PLANT GROWTH AND DEVELOPMENT

1. Rapid and dramatic increase in shoot length is called
   a) Triple response growth b) Bolting
   c) scarification d) Night break effect
2. Environment heterophylly is seen in
   a) Cotton b) Coriander c) Larkspur d) Buttercup
3. Genetically dwarf plants can be induced to grow tall by using
   a) Gibberellins b) Phycobillins c) Auxins d) Cytokinins
4. Increased growth per unit time is termed as
   a) Nascent growth rate b) Growth rate c) Biomass d) All of these
5. Which plant hormone promotes seed dormancy, bud dormancy and causes stomatal closure?
   a) IAA b) Abscisic acid c) GA d) cytokinin
6. I. Lag phase → Log phase → Stationary phase
   II. Geometric and Arithmetic phase of growth
   III. Growth shown by all living organism *in vivo*
   IV. $L_t = L_0 + rt$
   Match the above characters with sigmoid curve, arithmetic growth, embryo development and choose the correct option accordingly

	Sigmoid curve	Arithmetic growth	Embryo development
a)	II	I	III, IV
b)	I, III	IV	II
c)	I	II, III	IV
d)	III, IV	I	II

7. A plant have 13 hours critical day light under which condition it will flower

	Duration of light period	Duration of dark period
a)	13	11
b)	11	13
c)	12	12
d)	10	14

8. The shedding of leaves, flowers or fruits due to change in the hormonal balance in plants, is referred as
   a) Senescence b) Ascission c) Photoperiodism d) vernalization
9. The phytohormone that induces cell elongation is known to be produced by a fungus. The asexual stage of this fungus is called
   a) *Rhizopus sexualis* b) *Fusarium moniliformae*
   c) *Gibberella fujikuroi* d) *Fusarium oxysporum*
10. Cytokinins are mostly
    a) Glucosides b) Amino purines c) Acidic d) phenolic
11. Geotropic response is perceived by
    a) Mature roots b) Elongation roots c) Root cap d) Root hairs
12. The natural plant hormone isolated from corn kernels and coconut milk is
    a) Florigen b) GA_3 c) Free auxins d) Zeatin
13. In the expression, $W_1 = W_0\, e^{rt}$ (geometrical growth), W_1, W_0, r, t represents

	W_0	W_1	r	t
a)	Initial size	Final size	Growth rate	Time of growth
b)	Final size	Initial size	Growth rate	Time of growth

c) Final size Initial size Growth rate Time of dividing
d) Initial size Final size Growth rate Time of dividing

14. Natural cytokinins are synthesized in tissue that are
a) Senescent b) Dividing rapidly c) Storing food material d) Differentiating

15. Which of the following processes is concerned with Cholodny-Went theory?
a) Photomorphogenesis b) Photoperiodism c) Phototropism d) photorespiration

16. Growth at cellular level is the increase in the amount of
a) Cell wall b) Cell membrane c) Protoplasm d) All of the above

17. Which one of the following is a natural growth inhibitor?
a) NAA b) ABA c) IAA d) GA

18. I. Antagonist to GA
II. Promoted bud dormancy
III. Promoted stomatal closure
IV. Promoted abscission layer
Identify the hormone/s which promote/s all these events in plants and choose the correct option
a) Cytokinin b) Auxin c) Abscisic acid d) C_2H_4

19. Thigmotropism is best seen in
a) Tendrils b) Leaf apex c) Root apex d) Stem apex

20. In coleoptile tissue, auxin is
a) Not transported because it is used where it is made
b) Transported by diffusion
c) Transported from the base to tip by osmosis
d) Produced by growing apices of stem, which migrate to the region of its action

21. Which of the following induces flowering in long day plants?
a) Gibberellins b) Cytokinin c) Auxins d) Ethylene

22. I. Lag phase
II. Stationary phase
III. Exponential phase
Arrange the above steps of geometrical growth (from beginning to last) in a correct sequence of their occurrence and choose the correct option accordingly
a) I → II → III b) I → III → II c) III → II → I d) III → I → II

23. Fruits can be left on the tree longer, so as to increase the market period. This is due to the function of
a) Delay senescence by auxin b) Delay senescence by $CH_2 - CH_2$
c) Delay senescence by cytokinin d) Delay senescence by GA

24. Name the process when dedifferentiated cells again loss the ability to divide and get mature?
a) Cell-enlargement b) Redifferentiation c) Dedifferentiation d) Differentiation

25. For cryopreservation, plant materials are frozen at
a) $-196°C$ b) $-150°C$ c) $-80°C$ d) $-40°C$

26. Maximum elongation takes place in
a) Conducting tissue b) Fibre
c) Both (a) and (b) d) Cell wall and membrane

27. One hormone helps in ripening of fruits, while the other stimulates closure of stomata. These are respectively
a) Abscisic acid and auxin b) Ethylene and abscisic acid
c) Auxin and ethylene d) Ethylene and gibberellic acid

28. Micropropagation is done by
a) Auxins b) GA c) Cytokinin d) Both (a) and (b)

29. Auxanometer is used to mesure
a) The growth in length of a plant organ b) The growth in breadth of a plant organ
c) Population of the pests attacking a plant d) Both (a)and(b)

30. The cut flowers and vegetables can be kept fresh for a long period by this plant hormone.
    a) Gibberellins b) Cytokinins
    c) Auxins d) Ethylene
31. Photoperiodism was first characterized in
    a) Tobacco b) Potato c) Tomato d) Cotton
32. Hydroponics is a system of growing plants in
    a) Soil less culture or solution culture b) Acidic soils
    c) Soil less culture with alkaline pH d) Soil less culture with acidic pH
33. If a plant need 10 hours darkness than identify the condition under which it will flower
    I. 14 hours day period
    II. 10 hours dark period
    III. $9\frac{1}{2}$ hours dark period
    IV. 9 hours dark period
    Choose the correct option
    a) I and III b) II and III c) I and IV d) I and II
34. What helps in flowering?
    a) Cytochrome b) ABA c) Phytochrome d) Ethylene
35. Which of them is not an extrinsic factor?
    a) Light, O_2 b) Temperature, CO_2
    c) Nutrient, water d) Growth regulator and genetic factor
36. The stress hormone that helps plant to respond drought is
    a) Auxins b) Abscisic acid c) Cytokinin d) Ethylene
37. Auxins promote
    a) Cell growth and enlargement b) Cambial activity
    c) Apical dominance d) All of the above
38. The flowers of *Oxalis* open during the day and close at night, such type of movement is
    a) Photonasty b) Nyctinasty c) Phototactic d) Seismonastic
39. Developing embryo (*in vitro*) shows
    a) Geometric growth b) Arithmetic growth
    c) Geometric and arithmetic growth d) None of the above
40. Respiratory climacteric is related with
    a) ABA b) C_2H_4 c) Auxin d) GA
41. I. Increased vacuolation
    II. Cell enlargement
    III. New cell wall deposition
    Which of the above are the characteristics of phase of elongation?
    Choose the correct option accordingly
    a) I and II b) II and III c) I and III d) I, II and III
42. Coiling of garden pea tendrils around any support is an example of
    a) Thigmotaxis b) Thigmonasty c) Thigmotropism d) Thermotaxis
43. Internodal elongation just prior to flowering in beet, cabbage and in many plants with rosette habit is called
    a) Pruning b) Blotting c) Grafting d) Cutting
44. Member of auxin, which is widely used to kill the dicotyledonous weed is
    a) IAA b) IBA c) NAA d) 2-4-D
45. Identify to which plant hormone, the given function belongs
    I. Initiates flowering in pineapples
    II. Induces flowering in mango
    III. Root growth and root hair promotion

I II III

a) C_2H_4 C_2H_4 C_2H_4 b) C_2H_4 IAA GA

c) C_2H_4 GA IAA d) GA IAA IBA

46. Growth period of plant is generally divided into

a) Four phases b) Three phases c) Two phases d) Five phases

47. Difference between kinetin and zeatin is

a) Kinetin is active zeatin, is non-active b) Zeatin is active kinetin, is non-active

c) Zeatin is synthetic, kinetin is natural d) Zeatin is natural, kinetin is synthetic

48. Auxanometer is used to detect

a) Respiration b) Transpiration c) Plant movement d) Growth

49. Auxin was isolated by

a) Charles Darwin b) Francis Darwin c) FW Went d) de Vries

50. The most common auxin is

a) GA b) ABA c) Kinetin d) IAA

51. Study the following statements

I. O_2 helps in releasing metabolic energy, which is essential for growth

II. Nutrients are required by plants for the synthesis of protoplasm

III. Change in temperature could be the detrimental for the survival of an organism

IV. Light and gravity don't affect the stages of growth

Choose the correct option

a) I, II, III and IV b) I, II and III c) I, III and IV d) I, II and IV

52. Which plant hormone is found in gaseous form?

a) Auxin b) Cytokinin c) Ethylene d) ABA

53. Measurement and comparison of total growth in geometrical growth of a plant per unit time is called

a) Absolute growth rate b) Qualitative growth rate

c) Relative growth rate d) Exponential growth rate

54. Auxin in plant means for

a) Cell elongation b) Fruit ripening

c) Cell division d) Inhibition of root growth

55. Grand place of growth is an another name of

a) Lag phase b) Stationary phase

c) Diminishing growth phase d) Exponential growth phase

56. Which of the following movements in plants is due to the increased concentration of auxin?

a) Movement of shoot towards the source of light b) Nyctinasty

c) Movement of sunflower towards sun d) All of the above

57. Primary growth of plants is contributed by

a) Root apical meristem b) Shoot apical meristem

c) Intercalary meristem d) All of these

58. Growth of the plant is open because of

a) Differentiation b) Dedifferentiation c) Redifferentiation d) All of the above

59. Senescence as an active developmental cellular process in the growth and functioning of a flowering plant, is indicated in

a) Vessels and tracheid differentiation b) Leaf ascission

c) Annual plants d) Floral parts

60. Phytohormone commonly called stress hormone is

a) Auxin b) Abscisic acid c) Gibberellins d) cytokinins

61. Which one of the following is not a effect of gibberellin?

a) Increase grapes stalk b) Delay senescence of fruit

c) Induce dormancy d) Increase sugarcane stem

62. Study the following question

I. Who was the first to confirm the release of volatile?
Substance from ripened organs of plants?
II. Who discovered kinetin from herring sperm?
III. Who discovered GA?
Which of the following option correctly answer the given questions?

a) I-Cousin, II-Miller and Skoog, III-Kurosawa
b) I-Cousin, II-Kurosawa, III-Darwin
c) I-Cousin, II-Darwin, III-Kurosawa
d) I-Kurosawa, II-Miller and Skoog, III-Cousins

63. Which of the following is essential for plant growth?

a) H_2O
b) O_2
c) Nutrients
d) All of these

64. Identify the pair of physiological effects of two phytohormones, which are synthesized from different amino acids?

I. Formation of perennating buds in *Lemna*.
II. Simultaneous flowering in pineapple.
III. Bolting in cabbage.
IV. Apical dominance in *Polyalthia*.

a) II and IV
b) I and IV
c) II and III
d) I and II

65. Choose the correct statement

I. Cytokinin – Delay of leaf senescene
II. Auxin – Apical dominance
III. Ethylene – Seed germination
IV. Gibberellins – Immature falling of leaves

a) I and II
b) I and IV
c) II and III
d) II and IV

66. In geometrical growth, log phase is represented by

a) Rapid consumption of nutrient
b) Rapid increment of cell number
c) Highest growth rate
d) All of the above

67. The pigment involved in photomorphogenetic movement is

a) Cytochrome
b) Phytochrome
c) Chromatin
d) vernalin

68. Growth in plants is measured by the increase in

I. fresh weight
II. dry weight
III. length, area and volume
IV. cell number

Choose the correct option

a) All except I and II
b) All except III
c) All except IV
d) I, II, III and IV

69. To make stored food available for germination, with which hormone seed should be treated?

a) Gibberellins
b) Auxin
c) Abscisic acid
d) Cytokinin

70. Which of the following induces flowering in long day plants?

a) Gibberellins
b) Cytokinin
c) Auxins
d) Ethylene

71. The movement of hairs in *Drosera* is

a) Thermonastic
b) Thigmonastic
c) Seismonastic
d) photonastic

72. Most widely used compound as a source of ethylene is

a) Nepthol
b) Acetol
c) Ethephon
d) Ethepcon

73. The site of perception of light is

a) Root
b) Shoot
c) Leaves
d) Meristem

74. On the basis of correlation, find the correct option from columns.

Column I	Column II	Column III
I. Foolish plant	(p) Volatile hormone	(i) Induces dormancy

II. Induces senescence	(q) GA	(ii)Ripens fruits
	(r) Zeatin	(iii) Usually sterile plant

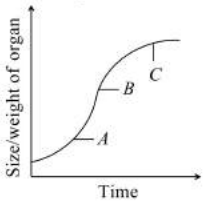
a) I-p-ii, II-r-i b) I-r-iii, II-q-iii c) I-q-iii, II-p-ii d) I-q-i, II-r-ii

75. Natural cytokinins are synthesised in which regions of plants?
a) Root apices b) Young fruit
c) Developing shoot buds d) All of the above
76. The rosette habit of cabbage can be changed by application of
a) IAA b) GA c) ABA d) Ethaphon
77. Which is used as weedicide?
a) 2,4-D b) IBA c) IAA d) ABA
78. The living differentiated cells, regain capacity of division under certain condition which called
a) Redifferentiation b) Dedifferentiation c) Differentiation d) Reverse division
79. Photoperiodism was first studied by
a) Garner and Allard b) Darwin c) FW Went d) Cousins
80. A phytohormone, which increases the production of starch hydrolyzing enzymes during the germination of maize seeds, is employed for the following
a) Increasing the vase-life period of flowers b) Induction of seedless fruits in grapes
c) Acceleration of ripening of banana fruits d) Eradication of dicot weeds
81. Treatment of seed at low temperature under moist conditions to break its dormancy, is called
a) Scarification b) Vernalization c) Chelation d) Stratification
82. The Plant Growth Regulator (PGR), ethylene comes under the category of
a) Simple plant hormone b) Complex plant hormone
c) Plant growth inhibitor hormone d) Plant growth promoter hormone
83. Plants requiring low light intensity for optimum photosynthesis are called
a) Heliophytes b) Pteridophytes c) Sciophytes d) Bryophytes
84. *Nicotiana sylvestris* flowers only during long days while *N. tobacum* flowers only during short days. If raised in the laboratory under different photoperiods, they can be induced to flower at the same time and can be cross fertilized to produce self-fertile offspring.
What is the best reason for considering *N. sylvestris* and *N.tobacum* to be separate species?
a) They are physiologically distinct b) They are morphologically distinct
c) They cannot interbreed in nature d) They are reproductively distinct
85. Large amount of ethylene is synthesised by
a) Developing roots and fruits b) Developing shoots and flowers
c) Senescence tissues and ripening fruits d) Young tissue and unripened fruits
86. In geometrical growth, lag phase is represented by
a) Initial rapid growth b) Latter rapid growth c) Initial slow growth d) Latter slow growth
87. Natural and synthetic-auxin (IAA, NAA, IBA, 2-4-D) have been used extensively in
a) Agriculture b) Horticulture c) Both (a) and (b) d) Sericulture
88. Water is required in plant growth for
a) Enzymatic reactions b) Cell enlargement c) Extension growth d) All of these
89. IAA is derived from or which of the following is involved in the synthesis of a plant IAA and vasoconstrides cerotonin?
a) Tryptophan b) Tyrosine c) Phenylalanine d) None of these
90. During differentiation, the cells undergo few to major structural changes in their
a) Cell wall b) Protoplasm c) Both (a) and (b) d) Cytoplasm
91. Study the following statement
I. Cytokinins are formed primarily in roots

