	INDIAN SCHOOL AL WADI AL KABIR	
CLASS XI	**DEPARTMENT OF SCIENCE 2026 – 2027** **SUBJECT: BIOLOGY**	**DATE: 12/11/2026**
WORKSHEET NO: 12	**TOPIC: MORPHOLOGY OF FLOWERING PLANTS**	**NOTE: A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT:**	**ROLL NO.**

I. OBJECTIVE TYPE QUESTIONS (1M EACH):

1. Which of the following statements about the leaf is correct?
   A. In a pinnately compound leaf, all leaflets are attached at a common point at the tip of the petiole
   B. In a compound leaf, an axillary bud is present in the axil of each leaflet
   C. In monocots, the leaf base expands into a sheath that partially or wholly covers the stem
   D. A pulvinus is a swollen leaf base typically found in grasses
2. A seedling's root tip was treated with a chemical that blocks cell enlargement but does not stop cell division. Which is the most probable immediate effect?
   A. The root cap will not be formed
   B. Root hairs will fail to differentiate from epidermal cells
   C. New cells will still be produced, but the root will not show appreciable increase in length
   D. The region of meristematic activity will disappear
3. Consider the following statements about phyllotaxy.
   i) Alstonia shows whorled phyllotaxy.
   ii) Guava shows alternate phyllotaxy.
   iii) Sunflower shows alternate phyllotaxy.
   iv) Calotropis shows opposite phyllotaxy.
   A. I, II and III only
   B. I, III and IV only
   C. II, III and IV only
   D. I, II and IV only
4. In the bud condition of a flower, the posterior petal overlaps the two lateral petals, and the two lateral petals overlap the two anterior petals. The aestivation and a suitable example are:
   A. Imbricate: Cassia
   B. Vexillary: pea
   C. Twisted: cotton
   D. Valvate: Calotropis
5. Match Column I (type of placentation) with Column II (example).

Column I	Column II
A. Marginal	1. Mustard
B. Axile	2. Primrose
C. Parietal	3. Pea
D. Free central	4. Lemon

A. A-3, B-4, C-1, D-2
B. A-3, B-1, C-4, D-2
C. A-4, B-3, C-2, D-1
D. A-2, B-4, C-1, D-3

6. The floral formula of a flower is: ⊕ ♂ K(5) C(5) A5 G(2) (the line below G indicates a superior ovary). Which of the following inferences is NOT correct?
   A. The flower is radially symmetrical and bisexual
   B. Sepals are fused and petals are fused
   C. The ovary is superior and syncarpous, formed of two carpels
   D. The five stamens are united with each other
7. Which one of the following correctly describes the embryo of a maize grain?
   A. Scutellum is the single cotyledon; coleoptile encloses the radicle
   B. Scutellum is the single cotyledon; coleorhiza encloses the radicle and coleoptile encloses the plumule
   C. Scutellum is the aleurone layer; coleorhiza encloses the plumule
   D. Two cotyledons are present; the aleurone layer encloses the embryo axis
8. Which statement about a drupe is INCORRECT?
   A. It develops from a monocarpellary superior ovary and is one-seeded
   B. The pericarp is differentiated into epicarp, mesocarp and endocarp
   C. In coconut, the mesocarp is fibrous, and the endocarp is stony.
   D. In mango, the edible part is the endocarp

II. ASSERTION AND REASON (1M)

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.

9. **Assertion (A):** In an epigynous flower, the ovary is inferior.
   Reason (R): The margin of the thalamus grows upward, enclosing the ovary completely and fusing with it, while the other floral parts arise above the ovary.

10. **Assertion (A):** In a cymose inflorescence, the flowers are borne in acropetal succession.
    Reason (R): The main axis of a cymose inflorescence terminates in a flower.

11. **Assertion (A):** The aestivation of the corolla in Calotropis is valvate.

Reason (R): In valvate aestivation, the sepals or petals overlap one another at the margins.

12. **Assertion (A):** Gram seed is non-albuminous (non-endospermic).
    Reason (R): Seeds of some monocotyledons, such as orchids, are also non-endospermic.

13. **Assertion (A):** A bud is present in the axil of the petiole of a compound leaf but not in the axil of its leaflets.
    Reason (R): Leaflets are parts of a single leaf whose lamina is divided, and are not independent leaves.

