

**SAMPLE CONTENT**

**MHT-CET**

**TRIUMPH**



# BIOLOGY

**PART 2**

**BASED ON THE LATEST SYLLABUS OF MHT-CET**

**5371  
MCQs**

Archaeopteryx is the connecting link between birds and reptiles. This transitional fossil provides palaeontological evidence that birds evolved from reptiles.

**Std.**

**XII**

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**Target** Publications® Pvt. Ltd.

Written in accordance with the latest MHT-CET Paper Pattern prescribed by  
State Common Entrance Test Cell, Maharashtra State

# MHT-CET TRIUMPH BIOLOGY

5371  
MCQs

Based on the latest Syllabus of MHT-CET

PART 2

Std. XII

## Salient Features

- ☞ Includes all the chapters of Std. XII as per the latest MHT-CET Syllabus
- ☞ Includes '5371' MCQs
- ☞ Quick Review and exhaustive subtopic wise coverage of MCQs
- ☞ Solved Previous Years' MHT-CET questions till 2023
- ☞ Evaluation Test for each chapter
- ☞ Two Model Question Papers with answer keys (Solutions provided through Q.R. codes)
- ☞ Two Question Papers & Answer Keys of MHT-CET 2023 (Solutions provided through Q.R. codes)
- ☞ Includes **Smart Keys** (Key Notes For Good Practice, Smart Code, Caution, Thinking Hatke)
- ☞ Video/pdf links via QR codes for boosting conceptual retention
- ☞ Answer keys for all the chapters and Evaluation Tests at the end of book
- ☞ *Solutions to MCQs and Evaluation Test can be accessed through Q.R. code given at the end of each chapter*

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## PREFACE

*“Don't follow your dreams; chase them!”* A quote by Richard Dumbrill is perhaps the most pertinent for one who is aiming to crack entrance examinations held after Std. XII. We are aware of the aggressive competition a student appearing for such career-defining examinations experiences and hence wanted to create books that develop the necessary knowledge, tools, and skills required to excel in these examinations.

For the syllabus of **MHT-CET**, 80% of the weightage is given to the syllabus for XII<sup>th</sup> standard while only 20% is given to the syllabus for XI<sup>th</sup> standard (with inclusion of only selected topics).

We believe that although the syllabus for Std. XII and XI and MHT-CET is aligned, the outlook for studying the subject should be altered based on the nature of the examination. To score well in the MHT-CET, a student has to be not just good with the concepts but also quick to complete the test successfully. Such ingenuity can be developed through sincere learning and dedicated practice.

As a first step to MCQ solving, students should start with elementary questions. Once momentum is gained, complex MCQs with a higher level of difficulty should be practised. Such holistic preparation is the key to succeeding in the examination!

Target's **Triumph MHT-CET Biology Standard XII** book which covers all the chapters of Std. XII has been designed to achieve the above objectives. Beginning with basic MCQs, the book proceeds to develop competence to solve complex MCQs. It offers ample practice of recent questions from MHT-CET examinations. It also includes solutions (via QR codes) that provide explanations to help students learn how to solve the MCQs.

The sections of **Key Notes For Good Practice, Quick Review** and **MCQs (Classical, Critical, Concept Fusion, Previous Years' MHT-CET Questions, Evaluation Test)** form the backbone of every chapter and ensure adequate revision.

The two **Model Question Papers** given at the end of the book are specially prepared to gauge the student's preparedness to appear for the MHT-CET examination. Two **MHT-CET 2023 Question Papers** have been provided to offer students a glimpse of the complexity of the questions asked in the examination.

All the features of this book pave the way for a student to excel in the examination. The features are designed keeping the following elements in mind: Time management, easy memorization or revision, and non-conventional yet simple methods for MCQ solving. The features of the book presented on the next page will explain more about them!

*We hope the book benefits the learner as we have envisioned.*

Publisher

**Edition:** Second

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.

Please write to us on: [mail@targetpublications.org](mailto:mail@targetpublications.org)

### Disclaimer

This reference book is transformative work based on Std. XII Biology Textbook; Reprint: 2022 published by the Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune. We the publishers are making this reference book which constitutes as fair use of textual contents which are transformed by adding and elaborating, with a view to simplify the same to enable the students to understand, memorize and reproduce the same in examinations.

This work is purely inspired upon the course work as prescribed by the Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune. Every care has been taken in the publication of this reference book by the Authors while creating the contents. The Authors and the Publishers shall not be responsible for any loss or damages caused to any person on account of errors or omissions which might have crept in or disagreement of any third party on the point of view expressed in the reference book.

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## FEATURES

**Quick Review** includes tables/charts to summarize the key points in the chapter. *This is our attempt to help students to reinforce key concepts.*

**Quick Review**

**Sub-topic wise Segregation**

Every section is **segregated sub-topic wise.**

*This is our attempt to cater to individualistic pace and preferences of studying a chapter in students and enable easy assimilation of questions based on the specific concept.*

**Classical Thinking** section encompasses straight forward questions including knowledge based questions.

*This is our attempt to revise chapter in its basic form and warm up students to deal with complex MCQs.*

**Classical Thinking**

**Critical Thinking**

**Critical Thinking** section encompasses challenging questions which test understanding, rational thinking and application skills of students.

*This is our attempt to take students from beginner to proficient level in smooth steps.*

**Concept Fusion** section encompasses questions whose solutions require knowledge of concepts covered in different sub-topics of same chapter or from different chapters.

*This is our attempt to develop cognitive thinking in the students essential to solve questions involving fusion of multiple key concepts.*

**Concept Fusion**

**MHT-CET Previous Years' Questions**

**MHT-CET Previous Years' Questions** section encompasses questions from MHT-CET examinations.

*This is our attempt to give students practice of MHT-CET questions and advance them to acquire knack essential to solve such questions.*

**Evaluation Test** encompasses questions based on concepts covered in the entire chapter.

*This is our attempt to allow self-assessment of the chapter*

**Evaluation Test**

Continued...

## FEATURES

**Smart Keys** comprise a set of remarkable study techniques contrived to benefit students.

*This is our attempt to promote quick, innovative, and divergent thinking as well as enable the students to perceive the underlying depth and implications of concepts.*

**Caution** apprises students about mistakes often made while solving MCQs.

**Thinking Hatke** reveals quick witted approach to crack the specific question.

**Smart Keys**

**Caution**

**Thinking Hatke**

**QR Code**

**Key Notes For Good Practice**

**Key Notes For Good Practice**

consolidate critical information, useful facts and tips about the key concepts.

**Smart Code**

**Smart Code** showcases simple and smart mnemonic created for selected concepts.

**QR Code** includes

- Video/pdf links for boosting conceptual retention
- Solutions to MCQs and Evaluation Test for each chapter
- Solutions to Model Question Papers I and II
- Solutions to MHT-CET 2023 Question Papers

## ◆ ◆ ◆ MHT-CET PAPER PATTERN ◆ ◆ ◆

- There will be three papers of Multiple Choice Questions (MCQs) in 'Mathematics', 'Physics and Chemistry' and 'Biology' of 100 marks each.
- Duration of each paper will be 90 minutes.
- Questions will be based on the syllabus prescribed by Maharashtra State Board of Secondary and Higher Secondary Education with approximately 20% weightage given to Std. XI and 80% weightage will be given to Std. XII curriculum.
- Difficulty level of questions will be at par with JEE (Main) for Mathematics, Physics, Chemistry and at par with NEET for Biology.
- There will be no negative marking.
- Questions will be mainly application based.
- Details of the papers are as given below:

Paper	Subject	Approximate No. of Multiple Choice Questions (MCQs) based on		Mark(s) Per Question	Total Marks
		Std. XI	Std. XII		
Paper I	Mathematics	10	40	2	100
Paper II	Physics	10	40	1	100
	Chemistry	10	40		
Paper III	Biology	20	80	1	100

- Questions will be set on
  - the entire syllabus of Std. XII of Physics, Chemistry, Mathematics and Biology subjects prescribed by Maharashtra Bureau of Textbook Production and curriculum Research, Pune, and
  - chapters / units from Std. XI curriculum as mentioned below:

Sr. No.	Subject	Chapters / Units of Std. XI
1	Physics	Motion in a plane, Laws of motion, Gravitation, Thermal properties of matter, Sound, Optics, Electrostatics, Semiconductors
2	Chemistry	Some Basic Concepts of Chemistry, Structure of Atom, Chemical Bonding, Redox Reactions, Elements of Group 1 and Group 2, States of Matter: Gaseous and Liquid States, Basic Principles of Organic Chemistry, Adsorption and Colloids, Hydrocarbons
3	Mathematics	Trigonometry - II, Straight Line, Circle, Measures of Dispersion, Probability, Complex Numbers, Permutations and Combinations, Functions, Limits, Continuity
4	Biology	Biomolecules, Respiration and Energy Transfer, Human Nutrition, Excretion and osmoregulation

## CONTENTS

Sr. No.	Textbook Chapter No.	Chapter Name	Page No.
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Practice test Papers are the only way to assess your preparedness for the Exams.

Scan the adjacent QR code to know more about our "**MHT-CET Biology Test Series with Answer Key & Solutions**" book for the MHT-CET Entrance examination.



# Reproduction in Lower and Higher Plants



## "Coconut: From Endosperm to Refreshing Drink and Nutritious Kernel"

Coconut water is a refreshing and nutritious drink that has been enjoyed for centuries in tropical regions. But have you ever wondered about the structure that has resulted in the formation of coconut water and kernel? Coconut water is a **free nuclear endosperm**, and the kernel that we eat in tender coconut is a **cellular endosperm**. So next time you're sipping on cold coconut water, remember the fascinating science behind its creation!

### Chapter Outline

1.1	Asexual Reproduction	1.9	Double Fertilization
1.2	Sexual Reproduction	1.10	Development of Endosperm
1.3	Microsporogenesis	1.11	Development of Embryo
1.4	Structure of Anatropous Ovule	1.12	Seed and Fruit Development
1.5	Megasporogenesis	1.13	Apomixis
1.6	Pollination	1.14	Parthenocarpy
1.7	Outbreeding Devices (Contrivances)	1.15	Polyembryony
1.8	Pollen-Pistil Interaction		

### Grasp the Terminology

Term	Meaning
<b>Dithecous anther</b>	Anther with two anther lobes
<b>Tetrasporangiate anther</b>	Dithecous anther with four pollen sacs.
<b>Microsporogenesis</b>	Formation of microspores by the meiosis of diploid microspore mother cells.
<b>Megasporogenesis</b>	Process of formation of haploid megaspores from diploid megaspore mother cell (MMC) by meiotic division.
<b>Parthenocarpy</b>	Development of fruit without fertilization.

### Key Notes For Good Practice

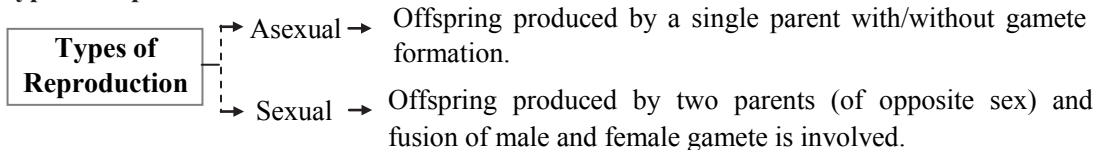
- Pollen grain/microspore is the first cell of the male gametophyte.
- Vegetative cell helps in formation of pollen tube.
- Continued self-pollination results in the inbreeding depression.
- Double Fertilization is a characteristic feature of angiosperms.





**Quick Review**

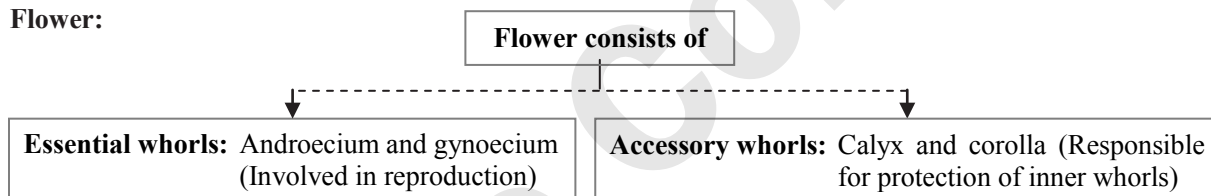
➤ **Types of reproduction:**



➤ **Asexual reproduction in lower organisms:**

Sr. No.	Method	Description	Examples
1.	<b>Binary fission</b>	Parental cell divides into two halves and each half grows rapidly into an adult.	<i>Amoeba</i> , <i>Paramecium</i>
2.	<b>Fragmentation</b>	Multicellular organisms break into fragments and each fragment can develop into new individuals.	<i>Spirogyra</i>
3.	<b>Budding</b>	Small buds are produced which initially remain attached to the parent cell, but later get separated and mature into new organisms (cells).	Yeast, <i>Protosiphon</i>
4.	<b>Spore formation</b>	Flagellated, motile zoospores are formed which grow independently into new individuals.	<i>Chlamydomonas</i>
5.	<b>Conidia</b>	Conidia are asexual reproductive structures.	<i>Penicillium</i>
6.	<b>Gemmules</b>	Gemmules are asexual reproductive structures.	<i>Marchantia</i>

➤ **Flower:**



➤ **Structure of anther:** Angiospermic anther is **bilobed** and **tetrasporangiate**.

**Wall layers of microsporangium** (from outer side to inner side):

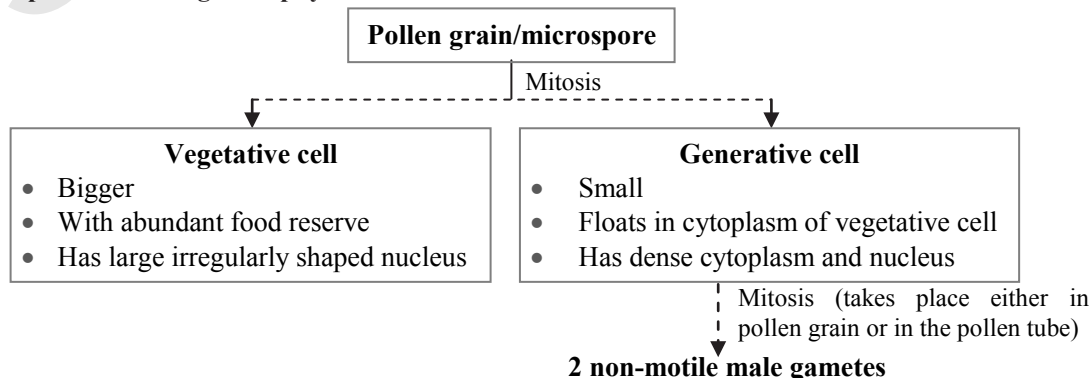
Epidermis → Endothecium → Middle layers → Tapetum  
(Outermost) (Innermost)

➤ **Structure of pollen grain (microspore):**

Pollen grain has a double layered wall			
1.	<b>Exine</b>	Outer, thick and resistant layer	Composed of sporopollenin
2.	<b>Intine</b>	Inner layer	Composed of cellulose and pectin.

