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Code No : SG 97

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Preface

• I am convinced that it will not be long before the whole world acknowledges the results of my work. To live without experiencing some shame and blushes of admiration would surely be a wretched life. 9

- Gregor Mendel

Respected Principals, Correspondents, Head Masters / Head Mistresses, Teachers,

From the bottom of our heart, we at SURA Publications sincerely thank you for the support and patronage that you have extended to us for more than a decade.

It is in our sincerest effort we take the pride of releasing **SURA's Bio-Botany and Botany** guide for +2 Standard. Our guide has been authored and edited by qualified teachers having teaching experience for over a decade in their respective subject fields. Our guide has been reviewed by reputed Professors who are currently serving as Head of the Department in esteemed Universities and Colleges.

With due respect to Teachers, I would like to mention that our guide will serve as a teaching companion to qualified teachers. Also, this guide will be an excellent learning companion to students with exhaustive exercises and in-text questions in addition to precise answers for textual questions.

In complete cognizance of the dedicated role of Teachers, I completely believe that our students will learn the subject effectively with this guide and prove their excellence in Board Examinations.

I once again sincerely thank the Teachers, Parents and Students for supporting and valuing our efforts.

God Bless all.

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UNIT VI: Reproduction in Plants



Asexual and Sexual Reproduction in Plants

Chapter Snapshot

- **1.1** Asexual Reproduction
- 1.2 Vegetative Reproduction 1.2.1 Natural methods
 - **1.2.2** Artificial Methods
- **1.3** Sexual Reproduction
- **1.4 Pre-fertilization: Structures and Events**
 - **1.4.1** Male Reproductive part Androecium
 - **1.4.2** Female reproductive part Gynoecium

1.4.3 Pollination

- **1.5** Fertilization
 - **1.5.1** Double fertilization and triple fusion
- **1.6** Post Fertilization: Structure and Events
- 1.7 Apomixis
- **1.8** Polyembryony
- **1.9** Parthenocarpy

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MUST KNOW DEFINITIONS

Polyembryony	:	Occurrence of more than one embryo in a seed.
Amphimixis	:	Method of reproduction which involves fertilization.
Apomixis	:	Method of reproduction which does not involve fertilization.
Endosperm	:	A triploid nutritive tissue that nourishes the developing embryo.
Microsporogenesis	:	Stages involved in formation of haploid microspores from diploid microspore mother cells.
Embryo sac	:	Oval sac-like structure found in the nucellus of the ovule and acts as female gametophyte.
Megasporogenesis	:	The process of development of a megaspore from a megaspore mother cell.
Pollination	:	Transfer of pollen from anther to stigma.
Self pollination	:	Transfer of pollen from anther to stigma of the same flower.
Cross pollination	:	Transfer of pollen from anther of a flower to the stigma of another flower on the same plant or different plant of the same species.
Double fertilization	:	Fusion of one Female Gametes to two Male Gametes.
Triple fusion	:	Fusion of sperm with diploid secondary nucleus to form triploid endosperm nucleus.
Radicle	:	Embryonic root is called radicle.
Plumule	:	Embryonic shoot is called plumule.
Apospory	:	The process of embryo sac formation from diploid cells of nucellus as a result of mitosis.
Budding		A method of asexual reproduction where small outgrowth (Bud) from a parent cell are produced.
Callus	:	Undifferentiated mass of cells obtained through tissue culture.
Clone	:	Genetically identical individuals.
Endothecium	:	A single layer of hygroscopic, radially elongated cells found below the epidermis of anther which helps in dehiscence of anther.
Fertilization	:	The act of fusion of male and female gamete
Grafting	:	Conventional method of reproduction where stock and scion are joined to produce new plant.

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Horticulture	:	Branch of plant science that deals with the art of growing fruits, vegetables, flowers and ornamental plants.
Nucellus	:	The diploid tissue found on the inner part of ovule next to the integuments.
Pollenkitt	:	A sticky covering found on the surface of the pollen that helps to attract insects.
Regeneration	:	Ability of organisms to replace or restore the lost parts.
Sporopollenin	:	Pollen wall material derived from carotenoids and is resistant to physical and biological decomposition.
Tapetum	:	Nutritive tissue for the developing sporogenous tissue.
Transmitting tissue	:	A single layer of glandular canal cells lining the inner part of style.

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TERMINOLOGIES & EXAMPLES

Conidia	:	Aspergillus and		Stolon	:	Mentha and Fragaria
		Penicillium		Offset	:	Pistia and Eicchornia
Budding	:	Yeast and Hydrilla		Sucker	:	Chrysanthemum
Fragmentation	:	Spirogyra		Bulbil		Diascorea and Agave
Gemma	:	Marchantia			-	D 1 11
Regeneration	:	Planaria		Epiphyllous Bud	:	Bryophyllum
Binary Fission	:	Bacteria		Root Cutting	:	Malus
Buds in Roots	:	Murraya, Dalbergia and		Stem Cutting	:	Hibiscus, Bougainvillea
		Millingtonia				and Moringa
Tuberous Roots		Ipomoea batatus and		Leaf Cutting	:	Begonia and Bryophyllum
	ľ	Dahlia		Grafting	:	Citrus, Mango, Apple
Rhizome	:	Musa paradisiaca,		Layering	:	Ixora and Jasminum
		Zingiber officinale and		Pollinium	:	Calotropis
		curcuma longa		Compound Pollen	:	Drosera and Drymis
Corm	:	Amorphophallus and		grain		
		Colocasia	Pollen-10		:	Myosotis
Tuber	:	Solanum tuberosum		micrometer		
Bulb	:	Allium cepa and Lilium		Pollen-200	:	Cucurbitaceae and
Runner	:	Centella asiatica		micrometer		Nyctaginaceae

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Orthotropous	:	Piperaceae and
Ovule		Polygonaceae
Anatropous Ovule	:	Dicot and Monocot
Hemianatropous Ovule	:	Primulaceae
Campylotropous Ovule	:	Leguminosae
Amphitropous Ovule	:	Alismataceae
Circinotropous Ovule	:	Cactaceae
Monosporic megaspore	:	Polygonum
Bisporic Megaspore	:	Allium
Tetrasporic Megaspore	:	Peperomia
Cleistogamous flowers	:	<i>Commelina, Viola</i> and <i>Oxalis</i>
Homogamy	:	Mirabilis jalaba, Catharanthus roseus
Monoecious flower	:	Coconut and Bitter gourd
Dioecious flower	:	Borassus and Carica
		рарауа
Protandry	:	papaya Helianthus and Clerodendrum
Protandry Protogyny	:	papaya Helianthus and Clerodendrum Scrophularia nodosa and Aristolochia bracteata
Protandry Protogyny Distyly	:	papaya Helianthus and Clerodendrum Scrophularia nodosa and Aristolochia bracteata Primula
Protandry Protogyny Distyly Tristyly	:	papaya Helianthus and Clerodendrum Scrophularia nodosa and Aristolochia bracteata Primula Lythrum
Protandry Protogyny Distyly Tristyly Self sterility	:	papayaHelianthus and ClerodendrumScrophularia nodosa and Aristolochia bracteataPrimulaLythrumAbutilon and Passiflora
Protandry Protogyny Distyly Tristyly Self sterility Anemophily	· · · · · · · · · · · · · · · · · · ·	papayaHelianthus and ClerodendrumScrophularia nodosa and Aristolochia bracteataPrimulaLythrumAbutilon and PassifloraGrasses, Sugarcane, Bamboo, Coconut, Palm and Maize

:	Vallisneria spiralis and Elodea
:	Zostera marina, Ceratophyllum
:	Erythrina, Bombax, Syzygium, Bignonia and Strelitzia
:	Jack fruit
:	Myristica and Pithecellobium
:	Coccinia, Capsella and Arachis
:	Adoxa, Helianthus and Scoparia
:	Hydrilla and Vallisneria
:	Myristica
:	Wheat, Maize, Barley and Sunflower
:	Bean, Mango, and Cucurbits.
:	Fritillaria imperialis
:	Citrus and Mangifera
:	<i>Eupatorium</i> and <i>Aerva</i>
:	Hieracium and Parthenium
:	Banana, Grapes and Papaya
:	Citrus and cucurbita
:	Pear

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EVALUATION

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 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. [Ans. (d) Yeast reproduce by budding] 	 7. Arrange the layers of anther wall from locus to periphery [QY -'24] (a) Epidermis, middle layers, tapetum, endothecium. (b) Tapetum, middle layers, epidermis, endothecium. (c) Endothecium, epidermis, middle layers, tapetum. (d) Tapetum, middle layers, endothecium, epidermis. [Ans. (d) Tapetum, middle layer, endothecium, epidermis]
 An eminent Indian embryologist is (a) S.R. Kashyap (b) P. Maheswari (c) M. S. Swaminathan (d) K. C. Mehta [Ans. (b) P. Maheshwari] 	 8. Identify the incorrect pair. (a) Sporopollenin – Exine of pollen grain (b) Tapetum – Nutritive tissue for developing microspores.
 3. Identify the correctly matched pair [FRT-'22] (a) Tuber - Allium cepa (b) Sucker - Pistia (c) Rhizome - Musa (d) Stolon - Zingiber [Ans. (c) Rhizome - Musa] 4. Size of pollen grain in Myosotis [Govt.MQP-2019; Aug-2021; HY-'23; Mar. & June-'24; QY-'24] (a) 10 micrometer (b) 20 micrometer (c) 200 micrometer 	 (c) Nucellus – Nutritive tissue for developing embryo. (d) Obturator – directs the pollen tube into micropyle [Ans. (c) Nucellus – Nutritive tissue for developing embryo] 9. Assertion : Sporopollenin preserves pollen in fossil deposits. Reason : Sporopollenin is resistant to physical and biological decomposition. (a) assertion is true; reason is false
 5. First cell of male gametophyte in angiosperm is [Mar-2020; May-'22] (a) Microspore (b) Megaspore (c) Nucleus 	 (b) assertion is false; reason is true (c) Both assertion and reason are not true (d) Both assertion and reason are true [Ans. (d) Both assertion and reason are true]
(d) Primary Endosperm Nucleus	10. Choose the correct statement(s) about tenuinucellate ovule
6. Match the following [HY-23] 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 – i ; IV – ii (c) I – iii ; II – iv ; III – ii ; IV – i (d) I – iii ; II – i ; III – iv ; IV – ii [Ans. (b) I – iii ; II – iv ; III – i ; IV – ii]	 (d) Ovules have fairy large nucellus (c) Sporogenous cell is epidermal (d) Ovules have single layer of nucellus tissue [Ans. (a) Sporogenous cell is hypodermal & (d) Ovules have single layer of nucellus tissue] 11. Which of the following represent megagametophyte? [Mar-'23] (a) Ovule (b) Embryo sac (c) Nucellus (d) Embryo sac]

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- **12.** In *Haplopappus gracilis*, number of chromosomes in [†] cells of nucellus is 4. What will be the chromosome number in primary endosperm cell? [July-'22] (a) 8 (b) 12
 - (c) 6 (d) 2 [Ans. (b) 12]
- **13.** Transmitting tissue is found in
 - (a) Micropylar region of ovule [June-'24]
 - (b) Pollen tube wall
 - (c) Stylar region of gynoecium
 - (d) Integument

[Ans. (c) Stylar region of gynoecium]

(b) radicle

14. The scar left by funiculus in the seed is

- [May-'22; June & QY-'23]
- (a) tegmen (c) epicotyl
 - (d) hilum
 - [Ans. (d) hilum]
- 15. A plant called X possesses small flower with reduced perianth and versatile anther. The probable agent for pollination would be [QY-2019]
 - (a) water (b) air
 - (c) butterflies (d) beetles

[Ans. (b) air]

16. 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 flower.
- (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

[Ans. (b) (ii) and (iv) are correct]

17. Coleorhiza is found in

[July-'22; June & QY-'23 & '24; Mar.-'24] (b) Bean

(d) Tridax

- (a) Paddy (c) Pea

[Ans. (a) Paddy]

18. Parthenocarpic fruits lack [Aug-2021; FRT-'22]

- (a) Endocarp (b) Epicarp [June-'24] (d) Seed
- (c) Mesocarp

[Ans. (d) Seed]

19. In majority of plants, pollen is liberated at

- [June-'23; Mar. & QY-'24] (a) 1 celled stage (b) 2 celled stage
- (c) 3 celled stage
- (d) 4 celled stage

[Ans. (b) 2 celled stage]

20. What is reproduction?

- Ans. (i) Reproduction is a vital process for the existence of a species.
 - It brings suitable changes through variation (ii) in the off springs for their survival on Earth.
 - (iii) Plant reproduction is important for the continuation and existence of all other organisms. Since the latter directly (or) indirectly depend on plants.
- 21. List out two sub-aerial stem modifications with example.
- Ans. (i) Runner – Centella asiatica
 - Sucker Chrvsanthemum (ii)
 - Stolon - Mentha and Fragaria (iii)
 - (iv) offset - Pistia, Eichhornia, etc

22. What is layering?

- Ans. (i) 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 (ii) cut and planted to grow as a new plant. **Example :** *Ixora* and *Jasminum*.
 - (iii) Types: + Mound layering + Air layering

23. What are clones?

Ans. The individuals formed by asexual reproduction are morphologically and genetically identical are called clones.

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

- Ans. (i) Bryophyllum undergoes vegetative reproduction by leaf.
 - In the leaf margins of *Bryophyllum* plant, (ii) there is a special buds (adventious buds) called epiphyllous buds are developed.
 - These buds on leaf margins, detached (iii) from the parent plant and grow into new individual plants.

