INDIAN SCHOOL AL WADI AL KABIR		
CLASS: XII	**DEPARTMENT: SCIENCE 2026 – 2027** **SUBJECT: BIOLOGY**	**DATE: 01/04/2026**
WORKSHEET NO. 1	**UNIT- I- REPRODUCTION** **CHAPTER:01 SEXUAL REPRODUCTION IN FLOWERING PLANTS**	**NOTE:** **A4 FILE FORMAT**
NAME OF THE STUDENT:	**CLASS & SEC:**	**ROLL NO.**

I. OBJECTIVE-TYPE QUESTIONS

1. The filiform apparatus is a special cellular thickening found at the micropylar tip of:
A. Antipodals
B. Egg cell
C. Synergids
D. Central cell

2. A typical mature dicot embryo sac is:
A. 8-nucleate, 8-celled
B. 7-nucleate, 8-celled
C. 8-nucleate, 7-celled
D. 7-nucleate, 7-celled

3. Apomixis is a characteristic of:
A. Members of the Asteraceae family
B. Water lily
C. Zostera
D. Castor

4. Production of the embryo sac from the functional megaspore involves:
A. Single meiotic division
B. First meiotic division, then two successive mitotic divisions
C. First meiotic division, then three successive mitotic divisions
D. Three successive mitotic divisions

5. Geitonogamy involves:
A. Fertilization of a flower by pollen from another flower of the same plant.
B. Fertilization of a flower by pollen from the same flower.
C. Fertilization of a flower by pollen from a flower of another plant in the same population.
D. Fertilization of a flower by pollen from a flower of another plant belonging to a distant population.

For the following questions, two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii), and (iv) as given below:

i) Both A and R are true, and R is the correct explanation of the assertion.

ii) Both A and R are true, but R is not the correct explanation of the assertion

iii) A is true, but R is false.

iv) A is false, but R is true

6. **Assertion (A):** In most angiosperms, the endosperm development precedes embryo development.
   Reason (R): The cells of the endosperm are filled with reserve food materials and are used for the nutrition of the developing embryo.
7. **Assertion (A):** A typical dicot embryo consists of an embryonal axis and two cotyledons.
   Reason (R): In Albuminous seeds, the endosperm is completely consumed during embryo development.
8. **Assertion (A):** The cells of the tapetum generally have more than one nucleus.
   Reason (R): Tapetal cells undergo endomitosis or nuclear division without cytokinesis.

II. VERY SHORT QUESTIONS (2M):

9. Describe the structure of the exine of a pollen grain.
10. What is "pollen-pistil interaction"?
11. Mention the function of (a) Filiform apparatus and (b) Germ pores.
12. Why is the endosperm triploid (3n) in angiosperms?
13. What are chasmogamous flowers? Can cross-pollination occur in cleistogamous flowers? Give reasons for your answer.

III. SHORT ANSWER TYPE QUESTIONS: (3M)

14. What is triple fusion? Where and how does it take place? Name the nuclei involved in triple fusion.
15. Differentiate between microsporogenesis and megasporogenesis. Which type of cell division occurs during these events? Name the structures formed at the end of these two events**.**

IV. SOURCE-BASED/ CASE STUDY-BASED QUESTIONS

16. Pollen viability is the capability of pollen to mature and then fertilise, and after fertilisation, it's the ability to develop into a seed and fruit. Male gametophytes are pollen grains. They're made within microsporangia in anthers and discharged when the anther dehisces.

A. Write the factors upon which pollen viability is dependent.

B. Mention any two families whose pollens are viable for months.

C. How are pollen grains stored for a longer period?

D. Storage of pollen grains for longer periods is of any importance, yes or no. Give a reason in support of your answer.

V. LONG ANSWER TYPE QUESTIONS. (5M)

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

18. a) What is self-incompatibility? Why does self-pollination not lead to seed formation in self-incompatible species?
    b) Mention two strategies evolved to prevent self-pollination in flowers.

