15

Plant Growth and Development

TOPIC 1
Plant Growth and Plant Hormones

01 The plant hormone used to destroy weeds in a field is **[NEET 2021]**

(a) IAA (b) NAA
(c) 2,4-D (d) IBA

Ans. *(c)*

2, 4 D hormone is used as a herbicide to destroy weeds.

Auxins like IAA and IBA are used to induce parthenocarpy. IAA also stimulate nodule formation. Auxin like NAA is used to increase dwarf shoots.

02 Plants follow different pathways in response to environment or phases of life to form different kinds of structures. This ability is called **[NEET 2021]**

(a) elasticity
(b) flexibility
(c) plasticity
(d) maturity

Ans. *(c)*

Plant plasticity refers to the ability to modify itself by forming different kind of structures to adapt and cope with changes in its environment. It can be intrinsic plasticity or extrinsic plasticity. In both the cases plants shows heterophylly along with other morphological features, e.g. in the leaves Larkspur and buttercup.

03 Inhibitory substances in dormant seeds cannot be removed by subjecting seeds to **[NEET (Oct.) 2020]**

(a) gibberellic acid
(b) nitrate
(c) ascorbic acid
(d) chilling conditions

Ans. *(c)*

Presence of inhibitory substances in dormant seeds can be removed by subjecting seeds to

(i) growth hormones like gibberellic acid, cytokinins,
(ii) by stratification in which seeds requiring low temperature are first allowed to imbibe water and then exposed to low temperature.
(iii) low concentration application of nitrates because it promote seed germination.

Ascorbic acid is known to cause seed dormancy as it is a potent chemical inhibitor. Thus, option (c) is incorrect.

04 Match the following concerning the activity/ function and the phytohormone involved. **[NEET (Oct.) 2020]**

Column I		Column II
A. Fruit ripener	(i)	Abscisic acid
B. Herbicide	(ii)	GA_3
C. Bolting agent	(iii)	2, 4-D
D. Stress hormone	(iv)	Ethephone

Select the correct option.

	A	B	C	D
(a)	(ii),	(iii),	(iv),	(i)
(b)	(iii),	(iv),	(ii),	(i)
(c)	(iv),	(iii),	(ii),	(i)
(d)	(iv),	(ii),	(i),	(iii)

Ans. *(c)*

Options (c) is the correct match which is as follows

The function of different phytohormones include ethephon is a commercial derivative of ethylene and it is used to ripen fruits. 2, 4-D is a synthetic auxin and it is used as herbicide against dicotyledonous weeds. Gibberellic acid induces bolting in plants, i.e. the promotion of internodal elongation just prior to their reproductive phase.

Abscisic acid is a stress hormone as it the plants to overcome unfavourable conditions by inhibiting growth.

05 A species which was introduced for ornamentation but has become a trouble some weed in India **[NEET (Oct.) 2020]**

(a) *Parthenium hysterophorus*
(b) *Eichhornia crassipes*
(c) *Prosopis juliflora*
(d) *Trapa spinosa*

Ans. *(b)*

Eichhornia crassipes, (water hyacinth) was introduced in several tropical countries including India for ornamentation but later this exotic species became a trouble-some aquatic weed.

This free floating weed clogged rivers and lakes and threatened the survival of many native species to the point of extinction. This species was called 'Terror of Bengal' in India.

06 Which of the following is not an inhibitory substance governing seed dormancy? **[NEET (Sep.) 2020]**

(a) Abscisic acid
(b) Phenolic acid
(c) *Para*-ascorbic acid
(d) Gibberellic acid

Ans. ***(d)***

Gibberellic acid is not an inhibitory substance governing seed dormancy because gibberellic acid promotes growth and elongation of cells. It affects decomposition of plants and helps plants grow if used in small amounts, but eventually plants develop tolerance to it. Action of ABA is counteracted by GA, which promotes seed germination at appropriate time. Abscisic acid, phenolic acid and para-ascorbic acid are inhibitory substances that causes seed dormancy as they occur in the seed coats and cotyledons of the embryos, e.g., apple, peach, ash, *Cucurbita*, iris, *Xanthium*.