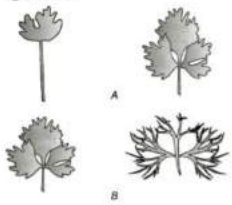
II. Auxin and cytokinin are antagonistic in apical dominance
III. Kinetin (a modified DNA purine) was discovered from herring sperm
IV. Zeatin is auxin
V. Zeatin was firstly extracted from herring
Choose the incorrect one

a) I and II b) III c) II and V d) IV and V

92. SDP also called
a) Short night plant b) Long night plant
c) Intermediate night plant d) None of these
93. Arithmetic growth is linear because
a) One daughter cell remains meristematic and other differentiates and mature
b) Both daughter cell remains meristematic
c) Both daughter cells gets matured
d) All of the above
94. In S-shaped curve, the growth is highest in which phase?
a) Lag phase b) Steady phase c) Log phase d) All of these
95. Identify A, B, C in the given graph and choose the correct option accordingly



a) A-Log phase, B-Lag phase, C-Stationary phase
b) A-Lag phase, B-Log phase, C-Stationary phase
c) A-Lag phase, B-Stationary phase, B-Log phase
d) B-Log phase, B-Stationary phase, A-Lag phase
96. Pick out the correct statements.
V. Cytokinins especially help in delaying senescence.
VI. Auxins are involved in regulating apical dominance.
VII. Ethylene is especially useful in enhancing seed germination.
VIII. Gibberellins are responsible for immature falling of leaves.
a) I and III b) I and IV c) II and III d) I and II
97. Haptonastic movement is found in
a) *Drosera* b) *Oxalis* c) *Mimosa* d) *Cucurbita*
98. Diagram A and B indicate the shape of leaves in larkspur and buttercup respectively, choose the correct option



a) The juvenile and adult leaf of larkspur differ in size due to genetic and plant growth regulator factors
b) Both leaf of buttercup differ in size due to genetic and intercellular factors
c) Both larkspur and buttercup leaf size variation is due to habitat plasticity
d) None of the above
99. Canary grass experiment for phototropism was firstly conducted by
a) Went b) Darwin c) Cousins d) Kurosawa
100. Which one is an example of redifferentiation?
a) Cork cambium b) Secondary cortex

c) Meristems
d) Interfasicular cambium

101. Which hormone is called the dormancy hormone?
a) IAA
b) NAA
c) ABA
d) GA

102. Plant growth regulators are also described as
a) Plant growth substance
b) Plant hormones
c) Phytohormones
d) All of these

103. Name of a gaseous plant hormone is
a) IAA
b) Gibberellins
c) Ethylene
d) Abscisic acid

104. Exponential growth can't be sustained for much time due to
I. limited space and nutrient
II. accumulation of toxic agent
III. unlimited space and nutrient
IV. accumulation of nutrient agent
Choose the correct combination of options
a) I and III
b) III and IV
c) I and II
d) IV and II

105. Programmed cell death is scientifically termed as
a) Autotomy
b) Cell lysis
c) Apoptosis
d) None of these

106. The following statements are given about plant growth hormones:
IX. Kinetin is a degradative substance from DNA molecule.
X. ABA is present, in all the plants.
XI. Low ratio of cytokinins to auxins favours root formation only.
XII. ABA is synthesized catabolically through mevalonate pathway.
The correct combination is
a) I and II
b) II and III
c) I and III
d) III and IV

107. Plants follow ...A... pathways in response to environment or phases of life to form different kind of structures. This ability is called ...B...
Complete the given statement with the correct combination of options
a) A-same; B-elasticity
b) A-elasticity; B-same
c) A-different; B-plastically
d) A-same; B-plastically

108. Opening of floral buds into flowers, is a type of
a) Autonomic movement of locomotion
b) Autonomic movement of variation
c) Paratonic movement of growth
d) Autonomic movement of growth

109. The bioassay of auxin is
a) *Avena* curvature test
b) Callus formation
c) Culture of fungus
d) Seed dormancy

110. The cells derived from cambium, root apical and shoot apical meristem differentiate and mature to perform specific functions. This act is called
a) Differentiation
b) Dedifferentiation
c) Redifferentiation
d) All of these

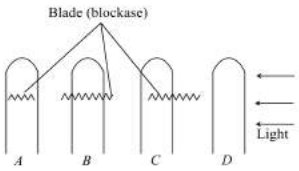
111. Induction of flowering by low temperature treatment is
a) Vernalization
b) Cryobiology
c) Photoperiodism
d) Pruning

112. Response of plants due to reversible turgor change in pulvinus is
a) Nyctinastic
b) Seismonastic
c) Heptonastic
d) Photonastic

113. The type of growth where new cells are always being added to plant body by the activity of meristem is called
a) Closed form of growth
b) Diffused form of growth
c) Open form of growth
d) Discontinuous form of growth

114. Which of the following is a day neutral plant?
a) *Helianthus annuus*
b) *Euphorbia pulcherrima*
c) *Avena sativa*
d) *Beta vulgaris*

115. Four coleoptile for experiment



Which coleoptile bend toward the light? Choose the correct option

a) *A* and *B* b) *C* and *D* c) *A* and *D* d) *C* and *B*

116. Which one of the following acids is a derivative of carotenoids?
a) Indole-butyric acid b) Indole-3 acetic acid c) Gibberellic acid d) Abscisic acid

117. Growth plotted against time gives a
a) Parabolic curve b) Sigmoid curve c) Upright line d) Horizontal line

118. Cell elongation in intermodal regions of the green plants takes place due to
a) Indole acetic acid b) Cytokinins c) Gibberellins d) Ethylene

119. An enzyme that can stimulate germination of barley seeds is
a) α-amylase b) Lipase c) Protease d) Invertase

120. The final structure at maturity of a cell/tissue is determined by
a) Type of cells b) Type of cell division
c) Location of cell within tissue d) Nutrient in cells

121. Charles Darwin and Francis Darwin are related with
a) Vernalisation b) Effect of plant hormones (auxin)
c) Photoperiodism d) Phototropism

122. Vernalisation can be reversed by
a) Application of high temperature b) Application of auxin
c) Application of more less temperature d) Application of gibberellin

123. Constantly dividing cells, both at the root apex and shoot apex represents
a) Elongation phase of the growth b) Meristematic phase of the growth
c) Maturation phase of the growth d) None of the above

124. In most of the higher plants, the growing ...A... bud inhibits the growth of ...B... bud, a phenomenon called apical dominance. Removal of the shoot tips usually results in growth of ...C... buds.
Complete the given statement with the correct combination of options given in the codes below
a) A-lateral, B-axillary, C-axillary b) A-apical, B-lateral, C-apical
c) A-apical, B-lateral, C-lateral d) A-lateral, B-apical, C-lateral

125. How many gibberellins are reported from widely different organism such as plant and fungi?
a) More than 50 b) More than 75 c) More than 100 d) More than 25

126. Abscisic acid is primarily synthesized in
a) Lysosomes b) Golgi complex c) Chloroplast d) ribosomes

127. Cytokinins are formed in
a) Roots b) Leaves c) Fruits d) Stems

128. Which hormone (PGR) encounters the apical dominance induced by auxin?
a) IAA b) Cytokinin c) C_2H_4 d) NAA

129. The terms auxin is applied to
I. IAA II. IBA
III. NAA IV. 2-4-D
Select the correct option
a) I, II and III b) II, III and IV c) I, III and IV d) I, II, III and IV

130. Which of the following is an anti-gibberellin?
a) Auxin b) ABA c) Ethylene d) Cytokinin

131. Which hormone is responsible for apical growth?
a) IAA b) ABA c) GA d) All of these

132. Increase in the girth of plant (organ) takes place by

a) Vascular cambium
b) Cork cambium
c) Both (a) and (b)
d) Root and shoot apical meristem

133. Effect of photoperiod on growth and development of plants especially on flowering is called
a) Vernalisation
b) Photoperiodism
c) Both (a) and (b)
d) Phototaxis

134. Vernalisation was found by
a) FW Went
b) Darwin
c) Lysenko
d) Cousins

135. The phytohormone that helps in germination of seed, is
a) ABA
b) Auxin
c) Gibberellin
d) cytokinin

136. Gibberellic acid induces flowering
a) In some gymnospermic plants only
b) In long day plants under short day conditions
c) In short day plants under long day conditions
d) In day –neutral plants under dark conditions

137. Vernalization is done at
a) Lower temperature
b) Low light intensity
c) Higher temperature
d) High light intensity

138. Development includes (plants)
I. Differentiation
II. Redifferentiation
III. Dedifferentiation
Select the right combination from the given option
a) I and II
b) II and III
c) III and I
d) I, II and III

139. 'Bakane' disease is related to (hormone and plant)

Hormone	Plant		
a) Auxin	Wheat	b) Cytokinin	Corn
c) Gibberellin	Rice	d) Ethylene	Tomato

140. One set of a plant was grown at 12 hours day 12 hours night period cycles and it flowered, while in the other set night phase was interrupted by flash of light and it did not produce flower. Under which one of the following categories will you place this plant?
a) Long day
b) Darkness neutral
c) Day neutral
d) Short day

141. Which of the following hormones does not naturally occur in plants?
a) 2,4-D
b) IAA
c) GA
d) ABA

142. The deteriorative processes in plants that naturally terminate their functional life, are collectively called
a) Wilting
b) Abscission
c) Plasmolysis
d) Senescence

143. Abscission and dormancy are caused by
a) ABA
b) $CH_2 - CH_2$
c) IAA
d) IBA

144. Process of vernalization can be induced by
a) Cytokinin
b) Auxin
c) Phototropin
d) GA

145. Growth of an organism is characterised by
a) An irreversible permanent increase in size of an organ
b) An irreversible permanent increase in size of a cell
c) Both (a) and (b)
d) Reversible permanent changes

146. The hormone involved in metabolism of food material in cereal grains during germination is
a) Auxin
b) Cytokinin
c) Gibberellin
d) None of these

147. A hormone delaying senescence is
a) Auxin
b) Cytokinin
c) Ethylene
d) gibberellin

148. Cytokinin helps in delaying the leaf falling/senescences mainly by
a) Promoting nutrient mobilisation
b) Inhibiting cell division
c) Promoting cell elongation
d) Promoting cell differentiation

149. ABA was discovered during
a) Mid 1960s
b) Mid 1959s
c) Mid 1096s
d) Mid 1996s

150. Parthenocarpy in tomatoes is induced by

a) Cytokinin b) Auxin c) Gibberellin d) $CH_2 - CH_2$

151. The role of PGR is of one kind of ...A... control. Along with genomic control and ...B... factors, they play an important role in plant growth. Many of ...C... factor, such as temperature, light, etc., control growth and development *via* PGR.
Choose the correct option A, B and C to complete the given statement
a) A-intrinsic, B- intrinsic, C-extrinsic b) A-intrinsic, B-extrinsic, C-extrinsic
c) A-extrinsic, B-extrinsic, C-intrinsic d) A-intrinsic, B-extrinsic, C-intrinsic

152. Growth promoting hormone is
a) IAA b) Gibberellin c) 2,4-D d) ABA

153. The study of different aspects or appearance of plants in different seasons of the year is called
a) Ecology b) Ecosystem c) Phenology d) Demography

154. In the given figure find out the absolute and relative growth rate and choose the correct option

Absolute Growth Rate Relative Growth Rate
a) 1 cm^2 1 cm^2 b) 100 cm^2 5 cm^2
c) 5 cm^2 100 cm^2 d) 0.5 cm^2 100 cm^2

155. Flowering of plants by exposure to low temperature is called
a) Vernalisation b) Cryobiology c) Photoperiodism d) Micrografting

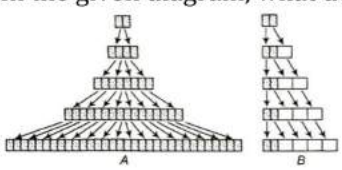
156. Which of the following movement in plants is not related to change in auxin level?
a) Nyctinastic leaf movement
b) Movement of root towards soil
c) Movement of sunflower, tracking the direction of sun
d) Movement of shoot towards light

157. I. Leaf abscission is ...A... by auxin in younger leaves and fruits
II. Apical dominance is ...B... by auxin
Complete the given statement by choosing appropriate options for the given blanks
a) A-inhibited; B-promoted b) A-promoted; B-inhibited
c) A-inhibited; B-inhibited d) A-promoted; B-promoted

158. Study the following statements of plants growth
I. One single maize root apical meristem can give rise to more than 17500 new cells per hour
II. A cell in watermelon can increase its size up to 3,50,000 times
III. Growth of pollen tube is measured in the terms of its length
IV. Growth in dorsiventral leaf is measured in terms of an increase in its surface area
Choose the correct option
a) I and II b) II and III c) III and IV d) I, II, III and IV

159. The phytohormone, which induces triple response growth is
a) IAA b) ABA c) GA_3 d) C_2H_4

160. In the given diagram, what does *A* and *B* indicates?



Choose the correct option
a) A-Mitosis; B-Meiosis
b) A-Arithmetic growth; B-Geometric growth

c) A-Geometric growth; B-Arithmetic growth
d) A-Multiplicative phase; B-Replicative growth

161. In expression, $L_t = L_0 + rt$, of arithmetic growth rate, L_t, L_0 and r represents

	L_t	L_0	r
a)	Length at time zero	Length at time $'t'$	Elongation per unit time
b)	Length at time $'t'$	Length at time zero	Elongation per unit time
c)	Length at time $'t'$	Length at time zero	Growth rate

d) Both (b) and (c)

162. Ethephon
a) Hasten fruit ripening in tomatoes
b) Accelerate abscission
c) Promote female flower cucumbers
d) All of the above

163. The chemical nature of gibberellins is
a) Acidic
b) Alkaline
c) Proteinaceous
d) Amines

164. Which hormone was first isolated from human urine?
a) Auxin
b) ABA
c) Ethylene
d) Gibberellic acid

165. Which phytohormone has viral inhibitory property?
a) IAA
b) GA_3
c) ABA
d) 2,4-D

166. Which of the following is the effect of a plant hormone, which is synthesized more in the absence of light?
a) Inhibits the development of seedless fruits
b) Responsible for closing of stomata
c) Induces the dormancy of seeds
d) Length of internodes increases

167. Shock movement in 'touch me not' plant is
a) Seismonasty
b) Photonasty
c) Chemonasty
d) Thermonasty

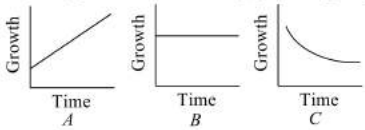
168. Vernalisation helps in
a) Shortening of reproductive phase
b) Shortening of juvenile phase
c) Shortening of vegetative phase
d) Both (a) and (c)

169. Efficiency index in the exponential phase of geometrical growth is the ability of plants to produce
a) Cell wall
b) New enzyme
c) New plant material
d) Young ones through mitosis

170. Day neutral plant relates to
a) Loss of activity during day time
b) Overactive during day time
c) Flowering in all possible photoperiods
d) No flowering in any photoperiod

171. Opening of flower is an example of
a) Spontaneous movement
b) Hyponastic movement
c) Epinastic movement
d) Cleistogamous movement

172. Among the following given graphs, which show the linear growth curve?



a) A and B
b) B and C
c) A and C
d) Only A

173. Which of the following movements is induced by injury?
a) Aerotropism
b) Geotropism
c) Tromonasty
d) Traumatropism

174. Substance related with phototropism in shoot, is
a) Ethanol
b) Cytokinins
c) Auxin
d) Gibberellins

175. I. Plasmatic growth
II. Differentiation
III. Maturation

IV. Senescence

Identify the correct sequence of the following events occurring in plants and choose the correct option accordingly

a) I → II → III → IV b) I → II → IV → III c) IV → III → II → I d) IV → I → II → III

176. Which pigment involves in photoperiodic change in plants?

a) Phytochrome b) Cytochrome c) Chlorophyll d) Anthocyanin

177. Initially, the ABA was identified as

a) Inhibitor B b) Abscission II c) Dormin d) All of these

178. Florigen is produced in the region of

a) Leaves b) Fruit c) Root d) Trunk

179. I. Cell elongation

II. Cell division

III. Cell differentiation

Among the above mentioned, what is/are the function(s) of auxin?

a) I and II b) III and I c) II and III d) I, II and III

180. Closure of lid of picher, in pitcher plant, is

a) Tropic movement b) Paratonic movement

c) Turgor movement d) Autonomous movement

181. In some plants, sleep movement of leaves is due to

a) Excess of photosynthesis b) Osmotic changes at base of leaf

c) Excess of respiration d) Excess of transpiration

182. Hormone inducing fruit ripening is

a) Ethylene b) Cytokinin c) Gibberellic acid d) Abscisic acid

183. The discovery of gibberellins is related with one of the following

a) Blast disease of rice b) Rust disease of wheat

c) Bakane disease of rice d) Early blight disease of potato

184. Phase of maturation is characterised by

I. Cells attaining their maximal size

II. Proper wall thickening and protoplasmic modification

III. Rapid cell division

Select the correct option

a) I and II b) II and III c) I and III d) I, II and III

185. The following statements are given about plant growth hormones:

I.Cytokinins suppress the synthesis of chlorophyll.

