

# Unit-VI: Reproduction in Plants

## Chapter-1. Asexual and Sexual Reproduction in Plants

### Book back Answers

#### I. One mark questions:-

1. Choose the correct statement from the following
  - a) Gametes are involved in asexual reproduction
  - b) Bacteria reproduce asexually by budding
  - c) Conidia formation is a method of sexual reproduction
  - d) Yeast reproduce by budding
2. An eminent Indian embryologist is
  - a) S.R.Kashyap
  - b) P.Maheswari
  - c) M.S. Swaminathan
  - d) K.C.Mehta
3. Identify the correctly matched pair
  - a) Tuber - *Allium cepa*
  - b) Sucker – *Pistia*
  - c) Rhizome - *Musa*
  - d) Stolon - *Zingiber*
4. Pollen tube was discovered by
  - a) J.G.Kolreuter
  - b) G.B.Amici
  - c) E.Strasburger
  - d) E.Hanning
5. Size of pollen grain in *Myosotis*
  - a) 10 micrometer
  - b) 20 micrometer
  - c) 200 micrometer
  - d) 2000 micrometer
6. First cell of male gametophyte in angiosperm is
  - a) Microspore
  - b) megaspore
  - c) Nucleus
  - d) Primary Endosperm Nucleus
7. Match the following
 

I) External fertilization	i) pollen grain	a) I-iv; II-i; III-ii; IV-iii
II) Androecium	ii) anther wall	b) I-iii; II-iv; III-i; IV-ii
III) Male gametophyte	iii) algae	c) I-iii; II-iv; III-ii; IV-i
IV) Primary parietal layer	iv) stamens	d) I-iii; II-i; III-iv; IV-ii
8. Arrange the layers of anther wall from locus to periphery
  - a) Epidermis, middle layers, tapetum, endothecium
  - b) Tapetum, middle layers, epidermis, endothecium
  - c) Endothecium, epidermis, middle layers, tapetum
  - d) Tapetum, middle layers endothecium epidermis
9. Identify the incorrect pair
  - a) sporopollenin - exine of pollen grain
  - b) tapetum – nutritive tissue for developing microspores
  - c) Nucellus – nutritive tissue for developing embryo
  - d) obturator – directs the pollen tube into micropyle
10. Assertion : Sporopollenin preserves pollen in fossil deposits  
Reason : Sporopollenin is resistant to physical and biological decomposition
  - a) assertion is true; reason is false
  - b) assertion is false; reason is true
  - c) Both Assertion and reason are not true
  - d) Both Assertion and reason are true.
11. Choose the correct statement(s) about tenuinucellate ovule
  - a) Sporogenous cell is hypodermal
  - b) Ovules have fairly large nucellus
  - c) sporogenous cell is epidermal
  - d) ovules have single layer of nucellus tissue
12. Which of the following represent megagametophyte
  - a) Ovule
  - b) Embryo sac
  - c) Nucellus
  - d) Endosperm
13. In *Haplopappus gracilis*, number of chromosomes in cells of nucellus is 4. What will be the chromosome Number in Primary endosperm cell?
  - a) 8
  - b) 12
  - c) 6
  - d) 2
14. Transmitting tissue is found in
  - a) Micropylar region of ovule
  - b) Pollen tube wall
  - c) Stylar region of gynoecium
  - d) Integument
15. The scar left by funiculus in the seed is
  - a) tegmen
  - b) radicle
  - c) epicotyl
  - d) hilum
16. A Plant called X possesses small flower with reduced perianth and versatile anther. The probable agent for pollination would be
  - a) water
  - b) air
  - c) butterflies
  - d) beetles
17. Consider the following statement(s)
  - i) In Protandrous flowers pistil matures earlier
  - ii) In Protogynous flowers pistil matures earlier
  - iii) Herkogamy is noticed in unisexual flowers
  - iv) Distyly is present in *Primula*
  - a) i and ii are correct
  - b) ii and iv are correct
  - c) ii and iii are correct
  - d) i and iv are correct

18. Coelorrhiza is found in  
a) Paddy                      b) Bean                      c) Pea                      d) Tridax
19. Parthenocarpic fruits lack  
a) Endocarp                      b) Epicarp                      c) Mesocarp                      d) seed
20. In majority of plants pollen is liberated at  
a) 1 celled stage                      b) 2 celled stage                      c) 3 celled stage                      d) 4 celled stage

## **II. Two, Three, Five Mark Questions:-**

### **21. What is reproduction?**

Reproduction is a vital process for the existence of a species and it also brings suitable changes through Variation in the off springs for their survival on earth.