07 The process of growth is maximum during **[NEET (Sep.) 2020]**

(a) lag phase (b) senescence
(c) dormancy (d) log phase

Ans. ***(d)***

The process of growth is maximum during log phase (exponential phase) because during log phase the growth rate of the cells gradually increases, at a maximum rate. In exponential growth, the initial growth is slow (lag phase) and thereafter it increases rapidly.

08 Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop. **[NEET (Sep.) 2020]**

(a) Gibberellin (b) Ethylene
(c) Abscisic acid (d) Cytokinin

Ans. ***(a)***

The correct option is (a) because spraying on sugarcane crop with gibberellins increases the length of the stem, thus increasing the yield by as much as 20 tonnes per acre.

09 Removal of shoot tips is very useful technique to boost the production of tea leaves. This is because **[NEET (Odisha) 2019]**

(a) gibberellins prevent bolting and are inactivated
(b) auxins prevent leaf drop at early stages
(c) effect of auxins is removed and growth of lateral buds is enhanced
(d) gibberellins delay senescence of leaves

Ans. ***(c)***

Removal of shoot tips is a very useful technique to boost the production of tea leaves. This is because effect of auxin is removed and growth of lateral bud is enhanced. This phenomenon in most higher plants in which growing apical buds (shoot tips) inhibit growth of lateral buds due to effects of auxin is called apical dominance.

10 In order to increase the yield of sugarcane crop, which of the following plant growth regulators should be sprayed? **[NEET (Odisha) 2019]**

(a) Ethylene (b) Auxins
(c) Gibberellins (d) Cytokinins

Ans. ***(c)***

In order to increase the yield of sugarcane crop, gibberellins should be sprayed.Sugarcane stores carbohydrates as sugar in their stems. Spraying sugarcane crop with gibberellins increases the length of the stem, thus increasing the yield by as much as 20 tonnes per acre.

11 It takes very long time for pineapple plants to produce flowers. Which combination of hormones can be applied to artificially induce flowering in pineapple plants throughout the year to increase yield? **[NEET (National) 2019]**

(a) Gibberellin and Cytokinin
(b) Gibberellin and Abscisic acid
(c) Cytokinin and Abscisic acid
(d) Auxin and Ethylene

Ans. ***(d)***

Auxin and ethylene can be applied to artificially induce flowering in pineapple plants throughout the year to increase yield.

Auxin induces flowering in pineapple and ethylene helps to synchronise flower and fruit growth in this plant. Though in other cases, ethylene causes fading of flowers.

12 Fruit and leaf drop at early stages can be prevented by the application of **[NEET 2017]**

(a) cytokinins (b) ethylene
(c) auxins (d) gibberellic acid

Ans. ***(c)***

Auxin delay abscission of leaves and fruits at early stages. Whenever leaf or fruit fall occurs, the organ concerned stops producing auxin. However, it promotes abscission of older, mature leaves and fruits.

13 The *Avena* curvature is used for bioassay of **[NEET 2016, Phase I]**

(a) GA_3 (b) IAA
(c) Ethylene (d) ABA

Ans. ***(b)***

Bioassay is a quantitative and qualitative test used to determine the nature and function of a biochemical by using living material, e.g. *Avena* curvature test is used as bioassay usually for auxins (Indole Acetic Acid).

14 You are given a tissue with its potential for differentiation in an artificial culture. Which of the following pairs of hormones would you add to the medium to secure shoots as well as roots? **[NEET 2016, Phase II]**

(a) IAA and gibberellin
(b) Auxin and cytokinin
(c) Auxin and abscisic acid
(d) Gibberellin and abscisic acid

Ans. ***(b)***

When a tissue with a potential of differentiation is grown in an artificial medium containing auxin and cytokinin in a specific ratio, it starts differentiating.

Thus, root and shoot differentiation occurs. Auxin initiate root formation while cytokinin starts shoot formation.