III. SHORT ANSWER TYPE QUESTIONS (2M EACH):

14. A student finds a twig with several leaflet-like structures along an axis. How can she decide whether it is a compound leaf or a branch bearing simple leaves? Give two points.
15. Distinguish between actinomorphic and zygomorphic flowers, giving one example of each.
16. Distinguish between epipetalous and epiphyllous stamens with one example of each.
17. Differentiate between a bisexual and a unisexual flower. Can a bisexual flower be incomplete? Justify your answer.
18. Differentiate between reticulate and parallel venation, giving one example of each. Which type of seed (monocot or dicot) is each usually associated with?

IV. SHORT ANSWER TYPE QUESTIONS (3M EACH):

19. Describe the three parts of a typical leaf. Mention the special features of the leaf base in dicots, monocots and leguminous plants.
20. Explain, with an example each, the following types of placentation: (i) marginal, (ii) parietal, (iii) basal.
21. Based on the position of the ovary on the thalamus and the insertion of other floral parts, distinguish hypogynous, perigynous and epigynous flowers with one example each.
22. Differentiate between racemose and cymose inflorescence on the basis of (i) main axis, (ii) order of opening of flowers, (iii) one example each.
23. Define aestivation. Explain the valvate, twisted and imbricate types with one example of each.

V. CASE STUDY BASED QUESTIONS (4M):

A flower is a modified shoot wherein the shoot apical meristem changes to a floral meristem. The apex produces different kinds of floral appendages laterally at successive nodes instead of leaves. When a shoot tip transforms into a flower, it is always solitary. The arrangement of flowers on the floral axis is termed an inflorescence. Depending on whether the apex develops into a flower or continues to grow, two major types of inflorescences are defined – racemose and cymose. In the racemose type of inflorescence, the main axis continues to grow; the flowers are borne laterally in an acropetal succession. In the cymose type of inflorescence, the main axis terminates in a flower; hence, it is limited in growth. The flowers are borne in a basipetal order. The flower is the reproductive unit in the angiosperms. It is meant for sexual reproduction. A typical flower has four different kinds of whorls arranged successively on the swollen end of the stalk or pedicel, called the thalamus or receptacle.

i) In a racemose inflorescence, flowers bloom from base to apex. How does this benefit the plant?
ii) A flower is called a modified shoot. Which evidence supports this?

iii) Explain why transformation of a shoot tip into a flower leads to solitary flowers, while continuous growth produces an inflorescence.
iv) Write the floral formula of the potato family.

VI. LONG ANSWER TYPE QUESTIONS (5M EACH):

24. Describe the main types of aestivation with the help of simple diagrams?
25. Describe the different regions of the root with the help of a labelled diagram.
26. Write a detailed note on the structure of a Dicotyledonous Seed with the help of a labelled diagram.
27. Briefly explain the identifying floral features of family Solanaceae.
28. Describe the androecium and gynoecium of a flower. In your answer, explain (i) parts of a stamen, (ii) cohesion and adhesion of stamens with examples, (iii) parts of a carpel, and (iv) apocarpous and syncarpous conditions with examples.

ANSWERS

<table>
<tr><td colspan="2">OBJECTIVE TYPE QUESTIONS (1M EACH)</td></tr>
<tr><td>1.</td><td>C. In monocots, the leaf base expands into a sheath that partially or wholly covers the stem.</td></tr>
<tr><td>2.</td><td>C. New cells will still be produced, but the root will not show appreciable increase in length.</td></tr>
<tr><td>3.</td><td>B. I, III and IV only</td></tr>
<tr><td>4.</td><td>B. Vexillary: Pea</td></tr>
<tr><td>5.</td><td>A. A-3, B-4, C-1, D-2</td></tr>
<tr><td>6.</td><td>D. The five stamens are united with each other.</td></tr>
<tr><td>7.</td><td>B. Scutellum is the single cotyledon; coleorhiza encloses the radicle and coleoptile encloses the plumule.</td></tr>
<tr><td>8.</td><td>D. In mango, the edible part is the endocarp.</td></tr>
<tr><td colspan="2">ASSERTION AND REASON (1M)</td></tr>
<tr><td>9.</td><td>i) Both A and R are true and R is the correct explanation of A.</td></tr>
<tr><td>10.</td><td>iv) A is false but R is true.</td></tr>
<tr><td>11.</td><td>iii) A is true but R is false.</td></tr>
<tr><td>12.</td><td>iii) A is true but R is false.</td></tr>
<tr><td>13.</td><td>i) Both A and R are true and R is the correct explanation of A.</td></tr>
<tr><td colspan="2">SHORT ANSWER TYPE QUESTIONS (2M EACH):</td></tr>
<tr><td>14.</td><td>The following two points can be used to distinguish between a compound leaf and a branch bearing simple leaves:
1. Presence of axillary buds: In a compound leaf, an axillary bud is present at the base of the petiole, but not at the base of individual leaflets. In a branch bearing simple leaves, an axillary bud is present at the base of each leaf.
2. Presence of an apical bud: A compound leaf does not have an apical bud at the tip of its rachis, whereas a branch has an apical bud at its growing tip.</td></tr>
<tr><td>15.</td><td><table><tr><th>Actinomorphic flowers</th><th>Zygomorphic flowers</th></tr><tr><td>Flowers can be divided into two equal radial halves through any vertical plane</td><td>Flowers can be divided into two equal halves only through one particular vertical</td></tr></table></td></tr>
</table>

