



PLANT GROWTH AND DEVELOPMENT

Plant Growth and Development

Root, stem, leaves, flowers, fruits and seeds arise in orderly manner in plants. The sequence of growth is as follows:

- Life cycle of plant: Plants complete their vegetative phase to move into reproductive phase in which flower and fruits are formed for continuation of life cycle of plant.
- Growth and differentiation: Development is the sum of two processes growth and differentiation. Intrinsic and extrinsic factors control the process of growth and development in plants.
- **Growth:** Growth is a permanent or irreversible increase in dry weight, size, mass or volume of cell, organ or organism. It is internal or intrinsic in living beings.
- Growth is a quantitative phenomenon: In plants growth is accomplished by cell division, increase in cell number and cell enlargement. So, growth is a quantitative phenomenon which can be measured in relation to time.
- Plant growth is generally indeterminate: Plant growth is generally indeterminate due to capacity of unlimited growth throughout the life. Meristem tissues are present at the certain locality of plant body.
- **Open form of growth:** The plant growth in which new cells are always being added to plant body due to meristem is called open form of growth.
- **Root apical meristem and shoot apical meristem:** Root apical meristem and shoot apical meristem are responsible for primary growth and elongation of plant body along the axis.
- Intercalary meristem: Intercalary meristem located at nodes produce buds and new branches in plants.



Secondary growth in plants

Secondary growth in plants is the function of lateral meristem that is vascular cambium and cork cambium.

- Seed Germination: The seed germinates only when favorable conditions for growth exists in the environment. In absence of favorable conditions it goes into a period of suspended growth or rest, called dormancy.
- Abscission: Shedding of plant organs like leaves, flowers and fruits etc. from the mature plant.
- Apical dominance: Suppression of the growth of lateral buds in presence of apical bud.
- **Dormancy:** A period of suspended activity and growth usually associated with low metabolic rate. Some, seeds undergo a period of dormancy and can germinate only after dormancy period gets over.
- **Phytochrome:** A pigment, found in plants which control the light dependent developmental process.
- **Phytohormone:** Chemical's secreted by plants in minute quantities which influence the physiological activities.
- Senescence: The last phase of growth when metabolic activities decrease.
- Vernalization: A method of promoting flowering by exposing the young plant to low temperature.
- **Quiescence:** Non germination of a viable seed due to non-availability of proper environmental conditions.
- Vivipary: It is the germination of seed while it is still attached to the parent plant and is nourished by it. e.g., Rhizophora and Sonneratia. As the germinating seed forms a seedling. It all down into the mud due to increase in weights. In the mud, lateral roots develops for anchorage.
- Heterophylly: Occurrence of more than one type of leaves in plants e.g., larkspur, Coriander leaves of Juvenile plant are different in shape from mature plant.
- **Bolting:** Elongation of internodes prior to flowering in plants like Cabbage.

Photoperiodism

Response of Plants to relative periods of day/ night to induce flowering.

Long Day Plants (LDP): Plants which need exposure to light for period exceeding critical duration e.g., wheat, rice, cucumber.

Short Day Plants (SDP): Plants that need exposure to light for period less than the critical length e.g., Cabbage.

Day Neutral Plants (DNP): There is no correlation between exposure to light duration & induction of flowering e.g., Tomato.

Growth is measurable

- At cellular level, growth is the increase in amount of protoplasm. It is difficult to measure the increase in amount of protoplasm but increase in cell, cell number and cell size can be measured.
- The parameter used to measure growth is increase in fresh weight, dry weight, length, area, and volume and cell number. All parameters are not used for every kind of growth.

Phase of growth

- Formative phase
- Phase of Enlargement
- Phase of maturation

Formative phase: Formative phase is also called as the phase of cell formation or cell division. It occurs at root apex, shoot apex and other region having meristematic tissue. The rate of respiration is very high in the cells undergoing mitosis division in formative phase.

Phase of Enlargement: Phase of Enlargement newly formed cells produced in formative phase undergo enlargement. Enlarging cells also develops vacuoles that further increase the volume of cell. Cell enlargement occurs in all direction with maximum elongation in conducting tissues and fibers.

Phase of maturation: the enlarged cells develops into special or particular type of cells by undergoing structural and physiological differentiation.

Growth Rate

Growth Rate increase in growth per unit time is called growth rate. Growth rate may be arithmetic or geometrical.

Arithmetic Growth

Arithmetic Growth the rate of growth is constant and increase in growth occurs in arithmetic progression- 2, 4, 6, 8 It is found in root and shoot elongation.

 $L_t = L_0 + rt$

Length after time = length at beginning + growth rate x time.

Geometric Growth

- Here initial growth is slow and increase rapidly thereafter. Every cell divides. The daughter cells grow and divide and the granddaughter cells that result into exponential growth.
- Geometrical growth is common in unicellular organisms when growing in nutrient rich medium.

 Sigmoid growth curve consists of fast dividing exponential phase and stationary phase. It is typical of most living organisms in their natural environment.

Exponential growth can be represented as follows:

 $W_1 = W_0e^{rt}$. $W_1 =$ final size, $W_0 =$ initial size, r = growth rate, t = time of growth and e is the base of natural logarithms (2.71828).

- Quantitative comparison between the growth of living system can be made by
- Measurement and comparison of total growth per unit time is called the absolute rate.
- The growth of given system per unit time expressed on a common basis is called relative growth rate.