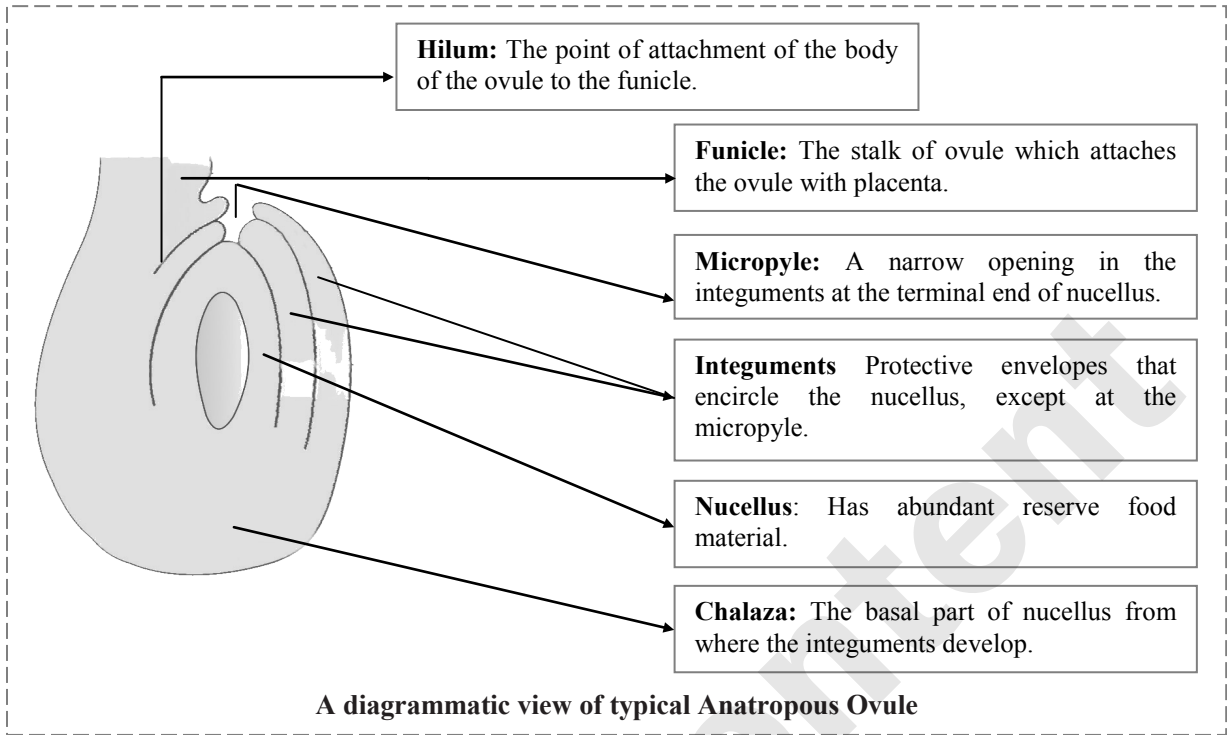
**Germ pore:** The thin areas of exine where sporopollenin is absent.

➤ **Development of male gametophyte:**

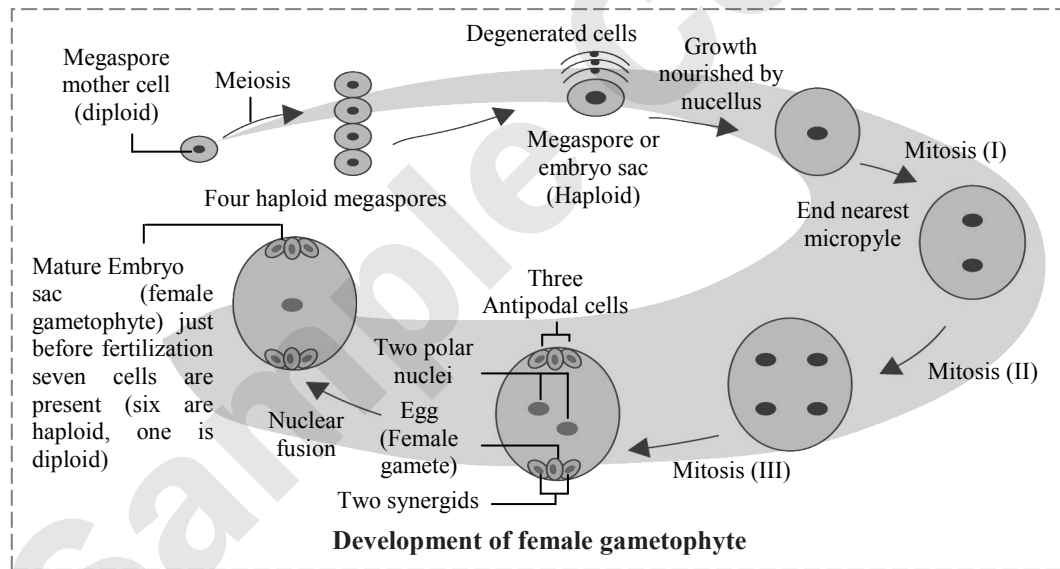




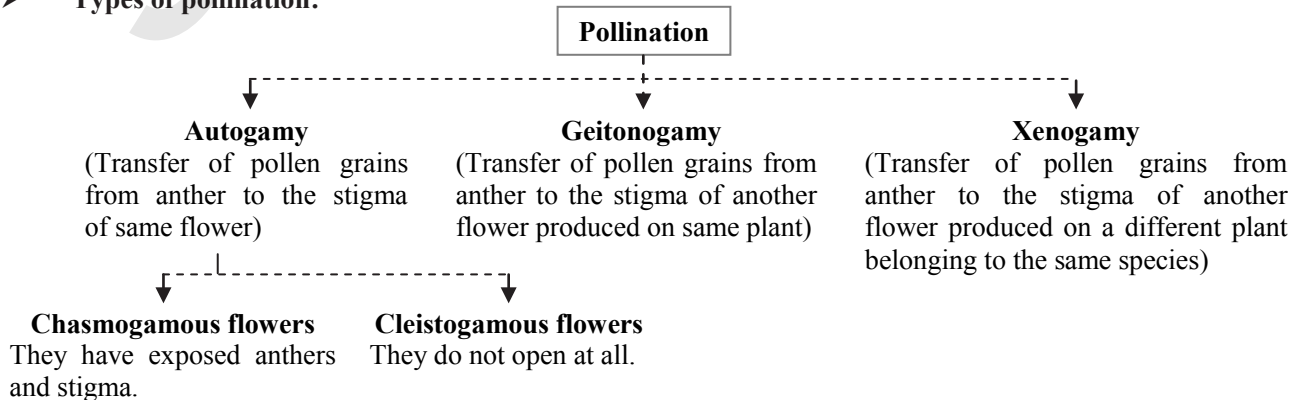
➤ **Structure of Anatroous Ovule:**



➤ **Megasporogenesis: 7-celled and 8-nucleated Embryo sac**



➤ **Types of pollination:**





➤ Agencies of pollination:

Agencies of pollination		Definition	Examples
Anemophily		Pollination through wind	Wheat, rice, corn, rye, barley, oats, <i>Potamogeton</i> , <i>Halogaris</i> , etc.
Hydrophily	Hypohydrophily	Pollination takes place below the water surface in submerged female flowers.	<i>Zostera</i>
	Epihydrophily	Pollination occurs on the surface of water.	<i>Vallisneria</i>
Entomophily		Pollination through the agency of insects	Rose, Jasmine, <i>Cestrum</i> , <i>Salvia</i> , Lotus, water hyacinth, water lily, etc.
Ornithophily		Pollination by birds	<i>Bombax</i> , <i>Callistemon</i> (Bottle Brush), <i>Butea</i> , etc.
Chiropterophily		Pollination carried out by bats	<i>Anthocephalus</i> , <i>Adansonia</i> , <i>Kigelia</i> .

**Caution**

Some species of *Potamogeton* are entomophilous, anemophilous or hydrophilous.

➤ Outbreeding Devices (Contrivances):

Unisexuality (dioecism)	Plant bears either male or female flowers.	
Dichogamy	Protandry	Anthers mature first, but the stigma of the same flower is not receptive at that time.
	Protogyny	Stigma of carpel matures earlier than anthers of the same flower.
Prepotency	Pollen grains of other flowers germinate rapidly over the stigma than the pollen grains from the same flower.	
Heterostyly (heteromorphy)	Stigmas and anthers are placed at different levels	
Herkogamy	Natural physical barrier is present between two sex organs and avoid contact of pollen with stigma of same flower.	
Self-incompatibility	Genetic mechanism due to which the germination of pollen on stigma of the same flower is inhibited.	

➤ Double Fertilization:

Pollen grain reaches the surface of the stigma, germinates and forms a pollen tube.

↓  
Chemicals secreted by the synergids guide the pollen tube

↓  
Pollen tube enters ovule

↓  
Penetrates embryo sac through its micropylar end

↓  
Penetrates in one of the synergids

↓  
Pollen tube ruptures and release two non-motile male gametes

↓  
**Syngamy:** Male Gamete(n) + Female Gamete(n) = Diploid Zygote (2n)

**Tripe Fusion:** Male Gamete(n) + Secondary Nucleus(2n) = Triploid Primary Endosperm Nucleus (3n)

Students can scan the given Q. R. Code in *Quill - The Padhai App* to get information about Double fertilization.





➤ **Development of endosperm:**

Type of endosperm	Formation of endosperm	Examples
<b>Nuclear Type (most common type)</b>	<p>Primary endosperm nucleus repeatedly divides mitotically without wall formation</p> <p>↓</p> <p>Formation of large number of free nuclei</p> <p>↓</p> <p>A big central vacuole appears in the centre of cell which pushes the nuclei towards the periphery.</p> <p>↓</p> <p>Wall formation occurs between the nuclei</p> <p>↓</p> <p>Formation of multicellular endosperm</p>	Wheat, sunflower and coconut (cell wall formation remains incomplete) Coconut has multicellular endosperm in the outer part and free nuclear as well as vacuolated endosperm in the centre.
<b>Cellular Type</b>	<p>Primary endosperm nucleus repeatedly divides mitotically</p> <p>↓</p> <p>Wall formation</p>	<i>Balsam, Petunia, Adoxa, etc.</i>
<b>Helobial Type</b>	<p>Primary endosperm nucleus divides mitotically</p> <p>↓</p> <p>Formation of transverse wall, which divides the cell unequally.</p> <p>↓</p> <p>Smaller cell is called chalazal cell and larger cell is the micropylar cell.</p> <p>↓</p> <p>Nuclei in each cell divide by free nuclear divisions</p> <p>↓</p> <p>Walls develop between nuclei in micropylar chamber</p>	<i>Asphodelus</i>

➤ **Development of embryo:**

<b>Embryo develops at</b>	Micropylar end of embryo sac where zygote is present.
<b>Stages of embryo development</b>	Zygote → proembryo → globular → heart-shaped → mature embryo.
<b>Embryo consists of</b>	Embryonal axis and two cotyledons: <b>Epicotyl</b> → Terminates with plumule <b>Hypocotyl</b> → Terminates in radicle

➤ **Post fertilization changes:**

Sr. No.	Pre fertilization structure	Post fertilization structure
1.	Ovule (megasporeangium)	Seed
2.	Ovary (carpel)	Fruit
3.	Secondary nucleus	Endosperm
4.	Outer integument	Testa (outer seed coat)
5.	Inner integument	Tegmen (inner seed coat)
6.	Micropyle	Opening in the seed

➤ **Depending upon presence and absence of endosperm, seeds are of two types:**

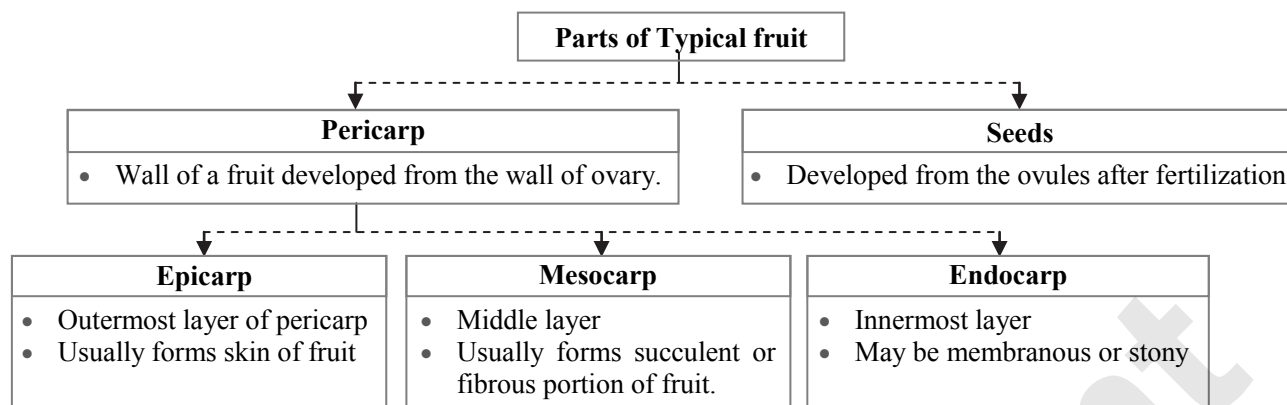
Endospermic or albuminous seeds	Non-endospermic or ex-albuminous seeds
These seeds possess endosperm.	These seeds do not have endosperm.
Generally, monocot seeds are endospermic. In some seeds (e.g. black pepper, beet), remnants of nucellus are persistent (perisperm).	Generally, dicot seeds are non-endospermic.
E.g. Maize, rice, castor, wheat, barley, etc.	E.g. Pea, beans, groundnut, mustard, etc.