### **22. Mention the contribution of Hofmeister towards Embryology.**

1848 - Hofmeister described the structure of pollen tetrad

### **23. List out two sub-aerial stem modifications with example.**

(i) Rhizome - *Musa paradisiaca* (ii) Tuber - *Solanum tuberosum*

### **24. What is layering?**

- (i) The stem of a parent plant is allowed to develop roots while still intact.
- (ii) When the root develops, the rooted part is cut and planted to grow as a new plant.
- (iii) Examples: *Ixora* and *Jasminum*.

### **25. What are clones?**

- (i) The morphologically and genetically identical individuals are called as clones.
- (ii) Which are produced by Asexual Reproduction.

### **26. A detached leaf of *Bryophyllum* produces new plants. How?**

- (i) In some plants adventitious buds are developed on their leaves.
- (ii) When they are detached from the parent plant they grow into new individual plants.
- (iii) Examples: *Bryophyllum*,

### **27. Differentiate Grafting and Layering.**

S.No.	Grafting	Layering
1.	In this method parts of two different plants are joined so that they continue to grow as one plant.	In this method the stem of a parent plant is allowed to develop roots while still intact.
2.	The plant which is in contact with the soil is called <b>stock</b> and the plant used for grafting is called <b>scion</b> .	When the root develops, the rooted part is cut and planted to grow as a new plant.
3.	Example: <i>Citrus</i> , <i>Mango</i> and <i>Apple</i> .	Examples: <i>Ixora</i> and <i>Jasminum</i> .

### **28. "Tissue culture is the best method for propagating rare and endangered plant species"- Discuss.**

- (i) The regeneration of a whole plant from single cell or tissue by the tissue culture technique is called Micropropagation.
- (ii) Rare and endangered plants can be propagated through micropropagation. So tissue culture is the best method for propagating rare and endangered plant species.

### **29. Distinguish mound layering and air layering.**

S.No.	Mound layering	Air layering.
1.	This method is applied for the plants having flexible branches.	In this method the stem is girdled at nodal region and hormones are applied to this region which promotes rooting.
2.	The lower branch with leaves is bent to the ground and part of the stem is buried in the soil and tip of the branch is exposed above the soil.	This portion is covered with damp or moist soil using a polythene sheet. Roots emerge in these branches after 2-4 months.
3.	After the roots emerge from the part of the stem buried in the soil, a cut is made in parent plant so that the buried part grow into a new plant.	Such branches are removed from the parent plant and grown in a separate pot or ground.

**30. Explain the conventional methods adopted in vegetative propagation of higher plants.**

The common methods of conventional propagation are cutting, grafting and layering.

(i) Cutting:

- 1.It is the method of producing a new plant by cutting the plant parts such as root, stem and leaf from the parent plant.
- 2.The cut part is placed in a suitable medium for growth. It produces root and grows into a new plant.
- 3.Examples: stem cutting - *Hibiscus*, leaf cutting - *Bryophyllum*.

(ii) Grafting:

- 1.In this method parts of two different plants are joined so that they continue to grow as one plant.
- 2.The plant which is in contact with the soil is called **stock** and the plant used for grafting is called **scion**.
- 3.Examples: Citrus, Mango and Apple.
- 4.Types of grafting: Bud grafting, tongue grafting, crown grafting, wedge grafting and approach grafting.

(iii) layering

- 1.The stem of a parent plant is allowed to develop roots while still intact.
- 2.When the root develops, the rooted part is cut and planted to grow as a new plant.
- 3.Examples: *Ixora* and *Jasminum*.
- 4.Types of Layering: Mount layering and Air layering.