Condition for growth

- Necessary condition for growth includes water, oxygen and essential elements. Water is required for cell enlargement and maintaining turgidity. Water also provides medium for enzymatic conditions.
- Protoplasm formation requires water and micro and macronutrients and act as source of energy.
- Optimal temperature and other environmental conditions are also essential for growth of the plant.
- Cells produced by apical meristem become specialized to perform specific function. This act of maturation is called differentiation.
- The living differentiated cells that have lost ability of division can regain the capacity of division. This phenomenon is called dedifferentiation. For example, interfascicular cambium and cork cambium.
- Dedifferentiated cells mature and lose the capacity of cell division again to perform specific functions. This process is called redifferentiation.

Development

It is the sequence of events that occur in the life history of cell, organ or organism which includes seed germination, growth, differentiation, maturation, flowering, seed formation and senescence.

Sequence of development process in plant cell: Different structures develop in different phases of growth as well as in response to environment. The ability to change under the influence of internal or external stimuli is called plasticity. Heterophylly in cotton plant is the example of plasticity.

Plant Growth Regulators

- Plant Growth Regulators are simple molecules of diverse chemical composition which may be indole compounds, adenine derivatives or derivatives of carotenoids.
- Auxin was isolated by F.W. Went from tips of coleoptiles of oat seedlings.

- The 'bakane disease' of rice seedlings is caused by fungal pathogen Gibberella fujikuroi. E. Kurosawa found that this disease is caused due to presence of Gibberellin.
- Skoog and Miller identified and crystallized the cytokinesis, promoting active substance called kinetin.

Auxin

Auxin was first isolated from human urine. It is commonly indole-3-acetic acid (IAA). It is generally produced at stem and root apex and migrate to site of action.

Functions:

- Cell enlargement.
- Apical dominance
- Cell division
- Inhibition of abscission
- Induce Parthenocarpy

Gibberellins

Gibberellins are promotery PGR found in more than 100 forms named as GA₁, GA₂, GA₃..... GA₁₀₀ The most common one is GA₃ (Gibberellic Acid).

Functions:

- Cell elongation.
- Breaking of dormancy.
- Early maturity
- Seed germination.

Cytokinins

Cytokinins the plant growth hormone is basic in nature. Most common forms include kinetin, zeatin, etc. They are mainly synthesized in roots.

Functions:

- Cell division and cell differentiation.
- Essential for tissue culture.
- Overcome apical dominance.
- Promote nutrient mobilization.

Ethylene

Ethylene it is a gaseous hormone which stimulates transverse or isodiametric growth but retards the longitudinal one.

Functions:

- Inhibition of longitudinal growth.
- Fruit ripening

- Senescence
- Promote apical dominance

Abscisic Acid

Abscisic Acid it is also called stress hormone or doormen. It acts as a general plant growth inhibitor. Abscisic acid is produced in the roots of the plant and terminal buds at the top of plant.

Function:

- Bud dormancy
- Leaf senescence
- Induce Parthenocarpy
- Seed development and maturation.

Alliant Academy

NCERT LINE BY LINE QUESTIONS

	A) Growth	K) L http://www.uptiotion	
	C crowth 1 differentiation	D) Create differentiation	
	C) Growin + differentiation	D) Growth – differentiation	
	<u>rarag</u>	raph 15.1	
•		rowth	
2.	Growth of living being is/are-	D) In the second in the second	(Pg. 240, E)
	A) Infeversible	D) All of these	
2	C) increase in weight	D) All of these	(D ~ 2 40 E)
5.	A) Crowth but not development	B) Development but not growth	(rg. 240, E)
	C) No growth and development	D) Both growth & development	
	C) No growin and development	b) boll grown & development	
	Plant Growth Gen	erally is indeterminate	
4.	Plant grows		(Pg. 240, E)
	A) For a limited time in life		
	B) For a very long time in life		
	C) For a very short time in a life		
F	D) For unlimited time throughout life		(D~ 240 M)
5.	The given ligure shows-		(rg. 240, wi)
	7	7 (
		The THE	
	, 1	平 平	
	A) Consider the description of the house		
	R) Commination & development in maize		
	C) Cormination & development in maize		
	D) Cormination & development in gram		
6	Plant grows throughout the life due to		(Pg 240 E)
0.	A) Moristomatic ticsuo	B) Paronchyma tissuo	(1 g. 240, L)
	C) Enidermal tissue	D) More than one option is corre	ct
7	Open form of growth involves	b) where that one option is corre	(Pσ 240 F)
7.	A) Continuous division in all cells formin	g new set of cells which divide fu	(1 6 , 2 , 0 , 1) rther
	necessarily		
	B) Division in some cells forming new set	of cells which do not divide furth	er
	necessarily		
	C) No division at all		
	D) Division in some cells at the time of inj	jury which forms new set of cells	to heal the injury
8.	Secondary growth does occur in-	· · · · · · · · · · · · · · · · · · ·	(Pg. 240, E)
	A) All angiosperms and no gymnosperms	3	
	B) Some angiosperm and gymnosperms		
	C) No angiosperm and only gymnosperm	IS	
	D) All angiosperm and all gymnosperms		
9.	Secondary growth does not mean-		(Pg. 240, E)
	A) Increase in length of plant	B) Increase in girth of plant	





