

Chapter 1

Asexual and Sexual Reproduction in Plants

Question 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

Answer:

- (c) Conidia formation is a method of sexual reproduction

Question 2.

An eminent Indian embryologist is _____

- (a) S.R. Kashyap
- (b) P. Maheswari
- (c) M.S. Swaminathan
- (d) K.C. Mehta

Answer:

- (b) P. Maheswari

Question 3.

Identity the correctly matched pair _____

- (a) Tuber – Allium cepa
- (b) Sucker – Pistia
- (c) Rhizome – Musa
- (d) Stolon – Zingiber

Answer:

- (c) Rhizome – Musa

Question 4.

Pollen tube was discovered by _____

- (a) J.G. Kolreuter
- (b) G.B. Amici
- (c) E. Strasburger
- (d) E. Hanning

Answer:

- (b) G.B. Amici

Question 5.

Size of pollen grain in Myosotis _____

- (a) 10 micrometer
- (b) 20 micrometer
- (c) 200 micrometer
- (d) 2000 micrometer

Answer:

- (a) 10 micrometer

Question 6.

First cell of male gametophyte in angiosperm is _____

- (a) Microspore
- (b) Megaspore
- (c) Nucleus
- (d) Primary Endosperm Nucleus

Answer:

- (a) Microspore

Question 7.

Match the following _____

- (I) External fertilization – (i) pollen grain
- (II) Androecium – (ii) anther wall
- (III) Male gametophyte – (iii) algae
- (IV) Primary parietal layer – (iv) stamens
- (a) I-(iv); II-(i); III-(ii); IV-(iii)
- (b) I-(iii); II-(iv); III-(ii); IV-(i)
- (c) I-(iii); II-(iv); III-(ii); IV-(i)
- (d) I-(iii); II-(i); III-(iv); IV-(ii)

Answer:

- (b) I-(iii); II-(iv); III-(ii); IV-(i)

Question 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

Answer:

- (d) Tapetum, middle layers endothecium epidermis

Question 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

Answer:

(c) Nucellus – nutritive tissue for developing embryo

Question 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.

Answer:

(b) assertion is false; reason is true

Question 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

Answer:

(a) Sporogenous cell is hypodermal

Question 12.

Which of the following represent megagametophyte _____

- (a) Ovule
- (b) Embryo sac
- (c) Nucellus
- (d) Endosperm

Answer:

(b) Embryo sac

Question 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

Answer:

(b) 12

Question 14.

Transmitting tissue is found in

- (a) Micropylar region of ovule

- (b) Pollen tube wall
- (c) Styler region of gynoecium
- (d) Integument

Answer:

- (c) Styler region of gynoecium

Question 15.

The scar left by funiculus in the seed is _____

- (a) tegmen
- (b) radicle
- (c) epicotyl
- (d) hilum

Answer:

- (d) hilum

Question 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

Answer:

- (b) air

Question 17.

Consider the following statement(s)

1. In Protandrous flowers pistil matures earlier
2. In Protogynous flowers pistil matures earlier
3. Herkogamy is noticed in unisexual flowers
4. Distyly is present in Primula

- (a) i and ii are correct
- (b) ii and iv are correct
- (c) ii and Hi are correct
- (d) i and iv are correct

Answer:

- (b) ii and iv are correct

Question 18.

Coelorhiza is found in _____

- (a) Paddy
- (b) Bean
- (c) Pea

(d) Tridax

Answer:

(a) Paddy

Question 19.

Parthenocarpic fruits lack _____

(a) Endocarp

(b) Epicarp

(c) Mesocarp

(d) seed

Answer:

(d) seed

Question 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

Answer:

(b) 2 celled stage

Question 21.

What is reproduction?

Answer:

- It is a vital process for the existence of a species.
- It brings suitable changes through variation in offsprings.
- Plant reproduction is important for the existence of all other organisms.

Question 22.

Mention the contribution of Hofmeister towards Embryology.

Answer:

Hofmeister described the structure of pollen tetrad

Question 23.

List out two sub-aerial stem modifications with example.

Answer:

Subaerial stem modifications.