15 Auxin can be bioassayed by **[CBSE AIPMT 2015]**

(a) Avena coleoptile curvature
(b) hydroponics
(c) potometer
(d) lettuce hypocotyl elongation

Ans. *(a)*

Auxin is a phytohormone that is often bioassayed by *Avena* coleoptile curvature test. The angle of curvature of a decapitated oat coleoptile is measured after placing an agar block containing auxin on one side. The ability of auxin to stimulate shoot growth is then measured.

16 Dr. F Went noted that if coleoptile tips were removed and placed on agar for one hour, the agar would produce a bending when placed on one side of freshly cut coleoptile stumps. Of what significance is this experiment? **[CBSE AIPMT 2014]**

(a) It made possible the isolation and exact identification of auxin
(b) It is the basis for quantitative determination of small amounts of growth-promoting substances
(c) It supports the hypothesis that IAA is auxin
(d) It demonstrated polar movement of auxins

Ans. *(b)*

Dr. F Went isolated auxin from *Avena* coleoptile tip. His experiment demonstrated the polar movement of auxins, i.e. it showed that the plants grow towards light in response to a signal generated in the tip of coleoptile by a plant hormone auxin.

17 Senescence as an active developmental cellular process in the growth and functioning of a flowering plant, is indicated in **[CBSE AIPMT 2008]**

(a) vessels and tracheid differentiation
(b) leaf abscission
(c) annual plants
(d) floral parts

Ans. *(b)*

Abscission is natural shedding of leaves, foliage branches, fruits, floral parts, etc. According to **Leopold** (1967) abscission is a senescence phenomenon. Senescence is known as 'the sum of deteriorative processes which naturally terminate the functional life of an organism.

Senescence is not confined only to whole plant, it may be limited to a particular plant organ such as leaf and flower or cells such as phloem and xylem.

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

Whole plant senescence also known as all senescence occurs in annuals, (e.g., rice, wheat, gram, mustard), biennials (e.g. henbane) or perennials.

18 Some of the growth regulators affect stomatal opening. Closure of stomata is brought about by **[CBSE AIPMT 1994]**

(a) indole butyric acid
(b) abscisic acid
(c) kinetin
(d) gibberellic acid

Ans. *(b)*

Abscisic acid promotes reversal of $H^+ \rightleftharpoons K^+$ pump and increasing availability of H^+ inside the guard cell cytoplasm. Loss of K^+ decreases osmotic concentration of guard cells as compared to adjacent epidermal cells. Due to the exosmosis the turgidity of guard cells decreases and it closes the pore of stoma.

19 Which one of the following growth regulators is known as 'stress hormone"? **[CBSE AIPMT 2014, 1993]**

(a) abscsic acid
(b) Ethylene
(c) GA_3
(d) Indole acetic acid

Ans. *(a)*

Abscisic Acid (ABA) is also known as 'stress hormone' or dormin because it is produced in much higher amounts, when plants are subjected to various kinds of stresses.

It often gives plant organs a signal that they are undergoing physiological stresses such as lack of water, saline soil, cold temperature and frost. ABA often cause responses that help plants and protect against these stresses.

20 During seed germination its stored food is mobilised by **[NEET 2013]**

(a) ethylene
(b) cytokinin
(c) ABA
(d) gibberellin

Ans. *(d)*

Gibberellin induces aleurone cells to secrete enzyme that break stored food in seed.

Cytokinines promote nutrient mobilisation which helps in the delay of leaf senescence. ABA plays an important role in seed development, maturation and dormancy. Ethylene induces fruit ripening, breaks seed dormancy.

21 Phototropic curvature is the result of uneven distribution of **[CBSE AIPMT 2010]**

(a) gibberellin (b) phytochrome
(c) cytokinins (d) auxin

Ans. *(d)*

Darwin and his son **Francis** used germinating oat (*Avena sativa*) and canary grass (*Phalaris canariensis*) seedling in their experiments and hypothesised that when shoots were illuminated from one side, they bent forward the light in response to an 'influence', that was transmitted downward from its source at the tip of the shoot. Paal concluded that the tip secretes a substance which promotes the growth of part below it.