**Caution**

Though castor is a dicot seed, it is endospermic.



➤ **Development of fruit:** A fruit is regarded as a mature or ripened ovary.



➤ **Apomixis:**

<b>Characteristics</b>	<ul style="list-style-type: none"> <li>• Formation of embryo(s) through asexual reproduction without gamete formation and fertilization</li> <li>• There is no meiosis and syngamy.</li> <li>• Embryo develops in the ovule and ovule develops to form seed.</li> </ul>						
<b>Types</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;"><b>Apogamy</b></td> <td>A gametophyte organ or cell produces embryo like structure without fertilization</td> </tr> <tr> <td style="text-align: center;"><b>Apospory</b></td> <td>Sporophyte (2n) cell produces a gametophyte (2n) without undergoing meiosis.</td> </tr> </table>	<b>Apogamy</b>	A gametophyte organ or cell produces embryo like structure without fertilization	<b>Apospory</b>	Sporophyte (2n) cell produces a gametophyte (2n) without undergoing meiosis.		
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**Caution**

- |                      |   |
|----------------------|---|
| <b>Apomixis</b>      | – Formation of seeds without fertilization.           |
| <b>Parthenocarpy</b> | – Formation of seedless fruits without fertilization. |

➤ **Polyembryony:** It is the presence of more than one embryo in a seed.

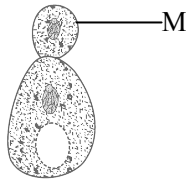
<b>Adventive polyembryony</b>	An embryo develops directly from the diploid cell of nucellus and integuments.
<b>Cleavage polyembryony</b>	Zygote proembryo sometimes divides (cleaves) into many parts or units. Each unit then develop into an embryo.



Classical Thinking

1.1 Asexual Reproduction

- Which of the following term is used to describe morphologically and genetically identical individuals produced by asexual reproduction?  
(A) Microspores (B) Clones  
(C) Embryos (D) Megaspores
- The most common type of asexual reproduction in filamentous algae is  
(A) binary fission (B) budding  
(C) fragmentation (D) sporulation
- Identify the asexual reproductive structure 'M' in the following diagram.



- (A) Zoospore (B) Bud  
(C) Gemmule (D) Conidium
- A type of asexual reproduction in a unicellular organism in which parent cell divides to produce two equal cells which develop into two new individuals is called  
(A) budding (B) binary fission  
(C) sporulation (D) fragmentation
- Which of the following organisms show binary fission mode of reproduction?  
(A) Hydra, Yeast  
(B) *Penicillium*, VAM  
(C) *Paramoecium*, *Amoeba*  
(D) *Chlamydomonas*, sponges
- Penicillium* produce non-motile spores called  
(A) gemmae (B) conidia  
(C) fragments (D) bud
- Gemmae formation is commonly seen in  
(A) *Amoeba* (B) *Paramoecium*  
(C) Sponges (D) Algae
- The asexual reproduction in angiosperm occurs naturally through vegetative parts such as root, stem, leaf or buds. Such type of reproduction is called  
(A) vegetative propagation  
(B) fragmentation  
(C) syngamy  
(D) binary fission
- Stock and scion are used in  
(A) cutting  
(B) grafting  
(C) layering  
(D) micropropagation

- An artificial method which involves joining the parts of two different plants in such a way that they unite and continue their growth as one plant is called  
(A) grafting  
(B) fragmentation  
(C) cutting  
(D) micropropagation
- A technique of grafting in which a single bud with a small part of bark and living tissue is grafted on the particular stock is called  
(A) cutting (B) bud grafting  
(C) cloning (D) stocking

1.2 Sexual Reproduction

- Which of the following is the initial stage of the sporophyte?  
(A) Haploid zygote  
(B) Diploid zygote  
(C) Haploid microspores  
(D) Haploid megaspores
- From the following identify the correct arrangement of floral whorls from outer to inner side in a flower.  
(A) calyx, gynoecium, androecium, corolla  
(B) calyx, corolla, androecium, gynoecium  
(C) corolla, calyx, androecium, gynoecium  
(D) gynoecium, androecium, corolla, calyx
- Individual members of androecium are called as  
(A) stamens (B) filaments  
(C) style (D) stigma
- Fertile part of a stamen is  
(A) filament (B) anther  
(C) connective (D) both (B) and (C)
- Two anther lobes are connected to each other by  
(A) tapetum (B) pollen sacs  
(C) connective (D) endothecium
- Each monotheous anther contains \_\_\_\_\_ pollen sac/s.  
(A) three (B) four  
(C) two (D) one
- Ditheous anther is  
(A) monosporangiate (B) bisporangiate  
(C) trisporangiate (D) tetrasporangiate
- \_\_\_\_\_ is the outermost layer of anther which is protective in function.  
(A) Epidermis (B) Endothecium  
(C) Tapetum (D) Pollen sac
- Endothecium layer of anther lobes is present  
(A) outside the epidermis  
(B) inner to epidermis  
(C) in the innermost region  
(D) in the middle region





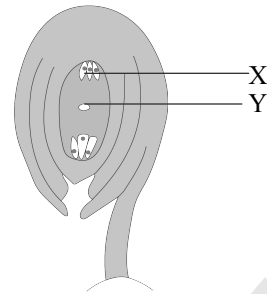
10. Generally in the wall of the anther lobes, how many middle layers are present?  
 (A) Seven to eight (B) One to two  
 (C) Ten to twelve (D) Nine to ten
11. \_\_\_\_\_ is the inner most nutritive layer of anther wall.  
 (A) Tapetum (B) Endothecium  
 (C) Middle layer (D) Epidermis
12. In an immature anther, inner to the tapetum, the microsporangium contains a compact mass of  
 (A) haploid sporogenous tissue  
 (B) diploid sporogenous tissue  
 (C) triploid sporogenous tissue  
 (D) tetraploid sporogenous tissue
- 1.3 Microsporogenesis**
1. Microsporogenesis is the formation of \_\_\_\_\_.  
 (A) pollen sac (B) anther  
 (C) pollen grains (D) pollen tube
2. Microsporogenesis takes place inside  
 (A) pollen grain (B) microsporangia  
 (C) endothecium (D) tapetum
3. Meiosis can be observed in  
 (A) cells of middle layer  
 (B) microspore mother cells  
 (C) microspores  
 (D) anther wall
4. Each pollen grain is  
 (A) multicellular, binucleate, spherical structure  
 (B) unicellular, uninucleate, spherical or oval, haploid structure  
 (C) multicellular, uninucleate, oval, diploid structure  
 (D) unicellular, binucleate, spherical, haploid structure.
5. The double layer wall of pollen grain is called  
 (A) exine (B) intine  
 (C) sporoderm (D) epiderm
6. The thick, highly resistant outer layer of pollen wall is called  
 (A) exine (B) intine  
 (C) endothecium (D) tapetum
7. Exine is interrupted at one or more places, called as  
 (A) megaspore (B) germ pore  
 (C) microspore (D) tube pore
8. The intine of a pollen grain is made up of  
 (A) cellulose and pectin  
 (B) lipid and protein  
 (C) pectin and lignin  
 (D) lignin and cutin
9. Which of the following has proved helpful in preserving pollen as fossils?  
 (A) Oil content  
 (B) Cellulosic intine  
 (C) Pollenkitt  
 (D) Sporopollenin
10. The development of male gametophyte is  
 (A) exosporic only  
 (B) endosporic only  
 (C) both exosporic and endosporic  
 (D) either exosporic or endosporic
11. Before pollination, protoplast of pollen grain undergoes \_\_\_\_\_ to form two unequal cells.  
 (A) mitosis  
 (B) meiosis  
 (C) both mitosis and meiosis  
 (D) none of these
12. In the pollen grain before pollination, the smaller cell formed after mitotic division is called  
 (A) tube cell (B) generative cell  
 (C) germ cell (D) stalk cell
13. Larger cell of pollen grain formed before pollination is called  
 (A) generative cell (B) vegetative cell  
 (C) prothial cell (D) stalk cell
14. Generative cell of a microspore undergoes which type of division?  
 (A) Mitosis (B) Meiosis  
 (C) Endomitosis (D) Budding
15. Male gametes are formed from  
 (A) stalk cell (B) tube cell  
 (C) prothial cell (D) generative cell
16. In most of the angiosperms, pollen grains are released at  
 (A) 4-celled stage (B) 2-celled stage  
 (C) 3-celled stage (D) pollen tube stage
17. 3-celled stage of the male gametophyte representing fully formed mature male gametophyte, is reached  
 (A) before pollination  
 (B) after pollination  
 (C) during fertilization  
 (D) after fertilization
18. Pollen tube is formed from  
 (A) pollen wall (B) callose layer  
 (C) exine (D) intine
19. Generally, in a pollen tube, \_\_\_\_\_ moves to the tip of the tube.  
 (A) generative nucleus  
 (B) tube nucleus  
 (C) male gametes  
 (D) stalk cell



### 1.4 Structure of Anotropous ovule

- The ovule of an angiosperm is technically equivalent to
  - megaspore
  - megasporangium
  - megasporophyll
  - megaspore mother cell
- Flower in which gynoecium possesses many free carpels is called as
  - Apocarpous
  - Uniovulate
  - Syncarpous
  - Multiovulate
- Which tissue of the ovary attaches the funiculus to an ovule in plants?
  - placenta
  - exine
  - nucellus
  - sporoderm
- A type of ovule, in which micropyle is directed downwards and is present adjacent to the funiculus is called
  - anatropous
  - campylotropous
  - circinotropous
  - amphitropous
- Stalk of ovule is called
  - pedicel
  - peduncle
  - funicle
  - petiole
- Nucellus consists of
  - parenchyma
  - collenchyma
  - sclerenchyma
  - perisperm
- The base of the ovule is called
  - chalaza
  - raphae
  - micropyle
  - placenta
- Protective covering of nucellus which develops from the chalazal part of nucellus is called
  - integuments
  - embryo sac
  - micropyle
  - chalaza
- The narrow opening of integuments at the terminal end of nucellus is called
  - funicle
  - embryo sac
  - micropyle
  - chalaza
- In a mature ovule, nucellus shows the presence of an oval shaped, haploid structure at micropylar end called
  - embryo sac
  - chalaza
  - funicle
  - nucellus
- In an anatropous ovule, antipodal cells are present towards the
  - micropylar region
  - chalazal region
  - egg
  - central cell

12. Identify labels 'X' and 'Y' in the given diagram of an anatropous ovule.



- X- Egg; Y- Male gamete
  - X- Synergid; Y- Egg cell
  - X- Antipodals; Y-Secondary nucleus
  - X- Nucellus; Y- Male gamete
13. Integument
  - gives protection to nucellus and embryo sac
  - after fertilization converted into seed coats
  - provides nutrition to the embryo sac
  - both (A) and (B)
14. Tegmen develops from
  - outer integuments
  - inner integuments
  - chalaza
  - perisperm
15. \_\_\_\_\_ forms the passage for the entry of pollen tube in ovule during fertilization.
  - Micropyle
  - Integuments
  - Nucellus
  - Egg Apparatus
16. \_\_\_\_\_ in the egg apparatus play supportive role and degenerate after fertilization.
  - Antipodals
  - Polar nuclei
  - Synergids
  - Nucellus

### 1.5 Megasporogenesis

- Formation of megaspores is called as
  - microsporogenesis
  - megasporogenesis
  - porogamy
  - chalazogamy
- The first cell of female gametophyte is
  - megaspore
  - microspore
  - megaspore mother cell
  - microspore mother cell
- Where does meiosis occur in an ovule?
  - Megaspore mother cell
  - Integument
  - Megaspore
  - Archivesporium
- In angiosperms, the arrangement of megaspores in a tetrad is
  - decussate
  - tetrahedral
  - linear
  - isobilateral





5. The 3-celled egg apparatus at the micropylar end comprises of
  - (A) egg cell and male gamete
  - (B) synergids and polar bodies
  - (C) egg and synergids
  - (D) egg and antipodals
6. Synergids show hair like projection called as
  - (A) antipodal
  - (B) filiform apparatus
  - (C) tegmen
  - (D) funicle
7. The female gametophyte (*Polygonum* type) at the time of fertilization is
  - (A) 4–nucleated and 4–celled
  - (B) 7–nucleated and 8–celled
  - (C) 8–nucleated and 7–celled
  - (D) 8–nucleated and 8–celled
7. Anemophilous flowers are
  - (A) small, inconspicuous without bright colours, fragrance and nectar.
  - (B) large with bright colours and pleasant fragrance.
  - (C) large with thick and fleshy floral whorls.
  - (D) large and stout.
8. Largest amount of pollen is produced by plants which show pollination by
  - (A) birds
  - (B) animal
  - (C) wind
  - (D) water
9. Which of the following characteristic is a wind pollinated flower likely to have?
  - (A) Large coloured flowers
  - (B) Fragrance
  - (C) Feathery stigmas
  - (D) Heavy spiny pollen

### 1.6 Pollination

1. The process of transfer of pollen grains from anther to the stigma of flower is called
  - (A) fertilization
  - (B) pollination
  - (C) crossing over
  - (D) transformation
2. Self-pollination means
  - (A) occurrence of male and female sex organs in the same flower.
  - (B) germination of pollens within the anther.
  - (C) transfer of pollens from anther to the stigma within same flower.
  - (D) transfer of pollens from anther of a flower to the stigma of another flower produced on different plant.
3. Pollination between different flowers on the same plant is
  - (A) xenogamy
  - (B) anemophily
  - (C) geitonogamy
  - (D) cleistogamy
4. The transfer of pollen grains from anther of a flower to the stigma of another flower produced on a different plant belonging to the same species is called
  - (A) autogamy
  - (B) geitonogamy
  - (C) xenogamy
  - (D) syngamy
5. Which of the following are abiotic agents of pollination?
  - (A) Wind, water
  - (B) Insects, birds
  - (C) Bees, bats
  - (D) both (B) and (C)
6. The transfer of pollen grains through wind is described as
  - (A) hydrophily
  - (B) anemophily
  - (C) entomophily
  - (D) ornithophily
10. Stamens with long filaments and versatile, exposed anthers are seen in
  - (A) hydrophilous flowers
  - (B) entomophilous flowers
  - (C) anemophilous flowers
  - (D) ornithophilous flowers
11. Which of the following is NOT an anemophilous plant?
  - (A) Wheat
  - (B) Maize
  - (C) Barley
  - (D) *Ceratophyllum*
12. The transfer of pollen grains through the agency of water is called
  - (A) anemophily
  - (B) entomophily
  - (C) hydrophily
  - (D) ornithophily
13. Adaptation shown by pollen grain by hydrophilous flower is
  - (A) hairy exine of pollen grains
  - (B) mucilage coat on pollen grains
  - (C) heavy weight pollen grains
  - (D) winged pollen grains
14. Which of the following floral adaptations are adapted by hydrophilous flowers?
  - (A) Flowers are small and inconspicuous.
  - (B) Flowers are without fragrance and nectar.
  - (C) Perianth and other floral parts are unwettable.
  - (D) All of the above
15. Pollination taking place below the surface of water in hydrophytes bearing submerged female flowers is called
  - (A) hypohydrophily
  - (B) epihydrophily
  - (C) anemophily
  - (D) entomophily
16. When pollination occurs on the surface of water it is called
  - (A) hypohydrophily
  - (B) epihydrophily
  - (C) anemophily
  - (D) ornithophily