VI BOARD QUESTIONS

19. Describe the structure of a typical 7-celled, 8-nucleate embryo sac. (2020)

20. Why is the tapetum in the anther wall extremely important? (2020)
21. State two advantages of apomictic seeds for farmers (2020)
22. Explain the three steps involved in artificial hybridisation of a bisexual flower. (2023)

ANSWER KEY	
I. OBJECTIVE-TYPE QUESTIONS	
1.	C. Synergids
2.	C. 8-nucleate, 7-celled
3.	A. Members of the Asteraceae family
4.	D. Three successive mitotic divisions
5.	A. Fertilization of a flower by pollen from another flower of the same plant
6.	i) Both A and R are true, and R is the correct explanation of the assertion.
7.	iii) A is true, but R is false
8.	i) Both A and R are true, and R is the correct explanation of the assertion.
II	**VERY SHORT QUESTIONS (2M):**
9.	**Composition:** The exine is the hard outer layer of the pollen grain made of sporopollenin, which is one of the most resistant organic materials known. **Resistance:** It can withstand high temperatures and strong acids/alkalis. No enzyme that degrades sporopollenin is so far known. **Germ Pores:** It has prominent apertures called germ pores where sporopollenin is absent, allowing the pollen tube to emerge. **Appearance & Fossilization:** The exine exhibits a fascinating array of patterns and designs. Due to the presence of sporopollenin, pollen grains are well-preserved as fossils.
10.	It is a **dynamic process** that involves pollen recognition by the pistil, followed by the promotion or inhibition of the pollen. **Recognition Mechanism:** The pistil has the ability to recognize whether the pollen is compatible (right type) or **i**ncompatible (wrong type). This is mediated by **c**hemical **components** of the pollen interacting with those of the pistil. **Promotion (If Compatible):** If the pollen is of the right type, the pistil accepts it and promotes post-pollination events, leading to pollen germination and the growth of the pollen tube. **Inhibition (If Incompatible):** If the pollen is of the wrong type, the pistil rejects it by preventing pollen germination on the stigma or the pollen tube growth in the style.
11.	**(a) Filiform apparatus:** Located at the micropylar tip of the synergids, it guides the entry of the pollen tube into the synergid. **(b) Germ pores:** These are apertures in the exine where sporopollenin is absent. They serve as the site from which the **pollen tube emerges** during germination.
12.	**Triple Fusion:** In the embryo sac, one male gamete (n) fuses with two **polar nuclei** (n+n) located in the central cell. Since this involves the fusion of three haploid nuclei, it is called **triple fusion**. **Formation of PEN:** As a result of triple fusion, a **triploid (3n) Primary Endosperm Nucleus (PEN)** is formed. **Endosperm Development:** The Primary Endosperm Cell (PEC) containing the PEN divides repeatedly to form the **endosperm tissue**, which provides nutrition to the developing embryo.

13. There are two types of flowers present in plants, namely Oxalis and Viola − chasmogamous and cleistogamous flowers. Chasmogamous flowers have exposed anthers and stigmata similar to the flowers of other species.
Cross-pollination cannot occur in cleistogamous flowers. This is because cleistogamous flowers never open at all. Also, the anther and the stigma lie close to each other in these flowers. Hence, only self-pollination is possible in these flowers.

III. SHORT ANSWER TYPE QUESTIONS: (3M)

14. Triple fusion is the fusion of the male gamete with two polar nuclei inside the embryo sac of the angiosperm. This process of fusion takes place inside the embryo sac.
When pollen grains fall on the stigma, they germinate and give rise to the pollen tube that passes through the style and enters the ovule. After this, the pollen tube enters one of the synergids and releases two male gametes there. Out of the two male gametes, one gamete fuses with the nucleus of the egg cell and forms the zygote (syngamy). The other male gamete fuses with the two polar nuclei present in the central cell to form a triploid primary endosperm nucleus. Since this process involves the fusion of three haploid nuclei, it is known as triple fusion. It results in the formation of the endosperm.
One male gamete nucleus and two polar nuclei are involved in this process.

15.

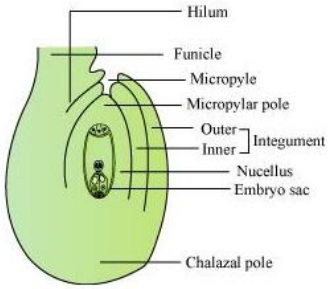
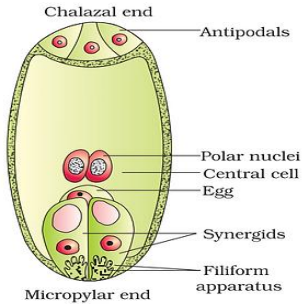
	Microsporogenesis	**Megasporogenesis**
1.	It is the process of the formation of microspore tetrads from a microspore mother cell through meiosis.	It is the process of the formation of the four megaspores from a megaspore mother cell in the region of the nucellus through meiosis.
2.	It occurs inside the pollen sac of the anther.	It occurs inside the ovule.

(b) Both events (microsporogenesis and megasporogenesis) involve the process of meiosis or reduction division, which results in the formation of haploid gametes from the microspore and megaspore mother cells.
(c) Microsporogenesis results in the formation of haploid microspores from a diploid microspore mother cell. On the other hand, megasporogenesis results in the formation of haploid megaspores from a diploid megaspore mother cell.