**31. Highlight the milestones from the history of plant embryology.**

S.No.	Year	Scientist name	Milestones
1.	1682	Nehemiah Grew	stamens as the male organ of a flower
2.	1694	R.J.Camerarius	structure of a flower, anther, pollen and ovule
3.	1848	Hofmeister	structure of pollen tetrad
4.	1898 & 1899	S.G.Nawaschin and L. Guignard	Double fertilization
5.	1964	S.Guha and S.C.Maheswari	haploids from <i>Datura</i> pollen grains
6.	2015	K.V.Krishnamurthy	summarized the molecular aspects of pre and post fertilization reproductive development in flowering plants

**32. Discuss the importance of Modern methods in reproduction of plants.**

- 1.Plants with desired characteristics can be multiplied in a short duration.
- 2.Plants produced are genetically identical.
- 3.Tissue culture can be carried out in any season to produce plants.
- 4.Rare and endangered plants can be propagated.
- 5.Disease free plants can be produced by meristem culture.

**33. What is Cantharophily.**

Pollination takes place by beetle is called Cantharophily.

**34. List any two strategy adopted by bisexual flowers to prevent self-pollination.**

The following strategies are adopted by bisexual flowers to prevent self-pollination

- 1.Dichogamy – (i) Protandry (ii) Protogyny
- 2.Herkogamy
- 3.Heterostyly
- 4.Self sterility

**35. What is endothelium.**

The inner layer of the integument may become specialized to perform the nutritive function for the embryo sac and is called as endothelium or integumentary tapetum. Example : Asteraceae

**36. “The endosperm of angiosperm is different from gymnosperm”. Do you agree. Justify your answer.**

- 1.Yes I agree, Endosperm of angiosperm is different from gymnosperm because, Angiosperm plant endosperms Are formed during fertilization but in gymnosperm plant endosperms are formed before fertilization.
- 2.So, angiosperm plant endosperms are triploid (3n) and gymnosperm plant endosperms are haploid (1n) condition.

**37. Define the term Diplospory.**

- 1.A diploid embryo sac is formed from megaspore mother cell without a regular meiotic division is called diplospory.
- 2.Examples. *Eupatorium* and *Aerva*.

**38. What is polyembryony. How it can commercially exploited.**

1. Occurrence of more than one embryo in a seed is called polyembryony.
2. The seedlings formed from the nucellar tissue in *Citrus* are found better clones for Orchards.
3. Embryos derived through polyembryony are found virus free.

**39. Why does the zygote divide only after the division of Primary endosperm cell.**

1. The primary endosperm nucleus (PEN) divides immediately after fertilization but before the zygote starts to divide, into an endosperm.
2. The primary endosperm nucleus is the result of triple fusion (two polar nuclei and one sperm nucleus) and thus has  $3n$  number of chromosomes.
3. It is a nutritive tissue and regulatory structure that nourishes the developing embryo.

**40. What is Mellitophily?**

Pollination takes place by bees is called mellitophily.

**41. "Endothecium is associated with dehiscence of anther" Justify the statement.**

1. It is generally a single layer of radially elongated cells found below the epidermis.
2. The cells along the junction of the two sporangia of an anther lobe lack these thickenings. This region is called stomium.
3. This region along with the hygroscopic nature of endothecium helps in the dehiscence of anther at maturity.

**42. List out the functions of tapetum.**

1. It supplies nutrition to the developing microspores.
2. It contributes sporopollenin through ubisch bodies thus plays an important role in pollen wall formation.
3. Exine proteins responsible for 'rejection reaction' of the stigma are present in the cavities of the exine. These proteins are derived from tapetal cells.

**43. Write short note on Pollen kitt.**

1. Pollenkitt is contributed by the tapetum and coloured yellow or orange and is chiefly made of carotenoids or flavonoids.
2. It is an oily layer forming a thick viscous coating over pollen surface.
3. It attracts insects and protects damage from UV radiation.

**44. Distinguish tenuinucellate and crassinucellate ovules.**

S.No.	Tenuinucellate ovule	Crassinucellate ovule
1.	If the sporogenous cell is hypodermal with a single layer of nucellar tissue around it is called tenuinucellate ovule.	Ovules with subhypodermal sporogenous cell is called crassinucellate ovule.
2.	Normally tenuinucellate ovules have very small nucellus.	Normally these ovules have fairly large nucellus.