17. \_\_\_\_\_ flowers produce ribbon-like pollen grains without exine.  
(A) Anemophilous  
(B) Entomophilous  
(C) Ornithophilous  
(D) Hypohydrophilous
18. In *Ceratophyllum*, pollination is  
(A) hydrophilous (B) chiropterophilous  
(C) entomophilous (D) anemophilous
19. In *Vallisneria*, pollination occurs  
(A) on surface of water  
(B) below surface of water  
(C) through wind  
(D) deep in water
20. Pollination through the agency of insects is known as  
(A) entomophily (B) ornithophily  
(C) hydrophily (D) anemophily
21. Attractants and rewards are required for  
(A) anemophily (B) entomophily  
(C) hydrophily (D) cleistogamy
22. Bright coloured flower is an adaptation for  
(A) zoophily (B) hydrophily  
(C) entomophily (D) anemophily
23. In Rose, Jasmine and *cestrum* pollination is carried out by  
(A) air (B) water  
(C) insects (D) birds
24. Bird pollination is  
(A) entomophily (B) anemophily  
(C) hydrophily (D) ornithophily
25. Find the odd pair from the following.  
(A) Anemophily – wind  
(B) Hydrophily – water  
(C) Ornithophily – insect  
(D) Chiropterophily – bat
26. Which of the following is/are an ornithophilous plant/s?  
(A) *Bombax*  
(B) *Callistemon* (Bottle Brush)  
(C) *Butea*  
(D) All of these
27. Chiropterophily is the pollination carried out by  
(A) insect (B) bat  
(C) birds (D) animals
28. \_\_\_\_\_ plants are nocturnal and open their flower during night.  
(A) Chiropterophilous (B) Entomophilous  
(C) Ornithophilous (D) Hydrophilous
29. Which of the following involves comparatively greater wastage of pollen?  
(A) Ornithophily (B) Anemophily  
(C) Entomophily (D) Chiropterophily

### 1.7 Outbreeding Devices (contrivances)

1. Which of the following is/are outbreeding device/s that prevent/s self-pollination?  
(A) Unisexuality (B) Protogyny  
(C) Protandry (D) All of these
2. Protogyny is a condition in which  
(A) gynoecium matures earlier than the androecium.  
(B) androecium matures earlier than the gynoecium.  
(C) both androecium and gynoecium mature at the same time.  
(D) gynoecium remains sterile and fruit formation does not occur.
3. When the anthers mature earlier than the stigma in the same flower, the condition is known as  
(A) herkogamy (B) protandry  
(C) heterostyly (D) dichogamy
4. In primrose, there are two or three types of flowers in which stigmas and anthers are placed at different levels, this condition is called  
(A) protogyny (B) dichogamy  
(C) heterostyly (D) herkogamy
5. A genetic mechanism due to which the germination of pollen on stigma of the same flower is inhibited is called  
(A) self-sterility  
(B) heterostyly  
(C) self-incompatibility  
(D) both (A) and (C)

### 1.8 Pollen-Pistil Interaction

1. Events from deposition of pollen grain on the stigma to the entry of pollen tube in the ovule are called  
(A) pollination  
(B) fertilization  
(C) pollen-pistil interaction  
(D) self-incompatibility
2. In the process of pollination in angiosperms, the receptive part in the flower receives  
(A) male gametes (B) pollen tube  
(C) pollen grains (D) insects
3. After a successful germination, the tip of the pollen tube enters in one of the \_\_\_\_\_ and then ruptures to release the contents.  
(A) synergids (B) antipodals  
(C) eggs (D) polar nuclei
4. \_\_\_\_\_ induces pollen germination and tube growth *in vitro*.  
(A) Conc.  $H_2SO_4$  (B) Sucrose  
(C) Abscisic acid (D) Dilute HCl

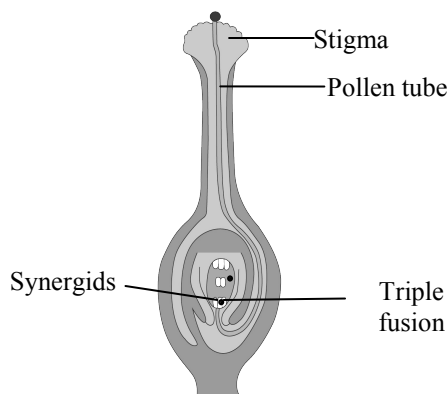


5. In \_\_\_\_\_ only desired pollen grains are hand pollinated and used for fertilization.
- (A) hybridization  
(B) self-incompatibility  
(C) vegetative propagation  
(D) asexual reproduction

### 1.9 Double Fertilization

1. Double fertilization is
- (A) Fusion of two male gametes with one egg  
(B) Fusion of one male gamete with two polar nuclei  
(C) Fusion of two male gametes of a pollen tube with two different eggs  
(D) Syngamy and triple fusion
2. Double fertilization is exhibited by
- (A) Gymnosperms (B) Algae  
(C) Angiosperms (D) Fungi
3. When pollen tube enters through micropyle, it is known as
- (A) mesogamy (B) siphonogamy  
(C) porogamy (D) chalazogamy
4. Complete the given analogy by selecting the correct option.  
Entry of pollen tube through  
Chalaza: Chalazogamy :: Integuments: \_\_\_\_\_
- (A) Syngamy (B) Porogamy  
(C) Siphonogamy (D) Mesogamy
5. A pollen tube always enters the embryo sac near the
- (A) egg apparatus (B) antipodals  
(C) secondary nucleus (D) chalaza
6. The fertilization process in which non-motile male gametes are transported upto the female gamete through a pollen tube is called
- (A) syngamy (B) siphonogamy  
(C) chalazogamy (D) mesogamy
7. Syngamy means
- (A) fusion of similar spores  
(B) fusion of dissimilar spores  
(C) fusion of cytoplasm  
(D) fusion of gametes
8. Syngamy results in
- (A) diploid zygote  
(B) triploid zygote  
(C) diploid endosperm  
(D) triploid endosperm
9. In double fertilization, the first male gamete fuses with egg and second male gamete fuses with
- (A) PEN  
(B) secondary nucleus  
(C) zygote  
(D) antipodal cells

10. Triple fusion means, fusion of
- (A) two antipodals with male gametes  
(B) two eggs with a male gamete  
(C) two male gametes with one egg  
(D) one male gamete with secondary nucleus
11. In angiosperm, triple fusion is necessary for the formation of
- (A) seed coat (B) fruit wall  
(C) embryo (D) endosperm
12. In angiosperms, triple fusion results in the formation of
- (A) primary endosperm nucleus  
(B) zygotic nucleus  
(C) secondary nucleus  
(D) polar nucleus
13. Real function of the 'endosperm' is to
- (A) supply nutrition to the growing embryo  
(B) form integuments of ovule  
(C) form funicle of ovule  
(D) none of these
14. Select the INCORRECT statement from the following with respect to double fertilization.
- (A) Syngamy is a type of generative fertilization.  
(B) Triple fusion is a type of vegetative fertilization.  
(C) The growth of pollen tube is guided by the chemicals secreted by the antipodal cells.  
(D) The zygote develops into an embryo.
15. Identify the INCORRECT label in the given figure of double fertilization.



- (A) Stigma (B) Triple fusion  
(C) Pollen tube (D) Synergids

### 1.10 Development of Endosperm

1. The primary endosperm nucleus undergoes free nuclear division or karyokinesis in
- (A) nuclear endosperm  
(B) cellular endosperm  
(C) helobial endosperm  
(D) none of these



2. In cellular endosperm,
  - (A) the primary endosperm nucleus undergoes karyokinesis only.
  - (B) the primary endosperm nucleus undergoes nuclear divisions which is immediately followed by cytokinesis.
  - (C) the first division of primary endosperm nucleus is followed by incomplete wall formation.
  - (D) the central cell is divided into a large micropylar and a small chalazal chamber.
3. Which of the following is the characteristic feature of helobial endosperm?
  - (A) The first division of primary endosperm nucleus is followed by a transverse wall formation.
  - (B) The central cell is divided into a large micropylar and a small chalazal chamber.
  - (C) It is common in Helobiales series of monocots.
  - (D) All of the above
4. In coconut, the endosperm in the centre is
  - (A) diploid
  - (B) multicellular
  - (C) free nuclear
  - (D) helobial
5. Which of the following plant shows cellular type of endosperm?
  - (A) Wheat
  - (B) *Petunia*
  - (C) *Asphodelus*
  - (D) Sunflower
6. During embryo development, the embryonal initial cell 2-celled pro-embryo undergoes a transverse and two vertical divisions at right angles to each other to form
  - (A) tetrad stage
  - (B) octant stage
  - (C) triplet stage
  - (D) none of these
7. The first cell of the suspensor towards the micropylar end becomes swollen and function as a
  - (A) hypocotyl
  - (B) haustorium
  - (C) radicle
  - (D) plumule
8. The lowermost cell of suspensor is known as
  - (A) hypocotyl
  - (B) haustorium
  - (C) hypophysis
  - (D) scutellum
9. The single shield shaped cotyledon in monocot is called as
  - (A) haustorium
  - (B) perisperm
  - (C) coleoptile
  - (D) scutellum
10. Fully developed embryo ultimately becomes
  - (A) globular shaped
  - (B) cordate shaped
  - (C) horse – shoe shaped
  - (D) kidney shaped

### 1.12 Seed and Fruit development

#### 1.11 Development of Embryo

1. The process of development of zygote into an embryo is called
  - (A) embryogenesis
  - (B) karyokinesis
  - (C) sporogenesis
  - (D) parthenogenesis
2. During the development of embryo, the zygote forms a wall around itself and is converted into
  - (A) oosphere
  - (B) oospore
  - (C) oogonia
  - (D) oocyte
3. The oospore during embryonic development divides
  - (A) transversely
  - (B) horizontally
  - (C) diagonally
  - (D) vertically
4. The 2-celled stage of embryo is called as
  - (A) suspensor
  - (B) embryonal cell
  - (C) proembryo
  - (D) plumule
5. Role of suspensor is
  - (A) to transport water to the embryo
  - (B) helping in cell division
  - (C) pushing the embryo in endosperm
  - (D) all of these
1. Which of the following shows post fertilization changes incorrectly?
  - (A) Ovary – Fruit
  - (B) Ovule – Seed
  - (C) Integuments – Perisperm
  - (D) Zygote – Embryo
2. Outer integument and inner integument of an ovule changes into
  - (A) seed and fruit respectively
  - (B) testa and tegmen respectively
  - (C) mesocarp and endocarp respectively
  - (D) seed and flower respectively
3. Persistent nucellus in the seed is known as:
  - (A) Hilum
  - (B) Perisperm
  - (C) Chalaza
  - (D) Tegmen
4. Ex-albuminous seeds differ from albuminous seeds in
  - (A) not having endosperm
  - (B) not having embryo sac
  - (C) having endosperm
  - (D) having embryo sac
5. Which of the following are non-endospermic seeds?
  - (A) Castor, sunflower
  - (B) Coconut, maize
  - (C) Wheat, bajra
  - (D) Pea, bean



6. What is the function of micropyle in seed?  
 (A) Entry of water during germination  
 (B) Acts as a first photosynthetic organ  
 (C) Entry of oxygen during germination  
 (D) Both (A) and (C)
7. A true fruit is developed from \_\_\_\_\_.  
 (A) ovule  
 (B) thalamus and ovary  
 (C) ovary only  
 (D) calyx and ovary
8. At the time of fruit formation, ovary wall changes into  
 (A) endocarp (B) mesocarp  
 (C) epicarp (D) pericarp
9. All the given below are significance of seed and fruit formation, except  
 (A) Seeds and fruits develop special devices for their dispersal and thus help in the distribution of the species.  
 (B) Fruits protect the seeds in immature condition.  
 (C) Fruits derive nutrition from developing seeds.  
 (D) Seeds serve as important propagating organs (units) of plant.
10. \_\_\_\_\_ is a temporary state of metabolic arrest that facilitates the survival of organisms during adverse environmental conditions.  
 (A) Dormancy (B) Viability  
 (C) Dispersal (D) Parthenocarpy
11. The functional ability of seeds to germinate after considerable dormancy period is called  
 (A) viability (B) dispersal  
 (C) apomixis (D) polyembryony

### 1.13 Apomixis

1. Formation of seeds without fertilization is called  
 (A) amphimixis (B) parthenocarpy  
 (C) polyembryony (D) apomixis
2. When diploid sporophyte cell produces a diploid gametophyte without undergoing meiosis is called  
 (A) apogamy  
 (B) autogamy  
 (C) apospory  
 (D) adventive polyembryony
3. Read the given statements with respect to non-recurrent apomixis.  
 i. In this, megaspore mother cell undergoes usual meiotic division and a haploid embryo sac is formed.  
 ii. Plants produced by this method are generally sterile and do not reproduce sexually.