25. Differentiate Grafting and Layering.

[Mar & HY-'23]

	Grafting	Layering
1.	Two different plants are involved.	Only parent plant is involved.
2.	Parts of two different plants	Stem of the parent
	grow as one plant.	develop roots.

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Ans.

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3.	Plant used for grafting is called scion.	The rooted part is cut and grown as a new plant.
4.	Shows characteristic of scion.	Results in propagation of parent plant.
5.	Eg. Citrus, Mango and Apple.	Eg. <i>Ixora</i> and <i>Jasminum</i> .

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

Ans. Micropropagation is one of the best method for propagating rare and endangered plant.

The regeneration of a whole plant can be done from single cell, tissue or small pieces of vegetative structures through tissue culture is called micropropagation.

It's a best method because,

- Plants with desired characteristics can be (i) multiplied in a short duration.
- Plants produced are genetically identical. (ii)
- (iii) It can be carried out in any season.
- (iv) Plants which do not produce viable seeds and seeds that are difficult to germinate can be propagated by tissue culture.
- Thus this method is ideal to propagate rare (v) and endangered plants,

27. Distinguish Mound layering and Air layering.

Ans.		[QY-'23]
	Mound Layering	Air Layering
1.	Lower branch is bent	The stem is girdled
	to the ground and	at nodal region and
	buried in the soil and	hormones are applied
	tip of the branch is	to this region which
	exposed above the soil.	promotes rooting.
2.	Applicable for plants	Applicable for flexible
	with flexible branches.	and non-flexible
		branches.
3.	A cut is made in	Branches removed
	parent plant so the	from the parent
	buried part grow into	plant and grown in a
	a new plant after root	separate pot or ground
	formation.	after root formation.

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

Ans. Conventional methods:

Methods of conventional propagation are cutting, grafting and layering.

- (a) Cutting:
 - (i) Producing a new plant by cutting the plant parts such as root, stem and leaf from the parent plant.
 - (ii) The cut part is placed in a suitable medium to produce root and grows into a new plant.
 - (iii) Depending upon the part used they are named as
 - * root cutting (Malus),
 - stem cutting (Hibiscus, Bougainvillea and Moringa) and
 - * leaf cutting (Begonia, Bryophyllum).
 - (iv) Stem cutting is widely used for propagation.

(b) Grafting:

- Parts of two different plants are joined (i) and grow as one plant.
- (ii) The plant which is contact with the soil is called **stock** and the plant used for grafting is called **scion**.

Examples: Citrus, Mango and Apple.

(iii) Based on the method of uniting the scion and stock, they are named as bud grafting, approach grafting, tongue grafting, crown grafting and wedge grafting.

(c) Layering:

- (i) The stem of a parent plant is allowed to develop roots while still intact.
- (ii) Developed root is cut and planted to grow as a new plant. Examples: Ixora and Iasminum.

Types: ✦ Mound layering ✦ Air layering

29. What is Cantharophily?

[FRT-'22; Mar; QY-'23 & '24; HY-'23; June-'24]

Ans. The cross pollination of flowers by beetles is called cantharophily. These beetles feed on the pollen or on some juicy tissues of the flowers.

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

Ans. Two types of strategies adopted by bisexual flowers to prevent self-pollination.

(1) Maturation of stamens and stigmas:

Dichogamy: Anthers and stigmas mature at different times in bisexual flowers.

- (i) **Protandry:** Stamens mature earlier than stigmas. **Examples:** *Helianthus* and *Clerodendrum*.
- (ii) **Protogyny:** Stigmas mature earlier than stamens. **Examples:** Scrophularia nodosa and Aristolochia bracteata.

(2) Arrangement of stamens and stigmas:

Herkogamy: Essential organs like stamens and stigmas arranged in a such way that selfpollination becomes impossible.

Example: *Gloriosa superba*: Style is reflexed away from the stamen.

Hibiscus: Stigmas far above the stamen.

31. What is endothelium? [Aug-2021; May-'22]

- Ans. (i) It is otherwise known as integumentary tapetum.
 - (ii) In some species, the inner layer of integument may become specialized to perform nutritive function for the embryosac and is called endothelium.
 Example : Asteraceae.

32. 'The endosperm of angiosperm is different from gymnosperm'. Do you agree. Justify your answer. [Govt.MQP-2019]

Ans. Yes I agree.

	Endosperm of Angiosperm	Endosperm of Gymnosperm
1.	It is formed after	It is formed before
	fertilization.	fertilization.
2.	It is a triploid tissue.	It is a haploid tissue.
3.	The function is	It acts as the female
	to nourish the	gametophyte and later
	developing embryo.	acts as nutritive tissue.

Thus the endosperm tissue is different in Angiosperms and gymnosperm.

33. Define the term Diplospory.

Ans. A diploid embryo sac is formed from megaspore mother cell without a regular meiotic division. It is a type of apomixis.

Example: *Eupatorium* and *Aerva*.

- **34.** What is polyembryony? How it can commercially exploited? [QY-'24]
- *Ans.* Occurrence of more than one embryo in a seed is called polyembryony.

Commercial application:

- (i) The nucellar tissue in *Citrus* are found better clones for Orchards.
- (ii) Embryos from polyembryony are virus free.

Hint: ORCHARDS - A piece of enclosed land planted with fruit trees.

- **35.** Why does the zygote divides only after the division of Primary endosperm cell?
- Ans. (i) Endosperm is responsible for supplying food to the developing Embryo.
 - (ii) After the completion of Primary Endosperm Cell (PEC), there is an abundant availability of food for the developing Embryo.
 - (iii) If the zygote divides first, It cannot receive the required nourishment for cell division.
 - (*iv*) Therefore, division of zygote begins only after the division of Primary Endosperm Cells (PEC).

36. What is Mellitophily? [May-'22; FRT-'22]

- Ans. (i) Pollination of flowers by bees is known as mellitophily.
 - (ii) It is a type of cross-pollination by biotic agencies like bees.

37. 'Endothecium is associated with dehiscence of anther' Justify the statement. [QY-'24]

- *Ans. (i)* **Endothecium** is a single layer of radially elongated cells found below the epidermis.
 - (ii) The inner tangential wall develops bands or thickenings of α cellulose.
 - (iii) The cells along the junction of two sporangia of an anther lobe lacks thickening. This region is called **stomium**.
 - (iv) Stomium along with the hygroscopic nature of endothecium helps in the dehiscence of anther at maturity.

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38. List out the functions of Tapetum.

[FRT-'22 ; May-'22; June-'23]

- Ans. (i) It supplies nutrition to the developing microspores.
 - (ii) It contributes sporopollenin through ubisch bodies pollen wall formation.
 - (iii) The pollenkitt material is contributed by tapetal cells and is later transferred to the pollen surface.
 - (iv) Exine proteins responsible for 'rejection reaction' of the stigma are present in the cavities of the exine. These proteins are derived from tapetal cells.

39. Write short note on Pollenkitt. (OR) What is Pollenkit? [HY-2019; FRT-'22; June-'23&'24]

- *Ans. (i)* It is an oily layer forming a thick viscous coating over pollen surface.
 - (ii) Pollenkitt is contributed by tapetum and coloured Yellow (or) Orange and is Chiefly made of Carotenoids or Flavonoids.
 - (iii) It attracts insects and protects damage from UV radiation.

40. Distinguish Tenuinucellate and Crassinucellate ovules. [QY-'23]

Ans.

Crassinucellate type Tenuinucellate type Ovules with 1. Sporogenous cell is hypodermal with a sub-hypodermal single layer of nucellar sporogenous cell tissue around in the ovule. 2. Ovules have very small Ovules have fairly large nucellus. nucellus.

Note: These two types of ovules are differentiated based on the position of the sporogenous cell.

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

Ans. In gymnosperms, the ovules are exposed and the pollens are deposited directly on it. Hence the pollution is direct in gymnosperm. Whereas in angiosperms it is said to be indirect, as the pollens are deposited on stigma or the pistil.

42. Write short note on Heterostyly.

- **Ans.** It is a contrivance of cross-pollination. 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.
 - (a) Distyly:
 - (i) The plant produces two forms of flowers, Pin or long style, long stigmatic papillae, short stamens and small pollen grains; Thrum-eyed or short style, small stigmatic papillae, long stamens and large pollen grains. Example: Primula.

a) Distyly - Primula

- (ii) The stigma of the Thrum-eyed flowers and the anther of the pin lie in same level to bring out pollination.
- (iii) Similarly the anther of Thrum-eyed and stigma of pin ones is found in same height. This helps in effective pollination.

(b) Tristyly:

(*i*) The plant produces three kinds of flowers, with respect to the length of the style and stamens.

Long style Normal style Short style

b) Tristyly - Lythrum

(ii) Here, the pollen from flowers of one type can pollinate only the other two types but not their own type.Example : Lythrum.

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- **43.** Enumerate the characteristic features of **† 45.** With a suitable diagram explain the structure Entomophilous flowers. [June & HY-'23; Mar-'24]
- Flowers are generally large or if small, they Ans. (i) are aggregated in dense inflorescence. **Examples:** Asteraceae flowers.
 - Flowers are brightly coloured. The adjacent (ii) parts of the flowers may also be brightly coloured to attract insect.

Examples: *Poinsettia* and *Bougainvillea* the bracts become coloured.

- Flowers are scented and produce nectar. (iii)
- (iv) Flowers with no secretion of nectar, the pollen is consumed as food or used in building up of its hive by honey bees. Pollen and Nectar are the floral rewards for the visitors.
- Flowers pollinated by flies and beetles produce (v) foul odour to attract pollinators.
- (vi) In some flowers juicy cells are present which are pierced and the contents are sucked by the insects.

44. Discuss the steps involved in Microsporogenesis.

[Aug-2021; FRT-'22; QY & HY-'23; Mar-'24]

- Ans. Formation of haploid microspores from diploid microspore mother cell through meiosis is called Microsporogenesis.
 - The primary sporogeneous cells directly, or (i) may undergo a few miotic divisions to form sporogenous tissue.
 - The last generation of sporogenous tissue (ii) functions as microspore mother cells.
 - (iii) Each microspore mother cell divides meiotically to form a tetrad of four haploid microspores (microspore tetrad).
 - (iv) Microspores separate from one another and remain free in the anther locule and develop into pollen grains.
 - In some plants, all the microspores in a microsporangium remain held together called pollinium.

Example: *Calotropis*, Compound pollen grains are found in Drosera and Drymis.

of an ovule.

[Govt.MQP-2019; Aug -2021; July-'22; June-'23; QY-'24]

- Ovule is also called megasporangium and Ans. (i) is protected by one or two covering called integuments..
 - A mature ovule consists of a stalk and a body. (ii) Stalk or **funiculus** is present at the base and it attaches the ovule to the placenta.
 - The point of attachment of funicle to the body (iii) of the ovule is known as hilum. It represents the junction between ovule and funicle.
 - In an inverted ovule, the funicle is adnate to (iv) the body of the ovule forming a ridge called raphe.

- Body of the ovule is made up of central mass (v) of parenchymatous tissue called nucellus, has large reserve food materials.
- Nucellus is enveloped by one or two protective (vi) coverings called integuments.
- (vii) Integuments encloses the nucellus completely but forms a pore at the top called **micropyle**.
- (viii) Ovule with one or two integuments are said to be **unitegmic** or **bitegmic** ovules.
- (**i**x) The basal region of the body of the ovule where the nucellus, the integument and the funicle merge is called as chalaza.
- Large, oval, sac-like structure in the nucellus (\mathbf{x}) toward the micropylar end called embryo sac or female gametophyte.
- (xi) It develops from the functional megaspore formed within the nucellus.
- (xii) In some species (unitegmic tenuinucellate), the inner layer of the integument may become specialised to perform the nutritive

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function for the embryo sac and is called as endothelium or integumentary tapetum Example : Asteraceae.

Two types of ovule based on the position of the sporogenous cell.

- (a) Tenuinucellate type:
 - 1. Sporogenous cell is hypodermal with a single layer of nucellar tissue around it.
 - 2. It has very small nucellus.
- (b) Crassinucellate type:
 - 1. Ovules with subhypodermal sporogenous cell.
 - 2. It has fairly large nucellus.
- (xiii) Group of cells found at the base of the ovule between the chalaza and embryo sac is called hypostase.
- (*xiv*) Thick-walled cells found above the micropylar end above the embryo sac is called **epistase**.
- **46.** Give a concise account on steps involved in fertilization of an angiosperm plant.
- *Ans.* The fusion of male and female gamete is called fertilization.

Steps in fertilization:

- (*i*) Germination of pollen to form pollen tube in the stigma.
- (ii) Growth of pollen tube in the style.
- (iii) Direction of pollen tube towards micropyle of ovule.
- (iv) Entry of the pollen tube into embryo sac.
- (v) Discharge of male gametes.
- (vi) Syngamy.
- (vii) Triple fusion.
- (1) Germination of pollen on stigma:
- (i) The events from pollen deposition on the stigma to entry of pollen tube into the ovule is called **pollen-pistil interaction**. This involves recognition of pollen and promotion / inhibition of germination and growth.