The stem is partly aerial and partly underground.

a) Runner. (Ex. oxalis, Centella Asiatica)

- It is running horizontally on the soil surface.
- Nodes have axillary buds, scale leaves, and adventitious roots.
- Runner arises from the axillary bud.
- Mother plant produces many runners in all directions.
- They break off and grow into individual plants.

b) Sucker. (Ex. Musa (banana), chrysanthemum)

Grows horizontally for a distance under the soil. Then it emerges obliquely upwards.

c) Stolon (Ex. Strawberry, Vallisneria)

Develop from underground stems.

They grow horizontally outwards.

d) Offset (condensed runners)

Unlike runners, they produce tilt of leaves above and duster of roots below Ex. Pistia, Eichhornia.

Question 24.

What is layering?

Answer:

Layering is a conventional propagation method, where the stem of a parent plant is allowed to develop roots while still intact. When the root develops, the rooted part is cut and planted to grow as a raw individual. E.g.: Jasminum.

Question 25.

What are clones?

Answer:

The individuals (Ex. Bacteria) formed by this method are morphologically and genetically identical. They are called clones.

Question 26.

A detached leaf of Bryophyllum produces new plants. How?

Answer:

In Bryophyllum, the leaf is succulent and notched on its margin. Adventitious buds develop at these notches and are called epiphyllous buds. They develop into new plants forming a root system and become independent plants when the leaf gets decayed.

Question 27.

Differentiate Grafting and Layering.

Answer:

Grafting

1. Two different plants are involved.
2. Two different plants are joined.

3. They continue to grow as one plant.
4. The plant in the soil is called stock.
5. The plant used for grafting is called the scion.
6. Ex. Citrus, Mango, Apple

Layering:

1. Only parent plant is involved.
2. Stem of the parent plant is allowed to develop roots.
3. The rooted part is cut and grown as a new plant.
4. Ex. Ixora, Jasminum

Question 28.

Tissue culture is the best method for propagating rare and endangered plant species” - Discuss.

Answer:

Micropropagation of plants in-vitro through tissue culturing is a modern and alternative tool to conserve and safeguard rare plant species. Since the basic principle behind PTC is totipotency. With the help of a single explant, it is possible to generate a huge population of plantlets within a short span of time. Conservation through micropropagation offers the possibility to rescue endangered and endemic species.

Question 29.

Distinguish mound layering and air layering

Answer:

Mound layering

1. Flexible branch is buried in the soil.
2. Roots emerge from the buried stem.
3. Buried part after cutting from parent, grows into a new plant.

Air layering

1. Nodal region is girdled.
2. Hormones are applied.
3. Rooting is promoted.
4. This area is covered by moist soil.
5. Roots emerge in 2-4 months.
6. These branches removed from parent and grown separately.

Air Layering:

In air layering, the stem is girdled at the nodal part and hormones are applied and covered with moist soil using a polythene sheet. Roots emerge in these branches after 2-4 months. Such branches are removed from parent plant and grown separately.

Question 30.

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

Answer:

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

a. Cutting: It is the method of producing a new plant by cutting the plant parts such as root, stem and leaf from the parent plant. The cut part is placed in a suitable medium for growth. It produces root and grows into a new plant. Depending upon the part used it is called as root cutting (Malus), stem cutting (Hibiscus, Bougainvillea and Moringa) and leaf cutting (Begonia, Bryophyllum). Stem cutting is widely used for propagation.

b. Grafting: In this, parts of two different plants are joined so that they continue to grow as one plant. Of the two plants, the plant which is in contact with the soil is called stock and the plant used for grafting is called scion. Examples are Citrus, Mango and Apple. There are different types of grafting based on the method of uniting the scion and stock. They are bud grafting, approach grafting, tongue grafting, crown grafting and wedge grafting.

(i) Bud grafting: AT- shaped incision is made in the stock and the bark is lifted. The scion bud with little wood is placed in the incision beneath the bark and properly bandaged with a tape.

(ii) Approach grafting: In this method both the scion and stock remain rooted. The stock is grown in a pot and it is brought close to the scion. Both of them should have the same thickness. A small slice is cut from both and the cut surfaces are brought near and tied together and held by a tape. After 1-4 weeks the tip of the stock and base of the scion are cut off and detached and grown in a separate pot.

(iii) Tongue grafting: A scion and stock having the same thickness is cut obliquely and the scion is fit into the stock and bound with tape.

(iv) Crown grafting: When the stock is large in size scions are cut into wedge shape and are inserted on the slits or clefts of the stock and fixed in position using graft wax.