	C) (ii) is arithmetic growth phase		
	D) (ii) is geometric growth phase		
22.	Choose the correct set of option for size	e or weight of organ against time	(Pg. 243, E)
	(i) $W1 = Wo \text{ ert}$	(ii) $Lt = Lo + rt$	
	(iii) Linear growth curve	(iv) Sigmoid growth curve	
	(v) Arithmetic growth	(vi) Geometric growth	
	A) (1), (111), (1 V)	B) (11), (111), (v_1)	
22	C) (1), (1V), (V1)	D) (11), (1 v), (v)	
23.	The three phases of sigmoid growth oc	cur in order are –	(Pg. 243, E)
	A) Log, lag, stationary	B) Log, stationary, lag	
24	C) Lag, log, stationary	D) Lag, stationary, log	(D- 040 E)
24.	In the formula $WI = WO \text{ ert}$, r is –	D) D(C) - i an and in days	(Pg. 243, E)
	A) Relative growth rate	b) Efficiency index	
	C) Ability of plant to produce new plan	it material	
25	b) All of these		$(D_{\alpha}, 244, E)$
25.	choose the correct option –		(Pg. 244, E)
		B	
	A		
	10 cm^2	55 cm ²	
I			
1		50 cm ²	
		В	
	A) Absolute growth rate of A is more t	han that of B	
	B) Absolute growth rate of B is more th	an that of A	
	C) Relative growth rate of A is more th	an that of B	
	D) Relative growth rate of B is more th	an that of A	
	Para	agraph 15.1.5	
	Cond	litions growth	
26.	The factors affecting growth can be -		(Pg. 244, E)
	A) Water, temperature, light, gravity		(- 8, -,
	B) Water, temperature, light but not gr	avity	
	C) Water, light but not temperature &	zravity	
	D) Water, light, gravity but not temper	ature	
	Par	agraph 15.2	
	Differentiation Dediffe	rentiation and Redifferentiati	on
27	During differentiation	rentiation and Redifferentiati	$(P\sigma 245 E)$
27.	A) Structural changes occur in nucleus	and cytoplasm	(I g. 243, L)
	B) Functional changes occur in nucleus	and cytoplasm	
	C) Structural changes occur in cell wall	and protoplasm	
	D) All of these		
28	Dedifferentiation can be seen in format	ion of_	(Pg 245 F)
20.	A) Intrafassicular paronchyma	B) Intrafascicular cambium only	(1 g. 243, L)
	C) Interfascicular cambium only	D) Entire vascular cambium	
29	Read the following statements -	D) Entrie vasculai Califolulli	(Pg 245 F)
<i>∠۶</i> .	(i) Cork cambium is a layer of meriston	n formed from parenchyma cells	(1 g. 273, L)
	(ii) Intrafascicular cambium is a layor of	f narenchyma cells formed from ma	ristem
	(iii) Vascular cambium divide and pro-	fuce cells that differentiate again	
	(iv) Plant growth can be determinate or	r indeterminate	



13

	C) Intercellular (plant growth regulators)			
	D) More than one option is correct	5 1 Plant Crowth		
	Pogulation Davagra	b 15/1 Charact	orictics	
27	Regulation ratagia	<u>pii 15.4.1 - Citatact</u>	ensues	(Pg 247 E)
57.	A) Small simple molecules of diverse ch	emical composition		(rg. 247, E)
	B) Large simple molecules of diverse ch	emical composition		
	C) Small, complex molecules of diverse c	hemical composition		
	D) Large, complex molecules of diverse c	hemical composition		
38.	An example of adenine derivative PGR			(Pg. 247, E)
	A) IAA B) Kinetin	C) ABA	D) Gibberel	lic acid
39.	Gibberellic acid is –	,	,	(Pg. 247, E)
	A) Indole compound	B) Adenine compou	nd	
	C) Carotenoid derivative	D) Terpene derivativ	ve	
40.	Abscisi <mark>c ac</mark> id is –			(Pg. 247, E)
	A) In <mark>dol</mark> e compound	B) Adenine compou	nd	
	C) Carotenoid derivative	D) <mark>Terpene der</mark> ivativ	ve	
41.	Kin <mark>eti</mark> n is –			(Pg. 247, E)
	A) Indole compound	B) Adenine compou	nd	
	C) Carotenoid derivative	D) Terpene derivativ	ve	
42.	A gaseous PGR is			(Pg. 247, E)
	A) ABA	B) Ethylene		
10	C) GA3	D) IAA		
43.	The PGRs that play important role in pla	nt responses to wound	ds are –	(Pg. 247, E)
4.4	A) Auxin B) Cytokinin	C) Gibberellin	D) Abscisic	acid
44.	PGR Ethylene can fit into –			(Pg. 247, E)
	B) Group of plant growth inhibitors			
	C) Both the groups of promoter & inhibit	ors but mostly inhibit	or	
	D) Both the groups of promoter and inhi	hitors but mostly pror	noter	
	Paragraph 15 4 2	The Discovery of	PGR	
45	Discovery of how many out of 5 major PC	GRs was accidental?		(Pg 247 F)
10.	A) 2 B) 1	C) 3	D) 5	(1 8. =17, 1)
46	Match the scientist with the plant they w	orked on –	2)0	(Pg. 248, M)
10.	Column I	Column II		(18, =10, 11)
	a F.W.Went	i) Canary grass		
	b E. Kurosawa	ii) Avena(oat)		
	c Charles & Francis Darwin	iii) Tobacco		
	d F.S koog	iv) Rice		
	A) a-iv, b-ii, c-iii, d-I	B) a-iii, b-i, c-ii, d-iv		
	C) a-ii, b-iv, c-i, d-iii	D) a-i, b-iii, c-iv, d-ii	i	
47.	Cousins confirmed the release of a volati	le substance _(i)_, from	m ripened _(i	i)_ that hastened
	the ripening of stored unripe_(iii)			(Pg. 247, E)
	A) (i)-ABA, (ii)-banana, (iii)-orange			
	B) (i)-ABA, (ii)-orange, (iii)-banana			
	C) (i)- C_2H_4 , (ii)-banana, (iii)-orange			
10	D) (i)- C_2H_4 , (ii)- orange, (iii)-banana	1 1 1 . 1.		
48.	Match the PGR with the plants which pla	iyed role in their disco	overy –	(Pg. 247, M)
	Column I	Column II		
	a Auxin	1) 10bacco		

