INDIAN SCHOOL AL WADI AL KABIR		
CLASS: XI	**DEPARTMENT: SCIENCE 2025 – 2026** **SUBJECT: BIOLOGY**	**DATE: 27.01.2026**
WORKSHEET NO. 17	**UNIT- IV- PLANT PHYSIOLOGY** **CHAPTER: 13 PLANT GROWTH AND DEVELOPMENT**	**NOTE:** **A4 FILE FORMAT**
NAME OF THE STUDENT:	**CLASS & SEC:**	**ROLL NO.**

I. OBJECTIVE-TYPE QUESTIONS

1. Which hormone is primarily responsible for seed dormancy?
   A. Auxin
   B. Abscisic acid
   C. Cytokinin
   D. Ethylene
2. Which hormone is known to delay leaf senescence?
   A. Auxin
   B. Gibberellin
   C. Cytokinin
   D. Ethylene
3. Growth can be measured in various ways. Which of these can be used as parameters to measure growth?
   A. Increase in cell number
   B. Increase in cell size
   C. Increase in length and weight
   D. All the above
4. To increase sugar production in sugarcanes, they are sprayed with:
   A. IAA
   B. Cytokinin
   C. Gibberellins
   D. Ethylene
5. Coconut water contains:
   A. ABA
   B. Auxin
   C. Cytokinin
   D. Gibberellin
6. What is the role of gibberellins in seed germination?

A. Inducing dormancy
B. Breaking dormancy
C. Inhibiting growth
D. Promoting root growth

7. In geometric growth, what happens during the log or exponential phase?
   A. Growth occurs at a constant rate
   B. Growth is initially rapid but gradually slows down
   C. Both progeny cells retain the ability to divide and grow rapidly.
   D. Only one daughter cell continues to divide.
8. The ability of plants to follow different pathways in response to the environment to form different structures is called:
   A. Heterophylly
   B. Plasticity
   C. Differentiation
   D. Redifferentiation
9. Which growth curve is characteristic of living organisms growing in a natural environment?
   A. Linear curve
   B. Exponential curve
   C. Sigmoid or S-curve
   D. Parabolic curve
10. The phase of growth where cells undergo increased vacuolation and cell enlargement is called:
    A. Meristematic phase
    B. Elongation phase
    C. Maturation phase
    D. Differentiation phase

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

11. **Assertion (A):** Removal of the shoot tip usually results in the growth of lateral buds.
    Reason (R): The source of auxin is removed, thereby releasing lateral buds from inhibition.
12. **Assertion (A):** Auxins help to prevent fruit and leaf drop at early stages.
    Reason (R): Auxins do not promote the abscission of older mature leaves and fruits.
13. **Assertion (A):** The period of growth is generally divided into three phases, namely, meristematic, elongation, and maturation.

Reason (R): The constantly dividing cells, both at the root apex and the shoot apex, represent the meristematic phase of growth.

II. VERY SHORT QUESTIONS (2M):

14. Explain the sigmoid growth curve and its phases in plant growth.
15. Discuss the physiological effects and applications of auxins in plant growth and development.
16. Define growth rate. Name two types of growth. Give the shape of the curve for this growth.
17. What induces ethylene formation in plants? Give any two different actions of ethylene on plants.

III. SHORT ANSWER TYPE QUESTIONS: (3M)

18. Explain the following terms –
    a) Differentiation
    b) Dedifferentiation
    c) Redifferentiation
19. Which one of the plant growth regulators would you use if you are asked to:
    a) Induce rooting in a twig
    b) Quickly ripen a fruit
    c) Delay leaf senescence
    d) Induce growth in axillary buds
    e) Induce immediate stomatal closure in leaves.
    f) To increase the length of the axis in grape stalks or to "bolt" a rosette plant (like beet or cabbage)
20. Define Plasticity. Draw a flowchart to explain the sequence of the developmental process in a plant cell
21. What would be expected to happen if:
    a) GA3 is applied to rice seedlings.
    b) The rotten fruit gets mixed with unripe fruits.
    c) You add cytokinin to the culture medium.