IV. SOURCE-BASED/ CASE STUDY-BASED QUESTIONS

16. A. The period for which pollen grains remain viable is highly variable and depends on:
1. Prevailing temperature.
2. Prevailing humidity

B. Rosaceae, Leguminosae , Solanaceae.
C. Pollen grains can be stored for years in liquid nitrogen at a temperature of -196ºC. This technique is often referred to as cryopreservation.
D. Yes, such stored pollen can be used as pollen banks (similar to seed banks) in crop breeding programmes to facilitate hybridization between different varieties or species, even if they flower at different times or are in different locations.

V. LONG ANSWER TYPE QUESTIONS. (5M)	
17.	**Funiculus** – It is a stalk-like structure that represents the point of attachment of the ovule to the placenta of the ovary. **Hilum** – It is the point where the body of the ovule is attached to the funiculus. Integuments –They are the outer layers surrounding the ovule that protect the developing embryo. **Micropyle** – It is a narrow pore formed by the projection of integuments. It marks the point where the pollen tube enters the ovule at the time of fertilization. **Nucellus** – It is a mass of parenchymatous tissue surrounded by the integuments from the outside. The nucellus provides nutrition to the developing embryo. The embryo sac is located inside the nucellus. **Chalaza** – It is the base swollen part of the nucellus from where the integuments originate. 
18.	a) Self-incompatibility is a genetic mechanism in angiosperms that prevents self-pollination. It develops genetic incompatibility between individuals of the same species or between individuals of different species. The plants that exhibit this phenomenon have the ability to prevent germination of pollen grains and thus, prevent the growth of the pollen tube on the stigma of the flower. This prevents the fusion of the gametes along with the development of the embryo. As a result, no seed formation takes place. b) Self-pollination involves the transfer of pollen from the stamen to the pistil of the same flower. Two strategies that have evolved to prevent self-pollination in flowers are as follows: • In certain plants, the stigma of the flower can prevent the germination of pollen grains and, hence, prevent the growth of the pollen tube. It is a genetic mechanism to prevent self-pollination called self- incompatibility. Incompatibility may be between individuals of the same species or between individuals of different species. Thus, incompatibility prevents breeding. • In some plants, the gynoecium matures before the androecium or vice versa. This phenomenon is known as protogyny or protandry, respectively. This prevents the pollen from coming in contact with the stigma of the same flower.
VI	**BOARD QUESTIONS**
19.	**Egg Apparatus (at Micropylar end):** Consists of two **Synergids** and one **Egg cell**. The synergids have a filiform apparatus to guide the pollen tube. **Central Cell:** The largest cell, containing **two polar nuclei**. After fusion or fertilization, it becomes the Primary Endosperm Cell (PEC). **Antipodal Cells (at Chalazal end):** Three cells located at the opposite end of the micropyle. Their function is generally nutritional, but they often degenerate after fertilization. **Numerical Summary:** Even though there are 8 nuclei (3 antipodal + 2 polar + 2 synergid + 1 egg), there are only 7 cells because the two polar nuclei share a single large central cell. 
20.	**Nourishment:** Its primary function is to nourish the developing pollen grains (microspores).

	Pollen Wall Formation: It is essential for the formation of the exine (the hard outer layer of the pollen grain), as it secretes precursors of sporopollenin**.** **Enzyme Secretion:** It secretes the enzyme **callose**, which dissolves the callose wall of the microspore tetrad to release individual pollen grains. **Cellular Characteristics:** Tapetal cells possess dense cytoplasm and are generally multinucleate (having more than one nucleus) due to endomitosis, supporting their high metabolic activity.
21.	**No Segregation of Traits:** Since apomixis involves no fertilization, the desirable characteristics of the hybrid are **not lost** (do not segregate) in the offspring. **Cost Savings:** Farmers do not need to buy expensive hybrid seeds every year; they can **reuse seeds** from their own harvest to get the same high-quality yield.
22.	**Emasculation:** The removal of anthers from the flower bud before they dehisce (open) using a pair of forceps Purpose: To prevent self-pollination within the same flower. **Bagging:** The emasculated flower is covered with a bag (usually made of butter paper). Purpose: To prevent contamination of the stigma by unwanted pollen from other sources. **Pollination and Re-bagging:** When the stigma of the bagged flower becomes receptive, mature pollen grains collected from the desired male parent are dusted onto the stigma. The flower is then re-bagged to allow the fruit to develop without further interference.

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