14



	B) Epidermal tissue of shoots only		
	C) Xylem secondary cells		
	D) Endodermal cells of roots & shoot		
58.	Assertion: Auxin is used in plant propaga	ation widely.	
	Reason: Auxin initiate rooting.		
	Choose the correct option -		(Pg. 248, M)
	A) Both Assertion and Reason are correct	, and Reason is correct explanatior	n of
	Assertion		
	B) Both Assertion and Reason are correct	, but Reason doesn't explain Asser	tion
	C) Assertion is correct but Reason is wron	ng	
	D) Both Assertion and Reason are incorre	ect	
59.	Auxin promote –		(Pg. 248, E)
	A) Rooting in stem cutting	B) <mark>Flow</mark> ering in pineapple	
	C) Bolting in beet	D <mark>) Both</mark> A & B	
60.	Statement-I Auxin prevent fruit and leaf	dro <mark>p at ea</mark> rly stage	
	Statement-II Auxin promote abscission of	f old <mark>er matur</mark> e leaves & fruits	
	Choose the appropriate option –		(Pg. 248, M)
	A) Statement-I is correct and Statement-I	I is i <mark>ncorrect</mark>	
	B) Statement-I is incorrect and Statement	-II i <mark>s corre</mark> ct	
	C) Both Statement-I & Statement-II are co	orrect	
	D) Both Statement-I & Statement-II are in	correct	
61.	Auxin -		(Pg. 248, E)
	A) Promotes apical dominance	B) Prevent apical dominance	
	C) Both promote & prevent apical domin	ance based on condition	
(0)	D) Can't say		
62.	In tea plantation and hedge –making		(Pg. 248, E)
	A) Lateral buds are removed	B) Shoot tips are removed	
(0)	C) Root tips are removed	D) None of these	(D~ 249 E)
63.	Auxin -	P) Act as harbisida	(Pg. 248, E)
	C) Holp in coll division	D) All of those	
61	2.4 Dis used to	D) All of these	(Da 248 E)
04.	2, 4-D is used to -	B) Kill dicot usually	(rg. 240, E)
	C) Kill monocot usually	D) Both $\Lambda \frac{\delta_r}{\delta_r}$ B	
	C) Kill monocot usually	D) both A & D	
	<u>raragr</u>	<u>apri 15.4.5.2</u>	
	GID	berellins	
65.	Gibberellins are		(Pg. 249, E)
	A) Promotory PGR	B) Inhibitory PGR	
	C) Neither promotory nor inhibitory PGF	X	
((D) Both promotory and inhibitory PGR		(D - 040 E)
66.	Which of the following statements are ind	correct –	(Pg. 249, E)
	A) There are more than 100 gibberellins r $P(A) = \frac{1}{2} $	eported	
	B) GA_3 was one of the gibberellins to be C	$\frac{11}{2}$	
(7	C) All GA are basic	D) GAS are also reported in fungi	$(\mathbf{D}_{\mathbf{z}}, \mathbf{D}_{\mathbf{z}}, \mathbf{D}_{\mathbf{z}})$
67.	A) In grapes in longth of stalls	P) In average in giveth of stall.	(Pg. 249, E)
	A) Increase in length of stalk	B) Increase in girth of stalk	
60	C) Decrease in length of Stalk	Decrease in girth of stalk	$(D_{\sigma}, 240, E)$
00.	A) Promotos senescence	B) Delay appagance	(rg. 249, E)
	A) Fromotes senescence	b) Delay senescence	
	C) Neither promote not delay senescence		