- (ii) If the pollen is compatible with the stigma it germinates to form a tube and facilitated by fluid in wet stigma and pellicle in dry stigma. The compatibility depends on recognition-rejection protein reaction between the pollen and stigma surface.
- (iii) All the cytoplasmic contents move to the tip region. The remaining part of the pollen tube is occupied by a vacuole which is cutt off from the tip by callose plug. The extreme tip of pollen tube appears hemispherical and transparent when viewed through the microscope. This is called capblock.
- (2) Growth of pollen tube in the style:
- (i) The growth of the pollen tube depends on the type of style.
- (ii) Styles may be hollow; solid or semi-solid.
- (iii) The style is lined internally by a single layer of glandular cells called **Transmitting tissue** and provides nourishment for the pollen tube and controls the incompatibility reaction between style and pollen tube.
- (3) Entry of pollen tube into the ovule:

There are three types of pollen tube entry into ovule.

- (i) Porogamy
- (ii) Chalazogamy
- (iii) Mesogamy
- (4) Entry of pollen tube into embryo sac:
- (i) Pollen tube enters the embryo sac at the micropylar end.
- (ii) A structure known as the **obturator** guides the pollen tube towards micropyle of the ovule.
- (iii) After entering into the embryo sac, a pore is formed in the pollen tube wall behind the apex.
- (*iv*) The content of the pollen tube (two male gametes, vegetative nucleus and cytoplasm) are discharged into the synergids into which pollen tube enters. The tube nucleus disorganizes.

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(5) Double fertilization and triple fusion:

- (*i*) Both the male gametes are involved in fertilization is called **double fertilization**.
- (ii) One male gametes fuses with the egg nucleus (syngamy) to form **Zygote**.
- (iii) The second male gamete fuses with the polar nuclei (secondary nucleus) to form primary endosperm nucleus (PEN).
- (iv) Fusion of three nuclei is known as triple fusion. This results in formation of endosperm which is the nutritive tissue for the growing embryo.

47. What is Endosperm? Explain the types.

[Sep-2020; Aug-2021; FRT-'22; QY-'23 & '24; HY-'23; June-'24]

Ans. The primary endosperm nucleus (PEN) divides after fertilization 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, 3 types of endosperm are recognized in angiosperms. They are:

(1) Nuclear endosperm:

Primary Endosperm Nucleus undergoes several mitotic divisions without cell wall formation thus a free nuclear condition exists in the endosperm.

Example: Coccinia, Capsella and Arachis.

(2) Cellular endosperm:

Primary Endosperm Nucleus (PEN) divides into 2 nuclei followed by a wall formation. Further divisions are also followed by walls.

Example: Adoxa, Helianthus and Scoparia.

- (3) Helobial endosperm:
- (*i*) Primary Endosperm Nucleus (PEN) moves towards the base of embryo sac and divides into two nuclei.
- (ii) Cell wall formation takes place leading to the formation a large micropylar chamber and a small chalazal chamber.
- (iii) The nucleus of the micropylar chamber undergoes several free nuclear division whereas that of the chalazal chamber may or may not divide.

Example: *Hydrilla* and *Vallisneria*.

Endospermous and Non-endospermous seeds:

- (i) Seeds without endosperms are called nonendospermous or eg- albuminous seeds.Examples: Pea, Groundnut and Beans.
- (ii) Seeds with endosperms are called endospermous or albuminous seeds. Example: Paddy, Coconut and Castor.

(iii) Ruminate endosperm:

The endosperm with irregularity and unevenness in its surface forms ruminate endosperm.

Example: Areca catechu, Passiflora and Myristica.

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48. Differentiate the structure of Dicot and Monocot seed.

Ans.

	Dicot seed	Monocot seed
1.	The seed coat is distinct from the fruit coat or pericarp	The seed coat is fused with the pericarp.
2.	The seed encloses two cotyledons.	The seed encloses only a single cotyledon.
3.	The seed coat is differentiated into outer testa and inner tegmen.	The seed coat is unilayered and is inseparable from the pericarp.
4.	The seeds may or may not possess endosperm. They are known respectively as the endospermic or non-endospermic seeds.	Most of the monocot members possess endospermic seeds.
5.	The two cotyledons enclose the embryonic axis in between them.	The embryo is found in the cotyledon.
6.	In the endospermic seed, the endosperm encloses the embryo.	The endosperm is found above the embryo. The endosperm and the embryo are separated by the epithelium.
7.	The embryonic root and shoot are not covered by sheaths.	The radicle is protected by a sheath called coleorhiza and plumule is protected by coleoptile.

49. Give a detailed account on parthenocarpy. Add a note on its significance. [Aug-2021; FRT, May & July-'22]

Ans. Parthenocarpy:

- (*i*) Fruit like structures may develop from the ovary without the act of fertilization. Such fruits are called **parthenocarpic fruits**.
- (ii) Many commercial fruits are made seedless. Examples: Banana, Grapes and Papaya.

Significance:

- (i) Have great significance in horticulture.
- (ii) Have great commercial importance.
- (iii) Used for the preparation of jams, jellies, sauces, fruit drinks etc.
- (iv) High proportion of edible part is available due to the absence of seeds.

[June-'23]

[June & QY-'24]

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Botany Long Version Questions (for pure science Group)

LONG VERSION EVALUATION

Q.No. 1 to 10 Refer Evaluation.

11. The correct order of haploid, diploid and triploid structure is fertilized embryosac is (a) Synergid, zygote and PEN (b) Synergid, antipodal and polar nuclei (c) Antipodal, synergid and PEN (d) Synergid, polar nuclei and zygote [Ans. (a) Synergid, zygote and PEN] **12.** Refer Evaluation Q.No. 11 **13.** Refer Evaluation Q.No. 12 14. Refer Evaluation Q.No. 13 **15.** Refer Evaluation Q.No. 14 16. Refer Evaluation Q.No. 15 17. Refer Evaluation Q.No. 16 **18.** Ruminate endosperm is found in [Mar-'23] (a) Cocos (b) Areca (c) Vallisneria (d) Arachis [Ans. (b) Areca] **19.** Refer Evaluation Q.No.17 **20.** Caruncle develops from (b) nucellus (a) funicle (d) embryo sac (c) integument [Ans. (c) integument] 21. Refer Evaluation Q.No. 18 22. Refer Evaluation Q.No. 19 23. Refer Evaluation Q.No. 20 24. Refer Evaluation Q.No. 21 **25.** Refer Evaluation Q.No. 22 **26.** Refer Evaluation Q.No. 23 27. How do Dioscorea reproduce vegetatively?

. [Mar-'24]

Ans. Dioscorea reproduces vegetatively by means of bulbils.

- **28.** Refer Evaluation Q.No. **24**
- **29**. Refer Evaluation Q.No. 25

30. Write short notes on approach grafting.

- Ans. (i) Both the scion and stock remain rooted.
 - (ii) Stock is grown in a pot and brought close to the scion.
 - (iii) Both of them should have the same thickness.

Approach grafting

- (iv) A small slice is cut from grafting both and the cut surfaces are brought near and tied together and held by a tape.
- (v) 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.
- **31.** Refer Evaluation Q.No. 26
- 32. Refer Evaluation Q.No. 27
- **33.** List down the advantages of conventional methods.
- Ans. Advantages of conventional methods
 - (i) Plants produced are genetically uniform.
 - (ii) Many plants can be produced quickly.
 - (iii) Some plants produce little or no seeds; in others, the seeds produced do not germinate. In such cases, plants can be produced in a short period by this method.
 - *(iv)* Some plants can be propagated more economically by vegetative propagation.

Example: Solanum tuberosum.

(v) Two different plants with desirable characters such as disease resistant and high yield can be grafted and grown as a new plant with the same desirable characters.

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34. Refer Evaluation Q.No. 28

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35. Differentiate secretory and invasive tapetum. **† 49.** Refer Evaluation Q.No. 39

[Aug-2021; June-'23; QY-''24]

A	ns.		
		Secretory tapetum (parietal/glandular/ cellular)	Invasive tapetum (periplasmodial)
	1.	The tapetum retains the original position and cellular integrity	The cells loose their inner tangential and radial walls.
	2.	It nourishes the developing microspores.	The protoplast of all tapetal cells coalesces to form a periplasmodium.

36. Refer Evaluation Q.No. 29

- **37.** Refer Evaluation Q.No. 30
- **38.** Refer Evaluation Q.No. 31
- **39.** Name the cell which divides to form male nuclei.
- Ans. Generative cells of Microspore.
- 40. Refer Evaluation Q.No. 32
- 41. Refer Evaluation Q.No. 33
- 42. Refer Evaluation Q.No. 34
- 43. Do you think parthenocarpy and apomixis are different process. Justify?
- Ans. Yes. Parthenocarpy and apomixis are different processes.

	Parthenocarpy	Apomixis
1.	Formation of fruit	Method of
	from the ovary	reproduction which
	fertilization. Eg: Banana, Grapes.	union of male and female gemetes.
2.	They do not have true seeds.	Formation of seeds without fertilization.
3.	High proportion of edible part due to absence of seeds.	Megaspore mother cell does not undergo mieosis or cell from
		the nucellus develops into the embryo. Eg: Parthenium

- 44. Refer Evaluation Q.No. 35
- 45. Refer Evaluation Q.No. 36
- **46.** Give examples for Helobial endosperm.
- Ans. Hydrilla and Vallisneria.

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- 47. Refer Evaluation Q.No. 37
- 48. Refer Evaluation Q.No. 38

- 50. Refer Evaluation Q.No. 40
- **51.** Give short notes on types of ovules.
- Ans. Types of Ovules: [Mar-2020; FRT-'22; QY-'23] Ovules are classified into six main types based on the orientation, form and position of the micropyle with respect to funicle and chalaza.

(d) Campylotropous

(f) Circinotropous

- (a) **Orthotropous:**
- Micropyle is at the distal end. (i)
- The Micropyle, the funicle and the chalaza (ii) lie in one straight vertical line. **Example:** Piperaceae

(e) Amphitropous

(b) Anatropous:

Body of the ovule inverted so that the micropyle and funiculus come to lie very close to each other.

Eg: Dicots and monocots.

- (c) Hemianatropous:
- Body is transverse. (i)
- (ii) It is right angles to the funicle. **Example:** Primulaceae.
- **Campylotropous:** (**d**)
- Body is curved at micropylar end (i)
- More or less bean shaped. (ii)
- (iii) Embryo sac is slightly curved.
- All the three, hilum, micropyle and chalaza (iv) are adjacent to one another, with the micropyle oriented towards the placenta. **Example:** Leguminosae.

There are two more types of ovules they are:

- **Amphitropous:** (e)
- The distance between hilum and chalaza is (i) less.

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- The curvature of the ovule leads to horse- **59**. Refer Evaluation Q.No. 47 (ii) shoe shaped nucellus.
 - **Example:** some Alismataceae.
- **Circinotropous:** Funiculus is very long and (f) surrounds the ovule. **Example:** Cactaceae.
- 52. Refer Evaluation Q.No. 41
- 53. Refer Evaluation Q.No. 42
- 54. Refer Evaluation Q.No. 43
- **55**. Explain the pollination mechanism in *Salvia*.

Ans. Pollination in Salvia (Lever mechanism):

- Salvia is adapted for Bee pollination. (i)
- The flower is protandrous and the corolla is (ii) bilabiate with 2 stamens.
- A lever mechanism helps in pollination. (iii)
- (iv) Each anther has an upper fertile lobe and lower sterile lobe separated by a long connective which helps the anthers to swing freely.
- When a bee visits a flower, it sits on the lower (v) lip which acts as a platform.
- It enters the flower to suck the nectar by (vi) pushing its head into the corolla.
- (vii) During the entry of the bee into the flower the body strikes against the sterile end of the connective.

Pollination in Salvia - Lever mechanism

- (viii) The fertile part of the stamen to descend and strike at the back of the bee.
- (ix) The pollen gets deposited on the back of the bee. When it visits another flower, the pollen gets rubbed on stigma and completes the pollination in Salvia.
- 56. Refer Evaluation Q.No. 44
- **57.** Refer Evaluation Q.No. 45
- 58. Refer Evaluation Q.No. 46

- **60.** Explain the development of a Dicot embryo.

Ans. Development of Dicot embryo:

Development of Dicot embryo (Capsella bursapastoris) is of Onagrad or crucifer type. The embryo develops at micropylar end of embryo sac.

- (i) The Zygote divides into upper or terminal cell and lower or basal cell.
- The basal cell divides transversely and the (ii) terminal cell divides vertically to form a 4 celled proembryo.
- (iii) A second vertical division right angle to the first one takes place in terminal cell forming a 4 celled stage called quadrant.
- Transverse division in the quadrant results (iv) in 8 cells arranged in 2 tiers of 4 each called octant stage.
- Upper tier of 4 cells of the octant is called **(v)** epibasal or anterior octant and the lower tier of 4 cells constitute hypobasal or posterior octants.
- A periclinal division in the octants results (vi) in the formation of 16 celled stage with 8 cells in the outer and 8 in the inner.
- (vii) The outer 8 cells represent the dermatogen and undergoes anticlinal division to produce epidermis.
- (viii) The inner 8 cells divide by vertical and transverse division to form outer layer of periblem which give rise to cortex and a central region of pleurome which forms stele. During the development, the 2 cells of the basal cell undergoes several transverse division to form a 6 to 10 celled suspensor.
- The embryo at this stage become globular (ix)and the suspensor helps to push the embryo deep into the endosperm.
- The uppermost cell of the suspensor enlarge (\mathbf{x}) to form a haustorium. The lowermost cell of the suspensor is called hypophysis.
- (xi) A transverse division and two vertical division right angle to each other of hypophysis results in the formation of 8 cells.

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- (xii) The eight cells are arranged in two tiers of 2.
 4 cells each. The upper tier give rise to root cap and epidermis.
- (xiii) At this stage, embryo appears heart shaped, cell divisions in the hypocotyl and cotyledon regions of the embryo results in elongation.
- (xiv) Further development results in curved horse shoe shaped embryo in the embryo sac. The mature embryo has a radicle, hypocotyl, two cotyledons and a plumule.