(v) Wedge grafting: In this method, a slit is made in the stock or the bark is cut. A twig of the scion is inserted and tightly bound so that the cambium of the two is joined.

c. Layering: In this method, the stem of a parent plant is allowed to develop roots while still intact. When the root develops, the rooted part is cut and planted to grow as a new plant. Examples: Ixora and Jasminum Mound layering and Air layering are few types of layering.

(i) Mound layering: This method is applied for the plants having flexible branches. 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. 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.

(ii) Air layering: In this method the stem is girdled at nodal region and hormones are applied to this region which promotes rooting. This portion is covered with damp or moist soil using a polythene sheet. Roots emerge in these branches after 2-4 months. Such branches are removed from the parent plant and grown in a separate pot or ground.

Question 31.

Highlight the milestones from the history of plant embryology.

Answer:

Milestones in Plant Embryology

1. 1682 – Nehemiah Grew mentioned stamens as the male organ of a flower.
2. 1694 – R.J.Camerarius described the structure of a flower, anther, pollen, and ovule
3. 1761 – J.G. Kolreuter gave a detailed account of the importance of insects in pollination
4. 1824 – G.B.Amici discovered the pollen tube.
5. 1848 – Hofmeister described the structure of pollen tetrad
6. 1870 – Hanstein described the development of the embryo in *Capsella* and *Alisma*
7. 1878 – E.Strasburger reported polyembryony
8. 1884 – E.Strasburger discovered the process of Syngamy.
9. 1898 -99 S.G.Nawaschin and L. Guignard independently discovered Double fertilization
10. 1904 – E.Hanning initiated embryo cultures.

Question 32.

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

Answer:

Advantages of modern methods

1. Plants with desired characteristics can be multiplied rapidly in a short duration.
2. Plants produced are genetically identical.
3. Tissue culture can be carried out in any season to produce plants.
4. Plants which do not produce viable seeds and seeds that are difficult to germinate can be propagated by tissue culture.
5. Rare and endangered plants can be propagated.
6. Disease free plants can be produced by meristem culture.
7. Cells can be genetically modified and transformed using tissue culture.

Question 33.

What is Cantharophily?

Answer:

- It is the cross-pollination of flowers by beetles. They feed on pollen or juicy tissues of their flower.
- The plants using this mode of pollination
- Ex. Nymphaea species of plants – Rhinoceros beetle.
- Giant Water lily – Scarab beetle
- Illicium plant – Diptera flies.

Question 34.

List any two strategies adopted by bisexual flowers to prevent self-pollination.

Answer:

- Protandry or protogyny
- Herkogamy

Question 35.

What is endothelium?

Answer:

- Some ovules are unitegmic (with one integument) tenuinucellate type, (with a single layer of micellar tissue).
- In these types of ovules, the inner layer of the integument is specialized for nutritive function for embryo sac. It is called endothelium (Integumentary tapetum) Ex. Asteraceae.

Question 36.

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

Answer.

Answer:

The endosperm of Angiosperm:

1. Develops as a result of double fertilization.
2. Endosperm is generally triploid (polyploid).

Endosperm of Gymnosperm:

1. Develops before the fertilization process.
2. Endosperm is haploid.

Question 37.

Define the term Diplospory.

Answer:

- A diploid embryo sac is formed from a megaspore mother cell without a regular meiotic division.
- Examples: Eupatorium and Aerva.

Question 38.

What is polyembryony? How it can commercially exploited.

Answer:

The occurrence of more than one embryo in a seed is called polyembryony.

1. Embryos developed through polyembryony are found virus free.
2. The seedlings formed from nuclear tissue in citrus are found on better clones for orchards.

Question 39.

Why does the zygote divide only after the division of Primary endosperm cell?

Answer:

- The Zygote needs nourishment during its development.
- Fertilized embryo sac offers little nourishment to the Zygote.
- The primary endosperm cell divides and generates endosperm tissue.
- This nourishes the Zygote. So, the Zygote divides after the primary Endosperm cell.

Question 40.

What is Mellitophily?

Answer:

Pollination carried out by Bees is said to be mellitophily.

Question 41.

“Endothecium is associated with dehiscence of anther” Justify the statement.

Answer:

- Endothecium is a layer in the anther wall.
- It has a single layer of radially elongated cells. It is below the epidermis.
- The tangential wall or radial wall has lignified thickenings.
- These cells are hygroscopic. This nature helps in the dehiscence of anther at maturity.