II.Auxins control apical dominance.

III.Gibberellins promote shoot elongation.

IV.Abscisic acid enabling seeds to withstand desiccation.

Which of the above statements are correct?

a) I and II b) II and III c) I and III d) II, III and IV

186. Growing season is the season of plants in which there is

a) Maximum vegetative growth b) Minimum vegetative growth

c) Moderate vegetative growth d) Maximum reproduction occurs

187. I. On plotting the length of an organ against time, a linear curve is obtained

II. $L_t = L_0 + rt$

III. Following mitotic division, one daughter cell continues to divide while the other differentiate and mature

Above are the properties of

a) Arithmetic growth rate b) Geometric growth rate

c) Both (a) and (b) d) Elongation growth rate

188. The problem of necrosis and gradual senescence, while performing tissue culture can be overcome by

a) Spraying auxins b) Spraying cytokinins c) Suspension culture d) subculture

189. The ability of plants to follow different pathway to form different structures in response to environment is called
a) Plasticity b) Elasticity c) Growth d) Development

190. Opening and closing of flowers represent a kind of
a) Nastic movement b) Tropic movement
c) Mutation d) Autonomic movement

191. During differentiation of tracheary elements,
a) The cells lose its protoplasm
b) Cells develop very strong elastic lignocellulosic secondary cell walls
c) Both (a) and (b)
d) The cell increases its protoplasm

192. Leaf abscission, fruit fall, and bud dormancy occurs by which phytohormone?
a) Auxin b) Cytokinin c) Gibberellins d) Abscisic acid

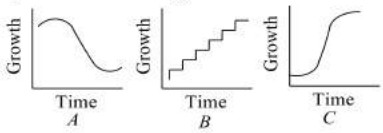
193. The response of different organisms to environment rhythms of light and darkness, is called
a) Phototropism b) Phototaxis c) Photoperiodism d) Vernalization

194. An example of short day plant is
a) Wheat b) Maize c) *Chrysanthemum* d) radish

195. The plant hormone produced by *Rhizobium* for nodulation is
a) IBA b) NAA c) 2,4-D d) IAA

196. Growth of the plant is
a) Determinate b) Indeterminate c) Both (a) and (b) d) None of the above

197. Plant growth Regulators (PGR) or plant hormones are generally
a) Produced from many parts of plant b) Produced from shoot apices and stem apices
c) Produce single effect d) Are basic in nature

198. 

Which of the following graph shows the sigmoid growth curve?
a) A and B b) C c) A d) B

199. Which of the following functions is/are not the function/s of cytokinin?
I. New leaves formation
II. Chloroplast formation in leaves
III. Lateral shoot formation
IV. Adventitious shoot formation
V. Rooting on stem cuttings
Choose the correct option
a) Only I b) II and III c) Only IV d) Only V

200. Stimulus of vernalisation is perceived by
a) Shoot tips b) Mature tissues c) Embryo tips d) Both (a) and (c)

201. Differentiation in plants is open because
a) Cells/tissue arising out of meristem regain the capacity of division under certain conditions
b) Cells/tissue arising out of different meristem have different structures at maturity
c) Cells/tissue arising out of different meristem have same structures at maturity
d) All of the above

202. Growth of plant is
a) Arithmetic b) Geometric c) Both (a) and (b) d) Additive

203. Mobilization of stored food in germinating seed is triggered by
a) ABA b) GA c) Cytokinin d) Ethylene

204. The cells in the root and shoot apex
a) Are rich is protoplasm
b) Have conspicuous nuclei
c) Have their cell wall which are primary in nature, thin and cellulosic with abundant plasmodesmatal connections
d) All of the above

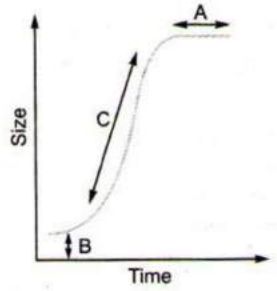
205. Identify two physiological processes induced by two different phytohormones having a common precursor, which is formed due to the catalytic activity of pyruvic dehydrogenase complex.
I. more female folwers in cucumber. II. a-amylase production in barley grain. III. Acceleration of fruit ripening in tomato.
IV. Delay in sprouting of potato tubers. the correct combination is
a) I and II b) I and III c) II and IV d) III and IV

206. Auxin originates at the tip of the stem and controls growth elsewhere. The movement of auxin is largely
a) Basipetal b) Acropetal c) Both (a) and (b) d) centripetal

207. S-shaped or sigmoid growth curve have
I. lag phase
II. log phase
III. stationary phase
IV. diminishing growth phase
Select the correct option
a) All except IV b) All except III c) All except II d) I, II, III and IV

208. The cells proximal (just next away from the tip) to the meristematic zone represents the phase of
a) Division b) Maturation c) Elongation d) Meristematic division

209. Given below is a graph drawn on the parameters of growth versus time. A, B and C respectively represent



a) Exponential phase, log phase and steady state phase
b) Steady state phase, lag phase and log phase
c) Slow growing phase, lag phase and steady state phase
d) Lag phase, steady state phase and log phase

210. When transition from juvenile to adult is gradual than this type of development is called
a) Homoblastic development b) Heteroblastic development
c) Homoheteroblastic development d) Hetero and homoblastic development

211. Specific areas in the higher plants which takes part in the formation of new cells are called
a) Permanent tissue b) Quicent centre c) Meristems d) Subapical part

212. which of the PGR_6 induces parthenocarpy in tomatoes?
a) Auxin b) Gibberellin c) Cytokinin d) Ethylene

213. Temperature required for vernalisation is
a) 5°C to 10°C b) 5°C to 15°C c) 0°C to 5°C d) 3°C to 17°C

214. Which of the following pairs, is not correctly matched?
a) Abscisic acid - Stomatal closure b) Gibberellic acid – Leaf fall
c) Cytokinin – Cell division d) IAA – Cell wall elongation

215. 'Bakane' (foolish seedling) disease of rice seedlings, was caused by
a) Fungi b) Protozoa c) Bacteria d) Virus

216. 6-furfuryl amino purine, 2-4 dichlorophenoxy acetic acid and indole-3 acetic acid are examples respectively for
a) Synthetic auxin kinetin and natural auxin
b) Gibberellins, natural auxin and kinetin
c) Natural auxin, kinetin and synthetic auxin
d) Kinetin, synthetic auxin and natural auxin

217. Which of the following is not an influence of auxin?
a) Apical dominance
b) Parthenocarpy
c) Tropic movements
d) Bolting

218. Importance of day length in flowering of plants was first shown in
a) *Lemna*
b) Tobacco
c) Cotton
d) *Pentunia*

219. Intussusception is
a) Removal of old material from cell wall
b) Deposition of new material into cell wall during differentiation
c) Deposition of new material into cell wall during cell division
d) Another name of cell division

220. One of the synthetic auxin is
a) NAA
b) IAA
c) GA
d) IBA

221. Examples of plants which requires vernalisation is/are
a) Pea
b) Beat
c) Cabbage
d) All of these

222. I. More female flowers in cucumber
II. α-amylase production is barley grain
III. Acceleration of fruit ripening in tomato
IV. Delayed in sprouting in potato tubers
From the given effects find, out the effects of ethylene and choose the correct option accordingly
a) I and II
b) I and III
c) II and IV
d) III and IV

223. Study the following statements
I. Increase in girth of plants is primary growth
II. Increase in girth of plants occurs due to apical meristem
III. Secondary growth of plants occurs due to lateral meristem
IV. Vascular cambium and cork cambium are the lateral meristem of plants
V. Elongation of a plant along the axis is called primary growth
Choose the incorrect options
a) I and II
b) III and IV
c) IV and V
d) I and V

224. Plant growth is unique because
a) Plant retains the capacity for unlimited growth
b) Plant retains the capacity for limited growth
c) Plants have diffused growth that differs from animals
d) None of the above

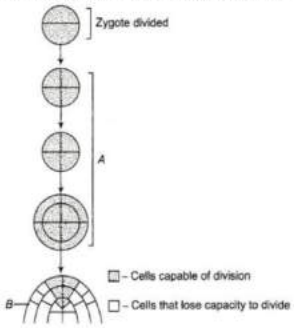
225. I. Kinetin is a degradative substance from DNA
II. ABA is present in all plants including lower plants
III. Low ratio of cytokinin to auxin favours root formation only
IV. ABA is synthesised catabolically through glycolysis pathway
Choose the correct combination of options
a) I and II
b) II and III
c) I and III
d) III and IV

226. Search for natural cytokinin lead to the
a) Isolation of zeatin from corn kernels
b) Isolation of zeatin from coconut milk
c) Isolation of zeatin from sugarcane
d) Both (a) and (c)

227. A sleep movement in plants is a nastic response, that occurs daily in response to
a) Dark
b) Light
c) Water
d) Both (a) and (b)

228. Synthetic auxins are used for
a) Killing weeds
b) Ripening fruits
c) Increasing the size of the fruits
d) Stimulating growth of cells in tissue culture

229. In the given diagram, identify the type of growth phase in *A* and *B* and choose a correct option accordingly



a) A-Arithmetic phase; B-Geometric phase
b) A-Arithmetic phase; B-Arithmetic phase
c) A-Geometric phase; B-Geometric phase
d) A-Geometric phase; B-Arithmetic phase

230. How does pruning help in making the hedge dense?
a) It induces the differentiation of new shoots from the rootstock
b) It frees axillary buds from apical dominance
c) The apical shoot grows faster after pruning
d) It releases wound hormones

231. Which one is not an ethylene effect?
a) Swelling of axis
b) Apical hook formation in dicot seedlings
c) Horizontal growth of seedlings
d) Apical dominance

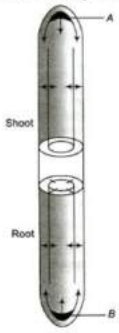
232. Which of the following in incorrectly matched?
a) Explant – Excised plant part used for callus formation
b) Cytokinins – Root initiation in callus
c) Somatic embryo- Embryo produced from a vegetative cell
d) Anther culture- Haploid plants

233. Which plant growth regulator is responsible for triple response?
a) C_2H_4
b) IAA
c) IBA
d) ABA

234. Choose the incorrect pair.
a) Auxins – To grow
b) Gibberellins – *Gibberella fujikuroi*
c) Cytokinins- Herring sperm DNA
d) Abscisic acid – Flowering hormone

235. Which of the following is/are example/s of long day plant?
I. Tomato
II. Maize
III. Rice
IV. Radish
Choose the correct option accordingly
a) I and II
b) III and IV
c) Only IV
d) I, II and III

236. Identify *A* and *B* in the given figure and choose the correct option accordingly



a) A-Root apical meristem; B-Shoot apical meristem
b) A-Shoot apical meristem; B-Root apical meristem
c) A-Apical tissue; B-Radicle tissue

d) A-Radicle tissue; B-Apical tissue

237. Indentify two of the following phytohormones, which regulate the stomatal movements?

I.IAA II. GA_3

III. Zeatin IV. ABA

a) I and III b) II and III c) III and IV d) II and IV

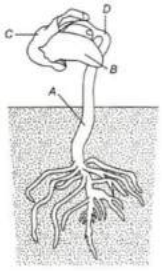
238. The ripening of fruits can be fastened by treatment with

a) Gibberellins b) Cytokinins c) Ethylene d) Auxin

239. Prunning of plants promotes branching because the axillary buds get sensitized to

a) Ethylene b) Gibberellin c) Cytokinin d) Indole acetic acid

240. Identify A, B, C and D from the given figure and choose the correct accordingly



a) A-Hypocotyl, B-Cotyledons, C-Seed coat, D-Epicotyl

b) A-Epicotyl, B-Cotyledons, C-Hypocotyl, D-Seed coat

c) A-Epicotyl, B-Seed coat, C-Hypocotyl, D-Cotyledon

d) A-Hypocotyl, B-Seed coat, C-Epicotyl, D-Cotyledon

241. Richmond-Lang effect is concerned with

a) Delay in senescence b) Breaking dormancy

c) Suppression of apical dominance d) Cell elongation

242. Which type of tropism is shown by tulip and sunflower respectively?

a) Thigmonasty and photonasty b) Hydronasty and thermonasty

c) Thermonasty and photonasty d) Hydronasty and photonasty

243. Which one is short day plant?

a) *Brassica compestris* b) *Raphanus sativus*

c) *Glycine max* d) *Papaver somniferum*

244. Gibberellin was first discovered from

a) Algae b) Fungi

c) Bacteria d) Roots of higher plants

245. Winter varieties of wheat and barley are planted in

a) Spring season b) Winter season c) Autumn season d) Summer season

246. With respect to photoperiodism, these are long day plants.

a) Wheat, oat, soybean b) Wheat, *Xanthium*, paddy

c) Wheat, poppy, soybean d) Wheat, poppy, beet

247. Which of the following flowers shows nyctinastic movement?

a) *Pentapetes* b) *Albizzia lebbek* c) *Mimosa pudica* d) *Bryophyllum*

248. Ethylene is connected with

a) Aerobic respiration b) Climacterics c) Anaerobic d) fermentation

249. Chooses the incorrect statement

a) PGR has diverse physiological effects on plants

b) PGR may act synergically or antagonistically

c) Two PGR can have same effect

d) GA fasters the maturity period

250. In the most situation, ABA acts as the

a) Agonist for auxin b) Antagonist to gibberellin

c) Antagonist of auxin
d) Agonist to gibberellin

251. If shoot cuttings are treated with auxin then
a) Root production takes place
b) Shoot elongation takes place
c) Both (a) and (b)
d) Lateral dominance takes place

252. Ethylene is used
a) To decrease the senescence
b) To increase the heights of stem
c) For ripening of fruits
d) For prevention of leaf fall