	D) Both promote & delay senescence l	pased on situation		
69.	Assertion: Spraying gibberellins on fr	uits extend its market p	eriod	
	Reason: Gibberellins delays senescenc	ze i		
	Choose the best option –			(Pg. 249, M)
	A) Both assertion & reason are correct	and reason is correct e	xplanation of	assertion
	B) Both assertion & reason are correct	but reason is not expla	nation of asser	tion
	C) Assertion is correct but reason is w	rong		uon
	D) Path accortion & reason are in corr	long		
70	D) both assertion & reason are in cont	ect		$(D_{2}, 240, E)$
70.	A) A D A 1 III III	1 • • 1 •		(rg. 249, e)
	A) ABA shows the malting process in	brewing industry		
	B) ABA speeds the malting process in	brewing industry		
	C) GA3 slows the malting process in b	prewing industry		
	D) GA3 speeds the malting process in	brewing industry		
71.	Gibberellins is used to improve yields	of –		(Pg. 249, E)
	A) Apple	B) Grape		
	C) Sug <mark>arc</mark> ane	D) <mark>All of th</mark> ese		
72.	Asse <mark>rtio</mark> n: Juvenile conifers are spraye	ed with <mark>GA</mark>		
	Rea <mark>son</mark> : GA delays senescence and ma	alting p <mark>eriod</mark>		
	Which of the given options are correct	t?		(Pg. 249, E)
	A) Both assertion & reason are correct	and re <mark>ason i</mark> s correct e	xplanation of	
	assertion			
	B) Both assertion & reason are correct	but reason is not expla	nation of asser	tion
	C) Assertion is correct but reason is w	rong		
	D) Both assertion & reason are in corr	ect		
73.	Bolting is –			(Pg. 249, E)
	A) Yellowing of leaves			
	B) Node elongation prior to flowering			
	C) Early maturing and seed production	'n		
	D) None of these			
74	GA promote bolting in -			(Pg. 249, E)
	A) Beet	B) Cabbage		(-8,,-)
	C) Plants with rosetle habit	D) All of these		
	c) i mins white to serve induct	D) I'll of these		
	Par	ograph 15/133		
		Cutolining		
		<u>Cytokinins</u>		
75.	Cytokinins were discovered as –			(Pg. 249,E)
	A) Kinin B) Kinetin	C) Kinesin	D) Zentin	
76.	Kinetin is a modified form of –			(Pg. 249, E)
	A) Purine – guanine	B) Pyrimidine – cy	tosine	
	C) Purine – adenine	D) Pyrimidine – th	iymine	
77.	Kinetin was discovered from –			(Pg. 249, E)
	A) Autoclaved herring egg DNA	B) Human urine		
	C) Corn kernel	D) None of these		
78.	Read the following statements regard	ing cytokinin –		(Pg. 249, E)
	i) Kinetin occurs naturally in plants	0 7		
	ii) Kinetin was discovered from cocon	ut milk		
	iii) Zeatin does not occur naturally in	plants		
	iv) Zeatin was isolated from human D	NA		
	How many of the statements are incom	rrect-		
	A) 1 B) 2	C) 3	D) 4	
	,- 2)-	-, -	~ / •	

79.	Natural cytokinin may be synthesized ir	1 –	(Pg. 249, E)
	A) Root apex	B) Developing shoot buds	
	C) Young fruits	D) More than one option is cor	rect
80.	Cytokinin helps to produce -		(Pg. 249, E)
	A) Chloroplast in leaves	B) Elongation in sugarcane	
	C) Synchronized fruit set in pineapple	D) Flowering in pineapple	
	Parag	raph 15.4.3.4	
		thylong	
Q 1	Ethylopo is synthesized in large amount	a by	(Pg 250 E)
01.	A) rinoping fruit	s by -	(1 g. 250, E)
	R) Tissues un democine concessor co		
	C) Newly developed leaves		
	D) Mana that an is a set in a set is a set in the set is a set is		
00	D) More than one option is correct		C II
82.	Ethylene causes _(1)_ growth of seedling	, swelling of axis and apical hool	(D OF OF
	in _(ii)_ seedling		(Pg. 250, E)
	A) Horizontal	Monocot	
	B) Vertical	Dicot	
	C) Horizontal	Dicot	
	D) Vertical	Monocot	
83.	Ethylene promotes –		(Pg. 250, E)
	A) Senescence and abscission of flowers		
	B) Senescence but not abscission of flow	ers	
	C) Abscission of flowers but not senesce	nce	
	D) Neither senescence nor abscission of	flowers	
84.	Et <mark>hy</mark> lene in fruits causes –		(Pg. 250, E)
	A) Rise in rate of respiration called respi	ratory anti-climactic	
	B) Rise in rate of respiration called respiration	ratory climactic	
	C) Fall in rate of respiration called respir	catory anti-climactic	
	D) Fall in rate of respiration called respir	ratory climactic	
85.	Ethylen <mark>e –</mark>		(Pg. 250, E)
	A) Promotes seed and bud dormancy		
	B) Promotes only seed dormancy		
	C) Promotes only bud dormancy		
	D) None of these		
86.	Statement-I Ethylene promotes internod	e/petiole elongation in deep wat	er rice plants
	Statement-II ethylene helps upper part o	of shoot to remain above water.	_
	Choose the appropriate option –		(Pg. 250, E)
	A) Statement-I is correct and Statement-	II is incorrect	
	B) Statement-I is incorrect and Statemen	t-II is correct	
	C) Statement-I and Statement-II are corr	ect	
	D) Statement-I and Statement-II are inco	prrect	
87.	Ethvlene –		(Pg. 250, E)
0	A) Promotes root hair formation and inc	rease in absorption surface	(-8, -0, -)
	B) Demotes root hair formation and incr	ease in absorption surface	
	C) Promotes root hair formation and dec	rease in absorption surface	
	D) Demotes root hair formation and dec	rease in absorption surface	
88	Ethylene initiates –	rease in assorption surface	(Pg 250 F)
00.	A) Flowering in pineapple	B) Flowering in mango	
	C) Synchronizing fruit-set in nineannle		
	C, Synchonizing in un-set in pineappie		