**45. 'Pollination in Gymnosperms is different from Angiosperms' – Give reasons.**

S.No.	Gymnosperms	Angiosperms
1.	Pollination in gymnosperms is direct method.	Pollination in angiosperms is indirect method.
2.	pollens are deposited directly on the exposed ovules.	pollens are deposited on the stigma of the pistil.

**46. Write short note on Heterostyly.**

1. Some plants produce two or three different types of flowers that are different in their length of stamens and style.
2. Pollination will take place only between organs of the same length.

**47. Enumerate the characteristic features of Entomophilous flowers.**

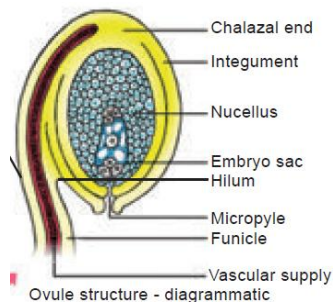
1. Generally flowers are large in size.
2. Flowers are brightly coloured.
3. Flowers are scented and produce nectar.
4. Flowers pollinated by flies and beetles produce foul odour to attract pollinators.
5. Flowers in which there is no secretion of nectar, the pollen is either consumed as food or used in building up of its hive by the honeybees.

**48. Discuss the steps involved in Microsporogenesis.**

1. formation of haploid(1n) microspores from diploid(2n) microspore mother cell through meiosis is called Microsporogenesis.
2. The primary sporogenous cells directly, or may undergo a few mitotic divisions to form sporogenous tissue.
3. The last generation of sporogenous tissue functions as microspore mother cells.
4. Each microspore mother cell divides meiotically to form a tetrad of four haploid microspores (microspore tetrad).
5. In some plants, all the microspores in a microsporangium remain held together called pollinium.  
Example: *Calotropis*.
6. Pollinia are attached to a clamp or clip like sticky structure called corpusculum.
7. The filamentous or thread like part arising from each pollinium is called retinaculum.
8. The whole structure looks like inverted letter 'Y' and is called translator.

**49. With a suitable diagram explain the structure of ovule or Megasporangium.**

1. Ovule is also called megasporangium. It is protected by one or two covering called integuments.
2. A mature ovule consists of a stalk which is called as funiculus (also called funicle) is present at the base and it attaches the ovule to the placenta.
3. The point of attachment of funicle to the body of the ovule is known as hilum.
4. In an inverted ovule, the funicle is adnate to the body of the ovule forming a ridge called raphe.
5. The body of the ovule is made up of a central mass of parenchymatous tissue called nucellus which has large reserve food materials.
6. The nucellus is enveloped by one or two protective coverings called integuments.
7. Integument encloses the nucellus completely except at the top where it is free and forms a pore called micropyle.
8. The ovule with one or two integuments are said to be unitegmic or bitegmic ovules.
9. The integument and the funicle meet or merge is called as chalaza.
10. There is a large sac-like structure in the nucellus toward the micropylar end called embryo sac or female gametophyte.



**50. Give a concise account on steps involved in fertilization of an angiosperm plant.**

**(i) Fertilization:**

1. The fusion of male and female gamete is called fertilization.
2. Fertilization in angiosperms is double fertilization type.

**(ii) The following steps are involved in fertilization:-**

germination of pollen to form pollen tube in the stigma  
↓  
growth of pollen tube in the style  
↓  
direction of pollen tube towards the micropyle of the ovule  
↓  
entry of the pollen tube into one of the synergids of the embryo sac  
↓  
discharge of male gametes  
↓  
syngamy and triple fusion

**(iii) pollen- pistil interaction:-**

The events from pollen deposition on the stigma to the entry of pollen tube in to the ovule is called Pollen- pistil interaction.



**51. What is endosperm. Explain the types.**

**(i) Endosperm:-**

1. The primary endosperm nucleus (PEN) divides immediately after fertilization but before the zygote starts to divide, into an endosperm.
2. Depending upon the mode of development three types of endosperm are recognized in angiosperms.