253. Growth curve is the
a) Pictorial representation of total growth/space
b) Graphical representation of total growth/space
c) Graphical representation of total growth/time
d) All of the above

254. Hormone replacing the requirement of vernalization is
a) ethylene
b) auxin
c) gibberellins
d) cytokinin

255. Photoperiod was first observed in
a) Potato
b) Maryland mammoth
c) Four O'clock
d) Evening primrose

256. Decapitation (shoot tip removal) is widely used in
a) Blotting
b) Hedge making
c) Tea plantation
d) Both (b) and (c)

257. Phototropic curvature is the result of uneen Distribution of
a) Gibberellin
b) Phytochrome
c) Cytokinins
d) Auxin

258. In photoactive plants, during day time the following ionic flux of guard cell is directly involves the expenditure of energy.
a) Outward movement of malate
b) Inward movement of potassium ions
c) Outward movement of protons
d) Inward movement of chloride

259. Which one of the following statement is incorrect?
a) Apparent growth is an irreversible increase in mass or volume
b) Real growth is the formation of new protoplasm
c) Growth in plants is open ended
d) Growth in plants is closed ended

260. Which hormone causes stunted growth in pea?
a) Gibberellic acid
b) Auxin
c) Cytokinin
d) Ethylene

261. Leaf abscission is caused by
a) ABA
b) Cytokinin
c) Auxin
d) gibberellin

262. I. Auxin II. Cytokinin III. GA IV. ABA
Which of the above mentioned PGA are acidic in nature? Choose the correct option accordingly
a) I and II
b) I, III and IV
c) I, II and III
d) I, II, III and IV

263. In plants, phototropism is the movement
a) Towards the light source
b) Away from the light source
c) Parallel to the light source
d) Lateral to the light source

264. Which was discovered first?
a) GA_1
b) GA_2
c) GA_3
d) GA_4

265. Which one is the example of dedifferentiation?
a) Procambium and vascular cambium
b) Cork cambium and interfasicular cambium
c) Cork cambium and vascular cambium
d) Procambium and cork cambium

266. Identify the correct option for *A* and *B*

Compound	**Function**
2,4-D	*A*
B	Fruit ripening

A **B**
a) Insecticide Auxin
b) Insecticide Cytokinin

c) Insecticide GA
d) Weedicide Ethylene

267. Auxin causes
a) Growth of apical bud
b) Growth of lateral bud
c) Seed dormancy
d) Fall of leaf

268. Apical dominance is caused by
a) Auxin
b) Cytokinin
c) Ethylene
d) Gibberellin

269. Permanent localised qualitative change in size, biochemistry, structure and function of cells or organs is called
a) Cell division
b) Meristematic division
c) Differentiation
d) Dedifferentiation

270. The maximum growth rate occurs in
a) Stationary phase
b) Senescent phase
c) Lag phase
d) Exponential phase

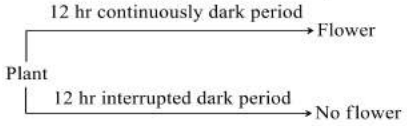
271. The coiling of tendril around some base in response to touch, is called
a) Hydrotaxis
b) Chemotaxis
c) Thigmotropism
d) Geotaxis

272. 'Apical dominance' in plants is the result of
a) Cytokinin
b) Auxin
c) Gibberellin
d) $CH_2 - CH_2$

273. Heterophylly can be observed in
I. cotton
II. coriander
III. larkspur
Select the right option
a) I, II and III
b) I and II
c) II and III
d) I and III

274. Apple's elongation and improvement of its shape is performed by
a) Auxin
b) Ethylene
c) C_2H_4
d) GA

275. In which category will you place this flower?



Choose the correct option
a) SDP
b) LDP
c) DNP
d) L-SDP

276. In the exponential phase of geometric growth, the
a) Progeny cells stops dividing
b) Both progeny cells follow mitotic division
c) Both (a) and (b)
d) Only one progeny cell follows mitotic division graphs

277. Surface area of roots by promoting roots growth and root hair formation is increased by
a) Cytokinin
b) Kinetin
c) Ethylene
d) ABA

278. Quantitative comparison between the growth of living system can be made in
a) Two ways
b) Three ways
c) One ways
d) Four ways

279. Gibberellins promotes cell division and elongation in
a) Leaves
b) Roots
c) Shoots
d) All of these

280. I. Indole-3-acetic acid
II. 2-4, dichlorophenoxy acetic acid
III. 6 Indole butyric acid
IV. Naphthalene acetic acid
Above are the examples of which PGR?
a) Auxin
b) Cytokinin
c) Ethylene
d) Gibberellin

281. Sprouting of potato under storage condition can be prevented by
a) auxin
b) gibberellin
c) Ethylene
d) cytokinin

282. The hormone present in the liquid endosperm of coconut is
a) Cytokinin b) Gibberellins c) Ethylene d) auxin

283. After a series of experiments, it was concluded that the ...A... of coleoptile was the site of transmittable influence that caused the ...B... of the entire coleoptile.
Complete the given statement with the correct combination of options given in the codes below
a) A-root site; B-bending b) A-lateral side; B-bending
c) A-shoot side; B-bending d) A-tip; B-bending

284. Bolting may be induced by
a) Gibberellins b) ABA c) auxin d) Cytokinin

285. Plant hormones are
a) Growth regulators b) Growth promoters c) Growth inhibitors d) All of these

286. Which one of the following pairs is not correctly matched?
a) Adenine derivative-kinetin b) Carotenoid derivative-ABA
c) Terpenes-IAA d) Indole compounds-IBA

287. I. Initiate rooting in stem cuttings
II. Promote flowering in pineapples
III. Controls xylem differentiation
Identify the functions of auxin and choose the correct option
a) I and II b) II and III c) III and I d) I, II and III

288. Short day plant is
a) *Xanthium* b) *Pisum* c) *Cucumis* d) *Avena*

289. *Beta vulgaris* is a
a) Short day plant b) Long day plant c) Day neutral plant d) Intermediate day

PLANT GROWTH AND DEVELOPMENT

: ANSWER KEY :

1)	b	2)	d	3)	a	4)	b	149)	a	150)	b	151)	b	152)	a
5)	b	6)	b	7)	a	8)	b	153)	c	154)	c	155)	a	156)	a
9)	b	10)	b	11)	c	12)	d	157)	a	158)	d	159)	d	160)	c
13)	a	14)	b	15)	c	16)	c	161)	d	162)	d	163)	a	164)	a
17)	b	18)	c	19)	a	20)	d	165)	c	166)	d	167)	a	168)	d
21)	a	22)	b	23)	d	24)	b	169)	c	170)	c	171)	c	172)	a
25)	a	26)	d	27)	b	28)	d	173)	d	174)	c	175)	a	176)	a
29)	a	30)	b	31)	a	32)	a	177)	d	178)	a	179)	d	180)	b
33)	d	34)	c	35)	c	36)	b	181)	b	182)	a	183)	c	184)	a
37)	d	38)	a	39)	c	40)	b	185)	d	186)	a	187)	a	188)	b
41)	d	42)	c	43)	b	44)	d	189)	a	190)	a	191)	c	192)	d
45)	a	46)	b	47)	d	48)	d	193)	c	194)	c	195)	d	196)	c
49)	c	50)	d	51)	b	52)	c	197)	a	198)	b	199)	d	200)	d
53)	a	54)	a	55)	d	56)	a	201)	a	202)	c	203)	b	204)	d
57)	c	58)	d	59)	b	60)	b	205)	d	206)	c	207)	d	208)	c
61)	c	62)	a	63)	d	64)	c	209)	b	210)	a	211)	c	212)	a
65)	a	66)	d	67)	b	68)	d	213)	c	214)	b	215)	a	216)	d
69)	a	70)	a	71)	b	72)	c	217)	d	218)	b	219)	b	220)	a
73)	c	74)	c	75)	d	76)	b	221)	d	222)	b	223)	a	224)	a
77)	a	78)	d	79)	a	80)	b	225)	c	226)	d	227)	d	228)	a
81)	d	82)	c	83)	c	84)	d	229)	d	230)	b	231)	d	232)	b
85)	c	86)	c	87)	c	88)	d	233)	a	234)	d	235)	c	236)	b
89)	a	90)	c	91)	d	92)	b	237)	c	238)	c	239)	c	240)	a
93)	a	94)	c	95)	b	96)	d	241)	a	242)	c	243)	c	244)	b
97)	a	98)	b	99)	b	100)	b	245)	c	246)	d	247)	b	248)	b
101)	c	102)	d	103)	c	104)	c	249)	d	250)	b	251)	a	252)	c
105)	c	106)	c	107)	c	108)	d	253)	c	254)	c	255)	b	256)	d
109)	a	110)	a	111)	a	112)	b	257)	d	258)	c	259)	d	260)	d
113)	c	114)	a	115)	b	116)	d	261)	a	262)	d	263)	a	264)	c
117)	b	118)	c	119)	a	120)	c	265)	b	266)	d	267)	a	268)	a
121)	d	122)	a	123)	b	124)	c	269)	c	270)	d	271)	c	272)	b
125)	c	126)	c	127)	a	128)	b	273)	a	274)	d	275)	a	276)	b
129)	d	130)	b	131)	a	132)	d	277)	c	278)	a	279)	d	280)	a
133)	b	134)	c	135)	c	136)	b	281)	a	282)	a	283)	d	284)	a
137)	a	138)	d	139)	c	140)	d	285)	d	286)	c	287)	d	288)	a
141)	a	142)	d	143)	a	144)	d	289)	b						
145)	c	146)	c	147)	b	148)	a								

PLANT GROWTH AND DEVELOPMENT

: HINTS AND SOLUTIONS :

1 **(b)**
Rapid and dramatic increase in shoot length is called **bolting**. Gibberellins induce stem elongation in 'rosette plants'. *E.g.,* cabbage, henane, etc, such plants show retarded internodal growth and profuse leaf development. In these plants, just prior to the reproductive phase, the internodes elongate enormously causing a marked increase in stem height, *i.e.,* bolting.

2 **(d)**
Environmental heterophylly is the difference in shapes of leaves produced in air and water. Buttercup represents the heterophyllous development due to environment

3 **(a)**
The application of **gibberellins** to certain dwarf mutant is known to restore the normal growth and development in many plants, *e.g.,* dwarf pea, dwarf maize. Cytokinins promote cell division and organ formation.

4 **(b)**
The increased growth per unit time is termed as growth rate. Thus, rate of growth can be expressed mathematically. An organism, or a part of an organism can produce more cells in a variety of ways. The growth rate shows an increase that may be (i) Arithmetic and (ii) Geometrical

5 **(b)**
Abscisic acid is a natural growth inhibitor. It promotes stomatal closure, *i.e.,* it is a stress hormone and helps the plant to cope with adverse enviromental conditions especially drought. It also induces dormancy of seeds and buds. These seeds sprout only when ABA is overcome y GA.

6 **(b)**
Embryo development shows both the phases of growth (*i.e.*, geometric and arithmetic)
Most of the animals or organism show sigmoid growth in natural condition

7 **(a)**
Conditions in which the duration of light is less than the critical period of time don't promote the flowering due to photoperiodism. (Response of plants to periods of day/light)

8 **(b)**
Abscission the shedding of a body part, commonly refers to the process by which a plant intentionally drops one or more of its parts, such as a leaf, fruit, flower or seed.

9 **(b)**
Asexual stage of this fungus is *Fusarium moniliformae.*

10 **(b)**
Cytokinins are amino purines which are derived from autoclaving sperm DNA.

11 **(c)**
Geotropic response is perceived by root cap.

12 **(d)**
This first natural cytokinin was obtained from unripe maize **grains** or **kernels** by **Lenthan et al**. it is known as **zeatin** (6-hydroxy 3-methyl trans2-butenyl amino –purine). It also occurs in **coconunt milk.**

13 **(a)**
The exponential growth or phase of geometrical growth of the plant can be expressed as
$W_1 = W_0\, e^{rt}$, where
W_0 = Initial size at the beginning of the period
W_1 = Final size at the beginning of the period
r = Growth rate
t = Time of growth
e = Base of natural logarithms

Here, the relative growth rate is also the measure of the ability of the plant to produce new plant material, which is referred to as efficiency index. Hence, the final size, W_1 depends on the initial size, W_0

14 **(b)**
Cytokinins are produced in actively growing tissues such as embryos, developing fruits and roots. cytokinins have so far been extracted from coconut milk (liquid endosperm), tomato juice, ect. In conjugation With auxins, they stimulate cell division even in permanent tissue. The root and auxin ratio.

15 **(c)**
Phototropism of stem and roots are due to differential hormonal effect. Mechanism is believed to be **Cholodny-Went theory**, which states that unilateral light produces more auxin (IAA) and hence, more growth in the shaded side resulting in binding.

16 **(c)**
Growth, at cellular level, is principally a consequence of increase in the amount of protoplasm. Since, increase in protoplasm is difficult to measure directly, one generally measures some quantity which is more or less proportional to it. Growth is, therefore, measured by a variety of parameters some of which are; increase in fresh weight, dry weight, length, area, volume and cell number

17 **(b)**
ABA (abscisic acid) is a naturally occurring growth inhibitor in plants.

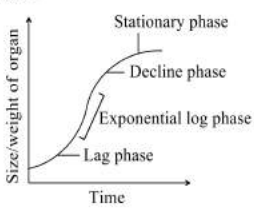
18 **(c)**
Abscisic acid (ABA). *Its important functions are*
(i) Promot abscission (ii) Promot dormancy
(iii) Plant growth inhibitor (iv) Inhibit seed germination
(vi) Seed development (vi) Antagonist to GA
(vii) Stomata closure

19 **(a)**
Thigmotropism movement is due to contact with a foreign body. It is most conspicuous in tendrils, which coil around support and help the plant in climbing, *e.g.,* tendrils of Cucubitaceae.

20 **(d)**
Auxin is produced by growing apical part of the plant, *i.e.*, apices of stems and roots. Then, it goes to the lateral parts (basipetal) and causes, the apical (root and shoot) parts of the plant to elongate

21 **(a)**
Gibberellin is a plant hormone, which first isolated from a fungus *Gibberella fujikuroi*. It is induces flowering in long-day plants in short day conditions.

22 **(b)**
Geometrical Growth In most system the initial growth is slow (lag phase), and it increases there after at a exponential rate (log or exponential phase). Both the progeny cells following mitotic cell division retains the ability to divide and continue to do so. However due to the limited nutrient supply, the growth slows down leading to stationary phase. If we plot the parameter of growth against time, a typical sigmoid curve is obtained.
It has following stages
1. During lag phase, organism adapt themselves to growth conditions. It is the period where the individual organism are maturing and not yet able to divide. During the lag phase of the bacterial growth cycle, synthesis of RNA, enzymes and other molecules occurs
2. The log phase (sometimes called the logarithmic phase or the exponential phase) is a period characterised by cell doubling. The number of new organism appering per unit time is proportional to the present population.
3. The stationary phase is often due to a growth-limiting factor such as the depletion of an essential nutrient, and/or the formation of an inhibitory product such as an organic acid. Stationary phase results from a situation in which growth rate and death rate are equal
4. Death phase, organism run out of nutrients and die



23 **(d)**
Gibberellin delay senescence. Thus, the fruit can be left on tree longer so as to extend the market period

24 **(b)**

Redifferentiation.

Redifferentiation as the name suggest indicates again differentiation. When dedifferentiated cell again get differentiated, the phenomena is called redifferentiation. *e. g.*, secondary cortex

25 **(a)**

In cryopresservation, plant materials are frozen at −196°C.