In 1926, F Went discovered that some unidentified compound probably caused curvature of oat coleoptile towards light, i.e., phototropism. The compound (auxin) found by Went is relatively abundant in coleoptile tips.

22 Coiling of graden pea tendrils around any support is an example of **[CBSE AIPMT 2010, 1995, 91]**

(a) thigmotaxis (b) thigmonasty
(c) thigmotropism (d) thermotaxis

Ans. *(c)*

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

23 One of the synthetic auxin is **[CBSE AIPMT 2009]**

(a) NAA (b) IAA (c) GA (d) IBA

Ans. *(a)*

NAA (Naphthalene Acetic Acid) and 2,4-D (2,4-dichlorophenoxy acetic acid) are synthetic auxins.

The term auxin is applied to the indole-3-acetic acid (IAA) and to other natural and synthetic compounds having certain growth regulating properties.

IAA and IBA (Indole Butyric Acid) have been isolated from plants. All these auxins have been used extensively in agricultural and horticultural practices.

24 Which one of the following acids is a derivative of carotenoids? **[CBSE AIPMT 2009]**

(a) Indole-butyric acid
(b) Indole-3-acetic acid
(c) Gibberellic acid
(d) Abscisic acid

Ans. ***(d)***

Abscisic acid is a terpenoid, which is a derivative of steroid (carotenoid).

Indole butyric acid and indole-3-acetic acid are auxins which are weak organic acids. Gibberellic acid (gibberellin) is a terpene.

25 Opening of floral buds into flowers, is a type of **[CBSE AIPMT 2007]**

(a) autonomic movement of locomotion
(b) autonomic movement of variation
(c) paratonic movement of growth
(d) autonomic movement of growth

Ans. ***(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 structure of the responsive organ and not to the direction of stimulus. Greater growth on one side causes the organ to bend to the opposite side.

26 'Foolish seedling' disease of rice led to the discovery of **[CBSE AIPMT 2007]**

(a) GA (b) ABA
(c) 2, 4 D (d) IAA

Ans. ***(a)***

Gibberellins (GA) were first observed from the fungus *Gibberella fujikuroi*, the causal organism of foolish seedling disease of rice plants in Japan by Kurasawa in 1926.

27 Which one of the following pairs, is not correctly matched ? **[CBSE AIPMT 2007]**

(a) Abscisic acid — Stomatal closure
(b) Gibberellic acid — Leaf fall
(c) Cytokinin — Cell division
(d) IAA — Cell wall elongation

Ans. ***(b)***

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

28 How does pruning help in making the hedge dense? **[CBSE AIPMT 2006]**

(a) It frees axillary buds from apical dominance
(b) The apical shoot grows faster after pruning
(c) It releases wound hormones
(d) It induces the differentiation of new shoots from the rootstock

Ans. ***(a)***

Pruning helps 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 pruning, the axillary buds grow and the hedge becomes dense.

29 An enzyme that can stimulate germination of barley seeds is **[CBSE AIPMT 2006]**

(a) lipase (b) protease
(c) invertase (d) α-amylase

Ans. ***(d)***

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

30 Treatment of seed at low temperature under moist conditions to break its dormancy is called **[CBSE AIPMT 2006]**

(a) vernalisation (b) chelation
(c) stratification (d) scarification

Ans. ***(c)***

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

Scarification involves any damage or breakage of seed coat by physical methods, (e.g. use of scalpel, wooden hammer, etc.) or chemical methods (use of mild acids) to break seed dormancy.

Vernalisation and Chelation are the chill treatment of plant in its early stages of life history to stimulate or induce early flowering.

31 Cell elongation in internodal regions of the green plants takes place due to **[CBSE AIPMT 2004]**

(a) indole acetic acid
(b) cytokinins
(c) gibberellins
(d) ethylene

Ans. ***(c)***

Gibberellin (GA_3) promotes internodal elongation in a wide range of species. This internodal elongation phenomenon is known as bolting.