Development of Dicot embryo (Capsella bursa-pastoris

- 61. Refer Evaluation Q.No. 48
- 62. Refer Evaluation Q.No. 49

PTA Question & Answers

CHOOSE THE CORRECT ANSWERS

18

1 MARK

- 1. Which one of the following is not an advantage of micro propagation? [PTA-1]
 - (a) Plants produced are genetically identical
 - (b) Endangered plants can be propagated
 - (c) Sometimes undesirable genetical changes occur
 - (d) Disease free plants can be produced[Ans. (c) Sometimes undesirable genetical changes occur]

- Which one of the following statements is nottrue regarding sporopollenin?[PTA-2]
 - (a) Sporopollenin is contributed by both pollen cytoplasm and tapetum
 - (b) It helps to withstand high temperature and is resistant to strong aid.
 - (c) Sporopollenin is derived from phycobilins
 - (d) It helps pollen during long period preservation in fossil deposits.

[Ans. (c) Sporopollenin is derived from phycobilins]

- **3**. In a male gametophyte, the chromosomal number of generative nucleus is (<u>A</u>) and tube nucleus is (<u>B</u>). [*PTA-4*]
 - (a) (A) (n) (B) (2n) (b) (A) - (2n) (B) - (n) (c) (A) - (2n) (B) - (2n) (d) (A) - (n) (B) - (n) [Ans. (d) (A) - (n) (B) - (n)]

4. Which one of the following is a dioecious plant? [PTA-5]

- (a) Coconut (b) Bitter gourd
- (c) Pea plant (d) Date palm

- **5.** Eyes of potato are referred to [*PTA-6*]
 - (a) adventitious roots
 - (b) axillary buds
 - (c) terminal buds
 - (d) intercalary buds [Ans. (b) axillary buds]

VERY SHORT ANSWERS

2 MARKS

1. Differentiate bisporic megaspore development from tetrasporic development. [PTA-1]

Ans.

	Bisporic megaspore development	Tetrasporic development
1.	Of the four megaspores formed, two are involved in Embryo sac formation.	All the four megaspores are involved in Embryo sac formation.
2.	Example: Allium.	Example: Peperomia.

[[]Ans. (d) Date palm]

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2. Draw this diagram and label the parts. [PTA-3] ⁶.

- 3. Which method of artificial vegetative reproduction is good in plants? Give reason for your answer. [PTA-4]
- Ans. (i) Different plants can be propagated.
 - (ii) The method used depends on type of plant, response of plant, economic reasons etc.
 - (iii) Therefore no specific method is said to be best. Both conventional and modern methods here advantages and disadvantages. Eg: Cutting, layering grafting etc.

4. Redraw the diagram and label the parts.

Ans.

5.

0

0

[PTA-4]

Basal cell

Terminal cell

2- celled proembryo

Write the practical application of activation of nucellar tissue. [PTA-5]

Ans. Practical applications:

- (i) The seedlings formed from the nucellar tissue in *Citrus* are found better clones for Orchards.
- (ii) Embryos are virus free.

 Write any two difference between male gametophyte and female gametophyte. [PTA-6]
 Ans.

	Male gametophyte	Female gametophyte
1.	Microspore	Megaspore
	produces the male	prouces the female
	gametophyte.	gametophyte.
2.	It produces male	It produces female
	gametes.	gametes.

SHORT ANSWERS

3 MARKS

1. Differentiate heterostyly from herkogamy.

Ans.		[PTA-2]
	Heterostyly	Herkogamy
	Heterostyly 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 langth	In bisexual flowers the essential organs, the stamens and stigmas, are arranged in such a way that self- pollination becomes impossible. Eg: Gloriosa superba, the style is reflexed avery from the stamens
	Eg: Primula.	and in <i>Hibiscus</i> the stigmas project far
		above the stamens.

- 2. How does pollen tube grow through a solid style? [PTA-3]
- Ans. (i) It is common among dicots.
 - (ii) It is characterized by the presence of central core of elongated, highly specialised cells called transmitting tissue.
 - (iii) This is equivalent to the lining cells of hollow style and does the same function.
 - (*iv*) Its contents are also similar to the content of those cells.
 - (v) The pollen tube grows through the intercellular spaces of the transmitting tissue.
- **3**. Grafting is a method of production of hybrid plants but not the method of reproduction. Do you agree this statement? Give logic reason for your answer. [PTA-4]
- *Ans.* No. Grafting is a common method of conventional vegetative propagation.

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- (i) In this, parts of two different plants are joined so that they continue to grow as one plant.
- (ii) 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.
- (iii) 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.
- 4. Write the three fusions of Angiosperms plant fertilization. [PTA-6]
- *Ans. (i)* One of the male gametes fuses with the egg nucleus (syngamy) to form Zygote.
 - (ii) The second gamete migrates to the central cell where it fuses with the polar nuclei or their fusion product.
 - (iii) The secondary nucleus and forms the primary endosperm nucleus (PEN). Since this involves the fusion of three nuclei, this phenomenon is called triple fusion.

LONG ANSWERS

5 MARKS

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- 1. A reproduction without the involvement of male and female gametes is called apomixis. Give an outline of the method. [PTA-2]
- *Ans.* I. Recurrent apomixis: It includes vegetative reproduction and agamospermy
 - **II.** Non recurrent apomixis: Haploid embryo sac developed after meiosis, develops into a embryo without fertilization.

The outline classification of Recurrent apomixis is given below.

(*i*) Vegetative reproduction: Plants propagate by any part other than seeds

Bulbils – *Fritillaria imperialis*; Bulbs – *Allium*; Runner – *Mentha arvensis*; Sucker - *Chrysanthemum*.

- (ii) Agamospermy: It refers to processes by which Embryos are formed by eliminating meiosis and syngamy.
- a) Adventive embryony:
- An Embryo arises directly from the diploid sporophytic cells either from nucellus or integument. It is also called sporophytic budding because gametophytic phase is completely absent. Adventive embryos are found in *Citrus* and *Mangifera*.
- **b) Diplospory:** A diploid embryo sac is formed from megaspore mother cell without a regular meiotic division Examples. *Eupatorium* and *Aerva*.
- c) Apospory: Megaspore mother cell (MMC) undergoes the normal meiosis and four megaspores formed gradually disappear. A nucellar cell becomes activated and develops into a diploid embryo sac. This type of apospory is also called somatic apospory. Examples: *Hieracium* and *Parthenium*.
- 2. Enumerate the characteristic features of anemophilous plants.[PTA-3; FRT & July-'22; Mar-'23; QY-'24]
- **Ans.** Anemophilous plants have the following characteristic features:
 - (i) The flowers are produced in pendulous, catkin-like or spike inflorescence.
 - (ii) The axis of inflorescence elongates so that the flowers are brought well above the leaves.
 - (iii) The perianth is absent or highly reduced.
 - (*iv*) The flowers are small, inconspicuous, colourless, not scented, do not secrete nectar.
 - (v) The stamens are numerous, filaments are long, exerted and versatile.
 - (vi) Anthers produce enormous quantities of pollen grains, which are minute, light and dry so that they can be carried to long distances by wind.
 - (vii) In some plants anthers burst violently and release the pollen into the air. Example: Urtica.
 - (viii) Stigmas are comparatively large, protruding, sometimes branched and feathery, adapted to catch the pollen grains. Generally single ovule is present.
 - (ix) Plant produces flowers before the new leaves appear, so the pollen can be carried without hindrance of leaves.

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3. Describe the structure of dicot seed.

[PTA-5; FRT-'22; QY-'23]

Ans. Cicer seed (example for Dicot seed)

- (*i*) The mature seeds are attached to the fruit wall by a stalk called funiculus.
- (ii) The funiculus disappears leaving a scar called hilum. Below the hilum a small pore called micropyle is present.
- (iii) It facilitates entry of oxygen and water into the seeds during germination. Each seed has a thick outer covering called seed coat.
- (*iv*) The seed coat is developed from integuments of the ovule.
- (v) The outer coat is called testa and is hard whereas the inner coat is thin, membranous and is called tegmen.
- (vi) In Pea plant, the tegmen and testa are fused.
- (vii) Two cotyledons laterally attached to the embryonic axis and stores the food materials in pea whereas in other seeds like castor the endosperm contains reserve food and the cotyledons are thin.

- (viii) The portion of embryonal axis projecting beyond the cotyledons is called radicle or embryonic root. The other end of the axis called embryonic shoot is the plumule.
- (ix) Embryonal axis above the level of cotyledon is called epicotyl whereas the cylindrical region between the level of cotyledon is called hypocotyl.

4. Summarise the whole life cycle of an Angiosperm plant in the form of schematic diagram. [PTA-6]

Ans. Flower Microspore mother cell Anther Megáspore Megaspore Pollen (n) mother cell (n) Sporophyte (2n) Embyo sac Egg (n) Male gametes (n) Embryo (2n) Endosperm Endosperm nucleus (3n) (3n) Syngamy Zygote Double fertilization (2n)

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GOVERNMENT EXAM QUESTIONS

Bio-Botany (Short version)

Сн	OOSE -	the C orr	ECT AN	SWERS		1 MARK		
1.	Mato	ch the follo	owing			[QY-2019]		
		Co	lumn-A			Column - B		
	i	Syngenes	ious		Α	Pollen grain		
	ii	Androeci	um		В	Anther wall		
	iii	Male gam	etophyte	e	С	Asteraceae	3.	D
	iv	Primary	Parietal	Layer	D	Stamens		eı
	i	ii	iii	iv			Ans	•
	(a) I	D A	В	С				
	(b) (C D	А	В				
	(c) (C D	В	А				
	(d) (C A	D	B	···			
			Ans.	(b) 1-0	J, 11-	-D, 111-A, 1V-B]		
2.	Iden	tify the ty	pe of en	nbryo	state	$e \longrightarrow $		
	(a) Zygote				[HY-	2019]	SHO	PT
	(b) (Globular e	mbryo					
	(c) 1	Mature em	bryo			(\circ)		D
	(d) 4	t celled em	bryo [A	ns. (b)	Glo	bular embryo]	Ans	•
3 .	Circi	inotropou	s ovule	is four	nd iı	n the family :		
	() T	1		(1.)	A 19	[FRT-'22]		
	(a) \mathbf{f}	Primulacea	ie	(D) (d)		Ismataceae		
	(c)	Jactaceae		(a) [A	ns	(c) Cactaceae		
4.	An e	xample fo	r Dioec	ious p	lant	: [FRT-'22]		
	(a) (Carica (b) Casto	or (c)	Ma	aize		
	(d) (Coconut			[A1	ns. (a) Carica]	2.	W
5 .	Shie	ld shaped	cotyled	on fou	ind	in the embryo		p
	of O	ryza seed	is know	n as	0	[QY-'23]	Ans	. P
	(a) ł	2pithelium		(b)	Sci	utellum		(i)
	(c) (Joleoptile		(a)		(b) Scutollum		
6.	Presi	istent nuce	llus in f	م he see	ns. 1 is 1	known as		
	(a) H	Hilum	1145 111 0	(b)	Tes	gman		(ii
	(c) (Chalaza		(d)	Pei	risperm		
				[A 1	ns. ((d) Perisperm]		(ii
VE	RY SHO	ort A nsw	'ERS			2 MARKS		
1	TATI		2					
1.	Wha	t is stomi	um?	alarra	· ام -	[Mar-'23]	3.	W
Ans	. (1)	in a anthe	er, cells	along	tne j	junction of the	Ans	. A

two sporangia of an anther lobe lack these

- (ii) This region is called stomium and helps in dehiscence of anther at maturity.
- **2.** Draw and label the structure of Embryo sac.

B. Draw and label the structure of Dicot mature embryo. [HY-'23]

SHORT ANSWERS

Draw and label the T.S. of mature anther.

[QY-2019 & '24; Mar-2020; Aug-2021] Connective tissue Epidermis Endothecium Middle layer Tapetum Stomium Pollen grain

2. Write any three practical applications of polyembryony. [Sep-2020]

Ans. Practical applications of polyembryony :

- (*i*) The seedlings formed from the nucellar tissue in *Citrus* are found better clones for Orchards.
- (ii) Embryos derived through polyembryony are found virus free.
- (iii) Polyembryony has ecological significance as it increases the probability of survival under different conditions.

3. What is apomixis?

[FRT-'22]

3 MARKS

Ans. Apomixis : Reproduction does not involve union of male and female gametes is called apomixis. The term Apomixis was introduced

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thickenings.

2.

4.

6.

8.

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by Winkler in the year 1908. It is defined as the substitution of the usual sexual system (Amphimixis) by a form of reproduction which does not involve meiosis and syngamy.

Maheswari (1950) classified Apomixis into two types - Recurrent and Non recurrent

- **Recurrent apomixis:** It includes vegetative (i) reproduction and agamospermy
- Non recurrent apomixis: Haploid embryo (ii) sac developed after meiosis, develops into a embryo without fertilization.
- Draw and label the parts of Ovule. 4.

5. Draw and explain Hemianatropous Ovule with an example. [July-'22]

Ans.

Ans.

Heminanatropous

In this, the body of the Ovule is placed transversely and at right angles to the funicle.

LONG ANSWERS

5 MARKS

- Explain the different mode of entry of pollen 1. tube into the ovule. [Mar-2020]
- Ans. Entry of pollen tube into the ovule: There are three types of pollen tube entry into the ovule.