26 **(d)**

Cell enlargement/elongation may occur in cell direction as in isodiametric parenchymatous cells. In many parts, cell enlargement takes place predominantly in linear direction so much then this enlargement phase which is called the phase of cell elongation. Maximum elongation occurs in conducting tissue and fibres

27 **(b)**

Ethylene helps in ripening of climacteric fruits, while abscisic acid stimulates closure of stomata.

28 **(d)**

Micropropagation is done by auxins and cytokinin Ratio of auxins and cytokinin in culture medium determines morphogenesis.

29 **(a)**

Auxanometer is used to measure the growth in length of a plant organ. There two types of auxanometer, *i.e.,* Arc auxanometer and Pfeffer's auxanometer (automatic auxanometer).

30 **(b)**

Cytokinins increase shelf life of vegetables and cut flowers.

31 **(a)**

The phenomenon of photoperiodism was first discovered by Garner and Allard (1920, 22) in tobacco plant. They observed that Maryl and Mammoth variety of tobacco could be made to flower only by reducing the light hours with artificial darkening. It could be made to remain vegetative in winter by providing extra light.

32 **(a)**

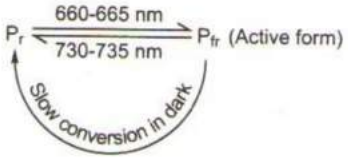
'Hydro' means 'water' and 'ponic' means 'culture'. Thus, it is related to growing plant in solution culture or soil less culture.

33 **(d)**

Condition in which the duration of dark period is less than the critical period of time does not promote flowering. Hence, SDP are called dark nigh plants. Even a fraction of second interruption during night could fail the flowering

34 **(c)**

Phytochrome is an amorphous photoreceptor protein pigment. It exists in two states, *i.e.,* phytochrome Red (P_r) and phytochrome far-red (P_{fr}).



It is considered that during the day, P_{fr} from of the phytochrome is accumulated in the plant which is inhibitory to flowering in short-day plants, but is stimulatory in long day plants.

36 **(b)**

Abscisic acid (ABA) is called as **stress hormone** or **dormin**, as it induces dormancy and helps to overcome conditions of stress. Its function is stomatal closure in plants.

37 **(d)**

Cell enlargement, cell division, increasement in the cells of vascular cambium, apical dominance and root formation in callus are the characteristic feaatures of **auxins**. Degree of cambial activity is directly proportional to auxin concentration.

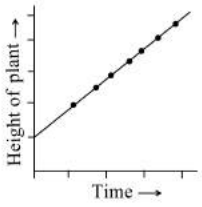
38 **(a)**

Photonasty is the response produced by plants in response to the availability of light.

39 **(c)**

Developing embryo shows both type of growth; geometrical and arithmetic.

Arithmetic Growth Rate The expression of arithmetic growth is exemplified by roots (or organ) elongating at constant rate. On plotting the length of an organ against time, a linear curve is obtained. Mathematically it is expressed as



Constant linear growth, a plot of length L against time

$L_t = L_0 + rt$

L_t = Length of time 't'

L_0 = Length of time to

r = Growth rate or elongation per unit time

Geometrical Growth In most system the initial growth is slow (lag phase), and it increases there after at a exponential rate (log or exponential phase). Both the progeny cells following mitotic cell division retains the ability to divide and continue to do so. However due to the limited nutrient supply, the growth slows down leading to stationary phase. If we plot the parameter of growth against time, a typical sigmoid curve is obtained.

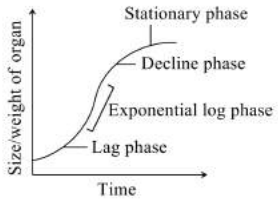
It has following stages

1. During lag phase, organism adapt themselves to growth conditions. It is the period where the individual organism are maturing and not yet able to divide. During the lag phases of the bacterial growth cycle, synthesis of RNA, enzyme and other molecules occurs

2. The log phase (sometimes called the logarithmic phase or the exponential phase) is a period characterised by cell doubling. The number of new organism appering per unit time is proportional to the present population.

3. The stationary phase is often due to a growth-limiting factor such as the depletion of an essential nutrient, and/or the formation of an inhibitory product such as an organic acid. Stationary phase results from a situation in which growth rate and death rate are equal

4. Death phase, organism run out of nutrients and die



40 **(b)**

Ethylene (C_2H_4) enhances the respiration rate during ripening of fruit. This rise in rate of respiration is called climacteric respiration

41 **(d)**

Characters of phase of elongation phase are

(i) cell enlargement

(ii) new cell wall deposition

(iii) increased vacuolation

42 **(c)**

Thigmotropism is the movement due to contact with a foreign body. In twinners and lianas, there is less growth on the side of contact and more growth on the side of branch away from the contact. Coiling of garden pea tendrils around any support is an example of thigmotropism.

43 **(b)**

Gibberellin also promotes blotting (internodal elongation just prior to flowering) in sugarbeet, cabbages and many plants with rosette habit

44 **(d)**

Auxins are widely used as herbicides, 2-4-D is widely used to kill dicotyledonous weeds. It does not affect mature monocotyledonous plants

45 **(a)**

Ethylene is used to initiate flowering and for synchronising fruit set in pineapples. It also induces flowering in mango. It is the most widely used PGR in agriculture

46 **(b)**

The period of growth is generally divided in to three phases

(i) Meristematic phase

(ii) Elongation phase

(iii) Maturation phase

47 **(d)**

The first cytokinin was discovered as kinetin (A modified form of adenine). Kinetin does not occur naturally in plants. Search for natural substances with cytokinin like activity led to the isolation of zeatin from corn-kernels and coconut milk

48 **(d)**

Two types of **auxanometer** (**Arc** and **Pfeffer's** automatic auxanometer) are used for measuring the growth of plants (in length).

49 **(c)**

Auxin was isolated by FW Went from the tips of coleoptiles of oat seedlings in 1928

50 **(d)**

The most common auxin is **Indole Acetic Acid** (IAA), which is the principle naturally occurring auxin in all higher plants. It performs many functions in plants.

51 **(b)**

Every organism has an optimum temperature range best studies for its growth. Any deviation

from this range could be detrimental to its survival. Environmental signals such as light and gravity also affect certain phases/stages of growth

52 **(c)**
Ethylene is a simple gaseous PGR. It is synthesised in large amounts by tissues undergoing senescence and ripening fruits

53 **(a)**
Quantitative comparison between the growth of living system can be made in two ways
(i) Measurement and comparis on of total growth per unit time is called absolute growth rate
(ii) The growth of the system per unit expressed on the common basis, *e. g.*, per unit initial parameter called the relative growth rate

54 **(a)**
Auxins induce cell elongation. IAA is true auxin. Auxins are generally acidic in nature.

55 **(d)**
The log phase or exponential growth is also called the grand phase of growth. The rate of maximum growth in the log phase is maintained for some time. It is then known as linear phase. It appears as upright line in growth curve

56 **(a)**
Auxin concentration increases in shaded area. i.e., auxins are collected in the opposite side of light. Increased auxin concentration is stimulatory for shoot growth and for this reason, shaded side shows more growth than the lighted side. Hence, bending of shoot takes place towards light.

57 **(c)**
Root Apical Meristem (RAM), Shoot Apical Meristem (SAM) and intercalary meristem are responsible for the primary growth to the plants and they principally contributes to the elongation of the plants along their axis.
In the dicotyledons and gymnosperms, the lateral meristems, vascular cambium and cork cambium appear later in life. These are the meristems that causes increase in the girth of the organ in which they are active. This is known as the secondary growth of the plant

58 **(d)**
Due to differentiation, dedifferentiation, and redifferentiation, plants growth is open

59 **(b)**
Senescence as an active developmental cellular process in the growth and functioning of a flowering plant, is indicated in leaf ascission.

60 **(b)**
Abscisic acid is commonly called stress hormone because the production of this hormone is stimulated by drought, water logging and other adverse environmental conditions.

61 **(c)**
Functions of Gibberellin are
(i) Increase in the length of axis (used to increase the length of grapes stalk)
(ii) Causes fruit like apple to elongate
(iii) Delay senescence of fruits
(iv) Used to speed up the malting process in brewing industry
(v) Spraying on sugarcane increases the stem height
(vi) Early seed production
(vii) Promotes blotting

62 **(a)**
Causin was the first to confirm the release of volatile substance from ripened oranges
Miller and Skoog discovered kinetin (modified form of adenine) from autoclaved herring sperm DNA
Kurosawa discovered GA from *Gibberella fujikuroi*

63 **(d)**
Water, oxygen, nutrients and other factors are very essential elements for growth
(i) The plant cells grow in size by cell enlargement, which in turn requires water. Turgidity of cells help in extension growth. Thus, plant growth and further development are intimately linked to the water status of the plant
(ii) Water also provides the medium for enzymatic reaction
(iii) Oxygen helps in releasing metabolic energy essential for growth activities
(iv) Nutrients are required by plants for the synthesis of protoplasm and all as sources of energy

64 **(c)**
Auxin is synthesized in shoot apices, leaf primordia from amino acid tryptophan and cause apical dominance. NAA and 2, 4- D (both auxins) are employed for inducing flowering in litchi and

pineapple. Buds develop when cytokinins are in excess.

65 **(a)**
Ethylene is a gaseous hormone responsible for fruit ripening. Germination of seed is triggered by soaking of seeds in water. After imbibing water, the embryo secretes gibberellin which stimulates the synthesis of α amylase. Gibberellin is not responsible for falling of leaves. Apical dominance of plants occur due to auxin hormone

66 **(d)**
In the exponential phase of growth (S-shaped), there is a rapid increase in size, cell number and mass of an organism, due to the rapid consumption of nutrients. Due to rapid consumption of nutrient, the growth rate is highest at this phase

67 **(b)**
The photomorphogenetic movement (photoperiodism) is the effect of photoperiods or dally duration of light hours in the growth and development of plants. **Phytochrome** (amorphous, photoreceptor, chromoprotein) is involved in photoperiodism.

68 **(d)**
Growth is measured by variety of parameters like
(i) increase in fresh weight
(ii) increase in dry weight
(iii) increase in length, area and volume,
(iv) increase in cell number

69 **(a)**
Gibberellins hormone induces seed germination. These hormones produce *m*RNA and hydrolytic enzymes like amylases, lipases, proteases, that decomposes the reserve food and supply the nutrients for seed germination.

70 **(a)**
Gibberellins are plant hormones, which are first isolated from a fungus *Gibberella fujikuroi*. They induces flowering in long day plants in short day conditions.

71 **(b)**
Bending of tentacles in sundew or *Drosera* after coming in contact with an insect is thigmonastic haptonastic or chemonastic movement of veriation. Opening and closing or flower in response to light and darkness is called **photonasty** e.g., *Calendula*

72 **(c)**
The most widely used compound as a source of ethylene is ethepton. Ethepton, in an aqueous solution is readily absorbed and transported within the plant and releases ethylene slowly

73 **(c)**
Photoperiod reception Photoperiodic stimulus is picked up by the fully developed leaves (Knott, 1934). Even one leaf or part of it (up to 1/8) is sufficient for photoperiod stimulus

74 **(c)**
The correct combinations are:

Foolish plant – Gibberellin – Seedless fruit.

Induces senescence – Volatile hormone – Ripens fruits.

75 **(d)**
Since the discovery of zeatin, several naturally occurring cytokinins and some synthetic compounds with cell division promoting activity have been identified. Naturally, cytokinins are synthesised in the regions where rapid cell division occurs like root apices, developing shoot buds, young fruit, etc.

76 **(b)**
Gibberellic acids induce sub-apical meristem to develop faster. This causes elongation of reduced stem or bolting in case of rosette plants (*e.g.,* Hanbane cabbage) and root crops, *e.g.,* radish.

77 **(a)**
2, 4-D (2, 4-dichloro-phenoxy acetic acid) is a synthetic auxin. It is selective weedicide and kills broad-leaved dicot plants only.

78 **(d)**
Dedifferentiation is regaining the capacity to divide of by differentiated cells. For example, formation of meristems in interfascicular cambium and cork cambium from fully differentiated parenchyma cells

79 **(a)**
Photoperiod was first studied by Garner and Allard (1920)

80 **(b)**
Gibberellin is a phytohormone, which increases the production of starch hydrolyzing enzymes in

germinating maize seeds. It is also responsible for the production of seedless fruit in grapes and tomatoes.

81 **(d)**
Stratification involves the treatment of seed at low temperature (5°C – 10°C) under sufficiently moist condition to break its dormancy and to induce germination.

82 **(c)**
Plant growth inhibitor hormone

83 **(c)**
Sciophytes or shade plants grow in areas having moderate or low intensity of light. Optimum growth occurs with light intensity of 10-30% of full sunlight.

84 **(d)**
Biological concept of species says that only the members of a species can breed freely in nature to produce fertile offsprings. The plant tobacco (*Nicotiana*) has two different species, *Nicotiana tobaccum* and *Nicotiana sylvestris*. These two species cannot reproduce freely.

85 **(c)**
Large amount of ethylene is synthesised by senescence tissue and ripening fruit

86 **(c)**
Lag phase is represent by initial slow growth rate

87 **(c)**
Due to their wide application, auxins have been used extensively in agriculture and horticulture

88 **(d)**
All of the above.
Water, oxygen, nutrients and other factors are very essential elements for growth
(i) The plant cells grow in size by cell enlargement, which in turn requires water. Turgidity of cells help in extension growth. Thus, plant growth and further development are intimately linked to the water status of the plant
(ii) Water also provides the medium for enzymatic reaction
(iii) Oxygen helps in releasing metabolic energy essential for growth activities
(iv) Nutrients are required by plants for the synthesis of protoplasm and all as sources of energy

89 **(a)**
Auxin (Indole Acetic Acid –IAA) is the derivative of **tryptophan**.

90 **(c)**
During differentiation, cells undergoes few to major structural changes both in their cell wall and protoplasm. For example, to form tracheary elements, the cells would loose their protoplasm. They also develop a very strong, elastic, lignocellulosic secondary cell walls to carry water to long distances even under extreme tension

91 **(d)**
Zeatin was the first natural cytokinin discovered from the corn-kernels and coconut milk.
Cytokinin is formed in roots and have opposite affect to auxin action in response to apical dominance. Kinetin was first extracted from herring sperm DNA

92 **(b)**
Short day plants are also called long night plants because they requires continuous or critical dark period for flowering

93 **(a)**
Arithmetic growth is linear because in this growth, there is a sequential adding of the new cell. One daughter cell remains meristematic (dividing) while the other becomes mature and gets differentiated

94 **(c)**
Log/exponential phase.
In the exponential phase of growth (S-shaped), there is a rapid increase in size, cell number and mass of an organism, due to the rapid consumption of nutrients. Due to rapid consumption of nutrient, the growth rate is highest at this phase.
Exponential or log phase can not sustain for long period because the nutrients and space are limited and there is competition as well.
Microorganism, when nutrients get exhausted, secrete toxic chemicals which inhibit the growth of other organisms

95 **(b)**
A-Lag phase, B-Log phase. C-Stationary phase

96 **(d)**
Ethylene is a gaseous hormone responsible for fruit ripening. Germination of seed is triggered by soaking the seed in water. After imbibing water the embryo secretes gibberellin, which diffuses to the aleurone layer and stimulates the synthesis of

several enzymes including α-amylase. These enzymes catalyze the breakdown of food reserve in endosperm.

Gibberellins are not responsible for immature falling of leaves.