	D) All of these	
89.	Most widely used source of ethylene –	(Pg. 250, E)
	A) Is ethepene	-
	B) Hasters fruit ripening in tomato and apple	
	C) In aqueous solution is absorbed on the plant roots	
	D) More than one option is correct	
90.	Ethylene promotes –	(Pg. 250, E)
	A) Female flowers in cucumber, increasing the yield	
	B) Female flowers in cucumber, decreasing the yield	
	C) male flowers in cucumber, increasing the yield	
	D) male flowers in cucumber, decreasing the yield	
	Paragraph 15.4.3.5	
	Abscisic Acid	
91.	ABA is –	(Pg. 250, E)
	A) Inhibitor of plant growth and metabolism	
	B) Inhibitor of plant growth but not metabolism	
	C) Inhibitor of plant metabolism but not growth	
	D) Inhibitor of neither plant growth nor metabolism	
92.	ABA –	(Pg. 250, E)
	A) Inhibit seed germination B) Promote seed dormancy	
	C) Inhibit seed dormancy D) Both A & B	
93.	ABA is called stress hormone because	(Pg. <mark>250</mark> , E)
	A) It causes stress to plant	
	B) It is released during stress in plant	
	C) It helps plant to fight stress conditions	
	D) More than one option is correct	
94.	AB <mark>A</mark> stimulates –	(Pg. 251, E)
	A) <mark>Sto</mark> mata opening for more CO ₂ exchange	
	B) St <mark>om</mark> ata closure to decrease transpiration	
	C) Sto <mark>ma</mark> ta opening to cause transpiration & calling effect	
	D) Both A & C	
95.	In most situation, ABA acts as an antagonist to-	(Pg. 251, E)
	A) Auxin B) GA C) Cytokinin D) Ethylen	e
	Paragraph 15.5	
	Photoperiodism	
96.	Identify the correct labels –	(Pg. 251, E)
	No. No.	
	Above Above	
	No Flowering	
	Flowering Critical B photo-	
	photo-	
	Parine A	
	Below Below Flowering after	
	vegetative maturity	
	No Flowering Flowering	
	(i) (ii) (iii)	

	(i)	(ii)	(iii)			
	A) Long day plant	Day neutral plant	Short day plant			
	B) Short day plant	Day neutral plant	Long day plant			
	C) Long day plant	Short day plant	Day neutral plant			
	D) Short day plant	Long day plant	Day neutral plant			
			•			
97.	Read the given statements -		(Pg. 251, E)			
	Statement-I Some plants require	<mark>e a periodic</mark> exposure to light to	include flowering			
	Statement-II Some plants are ab	le to measure the duration of ex	posure to light			
	Choose the correct statements -					
	A) Both statements are correct a	and are about photoperiodism				
	B) One of the statements is corre	ect about pho <mark>toper</mark> iodism				
	C) Both statements are correct and is about vernalization					
	D) One of the statements is corr	ect about ver <mark>naliza</mark> tion				
98.	For day neutral plants, there is		(Pg. 252, E)			
	A) No correlation between light	t duration and flowering				
	B) Direct correlation between light	ght duration and flowering				
	C) Indirect correlation between	light duration and flowering				
	D) Direct correlation between li	ght intensity and flowering				
99.	In photoperiodism –		(Pg. 252, E)			
	A) Duration of light period mat	ters only				
	B) Duration of dark period mat	ters only				
	C) Duration of light and dark p	eriod matters				
	D) Duration of light or dark per	riod doesn't matter				
100.	Photoperiods are perceived by		(Pg. 252, E)			
	A) <mark>Sh</mark> oot apices	B) Flowering apices				
	C) <mark>No</mark> dal buds	D) Leaves				
		<u>Paragraph 15.6</u>				
		Vernalization				
101.	Vernalization is –		(Pg. 252, E)			
	A) Quantitative dependence of	flowering on low temperature				
	B) Qualitative dependence of flo	owering on low temperature				
	C) Quantitative dependence of	flowering on high temperature				
	D) A and B are correct					
102.	Vernalization can be seen in –		(Pg. 252, E)			
	A) Spring varieties of rice	B) Spring varieties of	f wheat			
	C) Winter varieties of rice	D) Winter varieties o	of wheat			
103.	Vernalization is also seen in –		(Pg. 252, E)			
	A) Biennials like – sugarbeet	B) Biennials like mai	ze			
	C) Perennials like sugarbeet	D) Perennials like m	aize			
		Paragraph 15.7				
		Seed Dormancy				
104.	Some seeds which do not germi	inate even when external condit	ions are favorable,			
	are understood to be going thro	ough –	(Pg. 252, E)			
	A) Dormancy controlled by exte	ernal environment	-			
	B) Dormancy controlled endoge	enously				
	C) Dormancy controlled by con	ditions within the seed				
	D) More than one option is corr	rect				