- (a) Porogamy: when the pollen tube enters through the micropyle.
- Chalazogamy: when the pollen tube enters **(b)** through the chalaza.
- Mesogamy: when the pollen tube enters (**c**) through the integument.

Botany (Long version)

CHOOSE THE CORRECT ANSWERS

- 1. From the following which one is the column of sterile tissue surrounded by the anther lobe :
 - [Mar-2020] (b) pollen chamber (a) periplasmodium (c) connective tissue (d) tapetum [Ans. (c) connective tissue] **Cantharophily is :** [Sep-2020] (a) Bees (b) Butterflies (c) Flies (d) Beetles [Ans. (d) Beetles]
- 3. is popularly called "Terror of Bengal" [FRT-'22] (a) Murraya (b) Dalbergia
 - (c) Eichhornia crassipes (d) Pistia

[Ans. (c) Eichhorina crassipes]

Vegetative reproduction by root is found in [FRT-'22]

- (a) Bryophyllum (b) Curcuma longa
 - (d) Murraya

[Ans. (d) Murraya]

1 MARK

5. The size of the pollen in "Myosotis" is [FRT-'22]

- (a) From 10 micrometers to 100 micrometers
- (b) From 10 micrometers to 50 micrometers
- (c) From 10 micrometers to 300 micrometers
- (d) From 10 micrometers to 200 micrometers

[Ans. (d) From 10 micrometers to 200 micrometers]

- is an example for pollinium. [FRT-'22]
 - (a) Drosera (b) Calotropis
 - (d) Sporopollenin
 - [Ans. (b) Calotropis]

7. An example for cellular endosperm [FRT-'22]

(a) Valisneria

(c) Drymis

(c) Mentha

- (b) Arachis (c) Helianthus
 - (d) Hydrilla

[Ans. (c) Helianthus]

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- Choose the correct pair: [FRT-'22] (b) Ovule - Zygote
- (a) Ovary Seed
- (c) Egg Fruit
- (d) Nucellus Perisperm

[Ans. (d) Nucleus - Perisperm]

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9.	The appropriate cyopreservation:	temperature used for [[[ulv-'22]	Sно	RT ANSWERS	3 Marks	
10.	 (a) 196°C (c) 100°C Which one of the ffemale gametophyt (a) Microspore 	(b) - 196°C (d) - 100°C [Ans. (b) - 196°C] following is the first cell of e? [Mar-'23]	1. Ans.	Define epiphyllous bud Adventious buds deve Bryophyllum are called develop into new plant and become indepen- leaf gets decayed. It is reproduction.	d. [Sep-2020] elop at the notches of epiphyllous buds. They s forming a root system dent plants when the a method of vegetative	
11.	 (b) Primary endosp (c) Nucleus (d) Functional meg [Ans. The extreme tip o hemispherical and (a) Synergid 	erm Nucleus aspore (b) Functional megaspore] f the pollen tube appears transparent, is called as : (b) Obturator <i>108</i> .'231	 What is meant by polyembryony? [FRT Ans. Occurrence of more than one embryo in seed is called polyembryony. The first case polyembryony was reported in certain oran by Anton von Leeuwenhoek in the year 17 Polyembryony is divided into four catego 			
	(c) Cap block	(d) Microspore [Ans. (c) Cap block]	3.	Draw and label the stru	uture of Embryo sac.	
VER	Y SHORT ANSWERS	2 MARKS		* Refer Short version	on Government Exam	
1.	What is called Part example.	henocarpic fruits? Give an [Mar-2020]	Questions - 2 Marks - Q.No.1 4. Draw and label the parts of Ovule.			
Ans.	 (i) Fruit like struct without the ac are called part (ii) They will not h (iii) Example of con 	tures develop from the ovary t of fertilization. Such fruits henocarpic fruits . ave true seeds mmercial seedless fruits are	5.	* Refer Short version Questions - 3 Marks Draw and label the pa embryo sac.	[FRT-'22; Mar-'23] n Government Exam - Q.No.4 arts of polyembryony – [QY-'23]	
2 .	Banana, Grape Write the types of c sporogenous cell.	s and Papaya. ell based on the position of [Sep-2020] type	A113.		Zygotic embryo	
A 11 5 .	(ii) Crassinucellate	e type.			🞐 Endosperm	
 3. Tapetum is dual in origin. Justify. [QY-'23] Ans. It is derived partly from the peripheral wall layer and partly from the connective tissue of the anther lining the anther locule. Thus, the tapetum is dual in origin 				Polyembryony of Ulmus	Antipodal embryo y – Embryo sac glabra	
4.	Draw and label the	parts of cut opened dicot	LON		5 MARKS	
Ans.	seed.	[Mar- '24]	1. Ans.	What is tapetum? Write Tapetum: It is the inner and attains its maximu tetrad stage of microsp partly from the periphe from the connective tis the anther locule Thus, origin.	e its types and function. [May-'22] most layer of anther wall um development at the orogenesis. It is derived eral wall layer and partly usue of the anther lining the tapetum is dual in	

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There are two types of tapetum based on its behaviour. They are:

- (i) Secretory tapetum (parietal / glandular/ cellular): The tapetum retains the original position and cellular integrity and nourishes the developing microspores.
- *(ii)* **Invasive tapetum** (periplasmodial): The cells loose their inner tangential and radial walls and the protoplast of all tapetal cells coalesces to form a periplasmodium.

Functions of Tapetum :

- (i) It supplies nutrition to the developing microspores.
- (ii) The pollenkitt material is contributed by tapetal cells and is later transferred to the pollen surface.
- (iii) It contributes sporopollenin through ubisch bodies pollen wall formation.
- (iv) Exine proteins responsible for 'rejection reaction' of the stigma are present in the cavities of the exine. These proteins are derived from tapetal cells.

2. Explain T.S. of Mature Anther. Ans. T.S. of Mature Anther :

Transverse section of mature anther reveals the presence of anther cavity surrounded by an anther wall. It is bilobed, each lobe having 2 theca (dithecous).

1. Anther wall :

The mature anther wall consists of the following layers

- a. Epidermis b. Endothecium
- c. Middle layers d. Tapetum.
- **a. Epidermis:** It is single layered and protective in function. The cells undergo repeated anticlinal divisions to cope up with the rapidly enlarging internal tissues.

b. Endothecium:

- (i) It is generally a single layer of radially elongated cells found below the epidermis. The inner tangential wall develops bands (sometimes radial walls also) of α cellulose (sometimes also slightly lignified). The cells are hygroscopic.
- (ii) The cells along the junction of the two sporangia of an anther lobe lack these thickenings. This region is called stomium.
- **Middle layers:** Two to three layers of cells next to endothecium constitute middle layers. They are generally ephemeral. They disintegrate or get crushed during maturity.

d. Tapetum:

[FRT-'22]

- (i) It is the innermost layer of anther wall and attains its maximum development at the tetrad stage of microsporogenesis. It is derived partly from the peripheral wall layer and partly from the connective tissue of the anther lining the anther locule.
- (ii) Tapetum also controls the fertility or sterility of the microspores or pollen grains.
- 2. Anther Cavity: The anther cavity is filled with microspores in young stages or with pollen grains at maturity. The meiotic division of microspore mother cells gives rise to microspores which are haploid in nature.
- **3. Connective tissue:** It is the column of sterile tissue surrounded by the anther lobe. It possesses vascular tissues. It also contributes to the inner tapetum.

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www.surabooks.com 🖞 Sura's 🛶 XII Std - Bio-Botany & Botany 🛶 Unit VI **ADDITIONAL QUESTIONS AND ANSWERS** CHOOSE THE CORRECT ANSWERS 1 MARK 9. An example of protandry is _ (a) Helianthus and Borassus I. CHOOSE THE CORRECT ANSWER: (b) Helianthus and Clerodendron (c) Scrophularia and Aristolochia 1. Pollen tube was discovered by (d) Scrophularia and Aristolochia (a) J. G. Kolreuter (b) G. B. Amici [Ans. (b) Helianthus and Clerodendron] (c) E. Strasburger (d) E. Hanning 10. Pollen deposits on another flower of same [Ans. (b) G. B. Amici] individual plant is called 2. PEN is referred as (b) Xenogamy (a) Geitonogamy (a) Primary Endo Nutritive tissue. (c) Homogamy (b) Primary Endosperm Nucleus. (d) Cleistogamy [Ans. (a) Geitonogamy] (c) Primary Entry of Nucleus. (d) Post Entry of Nucleus. **11.** Find out the character which is not suitable for anemophilous plants. [Ans. (b) Primary Endosperm Nucleus] (a) Spike infloresence (b) Perianth is absent 3. How do you call the fertilized ovule? (c) Flowers are small (a) Embryo (b) Seed (d) Scented flowers [Ans. (d) Scented flowers] (d) Nutritive tissue (c) Endosperm **12.** Pollination by slugs and snails is called _____. [Ans. (b) Seed] (a) Ornithophily (b) Entomophily 4. Who initiated embryo culture? (c) Malacophily (d) Myrmecophily (a) D. A. Johansen (b) E. Hanning [Ans. (c) Malacophily] (c) G. B. Amici (d) J. G. Kolrecuter [Ans. (b) E. Hanning] **13.** Who classified parthenocarpy? **5**. Who discovered the pollen tube? (a) Nitsch, 1963 (b) Maheswari, 1950 (b) E. Strasburger (a) G. B. Amici (c) Winkler, 1908 (d) Guignard, 1898 (c) Hanstein (d) D. A. Johansen [Ans. (a) Nitsch, 1963] 14. The funiculus disappears and leaves a scar [Ans. (a) G. B. Amici] called ___ Sexual reproduction of higher plants include 6. (a) Micropyle (b) Tegmen stages. (c) Testa (d) Hilum (a) 2 (b) 4 (c) 3 (d) 5 [Ans. (d) Hilum] [Ans. (c) 3] **15.** Who proposed double fertilization? 7. Androecium is made up of (a) S. G. Nawaschin and L. Guignard in 1898. (a) Megasporphyll (b) Pistil (b) Carolus Linnaeus in 1753 (c) Sepals (d) Stamens (c) Bentham & Hooker in 1895 [Ans. (d) Stamens] (d) Engler & Prantl in 1859 8. New plants formed by asexual reproduction [Ans. (a) S. G. Nawaschin and L. Guignard method are morphologically and genetically in 1898] uniform and called as ____ **16.** Megaspore arises from _ (a) spores (b) buds (a) Integument (b) Nucellus (c) clones (d) gemma (c) Placenta (d) Raphe

[Ans. (c) Clones]

[Ans. (c) Placenta]

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17.	An example for herk	ogamy.	† 27 .		is an exa	mple for	sucker.
	(a) Aristolochia (b) Gloriosa				Dioscorea	((b) Chrysanthemum
	(c) primula	(d) Lythrum		(c)	Bryophyllum		
		[Ans. (b) Gloriosa]		(d)	Murraya	[Ans. (b) Chrysanthemum
18 .	Pollination by an ant	is called	28.	Tu	nicated bulb is	seen is _	
	(a) Malacophily	(b) Entomophily		(a)	Scilla	((b) Solanum
	(c) Myrmecophily			(c)	Allium	((d) Zingiber
	(d) Chiropterophily.	[Ans. (c) Myrmecophily]		-			[Ans. (c) Allium]
19.	Piston mechanism o	f pollination is found in	29.	Lay	vering is in	•	
	•			(a)	Hibiscus (D) F	Kose ((c) Jasminum
	(a) Aristolochia	(b) Arum		(u)	Curus		[Ans. (c) Jusminum
	(c) Asclepiadaceae	(d) Papilionaceae	II.	MA	TCH THE FOL	LOWIN	G :
		[Ans. (d) Papilionaceae]					
20.	Apospory is seen in _	· · · ·	1.	Α	Gemma	(i)	Hydra
	(a) Citrus	(b) Aerva		В	Budding	(ii)	Aspergillus
	(c) Parthenium	(d) Eupatorium		С	Conidia	(iii)	Marchantia
		[Ans. (c) Parthenium]		D	Binary fission	n (iv)	Bacteria
21.	Vallisneria Spiralis is				A B C	D	
	(a) Polygamous	(b) Monoecious		(a)	iii i ii	iv	
	(c) Dioecious	(d) trisexual		(b)	ii i ii	i iv	
		[Ans. (c) Dioecious]		(c) (d)	111 11 1V	7 1 ivr	
22.	In <i>Adansonia</i> digitata by .	a, Pollination is carried out		(u)	[<i>Ans.</i> (a) A – iii	i, B – i, C – ii, D – iv
	(a) Ant (b) Bat	(c) Water	9	Δ	Darietal	(i)	Dollan wall
	(d) Wind	[Ans. (b) Bat]	2.	А	tapetum	(1)	formation
23 .	The second gamete n	nigrates to the central cell		В	Periplasmodi	al (ii)	Secretory
	and fuses with the				tapetum		tapetum
	(a) polar nuclei	(b) zygote		С	Ubisch bodie	s (iii)	Exine proteins
	(c) obturator	(d) corpusculum		D	Rejection	(iv)	Invasive tapetum
94		[Ans. (a) polar nuclei]			reaction		-
24.	(a) closed style	(b) solid style			A B C	D D	
	(c) open style	(d) semi-solid style		(a)	i ii ii	i iv	
	(c) open style	[Ans. (c) open style]		(b)	ii i ii	i iv	
25	discovered	the process of sungamy		(c)	ii iv i	iii	
23.	(a) E Strasburger	(b) F Hanning		(d)	i iii ii	iv	
	(c) G. B. Amici	(d) Hanstein			[A1	ns. (c) A	-ii, B – iv, C-i, D-iii
		[Ans. (a) E. Strasburger]	3.	Α	Endothelium	(i)	Polygonaceae
26.	Adventitious buds or	roots are seen in		В	Orthotropous	s (ii)	Alismataceae
	(a) <i>Ipomoea</i>	(b) Pistia		С	Amphitropou	ıs (iii)	Cactaceae
	(c) Strawberry	(d) Agave		ם	Circinotropo	(iv)	Asteraceae
		[Ans. (a) Ipomoea]				us (IV)	montallal

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1.

