Name the type of experiment that you carried out.

(ii) Write the importance of such experiments. (2015)

**(i) Flow Chart of Breeding Experiment**




**(i) Name of this Experiment**

Name of this experiment is ***artificial hybridisation***.

**(ii) Importance of Such Experiments**

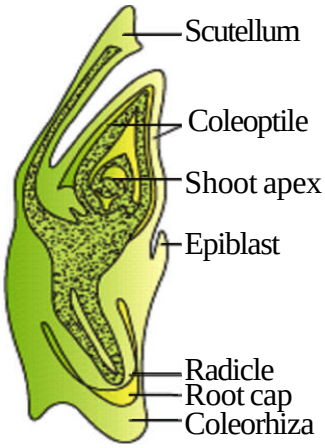
1. Creation of ***new improved crop varieties***
2. Creation of ***new genetic combinations in crops*** through hybridisation.
3. ***Incorporation*** of many ***desired characteristics*** in ***one variety*** from many other varieties.
4. Getting new varieties with ***hybrid vigor.***
5. To provide ***improved seeds*** to farmers.

150. (a) Draw a labelled diagram of L.S of an embryo of grass (any six labels).

(b) Give reasons for each of the following:

(i) Anthers of angiosperm flowers are described as dithecous.
(ii) Hybrid seeds have to be produced year after year. (2011)

**(i) L.S. of Grass Embryo**




(b) (i) Typical anther is bilobed and each lobe has ***two thecae*** (pollen sacs). So, typical anther is said to be ***dithecous***.

(ii) If the seeds collected from hybrids are sown, the plants in the ***progeny will segregate and do not maintain hybrid characters***. So, ***hybrid seeds*** have to be ***produced year after year.***

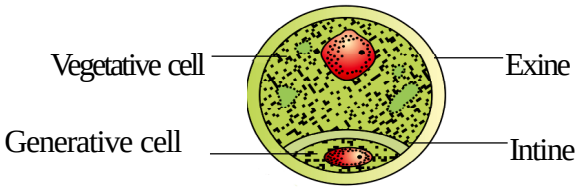
151. Name the fertile portion of stamen and pistil that take part in the production of gametophytes.

***Anther*** is the fertile portion of ***stamen*** that produces pollen grains.

***Ovary*** is the fertile portion of ***pistil*** that produces embryo sacs.

152. Draw a diagram of a male gametophyte of an angiosperm. Label any four parts. Why is the sporopollenin considered as the most resistant organic material? (2011)

**Diagram of male gametophyte**




**Most Resistant Organic Material**

***Sporopollenin*** is considered as the most resistant organic materials because of the following reasons:

- It can ***withstand high temperatures, strong acids*** and ***alkali***.
- ***No enzyme*** can degrade sporopollenin.
- It enables the pollen grains to be preserved as ***fossils***.

153. Describe the sequence of events that lead to the development of 3-celled pollen grain from a microspore mother cell in angiosperms. (2010)

Refer Q.No.136(i), Pg.No.56