Gibberellin is a plant growth hormone which was first time obtained from a fungus *Gibberella fujikuroi (Fusarium moniliformi).*

32 Differentiation of shoot is controlled by **[CBSE AIPMT 2003]**

(a) high gibberellin—cytokinin ratio
(b) high auxin—cytokinin ratio
(c) high cytokinin—auxin ratio
(d) high gibberellin—auxin ratio

Ans. ***(c)***

Ratio of cytokinins to auxins controls differentiation. If both of these are present in equal quantities, the cells divide but fail to differentiate. If there is more cytokinin than auxin, shoot buds develop. If there is more auxin than cytokinin, roots develop.

33 Plants deficient of element zinc, show its effect on the biosynthesis of plant growth hormone **[CBSE AIPMT 2003]**

(a) abscisic acid
(b) auxin
(c) cytokinin
(d) ethylene

Ans. ***(b)***

Deficiency of zinc effects biosynthesis of auxin. It is characterised by a reduction in internodal growth due to which plant develops in rosette habit. The leaves may also be small and distorted. These results are due to loss of capacity to produce Indole Acetic Acid (IAA).

34 Hormone responsible for senescence is **[CBSE AIPMT 2001]**

(a) ABA
(b) auxin
(c) GA
(d) cytokinin

Ans. *(a)*

Senescence is an active genetically controlled developmental process in which cellular structure and macromolecules are broken down and translocated away from the senescing organ (typical leaves) to actively growing region that serve as nutrient sinks. Senescence is initiated by environmental cues and is regulated by the hormones, e.g. ABA (Abscisic Acid).

Higher amount of ABA stops protein and RNA synthesis thus accelerating the senescence.

35 Which of the following prevents fall of fruits? **[CBSE AIPMT 2001]**

(a) GA_3 (b) NAA
(c) Ethylene (d) Zeatin

Ans. *(b)*

NAA (Naphthalene Acetic Acid) is a synthetic auxin hormone which is useful for preventing pre-harvest fruit drop of tomatoes.

36 Which breaks bud dormancy of potato tuber? **[CBSE AIPMT 2001]**

(a) Gibberellin (b) IAA
(c) ABA (d) Zeatin

Ans. *(a)*

Gibberellins overcome the natural dormancy of buds, seeds, tubers, etc. In this way, these are antagonistic to ABA.

IAA (Indole Acetic Acid) is the principal naturally occurring auxin, found in all plants including fungi. It helps in eradication of weeds, root initiation and production of parthenocarpic fruits.

ABA (Abscisic Acid) is the natural growth inhibitor. Zeatin is a naturally occurring cytokinin that stimulates mature plant cells to divide when added to a culture medium along with an auxin.

37 What reason will you assign for coconut milk used in tissue culture? **[CBSE AIPMT 2000, 03]**

(a) Gibberellins (b) Cytokinins
(c) Auxins (d) Ethylene

Ans. *(b)*

Skoog (1954-1956) observed that coconut milk contained a substance which stimulated cell division. The substance was later on called cytokinin.

The most widely occurring cytokinin in plants is isopentanyladenine (IPA). IPA has been isolated from *Pseudomonas tumefaciens*.

38 The closing and opening of the leaves of *Mimosa pudica* is due to **[CBSE AIPMT 1999]**

(a) thermonastic movement
(b) hydrotropic movement
(c) seismonastic movement
(d) chemonastic movement

Ans. *(c)*

Seismonastic movements are nastic movements of turgor in response to stimulus of shock (like touch/mechanical/electrical/thermal/chemical shock). On touching *Mimosa pudica*, its leaves droop down and the stimulus travels at the speed of 1 cm/sec.

39 Which combination of gases is suitable for fruit ripening? **[CBSE AIPMT 1998]**

(a) 80% CO_2 and 20% CH_2
(b) 80% CH_4 and 20% CO_2
(c) 80% CO_2 and 20% O_2
(d) 80% C_2H_4 and 20% CO_2

Ans. *(d)*

Ethylene is a gaseous hormone which promotes ripening of fruits. Methionine amino acid is precursor molecule for ethylene synthesis. Ethylene synthesis takes place in all parts of a plant such as roots, stems, leaves, fruits, seeds, etc.