	passing through the centre.	plane.
	They show radial symmetry.	They show bilateral symmetry.
	Examples: Mustard, Datura and chilli.	Examples: Pea, Gulmohur and bean.

16. 1. Epipetalous stamens: When stamens are attached to the petals, they are called epipetalous stamens. Example: Brinjal.
2. Epiphyllous stamens: When stamens are attached to the perianth (tepals), they are called epiphyllous stamens. Example: Lily.

17.

Bisexual Flower	**Unisexual Flower**
A flower containing both androecium and gynoecium is called bisexual.	A flower containing either androecium or gynoecium is called unisexual.
It has both male and female reproductive organs.	It has only one type of reproductive organ.
Examples: Hibiscus and mustard.	Examples: Papaya and cucumber.

Yes, a bisexual flower can be incomplete.
A flower is called incomplete if any one of its four floral whorls (calyx, corolla, androecium or gynoecium) is absent. Therefore, a flower can possess both androecium and gynoecium but still be incomplete if another whorl is missing.

18.

Reticulate venation	**Parallel venation**
Veins and veinlets are arranged in a net-like pattern	Veins run parallel to one another
Commonly found in dicot plants	Commonly found in monocot plants
Example: Mango and hibiscus	Example: Maize and grass

- Reticulate venation is usually associated with dicotyledonous seeds.
- Parallel venation is usually associated with monocotyledonous seeds.

SHORT ANSWER TYPE QUESTIONS (3M EACH):

19. A typical leaf consists of three main parts:
1. Leaf base: It is the part of the leaf by which the leaf is attached to the stem. In some plants, stipules may arise from the leaf base.
2. Petiole: It is the stalk of the leaf that attaches the leaf blade to the stem. It holds the leaf blade in a position to receive sunlight.
3. Lamina: It is the green, flattened and expanded part of the leaf. It contains veins and veinlets and is responsible for photosynthesis.

Special features of leaf base:
- Dicots: The leaf base may bear two small lateral appendages called stipules.
- Monocots: The leaf base expands into a sheath that partially or wholly covers the stem.
- Leguminous plants: The leaf base is commonly swollen and is called a pulvinus.

20. Placentation refers to the arrangement of ovules within the ovary.
(i) Marginal placentation:

- The placenta forms a ridge along the ventral suture of the ovary.
- The ovules are borne on this ridge in two rows.
- Example: Pea.

(ii) Parietal placentation:

- The ovules develop on the inner wall of the ovary or on peripheral parts.
- The ovary is usually unilocular but may become bilocular due to the formation of a false septum.
- Example: Mustard and Argemone.

(iii) Basal placentation:

- The placenta develops at the base of the ovary.
- A single ovule is generally attached to the placenta.
- Example: Sunflower and marigold.

21. The position of the ovary and the arrangement of other floral parts determine three types of flowers.

(i) Hypogynous flowers:

- The gynoecium occupies the highest position, while other floral parts arise below it.
- The ovary is superior.
- Examples: Mustard, China rose and brinjal.

(ii) Perigynous flowers:

- The gynoecium is situated in the centre, while other floral parts are located on the rim of the thalamus.
- The ovary is considered half-inferior.
- Examples: Rose, plum and peach.

(iii) Epigynous flowers:

- The margin of the thalamus grows upward, enclosing and fusing with the ovary.
- Other floral parts arise above the ovary.
- The ovary is inferior.
- Examples: Guava, cucumber and sunflower.