2.

3.

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	А	В	С	D
(a)	iv	i	ii	iii
(b)	ii	i	iii	iv
(c)	ii	iv	i	iii
(d)	i	iii	ii	iv

[Ans. (a) A -(iv), B-(i), C -(ii), D (iii)]

4.	А	Trist	yly		(i)	Primula
	В	Disty	Distyly		(ii)	Vallisneria
	С	Aner	Anemophily		(iii)	Lythrum
	D	Hydr	ophily	7	(iv)	Eichhornia bamboo
		А	В	С	D	
	(a)	iv	i	ii	iii	
	(b)	ii	i	iii	iv	
	(c)	iii	i	iv	ii	
	(d)	i	iii	ii	iv	

[Ans. (c) A-iii, B-i, C - iv, D - ii]

5.	А	Zoste	Zostera marina			Strelitzia
	В	Orni	thoph	ily	(ii)	Psychophily
	С	Bat p	ollina	tion	(iii)	Sea grass
	D	Butte	erflies		(iv)	Zoophily
		А	В	С	D	
	(a)	iii	i	iv	ii	
	(b)	ii	i	iii	iv	
	(c)	iii	ii	iv	i	
	(d)	i	iii	ii	iv	

[Ans. (a) A-iii, B-i, C – iv, D –ii]

j .	Α	Rhi	zome	2	(i)	Colocasia
	В	Cor	m		(ii)	Curcuma longa
	С	Bul	b		(iii)	Centella asiatica
	D	Rur	nner		(iv)	Allium cepa
		А	В	С	D	
	(a)	iii	i	iv	ii	
	(b)	ii	i	iii	iv	
	(c)	iii	ii	iv	i	
	(d)	ii	i	iv	iii	
				[4	(4)	

Ans. (d) A-ii, B-i, C – iv, D –iii

III. CHOOSE THE CORRECT STATEMENTS:

- (I) An example for root cutting is *Hibiscus*.
 - (II) Scilla is bulbous plant grows in rocky soils.
 - (III) Solanum tuberosum is the example of corm
 - (IV) Adventitious roots store food in Ipomea batatus.
 - (a) I, II correct II, IV wrong
 - (b) I, II wrong III, IV correct
 - (c) I, II,III correct IV wrong
 - (d) IV only
- [Ans. (d) IV only]
- (I) In 60% of the Angiosperms, pollen is liberated in 3 celled stage.
 - The pollen on reaching the stigma absorbs (II)moisture and swells.
 - (III) Exine grows as pollen tube.
 - (IV) Microspore is a diploid cell.
- (a) III and IV only (b) I, III and IV only
- (c) I, II, III and IV (d) II and III only

[Ans. (d) II and III only]

- Ovule is also called microsporangium. (I)
- (II) Stalk of mature ovule is called integument.
- (III) Body of an ovule is made up of nucellus
- (IV) Nucellus is enveloped by one or two coverings called integuments
- (a) I and II only (b) I and III only
- (c) I and II only (d) III and IV only
 - [Ans. (d) III and IV only]

IV. CHOOSE THE INCORRECT STATEMENTS:

- 1. (a) The body of the ovule becomes completely inverted in anatropous.
 - (b) The body of the ovule placed transversely in Hemianatropous.
 - (c) The body of the ovule becomes inverted in amphitropous.
 - (d) The curvature of the ovule leads to horseshoe shape in campylotropous.

[Ans. (b) The body of the ovule placed transversely placed in Hemianatropous]

- 2. (I) Embryosac is otherwise known as female gametophyte.
 - (II) The body of the ovule between the chalaza and embryo sac is called hypostase.
 - (III) Tenuinucellate ovules have very small nucellus.

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 (IV) The ovule with one integument is said to be monosporic. (a) I and II only (b) II and III only (c) II and IV only (d) I and IV only 	 (c) Assertion is true; Reason is false. (d) Both Assertion and Reason are false. 1. Assertion (A): Only one parent is required for
 (d) Falle IV only [Ans. (c) II and IV only] (I) Mound layering is applied for the plants having flexible branches 	Reason (R) : New individual plants produced are genetically identical.
(II) Part of the stem is buried in the soil.(III) Two different plants are joined.(IV) Is is the south of some horizontal statement of the statement o	[Ans. (a) Both Assertion and Reason are true and Reason is correct explanation of Assertion]
(IV) It is the method of producing a new plantby cutting the plant.(a) Land III only(b) II and IV only	2. Assertion (A) : Pollenkitt is contributed by the tapetum.
 (a) Fand II only (b) If and IV only (c) III and IV only (d) I and II only [Ans. (c) III and IV only] 	and phycobilin. [Ans. (c) Assertion is true; Reason is false]
"Hydrophily" (a) Pollination by wind	3. Assertion (A) : Ruminate endosperm has irregular surface.
(b) Pollination by water.(c) Epihydrophily is a type of hydrophily.	Reason (R): The best example of this is Areca Catechu.
(d) Pollen grains can float.[Ans. (a) Pollination by wind]	[Ans. (b) Both Assertion and Reason are true but reason is not correct explanation of Assertion]
 "Vegetative reproduction" (a) A male and female parent is required for propagation. (b) New individual plants produced are 	4. Assertion (A) : Parthenocarpy which arises due to mutation is called genetic parthenocarpy.
 genetically identical. (c) Used to harvest plants in large scale. (d) Helps to preserve its own species. 	Reason (R) : Seedless fruits are useful for the preparation of jams. [Ans. (b) Both Assertion and Reason are
[Ans. (a) A male and remale parent is required for propagation]	true but reason is not correct explanation

"Ovule"

3.

4.

5.

6.

- (a) Integument encloses ovule completely. (b) The body is made up of nucellus.
- (c) Tenuinucellate ovules has very large nucellus.
- (d) Mature ovule consists of stalk. [Ans. (c) Tenuinucellate ovules has very large nucellus]

V. Assertion and reason: **Directions:**

- (a) Both Assertion and Reason are true and Reason is correct explanation of Assertion.
- (b) Both Assertion and Reason are true but reason is not correct explanation of Assertion.

VI. CHOOSE THE CORRECT PAIR :

- **1.** (a) E. Strasburger Syngamy
 - (b) G. B. Amici Polyembryo
 - (c) Nehemiah Embryo culture _
 - Pollen tetrad (d) D.A. Johansen _ [Ans. (a) E. Strasburger – Syngamy]
- **2.** (a) Conidia Spirogyra
 - Yeast and Hydra (b) Budding
 - (c) Fragmentation Aspergillus
 - (d) Gemma Penicillium

[Ans. (b) Budding – Yeast and Hydra]

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-		1 Alexandre				
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3.	(a)	Vegetative	-	Begonia	5.	(a) Anemophily - Maize
		reproduction				(b) Entomophily - Salvia
	(b)	Asexual	-	Dalbergia		(c) Myrmecophily - Adansonia
	(a)	reproduction		Curry qualities a		(d) Ornithophily - Sterlitzia
	(C)	Layering	-	Crown graning		[Ans. (c) Myrmecophily – Adansonia]
	(a)	Graning	-	Mound layering		II. CHOOSE THE ODD-MAN OUT & GIVE
	A	ns. (a) Vegetati	ve repro	duction – Begonia	1	(a) Tongue grafting (b) Wedge grafting
4.	(a)	Root cutting	-	Moringa	1.	(c) Mound layering (d) Crown grafting
	(b)	Stem cutting	-	Hibiscus		[Ans. (c) Mound layering]
	(c)	Leaf cutting	-	Bougainvillea		Reason: It is a type of layering whereas other are
	(d)	Grafting	-	Ixora	2	(a) Integriments (b) Euriculus
		[Ans. ((b) Stem	cutting – <i>Hibiscus</i>]	2.	(c) Hilum (d) Exine
5 .	(a)	Monoecious	-	Date palm		[Ans. (d) Exine]
	(b)	Dioecious	-	Coconut		others are part of ovule
	(c)	Protandry	-	Helianthus	3.	(a) Dermatogen (b) Pleurome
	(d)	Protogyny	-	Clerodendrum		(c) Periblem (d) Endosperm
		Ans.	(c) Prot	andry – <i>Helianthus</i>]		[Ans. (d) Endosperm]
VII CHOOSE THE INCORPECT PAIR.				CT PAIR:		Reason: It is a part of the seed whereas others are
1.	(a)	Dioecious	-	Borassus		parts of embryo.
	(b)	Self sterility	-	Passiflora	4.	(a) Kunner (b) Khizome (c) Corm (d) Bulb
	(c)	Heterostyly	-	Hibiscus		[Ans. (a) Runner]
	(d)	Protogyny	-	Aristolochia		Reason: It is a sub aerial stem modification whereas
		[Ans	. (c) He	terostyly - Hibiscus]		others are underground stem modifications.
2.	(a)	Translator		Calotropis	ANS	SWER IN ONE WORD*
	(b)	Pit fall		Arum	1.	Scientist who reported polyembryony.
	(c)	Trap	_	Aristolochia		[Ans. Anton Von Leeuwenhoek]
	(d)	Piston	_	Asclepiadaceae	2.	Asexual method of reproduction in <i>Aspergillus</i> /
		[Ans. (d) Pisto	n – Asclepiadaceae]	2	Penicillium . [Ans. Conidia]
3.	(a)	Self-Pollination	ı -	Allogamy	э.	[Ang Voost / Hydro]
	(b)	Monocliny	-	Bisexuality	4	[Asswel mode of reproduction in marchantia
	(c)	Cicer	-	Dicot	4.	Asexual mode of reproduction in <i>marchanta</i> .
	(d)	Maize	-	Scutellum	5.	Morphologically and genetically similar organisms.
		[Ans. (a) §	elf-Poll	ination - Allogamy]		[Ans. Clones]
4.	(a)	Egg	-	Zygote	6.	Another name for reproductive propagules.
	(b)	Nucellus	-	Perisperm		[Ans. Diaspores]
	(c) (d)	Gvary Funicle	-	Stell	7.	A plant which produces vegetative or adventitious
	(u)		An	s. (c) Ovary – Seed		[Ans. Millingtonia / Murraya / Dalbergia]

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8.	A weed popularly known as Terror of Bengal.	1 33.	N
	[Ans. Water hyacinth (Eichhornia crassites)]		fl
9	Plants producing tuberous adventitious roots		
2.	[Ans. Dahlia / Ipomoea batatus]	34.	Ir
10.	Plants producing a rhizome.		a
	[Ans. Musa paradisiaca, Zingiber officinale /	35.	С
	Curcuma longa]		
11.	Example of corm.	26	٨
10	[Ans. Amorphophallus and Colocasia]	30.	А А
12.	Example of tuber. [Ans. Solanum tuberosum]	97	П
13.	Example of bulb.	37.	Р
14	[Ans. Allium cepu and Lillium] Example of runner [Ans. Contalla asiatica]		
15	Example of stolon	38.	A
10.	[Ans. Mentha and Fragaria]	20	n
16.	Example of offset. [Ans. Pistia and Eichhornia]	39.	C n
17.	Example of bulbils.	10	P.
	[Ans. Dioscorea and Agave]	40.	1
18.	Plant producing adventitious buds on leaves.	41	P
	[Ans. Bryophyllum]	TI .	fl
19.	Plant producing epiphyllous buds. [Ans. Scilla]	42.	N
20 .	Plant whose root cutting can be used for		ti
	vegetative propagation. [Ans. Malus]	43.	Р
21.	Stalk of the ovule. [Ans. Funiculus]	44.	P
22.	Tissue found in the ovule. [Ans. Nucellus]	45	р
23 .	Artificial method of propagation where two	46	Г р
	different plants are joined together.	40.	D
	[Ans. Grafting]	47.	г
24 .	Regeneration of a whole plant from single cell or	48.	P
	tissues. [Ans. Micropropagation]	49.	Р
25.	Mass of undifferentiated cells formed in tissue	50 .	P
	culture. [Ans. Callus]		
26 .	Pollen grains held together, after formation.	51.	E
	[Ans. Pollinium]		
27 .	Example of a plant with pollinium.	52 .	E
	[Ans. Calotropis]		
28.	Example of a plant with compound pollen	53 .	E
20	The region of a anther wall where debiscence		m
29.	occurs. [Ans. Stomium]	54 .	E
30.	Substance found in exine but absent in germ		
	pores. [Ans. Sporopollenin]	55.	N
31.	Science which deals with study of pollen grains.		aı
	[Ans. Palynology]	56.	R
32.	Substance of pollen wall which preserves the		- `
	pollen during fertilization.	57	N
	[Ans. Sporopollenin]		Τ,

33.	Name	the	first	cell	of	male	gametophyte	of	а
	flower	ing p	plant.						

[Ans. Pollengrain / microspore]

- 34. In which stage are the pollen liberated from the anther.[Ans. 2 celled stage]
 - 5. Cavity in the ovary which bears the ovules. [Ans. Locule]
- Another name for megasporangium in a flowering plant.
 [Ans. Ovule]
- **37.** Protective coverings of a ovule.