**(ii) Types of Endosperm:-**

1. Nuclear endosperm
2. Cellular endosperm
3. Helobial endosperm

**1. Nuclear endosperm:-**

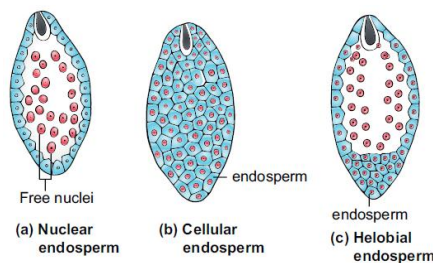
- (i) Primary Endosperm Nucleus undergoes several mitotic divisions without cell wall formation thus a free Nuclear condition exists in the endosperm.
- (ii) Examples: *Coccinia*, *Capsella* and *Arachis*.

**2. Cellular endosperm:-**

- (i) Primary endosperm nucleus divides into 2 nuclei and it is immediately followed by wall formation.
- (ii) Subsequent divisions also follow cell wall formation.
- (iii) Examples: *Adoxa*, *Helianthus* and *Scoparia*.

**3. Helobial endosperm:-**

- (i) Primary Endosperm Nucleus moves towards base of embryo sac and divides into two nuclei.
- (ii) Cell wall formation takes place leading to the formation of a large micropylar and small chalazal chamber.
- (iii) Examples : *Hydrilla* and *Vallisneria*.



**52. Differentiate the structure of Dicot and Monocot seed.**

S.No.	Dicot seed	Monocot seed
1.	Two Cotyledons	One Cotyledon (Scutellum)
2.	Reserve food Material stored in Cotyledons	Reserve food Material Stored in Endosperm
3.	Plumule is present	Coleoptile is present
4.	Radicle is present	Coleorhiza is present
5.	Funiculus is present	Absent
6.	Hilum is present	Absent
7.	Micropyle is present	Absent
8.	Testa is present	Absent
9.	Tegmen is present	Absent
10.	Eg: <i>Cicer arietinum</i> (chick pea)	Eg: <i>Oryza sativa</i> (Paddy)

**53. Give a detailed account on parthenocarpy. Add a note on its significance.**

**Parthenocarpy:-**

- (i) The development of fruit without fertilization is called Parthenocarpy.
- (ii) Examples: Banana, Grapes and Papaya.

**Types of Parthenocarpy:-**

Nitsch in 1963 classified the parthenocarpy into following three different types.

1. Genetic Parthenocarpy
2. Environmental Parthenocarpy
3. Chemically induced Parthenocarpy

**1. Genetic Parthenocarpy:**

- (i) Parthenocarpy arises due to hybridization or mutation.
- (ii) Examples: *Citrus*, *Cucurbita*.

## 2.Environmental Parthenocarpy:

- (i) Parthenocarpy arises due to environmental conditions like frost, fog, low temperature, high temperature etc.,
- (ii)Example: low temperature for 3-19 hours induces parthenocarpy in Pear.

## 3.Chemically induced Parthenocarpy:

- (i)Application of growth promoting substances like Auxins and Gibberellins induces parthenocarpy.

## Significance of Parthenocarpy:

- (i)The seedless fruits have great significance in horticulture.
- (ii)The seedless fruits have great commercial importance.
- (iii)Seedless fruits are useful for the preparation of jams, jellies, sauces, fruit drinks etc.
- (iv)High proportion of edible part is available in parthenocarpic fruits due to the absence of seeds.

\*\*\*\*\*

## I.One mark Answers:-

1. d) Yeast reproduce by budding
2. b) P.Maheswari
3. c) Rhizome - *Musa*
4. b) G.B.Amici
5. a) 10 micrometer
6. a) Microspore
7. b) I-iii; II-iv; III-i; IV-ii
8. d) Tapetum, middle layers endothecium epidermis
9. c) Nucellus – nutritive tissue for developing embryo
10. d) Both Assertion and reason are true.
11. a) Sporogenous cell is hypodermal
12. b)Embryo sac
13. b)12
14. c) Stylar region of gynoecium
15. d)hilum
16. b)air
17. b) ii and iv are correct
18. a)Paddy
19. d) seed
20. b) 2 celled stage

\*\*\*\*\*