The correct statement/s is/are

- (A) only i (B) only ii  
 (C) both i and ii (D) neither i nor ii

4. Adventive embryony can be observed in  
 (A) Orange (B) Mango  
 (C) Lemon (D) All of these

### 1.14 Parthenocarpy

1. The development of fruit, without fertilization, is called  
 (A) fruit culture (B) cell division  
 (C) parthenocarpy (D) parthenogenesis
2. An example of a naturally occurring parthenocarpic fruit is  
 (A) Guava (B) Mango  
 (C) Banana (D) Apple
3. In parthenocarpic plants, the placental tissue in the unfertilized ovary produces \_\_\_\_\_ which is responsible for enlargement of ovary into fruit.  
 (A) auxin IAA (Indole-3 Acetic Acid)  
 (B) Cytokinins  
 (C) ABA  
 (D) Ethylene
4. Parthenocarpy can be induced artificially by  
 (A) spraying of gibberellins  
 (B) delaying pollination  
 (C) use of foreign pollens  
 (D) all of these

### 1.15 Polyembryony

1. Presence of many embryos (Polyembryony) is a characteristic feature of  
 (A) *Citrus* (B) Pineapple  
 (C) Banana (D) None of these
2. In \_\_\_\_\_, an embryo develop directly from the diploid cell of nucellus and integuments as in *Citrus*.  
 (A) adventive parthenogenesis  
 (B) adventive polyembryony  
 (C) cleavage polyembryony  
 (D) cleavage parthenogenesis
3. What is cleavage polyembryony?  
 (A) An embryo develop directly from the diploid cell of nucellus and integuments.  
 (B) Fruit is developed without the process of fertilization.  
 (C) Zygote proembryo divides into many parts or units and each unit then develops into an embryo.  
 (D) Megaspore mother cell undergoes usual meiotic division to form a diploid embryo sac.

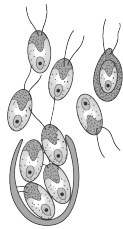




Critical Thinking

1.1 Asexual Reproduction

- Select the INCORRECT statement from the following.
  - Asexual reproduction does not involve fusion of sex cells.
  - Budding, gemmae formation, zoospores are examples of asexual reproduction.
  - Progeny formed by asexual reproduction differs genetically from its parent.
  - The new individuals formed by asexual reproduction are called clones.
- Select the CORRECT statement with respect to following diagram.

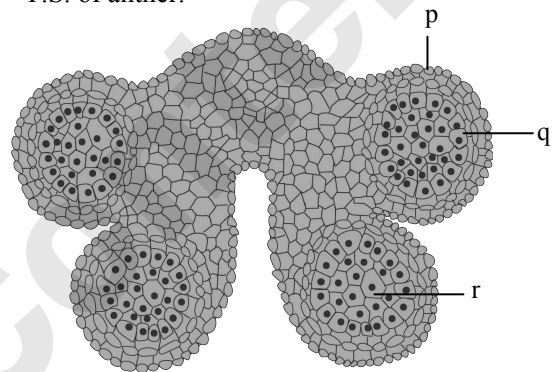


- It shows non-motile spores of Yeast.
  - It shows motile spores of *Amoeba*.
  - It shows *Chlamydomonas* which reproduces asexually by formation of zoospores.
  - It shows gemmae formed by *Marchantia*.
- Reproductive roots taking part in reproduction are found in
    - Asparagus*
    - Dahlia*
    - Sweet Potato
    - All of these
  - In grafting, what is a stock?
    - Roots of dicotyledonous plant.
    - Part of the other plant inserted on the rooted plant.
    - Plant rooted in the soil on which the part of the other plant is inserted.
    - Plant with a primary meristem.
  - Grafting is not possible in monocots because
    - they do not show secondary growth.
    - stock and scion of monocot plants do not fuse.
    - they do not have inter or intra-fascicular cambium.
    - all the above

1.2 Sexual Reproduction

- Anther is generally composed of
  - one sporangium
  - two sporangia
  - three sporangia
  - four sporangia

- Select the INCORRECT statement from the following with respect to anther.
  - The archesporial cell divides into an inner sporogenous cell and outer primary parietal cell.
  - Sporogenous tissue is formed from sporogenous cells of an anther.
  - Only few cells of sporogenous tissue are capable of giving rise to a microspore tetrad.
  - Parietal cells of an anther undergo divisions to form anther wall layers.
- Identify labels p, q and r in the given figure of T.S. of anther.



	p	q	r
(A)	Epidermis	Middle layers	MMC
(B)	Epidermis	Tapetum	Sporogenous tissue
(C)	Endothecium	Middle layers	MMC
(D)	Endothecium	Connective	Sporogenous tissue

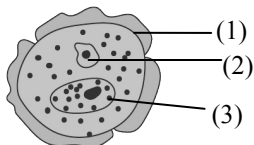
- The anther wall consists of four wall layers where
  - endothecium lies inner to middle layers
  - tapetum lies just inner to endothecium
  - tapetum lies next to epidermis
  - middle layers lie between endothecium and tapetum

1.3 Microsporogenesis

- Pollen grains can remain well preserved in fossil due to presence of
  - intine
  - germ pore
  - sporopollenin
  - none of these
- In flowering plant, a mature gametophyte is derived from a pollen mother cell by
  - 3 mitosis
  - 1 meiosis and 3 mitosis
  - 1 meiosis and 2 mitosis
  - single meiosis



3. In the given diagram of pollen grain, identify 1, 2 and 3.



- (A) 1 – Exine; 2 – Generative cell; 3 – Tube cell  
 (B) 1 – Intine; 2 – Generative cell; 3 – Tube cell  
 (C) 1 – Exine; 2 – Tube cell; 3 – Generative cell  
 (D) 1 – Intine; 2 – Vegetative cell; 3 – Generative cell
4. Select the INCORRECT statement with respect to generative cell.  
 (A) It is rich in food.  
 (B) It has irregular shaped nucleus.  
 (C) It is bigger than vegetative cell.  
 (D) It is thin walled.
5. If there are 4 microspore mother cells in anthers, what will be the number of pollen grains?  
 (A) 4 (B) 8 (C) 12 (D) 16
6. If there are 24 microspore mother cells in plant, then how many meiotic divisions are required to produce 576 haploid microspores?  
 (A) 24 (B) 96 (C) 12 (D) 72
7. How many pollen mother cells should undergo meiotic division to produce 64 pollen grains?  
 (A) 4 (B) 8 (C) 16 (D) 32
8. When a microspore mother cell with 40 chromosomes undergoes meiosis, each of the four resulting cells has  
 (A) 80 chromosomes (B) 40 chromosomes  
 (C) 20 chromosomes (D) 10 chromosomes
9. **Assertion (A):** Pollen mother cells (PMC) are the first male gametophytic cells.  
**Reason (R):** Each pollen mother cell (PMC) produces two pollen grains.  
 (A) Both A and R are true and R is the correct explanation of A.  
 (B) Both A and R are true and R is not the correct explanation of A.  
 (C) A is true and R is false.  
 (D) Both A and R are false.
10. Which one of the following statements is NOT true?  
 (A) Pollen grains of many species cause severe allergies.  
 (B) Stored pollen in liquid nitrogen can be used in the crop breeding programmes.  
 (C) Tapetum helps in the dehiscence of anther.  
 (D) Exine of pollen grains is made up of sporopollenin.

#### 1.4 Structure of Anatroous ovule

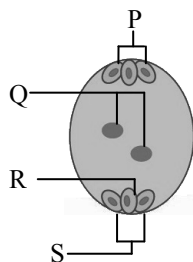
1. In anatroous ovule, the micropyle is  
 (A) in straight line with funicle  
 (B) at right angle with funicle  
 (C) at  $45^\circ$  with funicle  
 (D) side by side with funicle
2. The number of synergids and antipodals present in a typical angiosperm embryo sac at maturity respectively are  
 (A) two and three (B) one and three  
 (C) three and two (D) one and two
3. Secondary diploid nucleus is made up of  
 (A) 2 female gametes  
 (B) 2 polar nuclei  
 (C) 2 male gametes  
 (D) One male gamete and one female gamete
4. Polar nuclei are found in  
 (A) male gametophyte  
 (B) nucellus  
 (C) female gametophyte  
 (D) pollen chamber
5. Which cell of the gametophyte of a normal angiosperm is diploid at the time of fertilization?  
 (A) Prothial cell/vegetative cell  
 (B) Antipodal cell and synergids  
 (C) Secondary nucleus  
 (D) Generative cell
6. Which of the following pairs of plant parts are haploid?  
 (A) Nucellus and antipodals  
 (B) Antipodal and egg cell  
 (C) Antipodals and megaspore mother cell  
 (D) Nucellus and primary endosperm nucleus
7. Which one is female gametophyte in angiosperms?  
 (A) Embryo (B) Embryo sac  
 (C) Endosperm (D) Synergid

#### 1.5 Megasporogenesis

1. Which is the most common type of embryo sac in angiosperms?  
 (A) Bisporic with two sequential mitotic divisions  
 (B) Tetrasporic with one mitotic stage of divisions  
 (C) Monosporic with three sequential mitotic divisions  
 (D) Monosporic with two sequential mitotic divisions
2. Generally, how many megaspores take part in the development of female gametophyte?  
 (A) One (B) Two  
 (C) Three (D) Four



3. A linear tetrad of 4 cells lying in an axial row is formed during the development of  
(A) Embryo sac (B) Pollen grains  
(C) Ovary (D) Ovule
4. The haploid cell which divides by mitosis to form embryo sac is  
(A) diploid megaspore  
(B) microspore mother cell  
(C) functional megaspore  
(D) non-functional megaspore
5. The number of nuclei migrating from each of the micropylar quartet and chalazal quartet to the centre of the normal embryo sac is  
(A) one (B) two  
(C) four (D) number not fixed



6. Identify the part of embryo sac which takes part in formation of primary endosperm nucleus during fertilization.  
(A) P  
(B) Q  
(C) R  
(D) S
7. If the number of chromosomes in a root cell is 14, what will be the number of chromosomes in synergids of an ovule of that parent?  
(A) 7 (B) 14 (C) 21 (D) 28
8. The development of embryo sac is described as monosporic because;  
(A) it occurs within the megaspore.  
(B) only one egg takes part in fertilization.  
(C) mitosis occurs only once.  
(D) it develops from a single megaspore.

### 1.6 Pollination

1. A dioecious flowering plant prevents both:  
(A) Autogamy and xenogamy  
(B) Autogamy and geitonogamy  
(C) Geitonogamy and xenogamy  
(D) Cleistogamy and xenogamy
2. What is important for self-pollination?  
(A) Dichogamy (B) Dioecious plants  
(C) self-sterility (D) Bisexual flowers
3. Geitonogamy involves  
(A) Fertilization of a flower by the pollen from another flower of the same plant.  
(B) Fertilization of a flower by the pollen from the same flower.  
(C) Fertilization of a flower by the pollen from a flower of another plant in the same population.  
(D) Fertilization of a flower by the pollen from a flower of another plant belonging to a distant population.

4. Geitonogamy is found between flowers which are  
(A) genetically similar  
(B) genetically different  
(C) unisexual  
(D) self-sterile
5. Which of the following statements are true about self-pollination?  
(i) Self-pollination is the most economic method for plant modification.  
(ii) Genetic stability can be maintained in the progeny through self-pollination.  
(iii) Undesirable characters can be eliminated through self-pollination.  
(iv) Continued self-pollination may result in the less viable seeds.  
(v) Self-pollination favours evolution.  
(A) (i), (ii), (iv) are correct and (iii), (v) are incorrect.  
(B) (iii), (v) are correct and (i), (ii), (iv) are incorrect.  
(C) (i), (iii), (v) are correct and (ii), (iv) are incorrect.  
(D) all are correct
6. Heterozygosity is most favoured in  
(A) cleistogamy (B) autogamy  
(C) xenogamy (D) geitonogamy
7. Which of the following statement is INCORRECT with respect to epihydrophilous plants?  
(A) The pollen grains float on water surface and reach the stigma of female flower.  
(B) It is commonly observed in water hyacinth and water lily.  
(C) Specific gravity of pollen grain is equal to that of water.  
(D) In *Vallisneria* female flowers reach the water surface temporarily to ensure pollination.
8. Which of the following is hydrophilous plant?  
(A) *Halogaris* (B) *Potamogeton*  
(C) *Zostera* (D) Lotus
9. A close relation between flower and pollinating agent is best exhibited by  
(A) *Maize* (B) *Salvia*  
(C) *Zostera* (D) *Wheat*
10. Which of the following is NOT an adaptation in ornithophilous flowers?  
(A) Flowers are usually brightly coloured, large and showy.  
(B) They secrete profuse, dilute nectar.  
(C) Pollen grains are sticky and spiny.  
(D) The flowers produce sweet odour (smell) and have nectar glands.





11. Find the WRONG statement about entomophilous flowers from the following.
- Entomophilous flowers are large, showy and often brightly coloured.
  - The flowers produce sweet odour (smell) and have nectar glands.
  - Pollen grains of entomophilous flowers have smooth exine.
  - Stigma of entomophilous flowers is sticky.
12. Pollination in *Anthocephalus* and *Kigelia pinnata* is
- anemophilous
  - entomophilous
  - ornithophilous
  - chiropterophilous

### 1.7 Outbreeding Devices (contrivances)

- Cross pollination is preferred over self-pollination because
  - the new and improved varieties are formed.
  - it results in a better and healthier offspring.
  - it favours the process of evolution.
  - all of the above.
- Plants show outbreeding devices as,
  - continued self-pollination results in the inbreeding depression.
  - to promote cross pollination and increase genetic diversity.
  - self-pollination is an essential factor for evolution by natural selection.
  - i and iii
  - i and ii
  - ii and iii
  - only iii
- Dioecious condition seen in papaya plant prevents
  - autogamy only
  - geitonogamy only
  - autogamy as well as geitonogamy
  - pollination
- Dichogamy which helps in cross pollination is a floral mechanism in which
  - pollen sac and stigma are at different heights.
  - anther and stigma mature at different times.
  - structure of pollen sac and stigma functions as hurdles.
  - pollen grain is unable to germinate on the stigma of the same flower.
- Identify the condition in which pollen grains of other flowers germinate rapidly over the stigma than the pollen grains from the same flower.
  - Proandry
  - Prepotency
  - Progyny
  - Herkogamy

6. In *Calotropis*, pentangular stigma is positioned above the level of anthers (pollinia). This is an example of
- herkogamy
  - protandry
  - protogyny
  - self-sterility

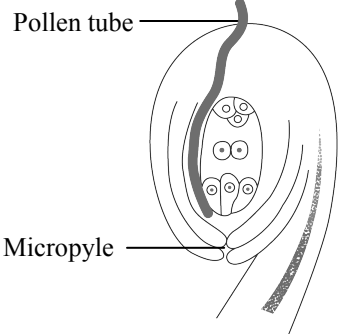
### 1.8 Pollen-Pistil Interaction

- Identify the correct order of events in pollen-pistil interaction from the options given below:
  - Release of male gametes into the embryo sac.
  - Deposition of pollen grains on stigma.
  - Entry of pollen tube into embryo sac.
  - Development of pollen tube.
  - Entry of pollen tube into the Ovule.
  - IV → III → II → I → V
  - II → IV → V → III → I
  - II → IV → III → V → I
  - V → IV → III → II → I
- Select the INCORRECT statement from the following.
  - The pistil has the ability to recognise and accept the right or compatible pollen of the same species.
  - The compatible pollen absorbs water and nutrients from the surface of stigma, germinates and produces pollen tube.
  - Pollination always guarantee the transfer of right type of pollen grain on stigma.
  - only iii
  - both i and ii
  - i, ii and iii
  - only i

### 1.9 Double Fertilization

- Which of the following statement is INCORRECT about double fertilization?
  - It involves use of only one male gamete.
  - It avoids the chances of polyembryony.
  - It consists of two fusions and results in the formation of two products.
  - First fertilization restores diploidy in life cycle.
- What is the fate of the male gametes discharged in the synergid?
  - One fuses with the egg, other(s) fuse(s) with synergid nucleus.
  - One fuses with the egg and other fuses with central cell nuclei.
  - One fuses with the egg, other(s) degenerate(s) in the synergid.
  - All fuse with the egg.
- Which of the following is not true for double fertilization?
  - Discovered by Nawaschin.
  - Male gamete and secondary nucleus fused to form endosperm nucleus.
  - Endosperm nucleus is diploid.
  - Endosperm provides nutrition to embryo.