97 **(a)**
Drosera Shows haptonastic movement.*Oxalis* Shows photonastic movement,
Mimosa pudica shows seismonastic movement and *Cucurbita* shows thigmotropic movement.

98 **(b)**
Diagram (A) is showing the heterophylly in larkspur showing, different shapes in leaves of the some plants due to difference in the maturity, i.e., at juvenile and at adult phase respectively.
Diagram (B) is showing heterophylly in buttercup, difference in shape of leaves of the same plant in different environment (R) terrestrial and water habitat, respectively

99 **(b)**
In 1880, Charles Darwin and his son Francis Darwin observed that coleoptiles of canary grass responds to unilateral stimulation

100 **(b)**
Redifferentiation as the name suggest, indicates again differentiation. When dedifferentiated cell again get differentiated, the phenomena is called redifferentiation. *e. g.*, secondary cortex

101 **(c)**
Firstly, the ABA was discovered and named dormin because this hormone induce dormancy in seeds. Hence, it is also called dormancy hormone

102 **(d)**
Plant growth regulators are also called plant hormone, plant growth substance and phytohormone

103 **(c)**
Ethylene is a simple, gaseous hydrocarbon and is a naturally occurring plant hormone. It acts for fruit development and ripening, controls leaves and flower abscission.

104 **(c)**
Exponential or log phase can not sustain for long period because the nutrients and space are limited and there is competition as well. Microorganisms, when nutrients get exhausted, secrete toxic chemicals which inhibit the growth of other organisms

105 **(c)**
Apoptosis is an active process of programmed cell death characterized by cleavage of chromosomal DNA, chromation condensation and fragmentation of both the nucleus and the cell.

106 **(c)**
Abscisic acid (ABA) is produced in many parts of the green plants. It is formed from mevalonic acid.

107 **(c)**
A – different, B – plasticity.
Plant follows different pathways in response to environment or phases of life to form different kind of structures. This ability is called plasticity, *e. g.*, heterophylly in cotton, coriander and larkspur

108 **(d)**
Opening of floral buds into flower is a type of autonomic movement of growth (nastic movement). This is non-directional movement in which the response is determined by the responsive organ and not to the direction of stimulus. Greater growth on one side causes the organ to bend to the opposite side.

109 **(a)**
A bioassay is the measurement of the effect of a known or suspected biologically active substance on living material. **Went** used *Avena sative*(oat) coleoptiles in a technique called the *Avena* coleoptile curvature test for auxin.

110 **(a)**
Growth is invariably associated with differentiation. For example, when a seed germinates it does not simply increases in size but form seedlings. Differentiation is a permanent, localised qualitative change in size, biochemistry, structure and function of cells, tissues or organs, *e. g.*, fibres, vessels, tracheids, sieve tubes, mesophyll, leaf, etc.

111 **(a)**
Vernalization is chilling or cold treatment of the young plants or seeds to induce flowering. It is process of shortening of the juvenile or vegetative phase and fastening the flowering by a process of cold treatment. It was first reported by a Russian worker, **Lysenko** (1928) while working in cold

requiring biennial plants. Common examples of plants requiring vernalization are winter rye, winter wheat, winter arely, pea, *Chrysanthemum*, etc.

112 **(b)**
Seismonastic movements are due to the touch, shock, rain electric currents etc. the best example of seismonastic movement is the leaves of sensitive plant *Mimosa pudica* (touch me not plant), the movement is produced due to turgor changes in the cells of pulvinus or swollen area lying at the base of petiole pinnae and pinnules.

113 **(c)**
Open form of growth.
Plant growth is unique as they retain the capacity for unlimited growth which is mainly due to the presence of meristems. The cells of such meristems have the capacity to divide and self perpetuate. This form of growth wherein new cells are always being added to the plant body by the activity of the meristem is called the open form of growth

114 **(a)**
Day neutral plants do not need a specific photoperiod to produce flowers. They are also called intermediates or photoneutrals. Their photoperiod varies from a few hours to 24 hours of uninterrupted light, *e.g.,* tomato, cucumber, sunflower, maize and cotton, etc.

115 **(b)**
Phototropism is the movement of coleoptile (plant organ) towards the light (due to auxin)
Figure 1 shows incomplete blockage of auxin, but direction of blockage does not favour the bending of coleoptile towards the light source
Figure 2 shows in complete blockage of auxin movement from apical part to lateral part. So, no bending of coleoptile is there
Figure 3 shows incomplete blockage, but the direction favours the bending of coleoptile towards the source
Figure 4 shows no blockage hence, the bending of coleoptile takes place easily

116 **(d)**
Abscisic acid is a terpenoid, I.e., a derivative of steroid. Indole butyric acid and indole-3-acetic acid are auxins, Which are weak organic acids. Gibberellic acid (gibberellin) is a terpene.

117 **(b)**
Growth plotted against time gives sigmoid curve. Its graph contains initial lag phase, middle log phase, final steady state phase.

118 **(c)**
Gibberellin promotes internodal elongation in a wide range of species. This internodal elongation phenomenon is known as blotting. Giberellin is a plant growth hormone, which was first obtained from a fungus
Gibberella fujikuroi (*Fusarium moniliformi*).

119 **(a)**
Barley seeds are rich in carbohydrate (starch). The starch is hydrolysed by α-amylase to monosaccharides unit at the time of germination of seeds.

120 **(c)**
The final structure at maturity of a cell tissue is determined by the location of cells

121 **(d)**
Darwin and his son were studying phototropism (growing plant toward light source) in canary grass. They deduced that the chemical produced in apical part of Canary grass is responsible for phototropism

122 **(a)**
Low temperature required for vernalisation is usually 0°-5°C. Low temperature should not be immediately followed by very high temperature (40°C) otherwise the effect of vernalisation is lost. This phenomenon is called de vernalisation

123 **(b)**
Meristematic Phase This phase is also called the formative or cell formation phase. In this phase there are constantly dividing cells present at the root and shoot apex. The cells in this region are rich in protoplasm, possess large conspicuous nuclei and the cell walls are, thin and cellulosic with abundant plasmodesmatal connections

124 **(c)**
A – apical, B – lateral, C – lateral

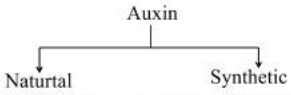
125 **(c)**
More than 100 gibberellins, reported from widely different organisms such as fungi and higher plants. They are denoted as GA_1, GA_2, GA_3 and so on. however, GA_3 was one the gibberellic acid to be discovered first and mostly intensively studied form

126 **(c)**
Abscisic acid (ABA) or stress hormone or dormin is present in all vascular plants as well as in some mosses, some green algae and some fungi. They completely absent in bacteria. This is commonly formed inside chloroplast either from mevalonic acid or xanthophyll like violaxanthin. Chloroplasts in leaves contain the cartenoids from which ABA arises, whereas in certain other parts like roots, fruits, seeds, etc, necessary carotenoids are in chromoplasts, leucoplasts or proplastids.

127 **(a)**
Roots seem to be the major source of cytokinin synthesis. From roots, the cytokinins pass upwardly through xylem.

128 **(b)**
Cytokinin encounter the apical dominance by promoting the cell division in lateral shoots. It is also used to increase the growth of lateral buds in short plants

129 **(d)**
The term 'auxin' is applied to the indole-3 acetic acid and to other natural and synthetic compound having certain growth regulating properties



1. IAA (Indole Acetic Acid)	NAA (Naphthalene Acetic Acid)
2. IBA (Indole Butyric Acid)	2-4-D (2-4-Dichlorophenoxy Acetic Acid)

130 **(b)**
The **ABA** inhibits giberellin-induced growth activities. On account of this antagonistic behaviour, it is often called anti-gibberellin.

131 **(a)**
IAA (auxin) is responsible for apical growth (apical dominance) in which presence of apical bud does not allow the nearby lateral buds to grow.

132 **(d)**
Increase in the girth of plants (organ) takes place by vascular and cork cambium.
Root Apical Meristem (RAM), Shoot Apical Meristem (SAM) and intercalary meristem are responsible for the primary growth to the plants and they principally contributes to the elongation of the plants along their axis.
In the dicotyledons and gymnosperms, the lateral meristems, vascular cambium and cork cambium appear later in life. These are the meristems that causes increase in the girth of the organ in which they are active. This is known as the secondary growth of the plant

133 **(b)**
The effect of photoperiod on plants is called photoperiodism. The photoperiod was first studied by Garner and Allard (1920)

134 **(c)**
Lysenko

135 **(c)**
During seed germination especially of cereals, gibberellin stimulates the production of hydrolytic enzymes like amylases, proteases and lipases. These enzymes solubilize the reserve food of seed.

136 **(b)**
When long day plants are grown under short day conditions, the gibberellins are produced in insufficient quantities and flowering does not occur. However, if the plant is transferred to long day conditions, or gibberellin solution is applied to leaves, flowering occurs.

137 **(a)**
The term vernalization was introduced by **Lysenko**. **Chourad** defined it is as acquisition of the ability to produce flowers by low temperature treatment. Vernalization is affected by two factor water and oxygen. In absence of proper water and O_2 contents, the chilling treatment becomes ineffective.

138 **(d)**
Development cannot take place without growth, and growth takes place by differentiation, dedifferentiation and redifferentiation. Hence, through these processes development takes place

139 **(c)**
Gibberellins were named after the fungus *Gibberella fujikuroi* which causes disease in rice plants. A Japanese plant pathologist, Elichi Kurosawa investigated it as the bakane (foolish seedling) disease

140 **(d)**
The conditions show that the plant requires photoperiod shorter than the critical day length.

This plant needs uninterrupted dark period for flowering.

Therefore, it is a short day plant and these plants do not flower if the dark period is interrupted with flashes of light.

141 **(a)**
Synthetic auxins are synthetic compounds which cause various physiological responses common to IAA. 2, 4-D (2, 4-dichlorophenoxy acetic acid) is a synthetic auxin and used as a weedicide.

142 **(d)**
Senescence occurs prior to death of an organ or organism. It can be defined as the total sum of deteriorative processes that naturally terminate the functional life of an organism.

143 **(a)**
ABA (Abscisic Acid) was discovered for its role in regulating abscission and dormancy. It acts as the general plant growth inhibitor and an inhibitor of plant metabolism. ABA inhibits seed germination

144 **(d)**
Vernalization is a process of shortening of the juvenile or vegetative phase and hastening flowering by a previous cold treatment. Vernalization or low temperature requirement of some plants can be replaced by **gibberellins.**

145 **(c)**
Growth is regarded as one of the most fundamental and conspicuous characteristics of a living being. Growth can be defined as the irreversible permanent increase in the size of an organ or its part or even of an individual cell. Generally growth is accompanined by metabolic process (both anabolic and catabolic), that occurs at the expanse of energy

146 **(c)**
Germination of seeds especially in cereals is triggered by soaking the seeds in water. After imbibition of water, the embryo seretes **gibberellin** which diffuses into aleurone layer and stimulates synthesis of amylase, protease, and lipase enzyme. The enzymes solubilize the reserve food of the seed.

147 **(b)**
Senescence is the process of ageing which is caused by increased entropy, cellular breakdown, reduced anabolic process and increased catabolic process. Cytokinins are amino purine derivatives which promote cell division and delay senescence by controlling protein synthesis.

148 **(a)**
Cytokinin promotes the nutrient mobilisation, which helps in the delay of leaf senescence

149 **(a)**
ABA was discovered during mid 1960's.
During mid 1960s, three independent researches reported the purification and chemical characterisation of three different kind of inhibitors as inhibitor B, abscission II and dormin. Later, three were proved chemically identical. It was named Abscisic Acid (ABA)

150 **(b)**
Functions of Auxin
(i) Auxin helps to initiate rooting in stem cuttings, an application widely used for plant propagation
(ii) Auxin promotes flowering, *e.g.*, in pineapples
(iii) It helps to prevent fruit and leaf drop at early stages
(iv) They promote the abscission of older mature leaves and fruits
(v) Apical dominance
(vi) Induce parthenocarpy in tomatoes
(vii) Controls xylem differentiation and helps in cell division

151 **(b)**
A – intrinsic, B – extrinsic, C – extrinsic

152 **(a)**
Indole -3 – acetic acid (IAA) is the best known natural auxin. It is growth promoting hormone.

153 **(c)**
A calendar year plant shows the period of active vegetative, growth, flowering, fruiting, senescence and dormancy. The different aspects or appearances of plants in different seasons of year is called phenology. They are controlled not only by seasons and other environmental factors, but also by metabolism, heredity, and internal signals

154 **(c)**
Absolute Growth Rate (AGR) is the comparison of total growth per unit time
Initial surface area = 5 cm^2, Final surface area = 10 cm^2
AGR = Final surface area – Initial surface area
= 10 − 5 = 5
Relative Growth Rate (RGR)
$$= \frac{\text{Final surface area} - \text{Initial surface area}}{\text{Initial surface area}} \times 100$$

$= \frac{10-5}{5} \times 100 \Rightarrow 100 = 100$

155 **(a)**

Vernalisation is a process of shortening of the juvenile or vegetative phase and faster flowering by previous cold treatment. It was firstly found by Lysenko (1928), a Russian worker

156 **(a)**

Nyctinastic or **sleep movement** is brought about by the alternation of day and night. These are also caused by the presence or absence of light (photonastic) as well as by the changes in temperature of the surrounding atmosphere (thermonastic).

157 **(a)**

A – Inhibited, B – Promoted

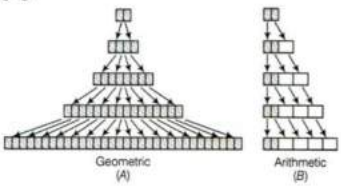
158 **(d)**

One single maize root apical meristem can give rise to more than 17,500 new cells per hour, whereas cells in watermelon may increase in size by up to 3,50,000 times. In the former, growth is expressed as an increase in cell number; the later expresses growth as an increase in size of the cell. While the growth of a pollen tube is measured in terms of its length, an increase in surface area denotes the growth in a dorsiventral leaf

159 **(d)**

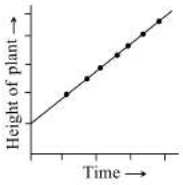
It was a Russian Physiologist named **Dimitry N Neljubow** (1876-1926), who first established that **ethylene** affects plant growth. He identified ethylene in illuminating gas but showed that it causes a **triple response** on pea seedlings-inhibited stem elongation, increased stem thickening and a horizontal growth habit.

160 **(c)**



Diagrammatic representation of (A) Geometric and (B) Arithmetic growth.

Arithmetic Growth Rate The expression of arithmetic growth is exemplified by roots (or organ) elongating at constant rate. On plotting the length of an organ against time, a linear curve is obtained. Mathematically it is expressed as



Constant linear growth, a plot of length L against time

$L_t = L_0 + rt$

L_t = Length of time 't'

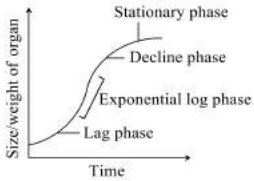
L_0 = Length of time to

r = Growth rate or elongation per unit time

Geometrical Growth In most system the initial growth is slow (lag phase), and it increases there after at a exponential rate (log or exponential phase). Both the progeny cells following mitotic cell division retains the ability to divide and continue to do so. However due to the limited nutrient supply, the growth slows down leading to stationary phase. If we plot the parameter of growth against time, a typical sigmoid curve is obtained.