40 A plant hormone used for inducing morphogenesis in plant tissue culture is **[CBSE AIPMT 1998]**

(a) gibberellins (b) cytokinins
(c) ethylene (d) abscisic acid

Ans. *(b)*

Ratio of cytokinin to auxin controls cell differentiation. If there is more cytokinin than auxin, shoot buds develop. Relatively more auxin than cytokinins leads to the development of roots. Abscisic Acid (ABA) is known as natural plant growth inhibitor. Gibberellin stimulates stem elongation, leaf expansion, bolting, flowering, etc. Ethylene is a fruit ripening hormone.

41 Gibberellins induce **[CBSE AIPMT 1997]**

(a) flowering
(b) production of hydrolysing enzymes in germinating seeds
(c) cell division
(d) hasten leaf senescence

Ans. *(b)*

During seed germination especially of cereals gibberellins stimulate the production of hydrolytic enzymes like amylases, lipases, ribonucleases. These enzyme solubilise the reserve food of the seed.

42 Ethylene gas is used for **[CBSE AIPMT 1995]**

(a) growth of plants
(b) delaying fruit's abscission
(c) ripening of fruits
(d) stopping the leaf abscission

Ans. *(c)*

Climacteric fruits are fleshy fruits which show a sudden sharp rise of respiration rate at the time of ripening. Ethylene is used to induce artificial ripening of these fruits, e.g. apple, mango, banana.

43 Movement of auxin is **[CBSE AIPMT 1994]**

(a) centripetal (b) basipetal
(c) acropetal (d) Both (b) and (c)

Ans. *(d)*

Went (1928) reported that auxin is transported basipetally, i.e., it moves from apical to basal end. However, McCready and Jacobs (1963) working on petiole segments of *Phaseolus vulgaris* observed acropetal movement of auxin but such type of movement occurs very little and directly dependent with the presence of oxygen.

Thus, recent studies have indicated that the polar movement of auxin is an active transport.

44 Removal of apical bud results in **[CBSE AIPMT 1993, 2000]**

(a) formation of new apical bud
(b) elongation of main stem
(c) death of plant
(d) formation of lateral branching

Ans. *(d)*

Apical dominance is the phenomenon in which the presence of apical bud does not allow the nearby lateral buds to grow. When the apical bud is removed the lateral buds sprout.

45 Klinostat is employed in the study of **[CBSE AIPMT 1993]**

(a) osmosis
(b) growth movements
(c) photosynthesis
(d) respiration

Ans. *(b)*

Clinostat/klinostat is an instrument which can nullify the effect of gravity and allow a plant to grow horizontally by slowly rotating it.

Rotating clinostat do not show any bending because the gravitation stimulus in this case is not unilateral as it affects all the sides of the rotating organs equally, whereas plant kept in unrotated/fixed clinostat bends downwards showing positive geotropism.

46 Cytokinins **[CBSE AIPMT 1992]**

(a) promote abscission
(b) influence water movement
(c) help retain chlorophyll
(d) inhibit protoplasmic streaming

Ans. *(c)*

Cytokinin retards the process of chlorophyll degradation. Leaf discs are taken in two lots. In one lot cytokinin is provided. After 48–72 hrs the leaf discs are compared for chlorophyll content. The leaf disc of cytokinin containing lot has high chlorophyll content.

47 Which is employed for artificial ripening of banana fruits? **[CBSE AIPMT 1992]**

(a) Auxin
(b) Cumarin
(c) Ethylene
(d) Cytokinin

Ans. *(c)*

Ethylene is a gaseous hormone that induces ripening and maturity of fruits. When applied as foliar spray ethylene accelerates maturity and induces uniform ripening in banana, pineapple, fig, etc. It also induces fruiting in ornamental plants and causes preharvest defoliation in nursery stock.

48 Bananas can be prevented from over-ripening by **[CBSE AIPMT 1992]**

(a) maintaining them at room temperature
(b) refrigeration
(c) dipping in ascorbic acid solution
(d) storing in a freezer

Ans. *(c)*

Ascorbic acid (vitamin-C) prevents over ripening of banana and other fruits because it is an antioxidant.