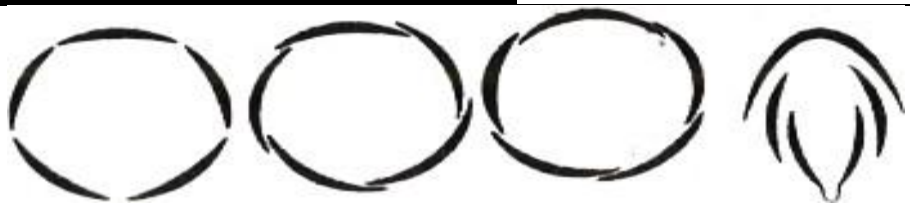
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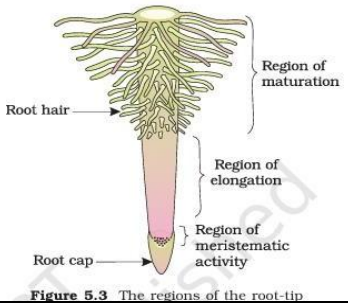
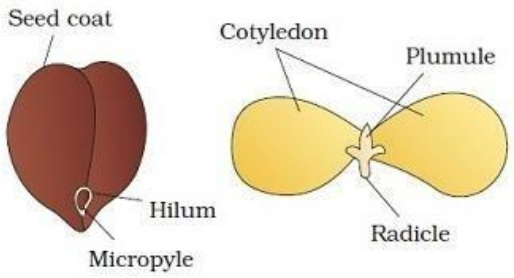
Basis	**Racemose inflorescence**	**Cymose inflorescence**
Main axis	Main axis continues to grow and does not terminate in a flower.	Main axis terminates in a flower and has limited growth.
Order of opening	Flowers are arranged in acropetal succession (older flowers at the base and younger flowers towards the apex).	Flowers are arranged in basipetal succession (older flowers at the apex and younger flowers towards the base).
Example	Mustard	Jasmine

23. Aestivation refers to the arrangement of sepals or petals in a floral bud with respect to the other members of the same whorl.

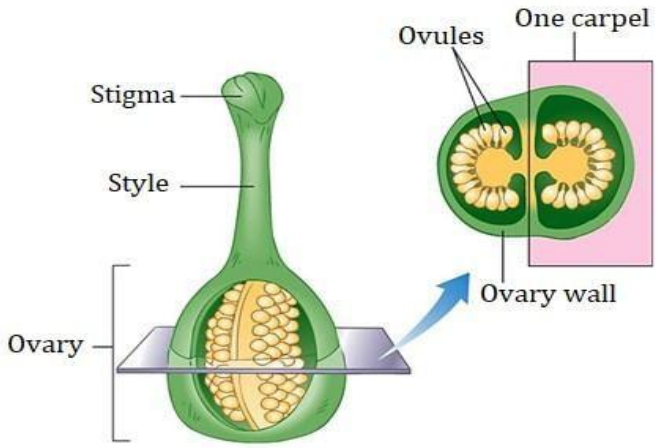
The three types are:

(i) Valvate aestivation:

	• When sepals or petals in a whorl just touch one another at the margins without overlapping, it is called valvate aestivation. • Example: Calotropis. (ii) Twisted aestivation: • When one margin of an appendage overlaps the margin of the next one, and the other margin is overlapped by the previous one, it is called twisted aestivation. • Example: China rose, cotton and lady's finger. (iii) Imbricate aestivation: • When the margins of sepals or petals overlap one another but not in any particular direction, it is called imbricate aestivation. • Example: Cassia and Gulmohur.
CASE STUDY BASED QUESTIONS (4M):	
i)	Ensure continuous flowering and prolonged pollination.
ii)	Floral appendages are produced instead of leaves. Shoot tip → flower: apex stops growing → solitary flower
iii)	Apex continues to grow → lateral flowers → inflorescence
iv)	Racemose: Main axis grows continuously; flowers in acropetal succession. Cymose: Main axis ends in a flower; flowers in basipetal succession.
LONG ANSWER TYPE QUESTIONS (5M EACH):	
24.	 Valvate Twisted Imbricate Vexillary **Valvate**-When sepals or petals in a whorl just touch one another at the margin, without overlapping, as in Calotropis, it is said to be valvate. **Twisted-** If one margin of the appendage overlaps that of the next one and so on as in China rose, lady's finger and cotton, it is called twisted. **Imbricate-** If the margins of sepals or petals overlap one another but not in any particular direction as in Cassia and Gulmohur, the aestivation is called imbricate. **Vexillary-** In pea and bean flowers, there are five petals, the largest (standard) overlaps the two lateral petals (wings) which in turn overlap the two smallest anterior petals (keel); this type of aestivation is known as vexillary or papilionaceous.
25.	Structure: • The root is covered at the apex by a thimble-like structure called the root cap .It protects the tender apex of the root as it makes its way through the soil. • **Region of meristematic activity-**The cells of this region are very small, thin-walled and with dense protoplasm. They divide repeatedly. • **Region of elongation**-The cells proximal to this region undergo rapid elongation and enlargement and are responsible for the growth of the root in length. • Region of maturation-The cells of this zone gradually differentiate and mature. From this region some of the epidermal cells form very fine and delicate,