It has following stages

1. During lag phase, organism adapt themselves to growth conditions. It is the period where the individual organism are maturing and not yet able to divide. During the lag phases of the bacterial growth cycle, synthesis of RNA, enzyme and other molecules occurs
2. The log phase (sometimes called the logarithmic phase or the exponential phase) is a period characterised by cell doubling. The number of new organism appering per unit time is proportional to the present population.
3. The stationary phase is often due to a growth-limiting factor such as the depletion of an essential nutrient, and/or the formation of an inhibitory product such as an organic acid. Stationary phase results from a situation in which growth rate and death rate are equal
4. Death phase, organism run out of nutrients and die

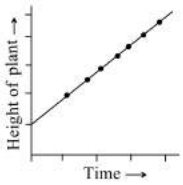


161 **(d)**

Both (b) and (c).

Arithmetic Growth Rate The expression of arithmetic growth is exemplified by roots (or

organ) elongating at constant rate. On plotting the length of an organ against time, a linear curve is obtained. Mathematically it is expressed as



Constant linear growth, a plot of length L against time

$L_t = L_0 + rt$

L_t = Length of time 't'

L_0 = Length of time to

r = Growth rate or elongation per unit time

162 **(d)**

Ethepton hastens fruit ripening in tomatoes and apples and accelerates abscission in flowers and fruits. It promotes female flowers in cucumbers thereby increasing the yield

163 **(a)**

Gibberellins (Tabuta; 1935) are weakly **acidic** plant growth hormones.

164 **(a)**

Auxin (derived from Greek work *auxin*, which means to grow) was first isolated from human urine. Kogl and Heagen Smith (1931) isolated three chemicals from human urine and named them as auxin

165 **(c)**

Abscisic acid (ABA) inhibits synthesis of RNA and proteins. It has been shown that ABA regulate the expression of certain genes during seed maturation and certain stress condition such as heat shock, adaptation to low temperature and tolerance.

166 **(d)**

Gibberellins are the plants hormone causing light inhibited stem growth, this shows that light lowers the level of endogenous gibberellins and stem growth, while in drak it reverses.
Gibberellins also produce some other physiological effects on plants like elongation of internodes and the stem, induce seed germination, breaking dormancy, induce perthenocarpy and maleness in plants, etc.

167 **(a)**

Seismonastic movement is a type of nastic movement. It comes in response of touch and this phenomenon is known as seismonasty, *e.g.,* leaflets of *Mimosa pudica*.

The nastic movements in response to light, chemical, temperature, etc, are called as photonastic, chemonastic and thermonastic movements respectively.

168 **(d)**

Vernalisation made plant of flower by shortening the vegetative or juveline growth of the plant

169 **(c)**

Ability of the plants to produce new plant material is called efficiency index.
The exponential growth or phase of geometrical growth of the plant can be expressed as
$W_1 = W_0\, e^{rt}$, where
W_0 = Initial size at the beginning of the period
W_1 = Final size at the beginning of the period
r = Growth rate
t = Time of growth
e = Base of natural logarithms
Here, the relative growth rate is also the measure of the ability of the plant to produce new plant material, which is referred to as efficiency index. Hence, the final size, W_1 depends on the initial size, W_0

170 **(c)**

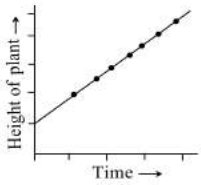
Day netural plants can flower in all possible photoperiods. Such plants can blossom throughout the year, *e.g.,* cucumber, cotton, sunflower, tomato, some varieties of pea, etc.

171 **(c)**

The movement which occurs due to difference in the rate of growth on two opposite sides of a plant organ is called **nastic movement**. When movement occurs due to faster growth of the upper surface of organ as compare to lower it is called **epinasty**, e.g., **opening of flower**.

172 **(a)**

In the given graphs, only 'A' shows the linear growth curve.
Arithmetic Growth Rate The expression of arithmetic growth is exemplified by roots (or organ) elongating at constant rate. On plotting the length of an organ against time, a linear curve is obtained. Mathematically it is expressed as



Constant linear growth, a plot of length L against time

$L_t = L_0 + rt$

L_t = Length of time 't'

L_0 = Length of time to

r = Growth rate or elongation per unit time

173 **(d)**

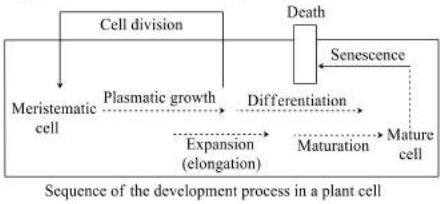
Injury induced growth movement is called **traumatropism**. Growth away from injured side is negative traumatropism and towards injured side accounts to be positive traumatropism.

174 **(c)**

Auxins concentration increase in shaded area (opposite side of light). Increased auxin concentrations are stimulatory for shoot growth so, shaded side shows more growth than lighed side. Thus, bending of shoot takes place towards the lighted side.

175 **(a)**

Development is a term that includes all changes that an organism goes through during its life cycle from germination of the seed to senescence. Diagrammatic representation of the sequence of processes, which constitutes the development of a cell of a higher plant is given in figure. It is also applicable to tissues/organs



Sequence of the development process in a plant cell

176 **(a)**

Phytochrome is a pigment universally present in green flowering plants responsible for photomorphogenic changes and developmental processes.

177 **(d)**

During mid 1960s, three independent researches reported the purification and chemical characterisation of three different kind of inhibitors as inhibitor B, abscission II and dormin. Later, three were proved chemically identical. It was named Abscisic Acid (ABA)

178 **(a)**

Florigen is hypothetical hormone, which has not yet een extracted. It is produced by the joint activity of leaves and growing points. It is produced in response to specific photoperiodicity. It induces only flowering. Growth is neither inhibited nor stimulated by this hormone.

179 **(d)**

Auxin elongates the cells present just below the apical part of shoot. It also do cell division and cell differentiation

180 **(b)**

Paratonic movements are produced in response to some external stimulus. These are said to be positive if directed towards the stimulus and negative if away from the stimulus. In pitcher plant, stimulus is provided by the insect.

181 **(b)**

In plants, some movements occur due to change of turgor pressure in cells particularly at the base of petiole of leaves and flowers. This turgor pressure change is related with change in osmotic pressure.

182 **(a)**

Ethylene is the only gaseous hormone. Main roles of ethylence are as follows:

1. It helps in ripening of fruits like mango, banana, etc. Due to this property, it is popularly known as ripening hormone.
2. It accelerates apical dominance, senesence of leaves and flowers.
3. It inhibits geotropism, flowering, etc.

183 **(c)**

Gibberellins are named after the fungus *Gibberella fujikurai* which caused disease in rice plants. Japanese plant pathologist **Elichi Kurosawa** investigated it as the Bakane (foolish seedling) disease.

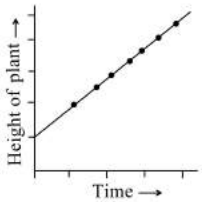
184 **(a)**

Further away from the apex, *i.e.*, more proximal to the phase of elongation, lies the portion of axis which is undergoing the phase of maturation. The cells of this zone, attain their maximal size in terms of wall thickening and protoplasmic modifications

185 **(d)**
'**Cytokinin**' delay the senescence of leaves and prevents chlorophyll degradation. It can be shown by rapid bioassay technique. Cytokinin treated leaf tips retards the process of chlorophyll degradation as compared to untreated leaf discs.

186 **(a)**
Parts of the year when maximum vegetative growth occurs is known as growing season

187 **(a)**
Arithmetic Growth Rate The expression of arithmetic growth is exemplified by roots (or organ) elongating at constant rate. On plotting the length of an organ against time, a linear curve is obtained. Mathematically it is expressed as



Constant linear growth, a plot of length L against time
$L_t = L_0 + rt$
L_t = Length of time 't'
L_0 = Length of time to
r = Growth rate or elongation per unit time

188 **(b)**
The ageing process of the leaves usually accompanies with loss of chlorophyll and repid breakdown of proteins called as **senescence**. Spraying of cytokinin delays senescence and increases the rate of chlorophyll formation.

189 **(a)**
Plant follows different pathways in response to environment or phases of life to form different kind of structures. This ability is called plasticity, *e. g.*, heterophylly in cotton, coriander and larkspur

190 **(a)**
Opening and closing of flowers is a case of photonasty. Flowers of certain plants open in light and close down in dark.

191 **(c)**
Both (a) and (b).
During differentiation, cells undergoes few to major structural changes both in their cell wall and protoplasm. For example, to form tracheary elements, the cells would loose their protoplasm. They also develop a very strong, elastic, lignocellulosic secondary cell walls to carry water to long distances even under extreme tension

192 **(d)**
Abscisic acid also called stress hormone, is responsible for bud dormancy, seed dormancy, abscission, leaf senescence, etc.

193 **(c)**
The effect of photoperiods (relative length of day anf night) or daily duration of light hours and dark periods on growth and development of plants is called **photoperiodism**. In other words, it involves the response of the organism to the environmental rhythms of light and darkness.

194 **(c)**
Short day plants generally require light period of less than 12 hours (*i.e.*, 8-10hrs) and continuous dark period of about 14-16 hrs for subseqent flowering. Most of the winter flowering plants belong to this category, e.g., *Chrysanthemum*,*Xanthium* (cocklebur), *Dahila*, rice, sugarcane, potato, tobacco, soyean (*Glycine max*), etc.

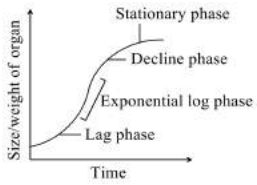
195 **(d)**
Rhizobium is a nitrogen fixing bacterium that inhabits the root nodules in leguminous crops. This bacterium leads to the production of plant hormone IAA (auxin), which is known to stimulate the nodule formation in legume plants.

196 **(c)**
Most plants structures have a determinate, limited growth with a definite final shape. Stems and roots show indeterminate growth, which have not a precisely established limit of growth fixed in advance.
Some exception are as follows determinate growth pattern of segmented stem of certain cactus and determined growth of root in many monocotyledons

197 **(a)**
(i) Generally, the plant hormones are same in function and chemical composition produced by different plant species
(ii) Generally, single plant hormone produce many effects
(iii) ABA, auxins, GA are acidic in nature

(iv) One hormone is generally produced by many parts of a plants

198 **(b)**
In the given graphs, graph '*e*' represents the sigmoid growth curve.
Geometrical Growth In most system the initial growth is slow (lag phase), and it increases there after at a exponential rate (log or exponential phase). Both the progeny cells following mitotic cell division retains the ability to divide and continue to do so. However due to the limited nutrient supply, the growth slows down leading to stationary phase. If we plot the parameter of growth against time, a typical sigmoid curve is obtained.
It has following stages
1. During lag phase, organism adapt themselves to growth conditions. It is the period where the individual organism are maturing and not yet able to divide. During the lag phases of the bacterial growth cycle, synthesis of RNA, enzyme and other molecules occurs
2. The log phase (sometimes called the logarithmic phase or the exponential phase) is a period characterised by cell doubling. The number of new organism appering per unit time is proportional to the present population.
3. The stationary phase is often due to a growth-limiting factor such as the depletion of an essential nutrient, and/or the formation of an inhibitory product such as an organic acid. Stationary phase results from a situation in which growth rate and death rate are equal
4. Death phase, organism run out of nutrients and die



199 **(d)**
Rooting on stem cutting is the function of auxin not cytokinin. Rooting on stem cutting is widely used for generation of new plants in short period of time

200 **(d)**
Site of vernalisation The stimulus of vernalization is perceived only by the meristematic cells, *e. g.*, shoot tip, embryo tip, root apex, developing leaves, etc.

201 **(a)**
The differentiation in plants is open, because cells/tissue arising out of the same meristem have different structure at the maturity. The cells tissues arising out of meristem region the capacity of division under certain condition

202 **(c)**
In Arithmetic Growth, following mitotic cell division, only one daughter cell continues to divide, while other differentiate and mature
In Geometrical Growth, both progeny cells following the mitotic cell division retain the ability to divide and continue to do so

203 **(b)**
One of the most dramatic effect of GA is its induction of α-hydrolytic enzymes like proteases, αamylases, lipases, which help to mobilise stored nutrients in the aleurone layer of endosperm of germinating barley seeds and cereal grains.

204 **(d)**
The cells in the root and shoot apex shows the following characteristics
(i) rich in protoplasm
(ii) conspicuous nuclei
(iii) cell wall are primary in nature, thin and cellulosic with abundant plasmodesmata connection

205 **(d)**
Ethylene causes acceleration of fruit ripening in tomato and maleic hydrazide (an auxin) delays sprouting of potato tubers. Precursors of both of these phytohormones are produced due to the catalytic activity of pyruvate dehydrogenase complex.

206 **(c)**
The movement of auxins is basipetal in stem, *i.e.,* from apex to base and acropetal in roots, *i.e.,* from tip towards shoot.

207 **(d)**
Geometric growth curve shows 'S'-shaped curve.
'S'-shaped have has following phases
(i) Lag phase (ii) Log phase
(iii) Stationary phase
(iv) Diminising of growth phase.
Geometrical Growth In most system the initial growth is slow (lag phase), and it increases there after at a exponential rate (log or exponential phase). Both the progeny cells following mitotic

cell division retains the ability to divide and continue to do so. However due to the limited nutrient supply, the growth slows down leading to stationary phase. If we plot the parameter of growth against time, a typical sigmoid curve is obtained.

It has following stages

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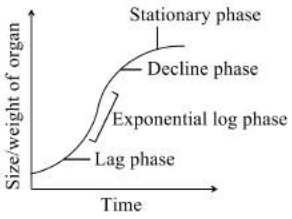
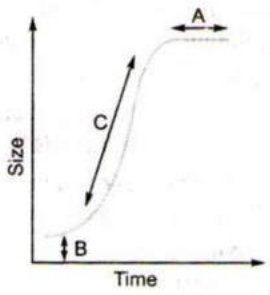


208 **(c)**

The cells proximal (just next, away from tip) to the meristematic zone represents the phase of elongation. Increased vacuolation, cell enlargement and new cell wall deposition are the characteristics of the cells in this phase

209 **(b)**

It is the graphic representation of growth against time. If total growth is plotted against time, an S-shaped or sigmoid curve is obtained. Where, **A** is the steady state phase. **B** is the lag phase and **C** is the log phase.



210 **(a)**

Juvenile phase is followed by adult phase. Transition from juvenile to adult is gradual in many cases, *e. g.*, lpomea, cotton. It is called homoblastic growth. In others, the transition is abrupt. This is called heteroblastic development

211 **(c)**

Higher plants possess specific areas, which take part in the formation of new cells. These area are called meristems. *Meristems are of three types*

(i) Apical meristem
(ii) Intercalary meristem
(ii) Lateral meristem

212 **(a)**

Auxin induces perthenocarpy in tomatoes.

213 **(c)**

Temperature between 0°C to 5°C is required during vernalisation

214 **(b)**

Gibberellins help in cell growth of stem, leaves and other aerial parts.

215 **(a)**

The effect of gibberellins had been know in Japan for over a century where a certain rice plant were found to suffer from 'Bakane' (foolish seedlings) disease. The disease was found by Kurosawa (1926) and it is caused by a fungus (*Gibberella fujikuroi*)

216 **(d)**

The first cytokinin was discovered from, degraded autoclaved herring sperm DNA by **Miller et al.** 1995. It is called **kinetin** (6-furfurly amino-purine). Kinetin does not occur naturally.

Many synthetic auxins are also manufactured. The important ones are 2, 4, D (2, 4-dichlorophenoxy acetic acid). 2, 4, 5-(2, 4, 5-Trichlorophenoxyacetic acid) and Naphthalene acetic acid (NAA).