49 Dwarfness can be controlled by treating the plant with **[CBSE AIPMT 1992, 2002]**

(a) cytokinin (b) gibberellic acid
(c) auxin (d) antigibberellin

Ans. *(b)*

The most important effect of GA is the stem elongation, in which GA induces internodal elongation or sub-apical elongation.

It has been confirmed on several plants such as pea, bean, tomato, cabbage, etc. where a significant elongation of internodes is reported. Genetically dwarf plants like pea and maize show normal size in the presence of gibberellins.

50 A chemical believed to be involved in flowering is **[CBSE AIPMT 1991, 95]**

(a) gibberellin (b) kinetin
(c) florigen (d) IBA

Ans. *(c)*

Chailakhyan (1936) proposed that photoperiodic induction produces a chemical complex 'florigen' for flowering. It is synthesised in the older leaves and then transferred to the growing region where it initiates the floral bud initiation. However, florigen has not been extracted, nor identified till now.

51 Abscisic acid causes **[CBSE AIPMT 1991]**

(a) stomatal closure
(b) stem elongation
(c) leaf expansion
(d) root elongation

Ans. *(a)*

Application of minute quantity of abscisic acid to leaves shall reduce transpiration to a great extent through partial closure of stomata.

52 The hormone responsible for apical dominance is **[CBSE AIPMT 1991, 92]**

(a) IAA (b) GA
(c) ABA (d) florigen

Ans. *(a)*

Apical dominance is the phenomenon in which the presence of apical bud does not allow the nearby lateral buds to grow. This is characteristically caused by high auxin concentration.

53 Which of the following movement is not related to auxin level? **[CBSE AIPMT 1990]**

(a) Bending of shoot towards light
(b) Movement of root towards soil
(c) Nyctinastic leaf movements
(d) Movement of sunflower head tracking the sun

Ans. *(c)*

Phototropic movements, e.g. bending of shoot toward light, movement of sunflower head tracking the sun, etc. and geotropic movement, e.g. movement of root towards soil are mediated through differential distribution of IAA.

Nyctinastic leaf movements are affected by diurnal variation of light intensity and temperature, such as elliptical up and down movement of the two lateral leaflet.

54 Phototropic and geotropic movements are linked to **[CBSE AIPMT 1990]**

(a) gibberellins (b) enzymes
(c) auxins (d) cytokinins

Ans. *(c)*

Differential distribution of indole 3-acetic acid produces tropical plant responses like phototropism and geotropism. Phototropism is directional growth movement of curvature induced by direction of light while geotropism is directional movement of curvature caused by the unilateral application of force of gravity.

55 Phytohormones are **[CBSE AIPMT 1990]**

(a) chemicals regulating flowering
(b) chemicals regulating secondary growth
(c) hormones regulating growth from seed to adulthood
(d) regulators synthesised by plants and influencing physiological processes

Ans. *(d)*

Phytohormones (Thimann; 1948) are the plant hormones, i.e. the organic substances which are naturally produced in plants, control the growth or other physiological functions at a site away from their place of synthesis and active in extremely minute quantities.

56 Highest auxin concentration occurs

[CBSE AIPMT 1990]

(a) in growing tips
(b) in leaves
(c) at base of plant organs
(d) in xylem and phloem

Ans. *(a)*

Boysen-Jensen (1913), Paal (1919) and Went (1928) reported that stem tip is the seat of growth regulating centre. Auxin shows polar transport from stem apex to base and from these to root apex.

57 Abscisic acid controls

[CBSE AIPMT 1990, 93, 99, 2000]

(a) cell division
(b) leaf fall and dormancy
(c) shoot elongation
(d) cell elongation and wall formation

Ans. *(b)*

Abscisic Acid (ABA) is called stress hormone or dormin. It is a growth retarding hormone which induces dormancy, promotes ageing and abscission of fruits, leaves and flowers. It also causes closure of stomata and overcome the conditions of stress.