[Ans. Integuments]

- An ovule which bears horse shoe shaped nucellus.
 [Ans. Amphitropous]
- **39.** Common type of ovule found in majority of the plants. [*Ans.* Anatropous]
- Number of cells and nuclei found in a embryo sac.
 [Ans. 7 celled and 8 nucleated]
- 41. Pollination which occurs without opening of flowers.
 [Ans. cleistogamy]
- **42.** Maturation of anther and stigma at different times. [*Ans.* Dichogamy]
- **43.** Pollination by birds. [Ans. Ornithophily]
- **44.** Pollination by wind. [Ans. Anemophily]
- **45.** Pollination by animals. [Ans. Zoophily]
- **46.** Pollination by water. **[Ans. Hydrophily]**
- **47.** Pollination by bats. [*Ans. cheiropterophily*]
- **48.** Pollination by snails. [Ans. Malacophily]
- **49.** Pollination by ants. **[Ans. Myrmecophily]**
- 50. Plant showing pollination by lever mechanism.[Ans. Salvia]
 - example of pollination by Trap mechanism. [Ans. Aristolochia]
- **52.** Example of pollination by pit fall mechanism. [*Ans. Arum*]
- Example of pollination by clip or translator mechanism. [Ans. Asclepiadaceae]
- **54.** Example of pollination by piston mechanism. [*Ans. Papilionaceae*]
- 55. Name of structure formed by union of stigma and androecium. [Ans. Gynostegium]
- **56.** Relationship between *Yucca* and moth.

[Ans. Obligate mutualism]

57. Name given for tip of pollen tube.

[Ans. Cap block]

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🖞 Sura's 🛶 XII Std - Bio-Botany & Botany 🛶 Unit VI **58.** Structure which guides the pollen tube towards micropyle of ovule. [Ans. Obturator] **59.** Fusion of sperm and egg nucleus. [Ans. Syngamy] **VERY SHORT ANSWERS 60.** Triploid tissue. [Ans. Endosperm] 61. Example of caruncle. [Ans. Ricinus communis] 1. What are diaspores? **62.** Example of fruit with fleshy receptacle. [Ans. Pyrus malus (apple)] **63.** Remnants of Nucellar tissue in seed. or diaspores. [Ans. Perisperm] 2. 64. Specialised tissue found in endosperm of cereals which secretes enzymes. [Ans. Aleurone tissue] **65.** Example for Ruminate endosperm. reproduction. [Ans. Areca catechu] **3**. **66.** Type of endosperm in coconut water. [Ans. Free nuclear endosperm] **67.** Type of development of dicot embryo. [Ans. Onagrad or crucifer type] What is a stock? 4. **68.** Seed coats. [Ans. Testa and tegmen] **69.** Embryonic root. [Ans. Radicle] **70.** Embryonic shoot. [Ans. Plumule] **5.** What is scion? Ans. (i) **71.** Shield shaped cotyledon found in maize. scion. [Ans. Scutellum] (ii) [Ans. Caryopsis] **72.** Type of fruit is maize. the soil. **73.** Protective sheath covering the radicle. What are integuments? **6**. [Ans. Coleorhiza] **74.** Protective sheath covering the plumule. integuments. [Ans. Coleoptile] 7. **75.** Tissue which forms bulk of maize grain. [Ans. Endosperm] Ans. (i) 76. Reproduction taking place without fusion of (ii) gametes. [Ans. Apomixis] **77.** Reproduction taking place by fusion of gametes. and store. [Ans. Amphimixis] What is palynology? 8. 78. Embryo formation without a gametophytic Ans. (i) phase. [Ans. Adventive embryony] (ii) **79.** Seedless fruits. [Ans. Parthenocarpic fruits] 80. Formation of embryos without meiosis and [Ans. Agamospermy] syngamy. area. **81.** Example of plant showing cleavage polyembryony. [Ans. Orchids]

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82. Formation of embryo sac from nucellar cell after degradation of megaspores. [Ans. Apospory]

* Only for quick revision not in pattern

2 MARKS

Ans. The unit of reproductive structure used in propagation is called **reproductive propagules**

What is asexual reproduction?

Ans. The method of reproduction which helps to perpetuate its own species without the involvement of gametes is referred to as asexual

What is an epiphyllous bud?

- Ans. Adventious buds develop at the notches of Bryophyllum are called epiphyllous buds. It is a method of vegetative propagation.
- Ans. The plant which is in contact with the soil is called **stock** in the process of grafting.
 - The plant part used for grafting is called
 - It is fixed to the stock which is attached to
- Ans. Ovule is also called megasporangium and is protected by one or two covering called
- Write down the disadvantages of conventional method of propagation of plants.
- Use of virus infected plants as parents produces viral infected new plants.
 - Vegetative structures used for propagation are bulky and so they are difficult to handle

Palynology is the study of pollen grains.

- It helps to identify the distribution of coal and to locate oil fields.
- (iii) Pollen grains reflect the vegetation of an

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9. What is carrot grass?

- Parthenium hysterophorus is commonly Ans. (i) called Carrot grass and is a native of tropical America.
 - It was introduced into India as a (ii) contaminant along with cereal wheat.
 - (iii) The pollen of this plant cause allergy.

10. What is the function of funiculus?

Ans. A mature ovule consists of a 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.

11. Define self sterility / self incompatablity.

Ans. In some plants, when the pollen grain of a flower reaches the stigma of the same flower, It is unable to germinate or prevented to germinate on its own stigma. It is a genetic mechanism. **Example:** Abutilon.

12. What is hilum?

Ans. The point of attachment of funicle to the body of the ovule is known as hilum.

13. What is megasporogenesis?

Ans. The process of development of a megaspore from a megaspore mother cell is called megasporogenesis.

14. What is meant by chasmogamy?

Ans. In majority of angiosperms, the flower opens and exposes its mature anthers and stigma for pollination. Such flowers are called chasmogamous and the phenomenon is called **chasmogamy**.

15. What is meant by xenogamy?

Ans. When the pollen (genetically different) deposits on another flower of a different plant of the same species is called **xenogamy**. It is a type of cross pollination.

16. What is malacophily?

Ans. Pollination of flowers by slugs and snails is called malacophily.

Example: Lemna.

17. Define pollination.

Ans. Transfer of pollen grains from the anther to the stigma of a flower is called pollination.

18. Name two abiotic agents involved in pollination.

- Anemophily Pollination by wind Ans. (i)
 - Hydrophily Pollination by water (ii)

19. What do you mean by cleistogamy?

Ans. Flowers never open and expose the reproductive organs. Pollination is carried out within the closed flowers. Hence self pollination is ensured. **Example:** Commelina, Viola and Oxalis.

20. Differentiate monoecious and dioecious. Ans.

Monoecious	Dioecious
Male and female flowers	Male and female flowers
are produced on the	are produced in different
same plant.	plants.
Ex. Coconut	Ex. <i>Borassus</i> and <i>Carica</i> .

- 21. Name the types of endosperm based on development.
- Nuclear endosperm Ans. (i)
 - Cellular endosperm (ii)
 - Helobial endosperm. (iii)

22. Differentiate epihydrophily and hypohydrophily Ans.

Epihydrophily	Hypohydrophily
Pollination occurs at	Pollination occurs inside
the water level.	the water.
Ex: Elodea,	Ex: Zostera marina,
Vallisneria spiralis	Ceratophyllum

23. Identify the parts of L.S. of seed. Name it.

B _

Ans. Monocot seed (L.S)

E

- Α _ Endosperm С
 - Coleoptile
 - Radicle
- **24.** What is psychophily?
- Ans. Pollination carried out by biotic agents such as butterflies is called psychophily.

25. What is meant by anemophily?

- Ans. Pollination by wind is called anemophily. Example : Bamboo.
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Scutellum

D - Shoot apex

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26. What is a pollinium?

Ans. In some plants, all the microspores in a microsporangium remain held together called pollinium. **Example:** *Calotropis.*

27. Differentiate dichogamy and herkogamy.

Ans. Dichogamy and herkogamy are contrivances for cross pollination.

	Dichogamy	Herkogamy
1.	In bisexual flowers, anthers and stigma mature at different times, thus preventing self pollination.	In bisexual flowers, the stamens and stigmas are arranged in such a way that self- pollination becomes impossible.
2.	Types: Protandry Eg: Helianthus. Types: Protogyny Eg: Aristolocia.	Ex: Gloriosa superba

28. Describe the wall layers of a pollen grain.

Ans. The outer layer called exine is thick and made of cellulose, sporopollenin and pollenkitt. The inner layer intine is thin, uniform and made of pectin, hemicellulose, cellulose and callose with proteins.

29. What are germ pores?

Ans. In a pollen grain, the exine is not uniform and thin in certain areas. When these areas are small and round, they are called germ pores. Pollen tube grown through the germ pores.

30. What is pollen calendar?

- *Ans. (i)* Pollen calendar shows the production of pollen by plants during different seasons.
 - (ii) This benefits the allergic persons.
 - (iii) Pollen grains cause allergic reactions like asthma, bronchitis, hay fever, allergic rhinitis etc.,
- **31.** Name two plants which are propagated by roots.

Ans. Dahlia, Dalbergia.

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32. What is cap block?

- *Ans. (i)* During germination of pollen, all the cytoplasmic contents of the pollen move to the tip of the pollen tube.
 - (ii) The tip appears to be hemispherical, transparent and is called the cap block.
 - (iii) When cap block disappear the growth of pollen tube stops.

SHORT ANSWERS

2.

3 MARKS

- **1.** Write the advantages of natural vegetative reproduction.
- Ans. (i) Only one parent is required for propagation.
 - (ii) New individual plants produced are genetically identical.
 - (iii) In some plants, this enables to spread rapidly. Example: Spinifex.
 - (*iv*) Horticulturists and farmers utilize these organs of natural vegetative reproduction for cultivation and to harvest plants in large scale.
 - Name the technique used to store pollen grains.
- *Ans. (i)* Liquid nitrogen (-196°C) is used to preserve pollen in viable condition for prolonged duration.
 - (ii) This technique is called cryopreservation and is used to store pollen grains (pollen banks) of economically important crops for breeding programmes.

3. What are the benefits of eating bee pollen?

- *Ans. (i)* **Bee pollen** is a natural substance and contains high protein, carbohydrate, trace amount of minerals and vitamins.
 - (ii) Therefore, it is used as dietary supplement and is sold as pollen tablets and syrups.
 - (iii) Further, it increases the performance of athletes, race horses and also heals the wounds caused by burns.
- **4**. Explain about the cutting method of vegetative propagation.
- Ans. (i) It is the method of producing new plant by cutting the plant parts such as root, stem, and leaf from the parent plant.

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(ii) The cut part is placed in a suitable medium for growth. It produces root and grows into a new plant.

Root Cutting – Malus

- Stem cutting Hibiscus, Bougainvillea and Moringa.
- **Leaf cutting** *Begonia* and *Bryophyllum*.
- 5. Give an account of endothecium of anther wall.
- *Ans.* (*i*) It is generally a single layer of radially elongated cells found below the epidermis.
 - (ii) The inner tangential walls develops bands of α cellulose. The cells are hygroscopic.
 - (iii) In the anthers of aquatic plants, saprophytes, cleistogamous flowers and extreme parasites endothecial differentiation is absent.
 - (iv) The cells along the junction of the two sporangia of an anther lobe lack these thickenings. This region is called **stomium** and helps in dehiscence of anther at maturity.

6. Define cross-pollination and explain its types.

- *Ans.* Cross-pollination is the transfer of pollens on the stigma of another flower. It is of two types.
 - (i) Geitonogamy :

When the pollen deposits on another flower of **same individual plant**, it is called geitonogamy. It occurs in plants of monoecious plants.

(ii) Xenogamy :

When the pollen deposits on another flower of a different plant of the same species, it is called Xenogamy.

- 7. Tabulate any 4 post fertilization changes in a flower.
- Ans.

	Parts before fertilization	After fertilization
1.	Ovary	Fruit
2.	Ovule	Seed
3.	Egg	Zygote
4.	Funicle	Stalk of seed

8. What are the functions of endosperm?

Ans. (i) It is the nutritive tissue for developing embryo.

- (ii) In majority of angiosperms, zygote divides only after the development of endosperm.
- (iii) Endosperm regulates the precise mode of embryo development.

9. Comment on pollination in *Ophrys*.

- Ans. (i) In Bee orchid (*Ophrys*), the morphology of the flower mimics that of female wasp (*Colpa*).
 - (ii) The male wasp mistakes the flowers for a female wasp and tries to copulate.
 - (iii) This act of pseudocopulation helps in pollination.

10. Comment on Terror of Bengal.

- Ans. (i) Water hyacinth (*Eicchornia crassipies*) is an invasive need on water bodies like ponds, lakes and reservoirs.
 - (ii) It is popularly called "Terror of Bengal" It spreads rapidly through offset all over the water body and depletes the dissolved oxygen and causes death of other aquatic organisms.

11. What is the significance of synergids?

- Ans. (i) The secrete chemotropic substances that help to attract the pollen tube.
 - (ii) The special cellular thickening called filiform apparatus of synergids help in the absorption, conduction of nutrients from the nucellus to embryo sac.
 - (iii) It also guides the pollen tube into the egg.
- **12.** What is Ornithophily?

Ans. Pollination by birds is called Ornithophily.

Example: *Erythrina*, *Bombax*, *Syzygium*, *Bignonia*, *Sterlitzia* etc., Humming birds, sun birds, and honey eaters are some of the birds which regularly visit flowers and brings pollination.