105.	Chemical inhibitions of germination a	re –	(P	g. 252 <i>,</i> E)
	A) Abscisic acid	B) Phenolic acid	l	
	C) Para-ascorbic acid	D) All of these		
106.	Germination may not occur due to -		(P	⁹ g. 252, E)
	i) Hard seed coat	ii) Immature en	ıbryo	
	iii) Chemical inhibitors	iv) Harsh enviro	onment	
	How many of above are correct?	,		
	A) 1 B) 2	C) 4	D) 3	
107.	Seed coat dormancy is broken by –	,	́ (P	g. 252, E)
	A) Mechanical abrasions		·	0 /
	B) Microbial actions in gut of animals			
	C) Certain chemicals			
	D) More than one option is correct			
108.	Effects of inhibitory substances on dor	rmanc <mark>y is re</mark> moved b	y application of cert	ain chemicals
	are –	5	, тт (Р	g. 253, E)
	A) Auxin B) Gibberellic ac	cid C) <mark>Cytokin</mark> in	D) ABA	0 , ,
	, , ,	, , , ,	,	
	NEET PREVI	OUS YEARS	QUESTIONS	
1	Furthered loof during at a sub-	o manage to d her the	aulication of	[2017]
1.	Fruit and lear drop at early stages can b	e prevented by the a	ipplication of	[2017]
	(a) Ethylene (b) Auxins	(c) Gibbereillic aci	a (a) Cytokinins	[001]
2.	The Avena curvature is used for bloassa	ay of	(1) $\Gamma(1 - 1)$	[2016]
	(a) ABA (b) GA3	(c) IAA	(d) Ethylene	[001 =]
3.	lypical growth curve in plants is			[2015]
	(a) Linear (b) Stair-steps sha	ped (c) Parabol	ic (d) Sigmoi	d
4.	What causes a green plant exposed to the	he light on only one	side, to bend toward	the source of
	light as it grows?			
	[2015]	1		
	(a) Green plants seek light because they	are phototropic.	a a fa ar	
	(b) Light sumulates plant cens on the shaded si	do stimulating grow h	tor coll alongation th	010
	(d) Green plants and light to perform a	de, stimulating great	ter cell elongation th	ere.
	(d) Green plants need light to perform p	photosynthesis.		[001]
5.	Auxin can be bloassayed by	(h) Determeter		[2015]
	(a) Hydroponics	(b) Potometer		
6	(c) Lettuce hypocotyl elongation (d) A	Avena coleoptile cur	vature	a have the acce
0.	Dr. F. Went noted that if coleoptile tips	were removed and p	blaced on agar for or	ie nour, the agar
	significance is this superiment?	on one side of fresh	ly-cut coleoptile stul	11ps. Of what
	significance is this experiment?			[2014]
	(a) It made possible the isolation and ex	act identification of	auxin.	matin a
	(b) It is the basis for quantitative determ	lination of small am	ounts of growth-pro	moting
	substances.	· · · · ·		
1	(d) It demonstrated apple and the first state of the second state	is auxin.		
	(a) It demonstrated polar movement of	auxins.		· · · · · · · · · · · · · · · · · · ·
7.	A rew normal seedlings of tomato were	kept in a dark room	1. After a few days th	iey were found
1	to nave become white coloured like alb	inos. which of the fo	niowing terms will y	ou use to
1	aescribe them?	/ \ T 1 .	1 (1) D (1)	[2014]
	(a) Mutated (b) Embolised	(c) Etiolate	a (d) Detolia	ited
8.	which one of the following growth regi	ulators is known as $\frac{1}{2}$	stress hormone'?	[2014]
1	(a) Abscissic acid (b) Ethylene	(c) GA3	(d) Indole acetic a	ac1d
1				

21

9.	What is the site of pe	erception of photope	eriod necessary for in	nduction of flow	wering in plants?
10	(1) Lateral buds	(2) Pulvinus	s (3) Shoot ap	pex (4) Le	aves [NEET-2019]
10.	It takes very long tin	ne for pineapple plai	nts to produce flowe	ers. Which com	bination of
	vear to increase viel	artificially if	iduce nowering in p	omeapple plant	INIFET_2019
	(1) Auxin and Ethyle	ene ene	(2) Gibbere	llin and Cytoki	nin
	(3) Gibberellin and A	Abscisic acid	(4) Cytokinin and	Abscisic acid	
11.	Removal of shoot tip	os is a verv useful teo	chnique to boost the	production of	tea-leaves. This is
	because:-	5		[NE	ET-2019 ODISSA]
	(1) Gibberellins prev	ent bolting and are i	inactivated		_
	(2) Auxins prevent le	eaf drop at early stag	ges		
	(3) Effect of auxins is	s removed and grow	th of lateral buds is	enhanced.	
	(4) Gibberellins dela	y senescence of leave	es.		
12.	In order to increase t	the yield of sugarcar	e cro <mark>p, wh</mark> ich of the	e tollowing plar	nt growth regulators
	should			INTE	
	(1) Ethylono	(2) Auving	(3) Cibborolling	(1) Cytokinir	E1-2019 OD155Aj
13	Who coined the tern	(2) Auxilis	(3) Gibberennis		IFFT-2020 COVID]
15.	(1) Skoog and Miller	(2) Darwin	(3) Went	(4) Kurosawa	
14.	Inhibitory substance	s in dormant seeds of	cannot be removed b	v subjecting se	eds to:
	J				EET2020 COVID]
	(1) <mark>Gi</mark> bberellic acid	(2) Nitrate	(3) Ascorbic acid	(4) Chilling o	conditions
15.	M <mark>atc</mark> h the following	concerning the activ	vity/function and th	e p <mark>hytohorm</mark> or	ne invol <mark>ve</mark> d
				[N]	EET-2020 COVID]
	(a) Fruit ripener	(i) Abscisic acid			
	(b) Herbicide	(11) GA_3			
	(c) Bolting agent	(111) 2, 4-D $(iv) Etherhorn$			
	Select the correct of	ntion from following	T '_		
	(1) (a)-(ii), (b)-(iii),	(c)-(iv), (d)-(i)	(2) (a)-(iii), (b)-(iv)	. (c)-(ii), (d)-(i)	
	(3) (a)-(iv), (b)-(iii),	(c)-(ii), (d)-(i)	(4) (a)-(iv), (b)-(ii),	(c)-(i), (d)-(iii)	
16.	Name the plant grov	vth regulator which	upon spraying on s	ugarcane crop,	increase the length
	of stem, thus increas	ing the yield of suga	arcane crop.	0	U
			_		[NEET-2020]
	1) Abscisic acid	2) Cytokinir	n 3) Gibberel	lin	4) Ethylene
17.	The process of grow	th is maximum duri	ng		[NEET-2020]
	1) Dormancy	2) Log phase	3) Lag phase	4) Senescence	e
18.	Which of the followi	ng is not an inhibito	ry substance goverr	ing seed dorm	ancy? [NEET-2020]
	1) Para-ascorbic acid	l 2) Gibberellic acid	3) Abscisic acid	4) Phenolic a	icid
19.	Plants follow differe	nt pathways in resp	onse to environmen	t or phases of li	fe to form different
	kinds of structures.	This ability is called:			[NEET-2021]
•	(1) Flexibility	2) Plasticity	3) Maturity	4) Elasticity	
20.	The plant hormone u	used to destroy weed	ds in a field is		[NEET-2021]
01	I) NAA The eite of momenti	2) 2, 4- D	3) IBA	4) IAA	[NIEET 0001]
21.	1) Stom	2) A villar bud	auring photoperio	alsm is:	[NEE1-2021] 4) Shoot apoy
22			J) Leai		4) 511001 apex
22.	in the exponential gi	rowth equation $N_t =$	n_0e , e represents	11 •.•	[INEE1-2021]
	1) The base of expon	ential logarithms	2) The base of natu 4 The lass of -6	ral logarithms	
	s) The base of geome	etric logarithms	4) The base of num	iber logarithms	i de la constante de