Question 42.

List out the functions of the tapetum.

Answer:

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. The pollenkitt material is contributed by tapetal cells and is later transferred to the pollen surface.

4. Exine proteins responsible for the 'rejection reaction' of the stigma are present in the cavities of the exine. These proteins are derived from tapetal cells.

Question 43.

Write a short note on Pollenkitt.

Answer:

- Pollen kitt is an oily layer on the pollen surface. It is a viscous coating.
- It is contributed by tapetum.
- It is coloured yellow or orange.
- It is made of carotenoids, flavonoids.
- It attracts insects.
- It protects from damage by Uv radiation.

Question 44.

Distinguish tenuinucellate and crassinucellate ovules.

Answer:

Tenuinucellate Ovule:

1. Ovules with hypodermal sporogenous cell with unilayered nucellus tissue is called tenuinucellate type.
2. They have very small nucellus

Crassinucellate Ovule:

1. Ovule with subhypodermal sporogenous cell is called crassinucellate type.
2. They have large nucellus

Question 45.

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

Answer:

Gymnosperms:

1. Pollination in gymnosperms is direct.
2. The pollens are deposited directly on the exposed ovules.

Angiosperms:

1. In Angiosperms it is indirect.
2. The pollens are deposited on the stigma of the pistil.

Question 46.

Write short note on Heterostyly.

Answer:

Heterostyly: Some plants produce two or three different forms of flowers that are different

in their length of stamens and style. Pollination will take place only between organs of the same length.

E.g: Primula.

Question 47.

Enumerate the characteristic features of Entomophilous flowers.

Answer:

- Generally large. It is small aggregated in the inflorescence. ex: Asteraceae flowers.
- Brightly coloured to attract insects.
ex: poinsettia and Bougainvillea the bracts become coloured.
- Scented with nectar.
- Pollen and nectar are floral rewards. Pollen is used for consumption.
- Foul odour also attracts flies and beetles
- Juicy cells of flowers are pierced and sucked by insects.

Question 48.

Discuss the steps involved in Microsporogenesis.

Answer:

Microsporogenesis: The stages involved in the formation of haploid microspores from diploid microspore mother cell through meiosis is called Microsporogenesis. The primary sporogenous cells directly, or may undergo a few mitotic divisions to form sporogenous tissue. The last generation of sporogenous tissue functions as microspore mother cells.

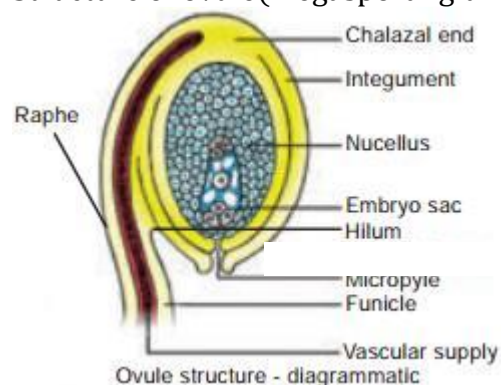
Each microspore mother cell divides meiotically to form a tetrad of four haploid microspores (microspore tetrad). Microspores soon separate from one another and remain free in the anther locule and develop into pollen grains.

Question 49.

With a suitable diagram explain the structure of an ovule.

Answer:

Structure of ovule(Megasporangium):



Ovule is also called megasporangium and is protected by one or two covering called

integuments. A mature ovule consists of a Raphe stalk and a body. The stalk or the funiculus (also called funicle) is present at the base and it attaches the ovule to the placenta. The point of attachment of funicle to the body of the ovule is known as hilum. It represents the junction ovule and funicle. In an inverted ovule, the funicle is adnate to the body of the ovule forming a ridge called raphe. The body of the ovule is made up of a central mass of parenchymatous tissue called nucellus which has large reserve food materials. The nucellus is enveloped by one or two protective coverings called integuments. Integument encloses the nucellus completely except at the top where it is free and forms a pore called micropyle.

The ovule with one or two integuments are said to be unitegmic or bitegmic ovules respectively. The basal region of the body of the ovule where the nucellus, the integument and the funicle meet or merge is called chalaza. There is a large, oval, sac-like structure in the nucellus toward the micropylar end called embryo sac or female gametophyte. It develops from the functional megaspore formed within the nucellus. In some species (unitegmic tenuinucellate) 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).