13. What is perisperm?

Ans. The nucellar tissue is either absorbed completely by developing embryo sac and embryo or small portion may remain as storage tissue. This remnant of nucellar tissue in the seed is called perisperm.

Example: Black pepper and Beetroot.

14. Why do insects visit flowers?

- Ans. (i) Flowers supply nectar and pollen which is the food for insects.
 - (ii) The flowers also provide microclimate, site and shelter for egg laying insects.

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15. Explain the types of embryosac developments. **† 19.** Comment on Aleurone tissue.

- Ans. There are 3 types of embryosac development
 - Monosporic: Of the four megaspores formed, (i) usually the chalazal one is functional and other three megaspores degenerate. The functional megaspore forms the female gametophyte or embryo sac. This type of development is called **monosporic** development. **Example:** Polygonum.
 - **Bisporic:** Of the four megaspores formed, (ii) if two are involved in embryo sac formation the development is called **bisporic**. **Example:** Allium.
 - (iii) Tetrasporic: If all the four megaspores are involved in Embryo sac formation the development is called tetrasporic. Example: Peperomia.

16. What is sporopollenin?

- It is a substance present is exine of pollen Ans. (i) wall material. It is derived from carotenoids.
 - It helps to withstand high temperature and (ii) is resistant to strong acid, alkali and enzyme action.
 - (iii) It preserves the pollen for long periods in fossil deposits, and it also protects pollen during its journey from anther to stigma.

17. Mention some adaptations of ornithophilous flowers.

The flowers are usually large in size. Ans. (i)

- The flowers are tubular, cup shaped or (ii) urn- shaped.
- (iii) The flowers are brightly coloured, red, scarlet, pink, orange, blue and yellow which attracts the birds.
- The flowers are scentless and produce nectar (iv) in large quantities for the birds visiting the flowers.
- (v) The floral parts are tough and leathery to withstand the powerful impact of the visitors.

18. What is Cheiropterophily?

Ans. Pollination carried out by bats is called cheiropterophily.

Example : Plants like *Kigelia africana*, *Adansonia* digitata, etc.,

- Ans. (i) Aleurone tissue consists of highly specialised cells of one or few layers which are found around the endosperm of cereals (Barley and Maize)
 - (ii) Aleurone grain contain spherosomes.
 - (iii) During seed germination, cells secrete certain hydrolytic enzymes like amylases and proteases which digest reserve food material are present in endosperm cells.

20. What is gynostegium?

- The union of stigma with the androecium Ans. (i) is called gynostegium.
 - (ii) In flowers of Asclepiadaceae, the 5 stamens unite with stigma and form a large 5-angled stigma which is receptive on the underside.
 - (iii) This is a special adaptation to effect pollination by translator mechanism.

21. What is a Translator?

- The pollen in each anther lobe unites into a Ans. (i) mass forming pollinium which is attached to the sticky clip like structure called **corpusculum**.
 - (ii) The filamentous part arising from each pollinium is called **retinaculum**.
 - The whole structure looks like inverted letter (iii) 'Y' and is called translator.
 - This is a special adaptation to effect pollination. (iv) **Example :** Calotropis.

22. What is special about pollination is Yucca?

- The relationship between Yucca and moth is Ans. (i) an **example** for obligate mutualism.
 - (ii) The moth uses the flower for laying eggs and also helps in pollination by pushing the pollen into the stigma.
 - The Larvae feed on developing seeds. (iii)
 - The moth cannot survive without Yucca (iv) flowers and the plant fails to reproduce sexually without the moth.

23. What is pollen pistil interaction?

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- Ans. (i) The events from pollen deposition on the stigma to the entry of pollen tube in to the ovule is called pollen- pistil interaction.
 - It is a dynamic process which involves (ii) recognition of pollen and to promote or inhibit its germination and growth.

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24. What is transmitting tissue?

- *Ans. (i)* The canal of the style in gynoecium is lined by a single layer of glandular canal cells called as transmitting tissue.
 - (ii) They secrete mucilaginous substances.
 - (iii) These serve as nutrition for growing pollen tubes and also control incompatibility reaction between style and pollen tube.
 - (*iv*) The substances contain lipids, carbohydrate, compatibility controlling proteins etc.

25. What are pollen robbers / nectar robbers? Many insects consume pollen and nectar from the flowers but do not help in pollination. They are called pollen / nectar robbers.

26. What is an obturator?

- *Ans. (i)* The pollen tube after travelling the whole length of the style enters into the ovary locule.
 - (ii) It is guided towards the micropyle of the ovule by a structure called obturator.
 - (iii) This may originate form the placenta, Funiculus, Style etc.

Example: Euphorbiaceae (from Placenta)

27. What is double fertilization?

- Ans. (i) During fertilization in angiosperms one male gamete fuses with the egg nucleus (syngamy) to form a diploid Zygote.
 - (ii) The male gamete fuses with the diploid secondary nucleus to form a triploid primary endosperm nucleus which forms the endosperm tissue.
 - (iii) This is called double fertilization.

28. What is triple fusion?

- *Ans. (i)* During fertilization in angiosperms, the second male gamete fuses with the diploid secondary nucleus to form the primary endosperm nucleus.
 - (ii) Since this involves the fusion of three nuclei, this phenomenon is called triple fusion.
 - (iii) This develops into the endosperm which gives nutrition to the developing embryo.

29. What is aril?

Ans. The funiculus of the ovule develops into a fleshy structure and is often very colourful after fertilization. This is called aril.Example: Myristica.

30. What is caruncle?

Ans. The cells present at the tip of the outer integument around the micropyle develop into a fleshy structure called **caruncle**.

Example: *Ricinus communis.*

- **31.** What is the kind of endosperm found in coconut?
- Ans. Coconut water from tender coconut is an example of free-nuclear endosperm and the white kernel part is the cellular.
- **32**. Define a seed.
- Ans. The fertilized ovule is called seed and possesses an embryo, endosperm and a protective coat. Seeds may be endospermous (Ex: Wheat) or non-endospermous (Ex: Bean).

33. Differentiate Apomixis and Amphimixis.

Ans.

Apomixis
When reproduction
does not involve
union of male and
female gametes is
called apomixis .

34. Draw a Tunicated bulb and label any 4 parts.

Ans.

35. Draw a diagram to show rhizome and label any 2 parts.

Ans.

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Rhizome – Zingiber officinale

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36. Find the parts of the flower.

Ans. A	-	Stigma	B -	Style
С	-	Stamen	D -	Petal
Ε	-	Sepal	F -	Ovary
_		~ 1		

G - Ovule H - Pedicel

- **38.** (a) Identify the plant.
 - (b) Name the modification.

Ans. (a) Pistia stratiotes

(b) Offset

39. What is coleoptile and coleorhiza?

Ans. In a monocot seed, the embryonic root or radicle including root cap is surrounded by a protective sheath called **coleorhiza**. The embryonic shoot or plumule is covered by a protective sheath called coleoptile.

40. What is scutellum?

Ans. In a monocot seed, there is a shield- shaped cotyledon called scutellum present towards lateral side of embryonal axis. It supplies the growing embryo with food material absorbed from the endosperm

LONG ANSWERS

5 MARKS

1. Describe the translator mechanism of cross pollination.

Ans. Pollination in Calotropis:

(i) This mechanism is found in members of Asclepiadaceae.

- (ii) The flowers are bisexual with 5 stamens forming gynostegium (union of stigma with the androecium).
- (iii) The stigma is large and 5 angled and is receptive on the underside.
- (iv) Each stamen at its back possesses a brightly coloured hood like outgrowth enclosing horn shaped nectar.
- (v) The pollen in each anther lobe of a stamen unites into a mass, forming a pollinium.
- (vi) Pollinia are attached to a clamp or clip like sticky structure called **corpusculum**.
- (vii) The filamentous or thread like part arising from each pollinium is called **retinaculum**.
- (*viii*) The whole structure looks like inverted letter 'Y' and is called **translator**.
- (ix) When the insect visits the flower for nectar, the translator gets attached to the proboscis or leg of the visitor.
- (x) During the visit to the next flower the pollinia come in contact with the receptive stigma carrying out pollination.
- 2. Write a note on contrivances of cross pollination.

Ans. Contrivances of cross-pollination:

The flowers of the plants have mechanisms that promote cross-pollination are called contrivances of cross-pollination or outbreeding devices. It includes the following

Types of dicliny:

1. Dicliny or Unisexuality:

Only cross-pollination is possible in unisexual flowers. There are two types.

 (i) Monoecious: Male and female flowers on the same plant. Eg: Coconut, Bitter gourd. In castor and maize, autogamy is prevented but geitonogamy takes place.

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(ii) Dioecious : Male and female flowers on different plants. Eg: Borassus, Carica and Phoenix. Here, both autogamy and geitonogamy are prevented.

2. Monocliny or Bisexuality: Flowers are bisexual and the special adaptation

of the flowers prevents self-pollination.

(i) Dichogamy:

In bisexual flowers, anthers and stigmas mature at different times. It is of two types:

(a) **Protandry:** Stamens mature earlier than the stigmas.

Examples: *Helianthus*, *Clerodendrum*.

(b) **Protogyny:** Stigmas mature earlier than the stamens.

Examples: Scrophularia nodosa and Aristolochia bracteata.

Dichogamy

(ii) Herkogamy:

In bisexual flowers, the stamens and stigmas are arranged in such a way that self-pollination becomes impossible.

Example: *Gloriosa superba*, the style is reflexed away from the stamens and in *Hibiscus* the stigmas project far above the stamens.

Herkogamy - Gloriosa

- (iii) Heterostyly: Some plants produce 2 or 3 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.
 - (a) Distyly: The plant produces two forms of flowers, Pin or long style, long stigmatic papillae, short stamens and small pollen grains; Thrum-eyed or short style, small stigmatic papillae, long stamens and large pollen grains. Example: *Primula*. The stigma of the Thrum-eyed flowers and the anther of the pin lie in same level to bring out pollination. Similarly the anther of Thrum-eyed and stigma of pin ones is found in same height. This helps in effective pollination.

(b) Tristyly: The plant produces three kinds of flowers, with respect to the length of the style and stamens. Here, the pollen from flowers of one type can pollinate only the other two types but not their own type.

Example : Lythrum.

(iv) Self - sterility/ Self - incompatibility:

The pollen grain of a flower reaches the stigma of the same, it is unable to germinate. It is a genetic mechanism.

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Examples: *Abutilon*, *Passiflora*.

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3. Explain the different methods of grafting.

Ans. 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 (Figure).

Examples are Citrus, Mango and Apple. 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: T- 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: 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 a 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:

A slit is made in the stock or the bark is cut. A twig of scion is inserted and tightly bound so that the cambium of the two is joined.

a) Types of Grafting Artificial methods of vegetative reproduction in plants

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[Marks: 25]

for

tissue

[Time : 1 hr]

I. CHOOSE THE CORRECT ANSWER. $10 \times 1 = 10$ † 2.

- 1. Choose the correct statements 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.

Identify the incorrect pair.

- (a) Sporopollenun Exine of pollen grain
- (b) Tapetum
 - NT 11
- (c) Nucellus
- (d) Obturator
- Nutritive tissue for developing embryo.

developing microspores.

Directs the pollen tube into micropyle

Nutritive

8.

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3. Choose the correct statement(s)

- (I) An example for root cutting is *Hibiscus*.
- (II) Scilla is bulbous plant and grows in rocky soils.
- (III) Solanum tuberosum is an example of corm
- (IV) Adventitious roots store food in Ipomea batatus.
- (a) I, II correct II, IV wrong
- (b) I, II wrong III, IV correct
- (c) I, II,III correct IV wrong
- (d) IV only

4.	Assertion (A)	:	Ruminate endosperm has
			irregular surface.

- Reason (R)
- : The best example of this is

(b) Embryo sac

- Areca Catechu.
- (a) Both Assertion and Reason are true and Reason is correct explanation of Assertion.
- (b) Both Assertion and Reason are true but reason is not correct explanation of Assertion.
- (c) Assertion is true; Reason is false.
- (d) Both Assertion and Reason are false.
- Which **5**. of the following represents megagametophyte?
 - (a) Ovule
 - (c) Nucellus (d) Endosperm
- Identify the correctly matched pair **6**.
 - Allium Cepa (a) Tuber
 - (b) Sucker - Pistia
 - (c) Rhizome Musa
 - (d) Stolon - Zingiber

7. Sexual reproduction of higher plants include

- stages.
- (a) 2 (b) 4 (c) 3 (d) 5

(i) Primula A Tristyly Vallisneria В Distyly (ii) С Anemophily Lythrum (iii)

Match the following.

- Eichhornia D Hydrophily (iv) bamboo В С D А
- i ii (a) iv iii (b) ii iii i iv (c) iii i iv ii (d) i iii ii iv

9. An eminent Indian embryologist _

(a) S. R. Kasyap (b) P. Maheshwari

 $2 \times 2 = 4$

 $2 \times 3 = 6$

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(c) M. S. Swaminathan (d) K. C. Mehta

10. Find the odd man out and given reason.

- (a) Integuments (b) Funiculus (c) Hilum (d) Exine
- H. **VERY SHORT ANSWER**
- 1. Explain 'ornithophily'.
- 2. What is cap block?
- **III. SHORT ANSWER**
- 1. Find the parts of embryo sac.

- 2. What is polyembryony? How can it be commercially exploited.
- **IV.** LONG ANSWER $1 \times 5 = 5$
- 1. Give a concise account on steps involved in fertilization in an angiosperm.