4. In angiosperms, the micropyle  
 (A) receives pollen grain  
 (B) secretes a pollen drop  
 (C) receives pollen tube  
 (D) all of these
5. The given figure represents
- 
- (A) Porogamy (B) Chalazogamy  
 (C) Mesogamy (D) Autogamy
6. Through which route the pollen tube can enter the ovule?  
 (A) Chalaza (B) Micropyle  
 (C) Funiculus (D) All of these
7. After penetrating stigmatic and stylar tissues, the pollen tube usually grows down towards the egg because  
 (A) the egg cell attracts the pollen tube as they have dissimilar electric charge.  
 (B) the filiform apparatus of synergids is believed to attract the pollen tube.  
 (C) it has no other passage to follow.  
 (D) it grows under control of nucleus.
8. The total number of nuclei involved in double fertilization are  
 (A) 2 (B) 4 (C) 5 (D) 6
9. If an endosperm of an angiosperm has 24 chromosomes, what would be the number of chromosomes in the megaspore mother cell of the same plant?  
 (A) 8 (B) 16 (C) 24 (D) 32
10. There are 12 chromosomes in the megaspore mother cell of an angiosperm. What shall be the chromosome number in the endosperm?  
 (A) 18 (B) 36 (C) 12 (D) 24

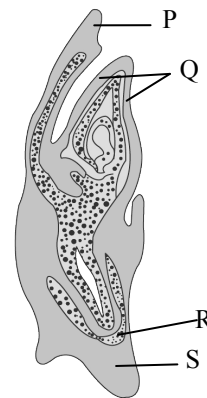
### 1.10 Development of Endosperm

1. In angiosperms, the oospore on development produces  
 (A) seed (B) embryo  
 (C) protonema (D) endosperm
2. At what stage of endosperm development, will you observe nuclear or cellular type of endosperm?

- (A) When division starts in embryo.  
 (B) When embryo is heart-shaped.  
 (C) Mature stage of endosperm.  
 (D) Just after division of primary endosperm nucleus.
3. During embryo development, the lower tier of octant give rise to \_\_\_\_\_ and \_\_\_\_\_.  
 (A) plumule and cotyledon  
 (B) hypocotyl and plumule  
 (C) plumule and radicle  
 (D) hypocotyl and radicle
4. Read the given statements and select the correct option.
- In post-fertilization changes within the ovule, the development of embryo is followed by the development of endosperm.
  - Helobial endosperm is intermediate between cellular and nuclear type endosperm
  - Helobial endosperm is mostly observed in 72 families of dicots.
- The correct statement/s is/are  
 (A) i and ii (B) only ii  
 (C) i, ii and iii (D) only i

### 1.11 Development of Embryo

1. Identify labels P, Q, R and S in the given figure of monocot embryo.



	P	Q	R	S
(A)	epiblast	coleorhiza	radicle	coleoptile
(B)	scutellum	coleoptile	root cap	coleorhiza
(C)	shoot apex	coleorhiza	radicle	coleoptile
(D)	epiblast	coleoptile	shoot apex	coleorhiza

2. Dicot embryo consists of  
 (A) radicle and plumule  
 (B) radicle, plumule, cotyledons and sometimes endosperm  
 (C) radicle, plumule, cotyledons and tegmen  
 (D) radicle, plumule, cotyledons, tegmen and testa



3. Select the INCORRECT statement from the following.
- (A) The embryo development is similar in both dicots and monocots up to the octant stage.
  - (B) In monocot embryo, the protective sheath of plumule is called coleorhiza and that of radicle is coleoptile.

- (C) In monocot embryo, single cotyledon occupies terminal position and plumule is lateral.
  - (D) In monocots, the single shield shaped cotyledon is called as scutellum.
4. Which of the following part of a pistil forms a fruit after fertilization?
- (A) Stigma
  - (B) Ovule
  - (C) Ovary
  - (D) Style

**◆ ◆ ◆ Concept Fusion ◆ ◆ ◆**

1. Which one of the following statements is NOT correct?
- (A) Water Hyacinth growing in the standing water, drains oxygen from water that leads to the death of fishes.
  - (B) Offspring produced by the asexual reproduction are called clone.
  - (C) Microscopic, motile, asexual reproductive structures are called zoospores.
  - (D) In potato, banana and ginger, the plantlets arise from the internodes which are present in the modified stem.
2. Haploids can be obtained from
- (A) a pollen grain
  - (B) root apex
  - (C) shoot apex
  - (D) embryo
3. If the diploid number of an angiospermic plant is 24, the number of chromosomes in the pollen grain, endosperm and integument will be
- (A) 12, 36, 12
  - (B) 12, 24, 36
  - (C) 12, 12, 36
  - (D) 12, 36, 24
4. In angiosperms, free nuclear divisions occurs during
- (A) gamete formation
  - (B) embryo formation
  - (C) endosperm formation
  - (D) flower formation
5. Which one is an example of triploid tissue?
- (A) Onion root
  - (B) Pollen grain of sunflower
  - (C) Maize and lily endosperm
  - (D) None of the above
6. If diploid chromosome number in a flowering plant is 12, then which one of the following will have only 6 chromosomes?
- (A) Endosperm
  - (B) Leaf cells
  - (C) Cotyledons
  - (D) Synergids
7. Match Column I and Column II and choose the correct option.

Column I		Column II	
i.	Ovule	a.	Pollen grain
ii.	Microspore	b.	Female reproductive whorl

- |      |        |    |                                 |
|------|--------|----|---------------------------------|
| iii. | Carpel | c. | Genetically identical organisms |
| iv.  | Clones | d. | Integumented Megasporangium     |
- (A) (i - d); (ii - a); (iii - b); (iv - c)
  - (B) (i - d); (ii - a); (iii - c); (iv - b)
  - (C) (i - d); (ii - c); (iii - b); (iv - a)
  - (D) (i - a); (ii - d); (iii - c); (iv - b)
8. The plants parts which consist of two generations one within the other:
- (a) Pollen grains inside the anther
  - (b) Germinated pollen grain with two male gametes
  - (c) Seeds inside the fruit
  - (d) Embryo sac inside the ovule
- (A) (a), (b) and (c)
  - (B) (c) and (d)
  - (C) (a) and (d)
  - (D) (a) only
9. Select the CORRECT sequence of events.
- (A) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell differentiation → Cell division (Cleavage) → Organogenesis
  - (B) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell division (Cleavage) → Cell differentiation → Organogenesis
  - (C) Gametogenesis → Gamete transfer → Syngamy → Zygote → Cell division → (Cleavage) → Organogenesis → Cell differentiation
  - (D) Gametogenesis → Syngamy → Gamete transfer → Zygote → Cell division (Cleavage) → Cell differentiation → Organogenesis
10. Which one of the following statements is correct?
- (A) Hard outer layer of pollen is called intine.
  - (B) Sporogenous tissue is haploid.
  - (C) Endothecium produces the microspores.
  - (D) Tapetum nourishes the developing pollen.



MHT-CET Previous Years' Questions

1. Bright colored flower is an adaptation for [2004]  
(A) Zoophily (B) Hydrophily  
(C) Entomophily (D) Anemophily
2. When pollen tube enters the ovule through the micropyle it is known as [2004]  
(A) Syngamy (B) Porogamy  
(C) Chalazogamy (D) Misogamy
3. Syngamy results in [2006]  
(A) Diploid zygote  
(B) Triploid zygote  
(C) Diploid endosperm  
(D) Triploid endosperm
4. Female gametophyte in flowering plants develops after [2007]  
(A) 1 meiosis and 2 mitosis  
(B) 2 meiosis and 2 mitosis  
(C) 1 meiosis and 3 mitosis  
(D) 2 meiosis and 1 mitosis
5. Suspensor is formed from [2008]  
(A) Basal cell (B) Hypophysis  
(C) Terminal cell (D) Haustorium
6. Grafting cannot be done to monocots because they lack [2009]  
(A) Cambium  
(B) Vascular bundle  
(C) Ground tissue  
(D) Parenchymatous tissue
7. Cross pollination does not occur in [2014]  
(A) allogamous flowers  
(B) geitonogamous flowers  
(C) cleistogamous flowers  
(D) chasmogamous flowers
8. An angiospermic male plant with 24 chromosomes in its pollen mother cells is crossed with female plant bearing 24 chromosomes in its root cells. What would be the ploidy of embryo and endosperm respectively formed after this cross? [2014]  
(A) 24 and 48 (B) 24 and 24  
(C) 48 and 72 (D) 24 and 36
9. Which one of the following is NOT a natural method of vegetative propagation? [2015]  
(A) runner (B) foliar buds  
(C) stem tuber (D) grafting
10. Pollen grain develops from \_\_\_\_\_ of anther. [2015]  
(A) epidermis  
(B) endothecium  
(C) tapetum  
(D) sporogenous tissue

11. Considering mode of asexual reproduction, match the Column I with II and select the correct option:

	Column I		Column II
i.	Yeast	a.	fragmentation
ii.	<i>Penicillium</i>	b.	zoospores
iii.	Filamentous algae	c.	budding
iv.	<i>Chlamydomonas</i>	d.	conidia

- [2015]
- (A) i – c, ii – d, iii – a, iv – b  
(B) i – b, ii – c, iii – a, iv – d  
(C) i – d, ii – c, iii – b, iv – a  
(D) i – c, ii – b, iii – a, iv – d
12. Environmental biotic factor that helps in pollination is [2015]  
(A) air (B) water  
(C) wind (D) insects
  13. Self-pollination which involves two different flowers of the same plant, is called [2015]  
(A) autogamy (B) geitonogamy  
(C) xenogamy (D) hybridization
  14. Large stout, nocturnal flowers producing copious nectar and emitting fermenting fruity odour, are the adaptations for [2015]  
(A) Entomophily (B) Ornithophily  
(C) Chiropterophily (D) Anemophily
  15. Anemophily is NOT observed in [2015]  
(A) Maize (B) Jowar  
(C) Sugarcane (D) *Salvia*
  16. In angiosperms, during development of embryo, the suspensor cells develop from [2015]  
(A) oospore (B) integument  
(C) endosperm (D) cotyledon
  17. If there are 1280 microspores in a tetralocular anther, how many microspore mother cells will be there in its each pollen chamber? [2015]  
(A) 80 (B) 160  
(C) 240 (D) 1280
  18. Which of the following wall layer of anther shows fibrous thickenings of callose? [2016]  
(A) Epidermis (B) Tapetum  
(C) Middle layer (D) Endothecium
  19. The wall of pollen tube is made up of [2016]  
(A) Cellulose and Pectin  
(B) Only sporopollenin  
(C) Lignin and Pectin  
(D) Pectin and Sporopollenin



20. What is the outbreeding device, where the stamens and carpels mature at different times called? [2016]  
 (A) Monoecy (B) Self sterility  
 (C) Dichogamy (D) Heterostyly
21. The CORRECT sequence of events during double fertilization in Angiosperms is [2016]  
 (A) Triple fusion, syngamy, porogamy  
 (B) Syngamy, triple fusion, porogamy  
 (C) Porogamy, syngamy, triple fusion  
 (D) Syngamy, porogamy, triple fusion
22. In an angiosperm a female plant having  $2n = 24$  is crossed with a male plant having  $2n = 12$ . What will be the chromosome number of the endosperm? [2016]  
 (A) 12 (B) 18 (C) 24 (D) 30
23. \_\_\_\_\_ is the most convenient and cheap method of artificial vegetative propagation. [2016]  
 (A) Grafting  
 (B) Budding  
 (C) Cutting  
 (D) Micropropagation
24. Which of the following in embryo sac of angiosperms shows filiform apparatus? [2016]  
 (A) Antipodals (B) Polar nuclei  
 (C) Egg (D) Synergids
25. Which of the following is the first cell of female gametophytic generation in angiosperms? [2016]  
 (A) Megaspore mother cell  
 (B) Microspore mother cell  
 (C) Functional megaspore  
 (D) Egg cell
26. In angiosperms, megaspores formed after meiosis of megaspore mother cell are arranged in \_\_\_\_\_. [2016]  
 (A) Isobilateral tetrad (B) Linear tetrad  
 (C) Tetrahedral tetrad (D) T-shaped tetrad
27. If the cells of the nucellus in the angiosperm ovule contain 24 chromosomes, what will be the number of chromosomes in the endosperm of a self-pollinated flower? [2017]  
 (A) 12 (B) 24 (C) 36 (D) 48
28. In some species of family Asteraceae seeds are produced without fertilization. It is called as \_\_\_\_\_. [2017]  
 (A) apomixis (B) amphimixis  
 (C) parthenocarpy (D) vivipary
29. The megasporangium proper of an angiosperm ovule is represented by [2017]  
 (A) integument (B) funicle  
 (C) nucellus (D) micropyle
30. Which one of the following is NOT a disadvantage of self-pollination? [2017]  
 (A) No scope for developing improved varieties  
 (B) Progeny becomes weaker  
 (C) Genetic stability can be maintained  
 (D) Less adaptability to climatic variations
31. Motile zoospores are produced by [2017]  
 (A) *Chlamydomonas* (B) *Penicillium*  
 (C) Bacteria (D) *Amoeba*
32. Which one of the following plants reproduces vegetatively by epiphyllous buds? [2017]  
 (A) Sweet potato (B) Potato  
 (C) Onion (D) *Kalanchoe*
33. Cambium is essential for grafting in plants because [2018]  
 (A) cambia of both stock and scion fuse together  
 (B) cambium produces new leaves  
 (C) cambium produces new roots  
 (D) cambium helps in the production of flowers
34. Which one of the following is NOT true about vegetative propagation? [2018]  
 (A) Easy and cheaper method  
 (B) Rapid propagation  
 (C) Production of genetically similar plants  
 (D) Production of genetically dissimilar plants
35. The exine of pollen grain is made up of [2018]  
 (A) chitin  
 (B) cellulose  
 (C) sporopollenin  
 (D) hemicellulose
36. The development of male gametes in the pollen grains in angiosperms involves \_\_\_\_\_. [2018]  
 (A) only one mitotic division  
 (B) two mitotic divisions  
 (C) both mitotic and meiotic divisions  
 (D) only one meiotic divisions
37. Which one of the following is NOT true about self-pollination? [2018]  
 (A) A sure method  
 (B) Most economic  
 (C) Maintains genetic purity  
 (D) Favors evolution
38. In angiosperms, the fusion of male gamete with the secondary nucleus is considered as "second fertilization" because [2018]  
 (A) it is fusion of two nuclei.  
 (B) secondary nucleus is a sister nucleus of the egg.  
 (C) it takes place in embryo sac.  
 (D) it takes place after pollination.