23.	23. The gaseous plant growth regulator is used in plants to:				[NEET-2022]
	 Speed up the Promote root 	surface			
	3) Help overcom	ne apical dominance	alda	Ĩ	
24.	Which one of the	e following plants do	es not show plasticity?		S[NEET-2022]
	1) Cotton	2) Coriander	3) Buttercup	4) Maize	
		liant			
1					

1	2	3	4	5	6	7	8	9	10
С	D	С	D	А	А	А	В	А	В
11	12	13	14	15	16	17	18	19	20
D	А	С	D	В	С	В	В	С	В
21	22	23	24	25	26	27	28	29	30
D	С	С	D	С	А	С	С	А	В
31	32	33	34	35	36	37	38	39	40
D	В	D	А	А	D	А	В	D	С
41	42	43	44	45	46	47	48	49	50
В	В	D	С	D	С	D	В	С	D
51	52	53	54	55	56	57	58	59	60
С	D	D	С	D	В	А	В	D	C
61	62	63	64	65	66	67	68	69	70
А	В	D	В	А	С	А	В	В	D
71	72	73	74	75	76	77	78	79	80
С	С	D	D	В	С	D	D	D	А
81	82	83	84	85	86	87	88	89	90
D	С	А	В	D	С	А	D	А	А
91	92	93	94	95	96	97	98	99	100
А	D	D	В	В	С	А	А	С	D
101	102	103	104	105	106	107	108		
D	D	А	D	D	С	D	В		

NCERT LINE BY LINE QUESTIONS – ANSWERS

NEET PREVIOUS YEARS QUESTIONS-ANSWERS

1 (b)	2 (c)	3 (d)	4 (c)	5 (d)	6 (b)	7 (c)	8 (a)	9 (4)	10 (1)
11 (2)	10 (0)	10 (1)	1 4 (0)	1 = (0)	1(())		10 (0)	10 (0)	AA (A)

- 11 (3)
 12 (3)
 13 (1)
 14 (3)
 15 (3)
 16 (3)
 17 (2)
 18 (2)
 19 (2)
 20 (2)
- **21** (3) **22** (2) 23 (2) 24 (4)

NEET PREVIOUS YEARS QUESTIONS-EXPLANATIONS

- 1. (b) Auxins helps to prevent premature leaf and fruit fall.
- 2. (c) Auxin has been clearly demonstrated in the leaf sheath or coleoptile of oat plant (*Avena sativa*). This plant coleoptile has been used for the test of hormone auxin (IAA) participating in the growth of the plant.
- 3. (d) Sigmoid growth curve maintains equilibrium with carrying capacity. It forms asymptote stage in plants.
- 4. (c) Auxin stimulates cell elongation. It accumulates on the shaded side which results in more elongation of cells towards shaded side of the plant. This causes bending of the plant towards source of light.
- 5. (d) Avena coleoptile curvature is used for the bioassay of auxin.
- 6. (b)
- 7. (c) Etiolation is depigmentation of leaf when plant is placed in dark for more than 36 hrs.
- 8. (a) Abscisic Acid (ABA) is called stress hormone which works in adverse environmental conditions when there is low water content in atmosphere or in drought conditions. ABA causes the stomatal closure of leaves due to which the water loss by the plant is minimized.
- 16. Gibberellin are useful for , increase the length of stem and crop yield in sugarcane
- 17. The process of growth is maximum during log phase
- 18. Gibberellic acid is growth promoting hormone its, promotes seed germination

- 19. Plants show plasticity which means the ability of plant to follow different pathways and produce different structures in response to environment.
- 20. 2, 4-D
- 21. The site of perception of light during photoperiodism is Leaf
- In the exponential growth equation $N_t = N_0$ ert, e represents the base of natural logarithms
 - Nt = Population density after time t
 - N_0 = Population density at time zero
 - r = Intrinsic rate of natural increase called biotic potential.
- 23 Gaseous Hormone Ethylene is used to promote root growth and root hair formation to increase the absorption surface

GAs Speed up the malting process

Cytokinins help overcome apical dominance

2,4 -D kill dicotyledonous weeds in the fields

NCERT - XI Page No – 250

24. Cotton, coriander, Buttercup show plasticity, whereas Maize doesn't show plasticity

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