IV. SOURCE-BASED/ CASE STUDY-BASED QUESTIONS

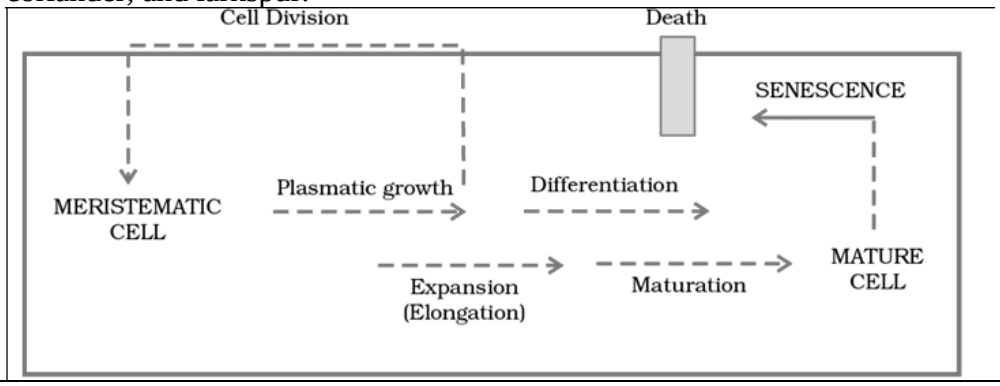
A biology student conducted an experiment to study growth in different plant parts.
She observed that the length of a pollen tube increased rapidly within a short time.
In another experiment, she noted that a dorsiventral leaf showed an increase in its surface area rather than length. She also examined the root tip under a microscope and found small, thin-walled cells with large nuclei near the apex, while cells located just behind this region increased rapidly in size.
Based on the above observations, answer the following questions:

a. What is meant by growth? Why is it considered irreversible? (1mark)
b. Distinguish between the elongation phase and maturation phase (2marks)
c. Why is growth difficult to measure directly at the cellular level? How is it measured? (1mark)

V. LONG ANSWER TYPE QUESTIONS. (5M)

22. What are the different phases of growth? Explain with the help of well-labeled diagrams?
23. Write an essay on plant growth regulators.
24. Briefly explain the discovery of the following growth regulators: (a) auxin, (b) gibberellic acid, (c) cytokinin, (d) abscisic acid (ABA), (e) ethylene

ANSWER KEY	
I. OBJECTIVE-TYPE QUESTIONS	
1.	B. Abscisic acid
2.	C. Cytokinin
3.	D. All of the above
4.	C. Gibberellins
5.	C. Cytokinin
6.	B. Breaking dormancy
7.	C. Both progeny cells retain the ability to divide and grow rapidly
8.	B. Plasticity
9.	C. Sigmoid or S-curve
10.	B. Elongation phase
11.	i) Both A and R are true, but R is the correct explanation of A.
12.	iii) A is true, but R is false
13.	i) Both A and R are true, and R is the correct explanation of A
II. VERY SHORT QUESTIONS (2M):	
14.	The sigmoid growth curve represents the growth of a plant over time and has three phases: lag phase, exponential phase, and stationary phase. In the lag phase, growth is slow as cells acclimate to conditions. In the exponential phase, growth is rapid due to active cell division and elongation. In the stationary phase, growth slows as resources become limited and cells mature.
15.	Auxins stimulate cell elongation, root initiation, and apical dominance. They prevent premature fruit and leaf drop and induce parthenocarpy. Auxins are used in agriculture for rooting cuttings, promoting uniform flowering, and preventing fruit drop. They are also used in herbicides to control weed growth.
16.	Growth rate: It is the increase in growth per unit time (i.e., the rate at which an organism or its part grows). Types of growth and shape of curve: 1. Arithmetic growth Growth increases by a constant amount per unit time. Curve shape: Straight line (linear) 2. Geometric growth Growth increases proportionately to the existing size. Curve shape: Sigmoid (S-shaped) curve

17.	Ethylene formation in plants is induced by mechanical stress, such as wounding, pressure, or touch (e.g., during ripening or injury). Any two actions of ethylene on plants: 1. Promotes fruit ripening (e.g., banana, mango). 2. Causes senescence and abscission of leaves, flowers, and fruits.
III. SHORT ANSWER TYPE QUESTIONS: (3M)	
18.	(a)The cells derived from root apical and shoot-apical meristems and cambium differentiate and mature to perform specific functions. This act leading to maturation is termed differentiation. (b)The living differentiated cells, which by now have lost the capacity to divide, can regain the capacity to divide under certain conditions. This phenomenon is termed dedifferentiation. (c)The process by which a dedifferentiated cell attains a particular function and loses its ability to divide again is called redifferentiation.
19.	a) Induce rooting in a twig -Auxin b) Quickly ripen a fruit - Ethylene c) Delay leaf senescence - Cytokinin d) Induce growth in axillary buds - Cytokinin e) Induce immediate stomatal closure in leaves - Abscisic acid (ABA). f) To increase the length of the axis in grape stalks or to "bolt" a rosette plant (like beet or cabbage)- GA3
20.	Plants follow different pathways in response to the environment or phases of life to form different kinds of structures. This ability is called plasticity, e.g., heterophylly in cotton, coriander, and larkspur. 
21.	**a) *GA*3 is applied to rice seedlings:** The seedlings will show extraordinary elongation of the stem (internodes). This is the characteristic "Bakane" (foolish seedling) effect, where plants grow too tall and weak due to the cell elongation properties of Gibberellins. **b) The rotten fruit gets mixed with unripe fruits:** The unripe fruits will ripen prematurely. This occurs because the rotten fruit releases ethylene (a gaseous hormone), which diffuses to nearby fruits and accelerates their ripening process by increasing their respiration rate. **c) You add cytokinin to the culture medium:** It will promote rapid cell division (cytokinesis) and help in the formation of a **c**allus (an undifferentiated mass of cells). Cytokinins are essential in tissue culture for stimulating the growth of new shoots from cultured cells.