39. Which character of angiosperms helped in their dominance on earth? [2018]  
 (A) Formation of seeds  
 (B) Formation of endosperm  
 (C) Double fertilization  
 (D) Presence of xylem vessels

40. Double fertilization in angiosperms was first discovered by S.G. Nawaschin in \_\_\_\_\_ plants. [2018]  
 (A) *Lilium* (B) sunflower  
 (C) wheat (D) mango

41. In angiosperms, a male gametophyte is developed from a pollen mother cell by \_\_\_\_\_. [2019]  
 (A) one meiotic and two mitotic divisions  
 (B) two mitotic divisions  
 (C) one mitotic and two meiotic divisions  
 (D) a single meiotic division

42. Progeny resulting from cross pollination are [2019]  
 (A) genetically stable  
 (B) always sterile  
 (C) homozygous and less viable  
 (D) genetically variable

43. Identify the correct sequence of matches with the type of pollination and its characteristics.

a.	Ornithophily	1.	Nocturnal flower
b.	Entomophily	2.	Light pollens
c.	Chiropterophily	3.	Funnel shaped corolla
d.	Anemophily	4.	Pleasant fragrance and nectar

[2019]

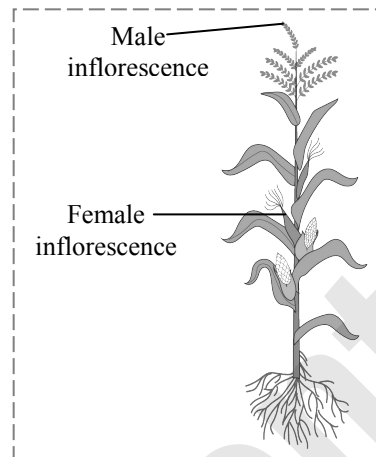
- (A) a-4,b-3,c-1,d-2 (B) a-2,b-1,c-3,d-4  
 (C) a-3,b-4,c-1,d-2 (D) a-3,b-4,c-2,d-1

44. Find out the wrong statement. [2019]  
 (A) Parthenocarpic fruits are generally preferred by consumers.  
 (B) Gibberellins induce parthenocarpy.  
 (C) Parthenocarpic fruits are seedless fruits.  
 (D) Parthenocarpic fruits are developed from fertilized ovary.

45. If the number of chromosomes in an endosperm of seed is 21, what will be the chromosome number in the secondary nucleus? [2019]  
 (A) 7 (B) 28 (C) 14 (D) 21

46. For the formation of 140 angiospermic seeds how many meiotic cell divisions are expected? [2019]  
 (A) 175 (B) 280  
 (C) 560 (D) 240

47. Arrangement of flowers in the given plant favours which type of pollination? [2019]



- (A) Omithophilous  
 (B) Chiropterophilous  
 (C) Anemophilous  
 (D) Entomophilous

48. How many pollen grains can be produced from a dithecous tetralocular anther with 75 microspore mother cells in each of its chamber? [2020]  
 (A) 1200 (B) 900  
 (C) 300 (D) 750

49. During the development of embryo sac, a megaspore mother cell undergoes \_\_\_\_\_ meiosis and \_\_\_\_\_ mitosis respectively. [2020]  
 (A) 1, 3 (B) 3, 1  
 (C) 1, 4 (D) 4, 1

50. The megasporangium in angiosperms is usually \_\_\_\_\_. [2020]  
 (A) unitegmic (B) polytegmic  
 (C) tritegmic (D) bitegmic

51. Epiphydrophyly is observed in which of the following plants? [2020]  
 (A) *Vallisneria* (B) *Lotus*  
 (C) *Ceratophyllum* (D) *Zostera*

52. Match the correct type of pollination in Column II for the flowers in Column I. [2020]

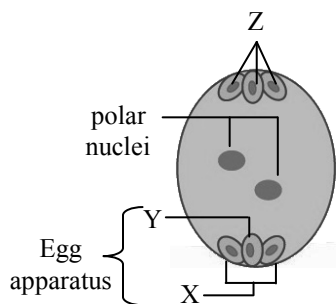
Column I		Column II	
a.	<i>Bombax</i>	i.	Entomophily
b.	<i>Zostera</i>	ii.	Epiphydrophyly
c.	<i>Vallisneria</i>	iii.	Hypo-Hydrophyly
d.	<i>Cestrum</i>	iv.	Chiropterophily
e.	<i>Anthocephallus</i>	v.	Ornithophily

- (A) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv), (e)-(v)  
 (B) (a)-(iv), (b)-(v), (c)-(i), (d)-(iii), (e)-(ii)  
 (C) (a)-(v), (b)-(i), (c)-(ii), (d)-(iii), (e)-(iv)  
 (D) (a)-(v), (b)-(iii), (c)-(ii), (d)-(i), (e)-(iv)



53. Generally, embryo sac in angiosperms is [2020]  
 (A) Bisporic, endosporic, 8 celled and 7 nucleated  
 (B) Bisporic, exosporic, 7 celled and 8 nucleated  
 (C) Monosporic, endosporic, 7 celled and 8 nucleated  
 (D) Monosporic, exosporic, 8 celled and 7 nucleated

54. Identify the correct set of labelling in the given diagram. [2020]



- (A) X - synergids, Y- antipodals, Z - egg  
 (B) X-synergids, Y - egg, Z - antipodals  
 (C) X-egg, Y - synergids, Z - antipodals  
 (D) X-antipodals, Y - egg, Z - synergids
55. The correct sequence of developmental stages of embryo in angiosperms is [2020]  
 (A) Octant → horse shoe shaped → heart shaped → globular  
 (B) Octant → heart shaped → horse shoe shaped → globular  
 (C) Globular → octant → heart shaped → horse shoe shaped  
 (D) Octant → globular → heart shaped → horse shoe shaped

56. The apical cell of the 2-celled pro-embryo in angiosperms undergoes \_\_\_\_\_ division to form 8-celled octant pro-embryo. [2020]  
 (A) Four transverse mitotic  
 (B) Four vertical mitotic  
 (C) Two meiotic  
 (D) One transverse and two vertical mitotic

57. In angiosperms, the embryo sac is \_\_\_\_\_. [2021]  
 (A) uninucleate (B) binucleate  
 (C) multinucleate (D) enucleate

58. Match the embryonal cell in column - I with their origin given in column - II and choose the correct options given below.

	Column I		Column II
a.	Suspensor initial	i.	Large basal cell of the 2-celled pro-embryo
b.	Embryonal initial	ii.	First cell of the suspensor towards micropylar end.

c.	Haustorium	iii.	Lower most cell of the suspensor
d.	Hypophysis	iv.	Small terminal cell of 2-celled pro-embryo

- [2021]  
 (A) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)  
 (B) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)  
 (C) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)  
 (D) (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

59. Heterostyly is a contrivance for \_\_\_\_\_. [2021]  
 (A) geitonogamy only  
 (B) autogamy only  
 (C) xenogamy only  
 (D) geitonogamy and xenogamy

60. In which of the following plants male flower floats on the surface of water? [2021]  
 (A) *Potamogeton* (B) *Zostera*  
 (C) Water lily (D) *Vallisneria*

61. Which one of the following statements is INCORRECT about angiospermic seed/fruit? [2021]  
 (A) The micropyle of the ovule persists in the seed.  
 (B) Coconut is a non-endospermic seed.  
 (C) Coconut is a fleshy fruit.  
 (D) Fruit development is triggered by hormones produced by developing seeds.

62. In angiosperms, the embryo is developed at \_\_\_\_\_ of the embryo sac. [2021]  
 (A) antipodal side (B) micropylar end  
 (C) chalazal end (D) centre

63. Based on following statements choose the correct option given below.  
**Statement - I:** Dormancy is a state of metabolic arrest that facilitates the survival of seeds during unfavourable conditions.  
**Statement - II:** Mature and viable seeds do not germinate even in the presence of favourable conditions unless the dormancy period is completed. [2021]

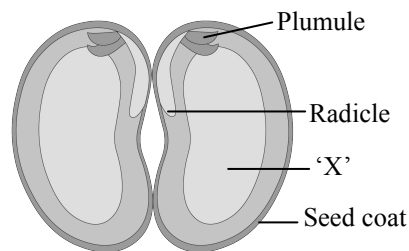
- (A) Both Statement - I and Statement - II are correct.  
 (B) Statement - I is correct but Statement - II is incorrect.  
 (C) Both Statement - I and Statement - II are incorrect.  
 (D) Statement - I is incorrect but Statement - II is correct.

64. Akash went on a field visit and collected some flowers like rice, corn, *Potamogeton*, *Halogaris*, *Salvia* and *Kigellia*. How many anemophilous flowers did he collect? [2021]  
 (A) 3 (B) 2 (C) 6 (D) 4



65. Which one of the following favours herkogamy for cross pollination? [2021]  
 (A) Barrier between the sex organs.  
 (B) Flowers unisexual.  
 (C) Both the sex organs mature at the same time.  
 (D) Anthers mature before the stigma becomes receptive.
66. Polyembryony was first observed by Leeuwenhoek in the seeds of \_\_\_\_\_. [2021]  
 (A) Citrus (B) Mango  
 (C) Orchid (D) Papaya
67. How many of the following statements are true about angiosperms?  
 A. The generative cell floats in the cytoplasm of vegetative cell.  
 B. The stalk of ovule is called funiculus.  
 C. Pollen grains are shed at two celled stage.  
 D. Embryo sac is diploid.  
 E. Megaspore mother cell towards chalazal end becomes functional. [2021]  
 (A) A, B and C only  
 (B) D and E only  
 (C) A and B only  
 (D) B and C only
68. Which one of the following is unlike other nuclei in the embryo sac of angiosperms regarding ploidy? [2021]  
 (A) Male gamete nucleus  
 (B) Egg nucleus  
 (C) Secondary nucleus  
 (D) Antipodal nucleus
69. A big central vacuole develops during the formation of \_\_\_\_\_ type of endosperm [2022]  
 (A) Nuclear (B) Helobial  
 (C) Mosaic (D) Cellular
70. Given below are two statements.  
**Statement I;** Generally, anther in angiosperms are ditheous having two pollen sacs in each lobe.  
**Statement II:** Each sporangium produces pollens from Sporogenous tissues by the process of sporogenesis.  
 In light of above statements, select the correct answer from the option given below. [2022]  
 (A) Both statement I and statement II are correct.  
 (B) Both statement I and statement II are incorrect.  
 (C) Statement I is correct, and statement II is incorrect.  
 (D) Statement I is incorrect, and statement II is correct.

71. Identify the part 'X' marked in the diagram of an open bean seed. [2022]



- (A) Endosperm (B) Cotyledon  
 (C) Epicotyl (D) Hypocotyl
72. How many of the following statements are true about the figure given below.  
 i. Germination of pollen grain.  
 ii. Motile male gametes.  
 iii. Two male gametes and one female gamete.  
 iv. Pollen grain without exine.  
 v. Tube nucleus at the tip of pollen tube. [2022]  
 (A) i and v are true (B) ii and iv are true  
 (C) i and ii are true (D) ii and iii are true
73. After double fertilization in angiosperms, the products of syngamy and triple fusion are \_\_\_\_\_ and \_\_\_\_\_ respectively. [2022]  
 (A) diploid embryo and triploid endosperm  
 (B) diploid embryo and diploid endosperm  
 (C) triploid embryo and haploid endosperm  
 (D) triploid embryo and diploid endosperm
74. Which one of the following shows more than one ovule? [2022]  
 (A) Rice (B) Mango  
 (C) Tomato (D) Wheat
75. In *Taraxacum*, the unreduced embryo sac is derived from \_\_\_\_\_. [2022]  
 (A) haploid nucellus tissue  
 (B) diploid microspore mother cell  
 (C) diploid megaspore mother cell  
 (D) functional megaspore
76. Match the type of pollination given in Column-I with its pollinating agent from Column-II.

	Column-I		Column-II
i.	Ornithophily	a.	Bat
ii.	Entomophily	b.	Wind
iii.	Anemophily	c.	Bird
iv.	Chiropterphily	d.	Insect

- [2022]  
 (A) i – b, ii – c, iii – d, iv – a  
 (B) i – c, ii – a, iii – d, iv – b  
 (C) i – d, ii – c, iii – b, iv – a  
 (D) i – c, ii – d, iii – b, iv – a





77. Match the plants given in Column-I with their type of endosperm in Column-II. Choose the correct answer from options given below.