Question 50.

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

Answer:

Steps involved in fertilization of angiosperms plant:

1. Germination of pollen grain on stigma.
2. Formation of pollen tube in stigma.
3. Growth of pollen tube inside the style.
4. Direction of pollen tube towards the micropyle of ovule.
5. Entry of pollen tube into the synergid of embryo sac.
6. Discharge of male gametes from the pollen tube.
7. Fusion of male gamete with egg cell (syngamy)
8. Fusion of second male gamete with polar nuclei (triple fusion/double

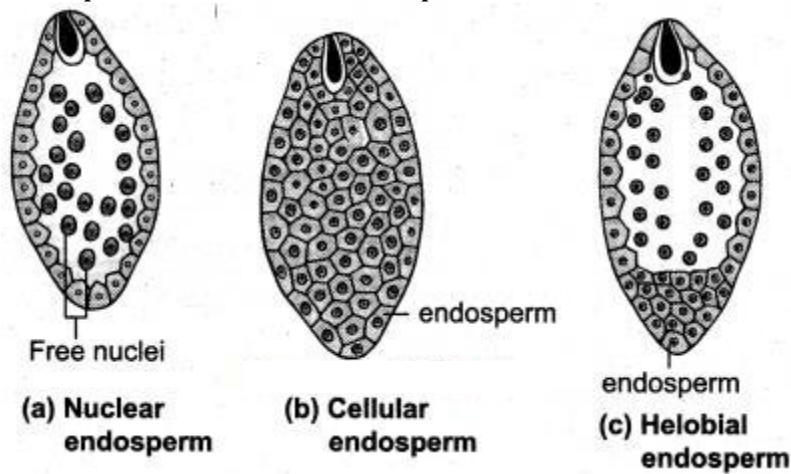
Question 51.

What is endosperm? Explain the types.

Answer:

1. Endosperm: The primary endosperm nucleus (PEN) divides immediately after fertilization but before the zygote starts to divide, into an endosperm. The primary endosperm nucleus is the result of triple fusion (two polar nuclei and one sperm nucleus) and thus has $3n$ number of chromosomes. It is a nutritive tissue and regulatory structure that nourishes the developing embryo. Depending upon the mode of development three types of endosperm are recognized in angiosperms. They are nuclear endosperm, cellular

endosperm and helobial endosperm.



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

3. Cellular endosperm: Primary endosperm nucleus divides into 2 nuclei and it is immediately followed by wall formation. Subsequent divisions also follow cell wall formation. Examples: *Adoxa*, *Helianthus* and *Scoparia*.

4. Helobial endosperm: Primary Endosperm Nucleus moves towards base of embryo sac and divides into two nuclei. Cell wall formation takes place leading to the formation of a large micropylar and small chalazal chamber. The nucleus of the micropylar chamber undergoes several free nuclear division whereas that of chalazal chamber may or may not divide. Examples : *Hydrilla* and *Vallisneria*.

5. Ruminant endosperm: The endosperm with irregularity and unevenness in its surface forms ruminant endosperm. Examples : *Areca catechu*, *Passiflora* and *Myristica*

Question 52.

Differentiate the structure of Dicot and Monocot seed

Answer:

Dicot Seed:

1. Possess two cotyledons
2. Absence of coleoptile and coleorhiza
3. Endosperm is scarce or absent

Monocot Seed:

1. Possess only one cotyledon
2. Presence of coleoptile and coleorrhiza surrounding plumule and radicle respectively.
3. Endosperm from the major storage tissue.

Question 53.

Give a detailed account of parthenocarpy. Add a note on its significance.

Answer:

1. Parthenocarpy

Development of fruit like structures from the ovary without fertilization. These fruits are parthenocarpic fruits. They have no true seeds. Commercially they are seedless fruits.

Genetic Parthenocarpy (Ex. Citrus)

Due to hybridization, Mutation.

Ex: Citrus, Cucurbita

Environmental Parthenocarpy

Environmental condition induces parthenocarpy. Ex) Low temperature for 3-19 hours.

Chemically Induced Parthenocarpy.

Growth promoting Auxins, Gibberellins induce parthenocarpy.

Significance

- Significance of seedless fruits in horticulture.
- Commercial Importance
- To prepare jam, jelly, sauce, fruit drinks.
- A high proportion of edible part due to absence of seed.