IV. SOURCE-BASED/ CASE STUDY-BASED QUESTIONS

22. A. Growth is a permanent increase in size, mass, or number of cells of an organism. It is irreversible because the plant cannot return to its original size.

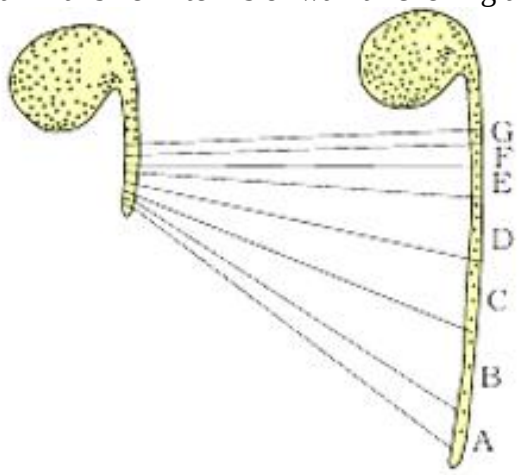
B.

Elongation Phase	Maturation Phase
Cells increase in size	Cells differentiate
Cell walls stretch	Cells attain permanent shape

C. Growth involves an increase in protoplasm, which cannot be measured directly. Hence, growth is measured indirectly using parameters like length, weight, area, or number of cells.

V. LONG ANSWER TYPE QUESTIONS. (5M)

23. a) The period of growth is generally divided into three phases, namely, meristematic, elongation, and maturation. The constantly dividing cells, both at the root apex and the shoot apex, represent the meristematic phase of growth. The cells in this region are rich in protoplasm and possess large, conspicuous nuclei. Their cell walls are primary in nature, thin, and cellulosic with abundant plasmodesmatal connections. The cells proximal (just next, away from the tip) to the meristematic zone represent the phase of elongation. Increased vacuolation, cell enlargement, and new cell wall deposition are the characteristics of the cells in this phase. Further away from the apex, i.e., more proximal to the phase of elongation, lies the portion of the axis that is undergoing the phase of maturation. The cells of this zone attain their maximal size in terms of wall thickening and protoplasmic modifications.



24. Plant growth regulators are organic compounds produced in small amounts that **control growth, development, and differentiation** in plants.

Types and Functions:

Hormone	Site of Synthesis	Major Functions	Applications
Auxins (IAA)	Shoot tips, young leaves	Cell elongation, root initiation, apical dominance, fruit development	Vegetative propagation, herbicides
Gibberellins (GA_3)	Young leaves, shoot tips, seeds	Stem elongation, seed germination, bolting, parthenocarpy	Increase sugarcane height, seedless grapes
Cytokinins	Root tips, developing fruits	Cell division, shoot formation, delays senescence	Micropropagation
Ethylene	Ripening fruits, senescing leaves	Fruit ripening, leaf/flower abscission	Ripening of bananas, tomatoes
Abscisic Acid (ABA)	Leaves, stems, seeds	Seed dormancy, stomatal closure, inhibits growth under stress	Drought tolerance

25. Auxin - Charles Darwin and his son Francis Darwin observed that the coleoptiles of canary grass responded to unilateral illumination by growing towards the light source (phototropism). After a series of experiments, it was concluded that the tip of the coleoptile was the site of transmissible influence that caused the bending of the entire coleoptile. Auxin was isolated by F.W. Went from the tips of coleoptiles of oat seedlings.
Gibberellic acid - The 'bakanae' (foolish seedling) disease of rice seedlings was caused by a fungal pathogen, *Gibberella fujikuroi*. E. Kurosawa (1926) reported the appearance of symptoms of the disease in rice seedlings when they were treated with sterile filtrates of the fungus. The active substances were later identified as gibberellic acid.

Cytokinesis (cytokinin) - F. Skoog and his co-workers observed that from the internodal segments of tobacco stems, the callus (a mass of undifferentiated cells) proliferated only if, in addition to auxins, the nutrient medium was supplemented with one of the following: extracts of vascular tissues, yeast extract, coconut milk, or DNA. Miller et al. (1955) later identified and crystallised the cytokinesis-promoting active substance that they termed kinetin.

Abscisic acid (ABA) - During the mid-1960s, three independent researchers reported the purification and chemical characterisation of three different kinds of inhibitors: inhibitor-B, abscission II, and dormin. Later, all three were proved to be chemically identical. It was named abscisic acid (ABA).
Ethylene - H. H. Cousins (1910) confirmed the release of a volatile substance from ripened oranges that hastened the ripening of stored unripe bananas. Later, this volatile substance was identified as ethylene, a gaseous PGR.

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