	thread-like structures called root hairs. These root hairs absorb water and minerals from the soil.  **Figure 5.3** The regions of the root-tip
26.	The structure of a bean seed is described below: 1. The bean seed is protected by a thin, greenish outermost covering called seed coat. It protects the seed from insects and bacteria as well as from mechanical injury. 2. The seed coat is divided into two parts, the outer part is called the testa, and inner part is called Tegmen. The tegmen is a thin membrane that lies under the Testa. 3. On the inner concave side of the seed, there is a scar called Hilum which marks the place where the seed was attached to the fruit wall. 4. Above the hilum is a small pore called Micropyle. The Micropyle absorbs and allows the entry of as much water as is required for germination. 5. On removing the testa and tegmen from a soaked bean seed, the seed is made up of two fleshy seed leaves called the Cotyledons. They contain stored food material which is used by the seedling for growth. 6. In between the two cotyledons is located the delicate embryo which consists of a Radicle and Plumule. The radicle develops into a root, while the plumule develops into a shoot. 
27.	• **Inflorescence:** Usually **axillary or terminal cymose** type. • **Flower: Bisexual** and **actinomorphic** (radially symmetrical). • **Calyx: 5 sepals**, united (gamosepalous), **persistent** in fruit. • **Corolla: 5 petals**, united (gamopetalous), forming a **funnel-shaped or rotate** corolla. • **Androecium: 5 stamens**, epipetalous (attached to petals), alternate with petals. • **Gynoecium: Bicarpellary**, **syncarpous**, ovary **superior**, **bilocular** with **axile placentation**. • **Fruit: Berry** or **capsule**. • **Seed: Many**, with **endosperm** present.

28.	The androecium and gynoecium are the reproductive whorls of a flower. The androecium is the male reproductive part, whereas the gynoecium is the female reproductive part. (i) Parts of a stamen: The androecium consists of stamens, which are the male reproductive organs of a flower. A typical stamen consists of two parts: 1. Filament: It is the long, slender stalk of the stamen that supports the anther. 2. Anther: It is the terminal, usually bilobed structure of the stamen. Each anther generally contains two lobes, and each lobe has two pollen sacs. Thus, a typical anther is dithecous and contains four microsporangia. (ii) Cohesion and adhesion of stamens: Cohesion: When stamens are united among themselves by their filaments or anthers, the condition is called cohesion. Types of cohesion include: • Monadelphous: Filaments are united into one bundle, but anthers remain free. Example: China rose. • Diadelphous: Filaments are united into two bundles. Example: Pea. • Polyadelphous: Filaments are united into more than two bundles. Example: Citrus. • Syngenesious: Anthers are united, but filaments remain free. Example: Sunflower. Adhesion: When stamens are attached to other floral parts, such as petals or perianth, the condition is called adhesion. Examples: • Epipetalous: Stamens attached to petals. Example: Brinjal. • Epiphyllous: Stamens attached to the perianth. Example: Lily. (iii) Parts of a carpel: The gynoecium is the female reproductive part of a flower and consists of one or more carpels. A typical carpel consists of three parts: 1. Stigma: It is the terminal receptive surface of the carpel that receives pollen grains. 2. Style: It is the elongated slender part that connects the stigma to the ovary. 3. Ovary: It is the swollen basal part of the carpel that contains ovules.



(iv) Apocarpous and syncarpous conditions :

Apocarpous gynoecium:

- When more than one carpel is present, and the carpels are free from one another, the condition is called apocarpous.
- Example: Lotus and rose.

Syncarpous gynoecium:

- When two or more carpels are fused together, the condition is called syncarpous.
- Example: Mustard and tomato.

The androecium produces pollen grains, while the gynoecium contains ovules. Both reproductive whorls play an important role in sexual reproduction in flowering plants.

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