217 **(d)**
Auxins induce parthenocarpy in a number of plants, *e.g,* tomatoes, apples, cucumber, etc.

F W Went isolated a substance from the coleoptile tip of *Avena sativa*, which is capable of promoting the cell elongation, phototropic curvature and growth.

218 **(b)**
The phenomenon of photoperiodism was first discovered by **Garner** and **Allard** (1920-1922). They observed that maryland mammoth variety of tobacco could be made to flower only by reducing the light hours with artificial darkening.

219 **(b)**
During the phase of elongation/enlargement the cell wall of the enlarging cell shows plastic extension through enzymatic loosening of microfibrils and deposition of new material. This deposition of new material into cell wall is called intussusception

220 **(a)**
The term 'auxin' is applied to the indole-3-acetic acid (IAA) and to other natural and synthetic compounds having certain growth regulating properties. NAA Naphthalane Acetic Acid (NAA) and 2,4-D (2,4-dichlorophenoxyacetic acid) have been isolated from plants. All these auxins have been used extensively in agricultural and horticultural practices.

221 **(d)**
Common examples of plants requiring vernalisation are winter rye, winter wheat, winter barley, pea, beet, cabbage, henbane, viola, clover, *Chrysanthenum*, etc.

222 **(b)**
Ethylene causes acceleration of fruit ripening in tomato and maleic hydrazine (an auxin) delays sprouting of potato tubers. Ethylene promotes the female flowers in cucumbers. Amylase production is the function of GA

223 **(a)**
Primary Growth results due to
(i) Elongation of plant along the axis is called the primary growth
(ii) Primary growth happens due to the presence of root apical meristem and shoot apical meristem.

Root Apical Meristem (RAM), Shoot Apical Meristem (SAM) and intercalary meristem are responsible for the primary growth to the plants and they principally contributes to the elongation of the plants along their axis. In the dicotyledons and gymnosperms, the lateral meristems, vascular cambium and cork cambium appear later in life. These are the meristems that causes increase in the girth of the organ in which they are active. This is known as the secondary growth of the plant

224 **(a)**
Plant growth is unique as they retain the capacity for unlimited growth which is mainly due to the presence of meristems. The cells of such meristems have the capacity to divide and self-perpetuate. This form of growth wherein new cells are always being added to the plant body by the activity of the meristem is called the open form of growth

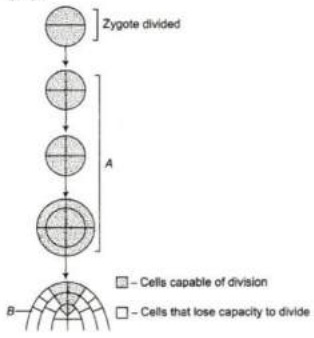
225 **(c)**
ABA is produced in many parts of green plants. Its presence is suspicious in lower plants (bryophytes and pteridophytes).
ABA is formed by melvonic acid pathway, not by glycolysis

226 **(d)**
Natural cytokinin was first obtained from corn kernels and coconut milk

227 **(d)**
Sleep movement is also known as **nastic response**, this occurs daily in the response to some stimulus, *i.e.,* day, night (dark), temperature. pH, turgor pressure, etc.

228 **(a)**
Synthetic auxins or auxin derivatives such as 2, 4-D; 2, 4, 5-T, dicamba, dinitrophenol, dalapan, etc, are used as weedicides/herbicides that kill weeds and unwanted plants in agriculture/horticulture.

229 **(d)**



Stages during embryo development showing geometric and arithmetic phase of growth during development

230 **(b)**
Pruning help in making the hedge dense as it frees the axillary buds from apical dominance. In fact, the apices of the plant axis (*e.g.,* shoot apex) has the highest concentration of auxin, which suppresses the axillary buds, while promotes the growth of apical bud. When the shoot apex is cut down through prunning, the axillary buds and the hedge becomes dense.

231 **(d)**
Effects of Ethylene
(i) Horizontal growth of seedling
(ii) Swelling of axis
(iii) Apical hook formation in dicot seedling
(iv) Promotes senescence and abscission of plants
(v) Break seed and bud dormancy
(vi) Initiate flowering in pineapple and flowering in mango
Apical dominance is the effect of auxin hormone

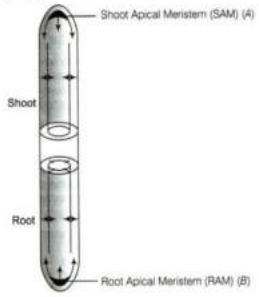
232 **(b)**
Root initiation in callus is the function of **auxin**. **Cytokinins** delay the senescence of leaves and other organs and also induce shoot formation.

233 **(a)**
Firstly, a Russian Physiologist Dimitry N Nelijubow who established ethylene's triple response on pea seedling. *These triple responses are*
(a) inhibited stem elongation
(b) increased stem thickening
(c) horizontal growth habit

234 **(d)**
Abscisic acid is a naturally occurring growth inhibitor. It acts as a 'stress hormone'. It causes abscission of leaves and promotes senescence. It initiates flowering only in certain short day plants.

235 **(c)**
LDP (Long Day Plant) These plants show flowering when they receive long photoperiod, above the critical photoperiod. *e. g.*, henbane, wheat, oat, beet, spinach, raddish, lettuce, etc.
SDP (Short Day Plant) These is plants show flowering when the photoperiod, or length below the critical period. Most of winter plants are SDP, *e.g.,* potato, bean, tobacco, rice, sugar cane etc.
DNP (Day Natural Plant) These plants can blossom thoughout the year. *e.g.*, tomato, maize, cotton, pepper, etc.

236 **(b)**



Diagrammatic representation of locations of root apical meristem, shoot apical meristem and vascular cambium. Arrows exhibit the direction of growth of cells and organ.
Vascular cambium ⇒ Responsible for secondary growth (increases girth)
Shoot and root apical ⇒ Responsible for primary growth
meristem (increases height)

237 **(c)**
Cytokinins(zeatin) are essential for opening of stomata, while abscisic acid takes part in closing of stomata.

238 **(c)**
Ethylene is a simple gaseous hydrocarbon and is naturally occurring plant hormone. It induces artifical ripening of fruits.

239 **(c)**
When apical meristem is removed, the cytokinin level of lateral bud is increased. This increase at the base of bud stimulates cell division and completes vascular connection between axillary bud and transport system.

240 **(a)**
A – Hypocotyl
B – Cotyledons
C – Seed coat
D – Epicotyle hook

241 **(a)**
Richmond and **Lang** (1967) observed that degradation of proteins and chlorophyll was delayed in the detached leaves of *Xanthium* by the application of cytokinin. This effect of cytokinin in

delaying the senescence is called as Richmond-Lang effect.

242 **(c)**
Nastic movements are determined by some external stimuli like light, temperature or contact, in which direction of response id prefixed. Flowers of tulips open during high temperatures and close down during low temperature, *i.e.,* **thermonastic movements**. The sunflower open during the day and close during night or cloudy sky, i.e., **photonastic**.

243 **(c)**
Glycine max is a short day plant.

244 **(b)**
Gibberellin was first discovered from fungi *Gibberella fujikuroi*.

245 **(c)**
Winter varieties of wheat and barley are planted in autumn so that they can get stimulus of cold in winter and produce seed in spring season

246 **(d)**
The long day plants fail to flower, if the day length is shorter than the critical period, *e.g.,* sugarbeet, wheat, poppy, radish, maize, spinach, etc.

247 **(b)**
Nyctinastic is found in members of Leguminosae such as *Albizza lebbek* and members of Oxalidaceae.

248 **(b)**
Climacteric fruits have high respiration rate during the fruit's ripening. During the ripening process of climacteric fruits, the production of phytohormone, ethylene, dramatically increases up to 1000 folds of the basal ethylene level.

249 **(d)**
Sypraying juvenile conifers with GAs hastens the maturity period, thus leading to early seed production. Gibberellin also promotes bolting (internode elongation just prior to flowering) in beet, cabbages and many plants with rosette habit

250 **(b)**
ABA plays an important role in seed development, maturation and dormancy. By inducing dormancy, ABA helps the seeds to withstand desiccation and other factors. As we can compare that most of ABA effects are opposite to G.A., thus, in most situation, the ABA is considered as antagonist to GA

251 **(a)**
Auxin helps to initiate root production in stem cuttings. This property of auxin is used widely son in the propagation of new plants

252 **(c)**
Ethylene is a ripening agent thus involved in the ripening of fruits.

253 **(c)**
Growth Curve is the graphical representation of total growth against time

254 **(c)**
Vernalization involves the cold treatment of plants to induce the flowering. Vernalization treatment of biennial plants for flowering can be replaced by gibberellins.

255 **(b)**
Garner and Allard (1920) firstly observed photoperiod in 'Maryland' Mammoth'. A variety of tobacco could be made to flower in summers by reducing the amount of light hour along with artificial darkening. It could be made to remain vegetative in winters by proving extra light

256 **(d)**
In most of the higher plants, the growing apical bud inhibits the growth of the lateral (axillary) buds, a phenomenon called apical dominance. Removal of shoot tips (decapitation) usually result in the growth of lateral buds. It is widely applied in tea plantation, hedge-making

257 **(d)**
Phototropic movement is the result of uneven distribution of auxin.

258 **(c)**
Ion movement into and out the guard cells during stomatal closure and opening depends on proton pumping of ATPase, which provides the proton gradients that are coupled to other secondary active transport mechanisms for K^{+} *and* Cl^{-}. The outward movement of protons is directly involves in expenditure of energy.

259 **(d)**
Growth of the plant is open ended because plant grows indefinitely forming new organs to replace the older or senescent ones. Meristem is responsible for undermined growth of plants.

Irreversible increase in the mass or volume is called opperent growth. Where as in real growth, formation of new plant protoplasm takes place

260 **(d)**
Ethylene is a growth inhibitor, which is found in gaseous form and inhibits the growth of pea plant.

261 **(a)**
Abscission involves the fall of leaves and fruits. **Addicott** and his co-workers (1964) observed that abscisic acid (ABA), a stress hormone, accelerating leaf abscission in cotton plants. Since then, it is belived that cause of abscission is the presence of growth inhibiting hormone (ABA) but its universal role for abscission is yet to be established.

262 **(d)**
Auxin, GA, ABA, cytokinin, all are acidic in nature

263 **(a)**
Phototropism movement of plants towards the light is called phototropism. Charles Darwin and his son observed that the coleoptiles of canary grass respond to unilateral illumination by growing towards the light source (phototropism)

264 **(c)**
GA_3.
More than 100 gibberellins, reported from widely different organisms such as fungi and higher plants. They are denoted as GA_1, GA_2, GA_3 and so on. however, GA_3 was one the gibberellic acid to be discovered first and mostly intensively studied form

265 **(b)**
Formation or cork cambium and interfascicular cambium is the example of dedifferentiation

266 **(d)**
(i) 2-4-D is an auxin, which is widely used as weedicide for discotyledonous weeds.
(ii) Ethylene causes fruit ripening

267 **(a)**
Auxins is a growth promoting plant hormone. It influences the growth of apical buds (apical dominancy) by inhibiting the growth of lateral buds. It is possible because the auxin is synthesized in the apical meristem from where it is translocated downwards causing inhibition of lateral buds.

268 **(a)**
Apical dominance is a condition in plants where the stem apex prevents the development of side shoots from lateral buds near the apex. The dominance is controlled by the presence of high concentration of plant hormone auxin at the apex, produced by the apical bud.

269 **(c)**
Permanent localised qualitative change in size, biochemistry, structure and function of cells or organs is called differentiation

270 **(d)**
Exponential phase or **log phase** is characterized by rapid growth in population, which continues till enough food is available.

271 **(c)**
Contact or touch stimulus that induced growth movements are called 'thigmotropism'. E.g., binding of tendril, twisting of twinner around a solid support, stem of *Ciscuta*, root of *Vanilla*.

272 **(b)**
In most of the higher plants, the growing apical bud inhibits the growth of the lateral (axillary) buds. This phenomenon is called apical dominance. This phenomenon takes place due to the synthesis of auxins by apical buds

273 **(a)**
Heterophylly can be observed in cotton, coriander, and larkspur

274 **(d)**
Gibberellins causes fruit like apple to elongate and improve its shape. They also delay senescence

275 **(a)**
SDP are also called long night plant. Even a flash of light during their critical dark period can cause non-flowering of plants. Hence in the question, the plant category is SDP (Short Day Plant)

276 **(b)**
In the exponential growth, there is geometric increase of organism (cell, mass, etc.) because both the cell follows the mitosis. This type of growth can be seen in microorganism and embryo stage of animals and plants

277 **(c)**
Ethylene promotes root growth and root hair formation. Thus, they help the plants to increase its absorption surface by increasing the surface area

278 **(a)**

Absolute growth rate.

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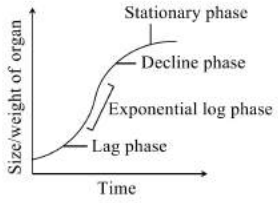

279 **(d)**

Gibberellins are growth hormones having gibbane ring structure, which causes cell elongation of intact plants. Thus, gibberellin promotes cell elongation in root, shoot and leaves of a plant.

280 **(a)**

Auxins (from greek *auxein* : to grow) were first isolated from human urine. The terms 'auxin' is applied to the indole-3-acetic and (IAA) and to other natural and synthetic compounds having certain growth regulating properties. They are generally produced by the growing apices of the stems and roots, from where they migrate to the regions of their action. Auxins, like IAA and Indole Butyric Acid (IBA) have been isolated from plants. NAA (naphthalene acetic acid) and 2, 4-D (2, 4-dichlorophenoxyacetic) are synthetic auxins. All these auxins have been used extensively in agriculture and horticultural practices

281 **(a)**

Auxin is the plant hormone used to prevent the sprouting of potato tubers under storage conditions.

282 **(a)**

In coconut, the endosperm is multicellular in the outer part and free nuclear in the centre (*i.e.,* liquid endosperm). The endosperm of coconut contains hormone **cytokinin**.

283 **(d)**

A – tip; B – bending

284 **(a)**

The rapid growth of internodes of rosette plants prior to flowering is called Bolting. It needs long days or cold nights. The exogenous application of gibberellin induces bolting.

285 **(d)**

Plant hormones or **phytohormones** can be defined as a chemical substance produced naturally in plants, which is translocated to another region for regulating (by inhibitory or enhancing effect) one or more physiological reactions when present in low concentration.

4. **Growth promoter** -Auxins, gibberellins and cytokinins

5. **Growth inhibitor** -Ethylene, ABA, etc.

286 **(c)**

Indole-3-Acetic Acid (IAA)is indole compound while gibberellic acid (GA) is terpene

287 **(d)**

I, II and III.

Functions of Auxin

(i) Auxin helps to initiate rooting in stem cuttings, an application widely used for plant propagation

(ii) Auxin promotes flowering, *e.g.*, in pineapples

(iii) It helps to prevent fruit and leaf drop at early stages

(iv) They promote the abscission of older mature leaves and fruits

(v) Apical dominance

(vi) Induce parthenocarpy in tomatoes

(vii) Controls xylem differentiation and helps in cell division

288 **(a)**

Xanthium is a short day plant.

289 **(b)**

Long day plant require light period of 14-16 hours for subsequent flowering. This distinctive feature of long day plant is the long light period entirely prevents flowering but long nights interrupted by light, even briefly, cause the infinitive effect of the night to be lost and the plants flower, e.g., *Hyocyamus niger* (henbane), *Spinacea* (spinach), *Beta vulgaris* (sugarbeet), wheat, oat, radish, lettuce.