	Column-I		Column-II
i.	Coconut	a.	helobial
ii.	Balsam	b.	perisperm
iii.	<i>Asphodelus</i>	c.	nuclear
iv.	Black pepper	d.	cellular

[2022]

- (A) i – d, ii – c, iii – b, iv – a  
 (B) i – a, ii – b, iii – c, iv – d  
 (C) i – c, ii – d, iii – a, iv – b  
 (D) i – b, ii – v, iii – d, iv – a

78. Embryos develop directly from diploid cells of the nucellus in \_\_\_\_\_. [2022]

- (A) *Citrus* (B) *Cynodon*  
 (C) *Mirabilis* (D) *Helianthus*

79. Match the following contrivance from Column-I with its example in Column-II.

	Column-I		Column-II
i.	Protandry	a.	<i>Calotropis</i>
ii.	Prepotency	b.	Tobacco
iii.	Self sterility	c.	Sunflower
iv.	Herkogamy	d.	Apple

[2022]

- (A) i – d, ii – c, iii – b, iv – a  
 (B) i – c, ii – d, iii – b, iv – a  
 (C) i – b, iii – a, iii – c, iv – d  
 (D) i – a, iii – b, iii – c, iv – d

80. In male reproductive whorl of a flower the archesporial cells are formed by \_\_\_\_\_. [2023]

- (A) epidermal cell of anther  
 (B) hypodermal cell of anther  
 (C) cells of connective  
 (D) cells of tapetum

81. A typical anther in most of the angiosperms is \_\_\_\_\_. [2023]

- (A) monotheous, bisporangiate  
 (B) monotheous tetrasporangiate  
 (C) ditheous, bisporangiate  
 (D) ditheous, tetrasporangiate

82. Given below are two statements.

**Statement I:** Self incompatibility is a device that prevents outbreeding.

**Statement II:** Self incompatibility is a genetic mechanism due to which germination of pollen on the stigma of the same flower is inhibited.

In the light of above two statements choose the correct answer from options given below.

[2023]

- (A) Both statement I and statement II are correct.  
 (B) Both statement I and statement II are incorrect  
 (C) Statement I is correct but statement II is incorrect.  
 (D) Statement I is incorrect but statement II is correct.

83. Free nuclear division means [2023]

- (A) Karyokinesis and cytokinesis occurring simultaneously.  
 (B) Karyokinesis is not followed by cytokinesis immediately.  
 (C) Only cytokinesis  
 (D) Karyokinesis followed by cytokinesis immediately.

84. Given below are two statements regarding Apomixis.

**Statement I** - Apogamy is a type of apomixis in which gametophytic cell produces embryo like structure without fertilization.

**Statement II** - Apospory is a process where diploid sporophyte cell produces diploid gametophyte without undergoing meiosis.

In light of above statements, select the correct answer from the option given below. [2023]

- (A) Both statement I and statement II are correct.  
 (B) Both statement I and statement II are incorrect.  
 (C) Statement I is correct and statement II is incorrect.  
 (D) Statement is incorrect and statement II is correct.

85. Stigma and pollen grain represent \_\_\_\_\_. [2023]

- (A) sporophyte and gametophyte respectively  
 (B) gametophyte and sporophyte respectively  
 (C) gametophyte only  
 (D) sporophyte only

86. If the chromosome number in cells of integuments is 10, then what will be the chromosome number in the synergids, definitive nucleus and antipodal cells in the embryo sac of an angiospermic ovule? [2023]

- (A) 5, 5, 5 respectively  
 (B) 5, 10, 5 respectively  
 (C) 10, 5, 10 respectively  
 (D) 5, 5, 10 respectively

87. How many pollen mother cells are involved in formation of 8 pollen tetrads? [2023]

- (A) 4 (B) 8 (C) 16 (D) 32



88. Identify the correct sequence of events of pollen pistil interaction given below.
- pollen tube grows through the stigma, style and reaches the ovule.
  - Pollen grain lands on the stigma.
  - Pollen germinates to form pollen tube.
  - Pollen tube carrying 2 male gametes enter the ovule.

Choose the correct option. [2023]

- b → c → d → a
- b → c → a → d
- b → a → c → d
- b → d → a → c

89. In angiosperms, the generative cell inside the pollen grain divides to form \_\_\_\_\_. [2023]

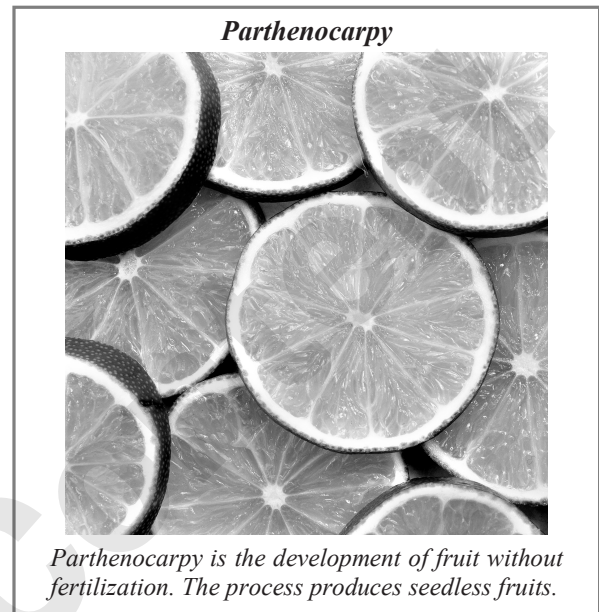
- one male gamete
- two male gametes
- four male gametes
- suspensor cell and one male gamete

90. Match the category of apomixis in Column I with its example in Column II and choose the correct option. [2023]

	Column I		Column II
i.	Diplospory	a.	Mango
ii.	Apospory	b.	Nicotiana

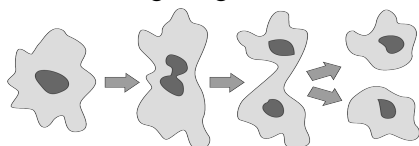
iii.	Adventive polyembryony	c.	<i>Taraxacum</i>
iv.	Non-recurrent apomixis	d.	Citrus

- i - c, ii - a, iii - b, iv - d
- i - c, ii - a, iii - d, iv - b
- i - c, ii - b, iii - a, iv - d
- i - b, ii - c, iii - d, iv - a



### Evaluation Test

- If the haploid number in a flowering plant is 14. What will be the number of chromosomes in integuments, antipodal cells, embryo, endosperm and nucellus respectively?
  - 14, 28, 7, 42, 21
  - 7, 14, 42, 28, 14
  - 28, 14, 28, 42, 28
  - 42, 28, 14, 28, 14
- Seeds are called products of sexual reproduction because they
  - are formed by fusion of gametes
  - give rise to new plants
  - can be stored for long time
  - are formed by fusion of pollen tubes
- Identify the mode of asexual reproduction shown in the diagram given below.



- Fragmentation
- Binary fission

- Budding
  - Gemmule formation
- Which of the following statement is true about tapetum?
    - It is the innermost wall layer.
    - It surrounds the sporogenous tissue of microsporangium.
    - It is nutritive in function.
    - All of the above
  - Which of the following shows entomophilous pollination?
    - Cestrum*, Lotus
    - Adansonia*, Sausage tree
    - Zostera*, *Vallisneria*
    - Maize, Jowar
  - Which of the following statements regarding asexual reproduction are correct?
    - It is uniparental.
    - The offsprings produced are genetically identical to the parent.
    - It is biparental.
    - The offsprings produced are not genetically identical to the parent.



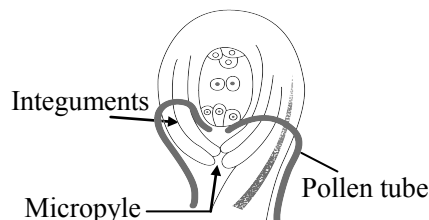
- (A) (i) and (ii) are correct.  
 (B) (iii) and (iv) are correct.  
 (C) (ii) and (iii) are correct.  
 (D) (i) and (iv) are correct.
7. Self-incompatibility means  
 (A) inhibition of pollen germination on the stigma of same flower.  
 (B) inhibition of pollen germination on the stigma of different flower.  
 (C) anther and stigma mature at different times  
 (D) germination of pollens within the anther
8. Find out the correct sequence of events taking place in pollen-pistil interaction.
- Pollen tube enters one of the synergids and bursts to release male gametes.
  - Pollen tube enters ovule through micropyle of ovary.
  - Pollen tube grows through the stigmatic tissue and then style.
  - Pistil recognizes the correct pollen and accepts it.
- (A) iv → iii → ii → i  
 (B) iv → ii → iii → i  
 (C) ii → iv → iii → i  
 (D) iii → iv → ii → i
9. Commonly in a mature fertilized ovule  $n$ ,  $2n$  and  $3n$  condition is respectively found in  
 (A) antipodals, synergids and integuments.  
 (B) egg, endosperm and nucellus.  
 (C) antipodals, zygote and endosperm.  
 (D) endosperm, nucellus and egg.
10. Match the following ovular structure with the post-fertilization structure and select the correct alternative.

	Column I		Column II
i.	Nucellus	a.	Fruit
ii.	Egg	b.	Endosperm
iii.	Ovary	c.	Perisperm
iv.	Secondary nucleus	d.	Embryo

- (A) i – c; ii – d; iii – a; iv – b  
 (B) i – a; ii – b; iii – d; iv – c  
 (C) i – c; ii – b; iii – a; iv – d  
 (D) i – d; ii – b; iii – c; iv – a
11. In angiosperms, the product of syngamy in double fertilization is  
 (A) haploid (B) diploid  
 (C) triploid (D) polyploid
12. The exact meaning of apomixis in plant is development of a plant  
 (A) from root cuttings  
 (B) without fusion of gametes  
 (C) from fusion of gametes  
 (D) from stem cuttings

13. The number of pollen grains, produced by 25 microspore mother cells is  
 (A) 30 (B) 50  
 (C) 80 (D) 100
14. Which of the following is male gametophyte?  
 (A) Embryo sac  
 (B) Antipodal cell  
 (C) Megasporangium  
 (D) Pollen grain with pollen tube
15. Female gametophyte in flowering plants develops after  
 (A) 1 meiosis and 2 mitosis  
 (B) 2 meiosis and 2 mitosis  
 (C) 1 meiosis and 3 mitosis  
 (D) 2 meiosis and 1 mitosis
16. When pollen tube enters the ovule through the micropyle it is known as  
 (A) syngamy (B) porogamy  
 (C) chalazogamy (D) misogamy
17. Triploid plants can be obtained from culture of  
 (A) Pollen (B) Endosperm  
 (C) Ovule (D) Megaspore
18. *Bryophyllum* is multiplied vegetatively by  
 (A) stem branch (B) leaves  
 (C) roots (D) rhizome
19. The point of attachment of funicle with chalazal end is called  
 (A) placenta (B) integument  
 (C) nucellus (D) hilum
20. Which of the following is a character of Papaya plant to avoid autogamy?  
 (A) Unisexuality (B) Protogyny  
 (C) Protandry (D) Heterostyly

21. The number of pollen sacs in a dithecous anther is \_\_\_\_\_.  
 (A) 8 (B) 6  
 (C) 4 (D) 2
22. Which one of the following flower is hypohydrophilous?  
 (A) *Zostera* (B) *Vallisneria*  
 (C) Lotus (D) Water lily
23. The given diagram represents



- (A) Porogamy (B) Mesogamy  
 (C) Chalazogamy (D) Xenogamy



24. What types of pollen are typically successful in germinating on the surface of the stigma in angiosperms?

- (A) interspecific (B) intraspecific  
(C) intergeneric (D) intrageneric

25. Match the character of flower in Column I with the example in Column II and choose the correct option.

	Column I		Column II
A	Apocarpous	I	Brinjal
B	Syncarpous	II	Pea
C	Uniovulate	III	<i>Michelia</i>
D	Multiovulate	IV	Wheat

- (A) A-III, B-I, C-IV, D-II  
(B) A-I, B-III, C-IV, D-II  
(C) A-III, B-IV, C-I, D-II  
(D) A-II, B-III, C-I, D-IV

26. What is the term used to describe the persistent nucellus found in black pepper seeds?

- (A) pericarp (B) perisperm  
(C) tegmen (D) endothecium

27. Filiform apparatus are found in \_\_\_\_\_.

- (A) endothecium of anther wall  
(B) tapetum of anther wall

- (C) Synergids of egg apparatus  
(D) ovule, towards chalazal end

28. What is the correct sequence of embryogenesis in dicot plants?

- i. zygote.  
ii. proembryo  
iii. globular embryo  
iv. heart shaped embryo  
v. mature embryo

Choose the correct option.

- (A) i → ii → iii → iv → v  
(B) i → iii → ii → iv → v  
(C) i → iii → v → ii → iv  
(D) ii → i → iii → iv → v

29. Perisperm is found in \_\_\_\_\_ seeds.

- (A) Castor, malze  
(B) Black pepper, Beet  
(C) Mango, Pea  
(D) Barley, Rice

30. Identify the INCORRECT pair.

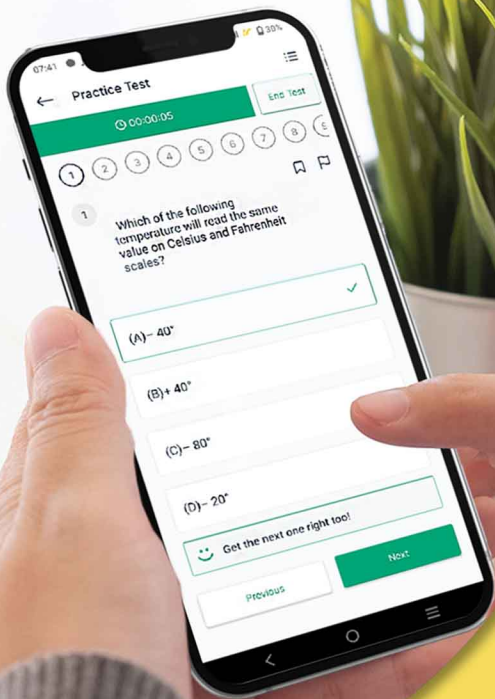
- (A) Anemophily – Wind  
(B) Ornithophily - Bat  
(C) Entomophily – Honeybee  
(D) Hydrophily – water

**Answer Key** of the chapter: *Reproduction in Lower and Higher Plants* & Evaluation Test is given at the end of the book.

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