58 Mowing grass lawn facilitates better maintenance because

[CBSE AIPMT 1989]

(a) wounding stimulates regeneration
(b) removal of apical dominance and stimulation of intercalary meristem
(c) removal of apical dominance
(d) removal of apical dominance and promotion of lateral meristem

Ans. *(d)*

Apical dominance of terminal bud is due to the secretion of auxin (IAA) by it. According to Thimann and Skoog (1933) removal of apical bud causes sprouting of lateral buds with stimulation of intercalary meristem and this is the reason that mowing grass lawn facilitates better maintenance.

59 Leaf fall can be prevented with the help of **[CBSE AIPMT 1989]**

(a) abscisic acid
(b) auxins
(c) florigen
(d) cytokinins

Ans. *(d)*

Cytokinin retards senescence and ageing of leaves by preventing disappearance of chlorophyll and degradation of proteins that occur with the ageing process of leaves.

60 Which of the following hormones can replace vernalisation?

[CBSE AIPMT 1989]

(a) Auxin (b) Cytokinin
(c) Gibberellins (d) Ethylene

Ans. *(c)*

Vernalisation refers to the application of low temperature to moistened seeds and young plants, causing shortening of vegetative phase and initiation of reproductive phase.

Chailakhyan (1968) reported that under long-day conditions vernalin hormone turn into gibberellin and thus, in some plants, the requirement for vernalisation is overcome by gibberellins.

61 Leaves of many grasses are capable of folding and unfolding because they **[CBSE AIPMT 1989]**

(a) are very thin
(b) are isobilateral
(c) have specialised bulliform cells
(d) have parallel vascular bundles

Ans. *(c)*

Leaves of monocots are characterised as isobilateral (equally green on both the surfaces), amphistomatic (stomata on both surface), dumb bell-shaped guard cells.

The upper epidermis possesses groups of larger sized thin walled vacuolate cells called bulliform or motor cells. Bulliform cells help in rolling of leaves during water stress or drought.

62 Movement of leaves of sensitive plant, *Mimosa pudica* is due to

[CBSE AIPMT 1988]

(a) thermonasty (b) seismonasty
(c) hydrotropism (d) chemonasty

Ans. *(b)*

In seismonastic movement, response is made to mechanical shocks such as blows, shaking or pressure. In *Mimosa*, turgor changes occur in thin walled cells of pulvinus (lower side) and pulvinnules (upper side), causing folding of pinnules, drooping of compound leaves.

63 Out or excised leaves remain green for long if induced to root or dipped in **[CBSE AIPMT 1988]**

(a) gibberellins (b) cytokinins
(c) auxins (d) ethylene

Ans. *(b)*

In Richmond-Lang effect, cytokinin delays senescence of leaves. As cytokinin treated detached leaves remain green after a period of twenty days whereas controlled leaves were completely yellow and drying at tips and margins.

It was concluded that cytokinin was able to postpone for a number of days the disappearance of chlorophyll and degradation of proteins that normally occur with the ageing process of leaves.

64 Hormone primarily connected with cell division is

[CBSE AIPMT 1988, 91]

(a) IAA
(b) NAA
(c) cytokinin/zeatin
(d) gibberellic acid

Ans. *(c)*

Cell division is by far the most characteristic property associated with cytokinins, though cytokinin never acts alone, as in combination with auxins, cytokinins stimulate cell division even in non-meristematic tissues.

TOPIC 2
Photoperiodism, Vernalisation and Senescence

65 The site of perception of light in plants during photoperiodism is

[NEET 2021]

(a) shoot apex (b) stem
(c) axillary bud (d) leaf

Ans. *(d)*

The response of plants to periods of day/night is termed as photoperiodism. The site of perception of photoperiod is leaf. The hormone florigen is responsible for inducing flowering as it migrates from leaves to shoot apices on induction of required photoperiods.

66 What is the site of perception of photoperiod necessary for induction of flowering in plants? **[NEET (National) 2019]**

(a) Pulvinus (b) Shoot apex
(c) Leaves (d) Lateral buds

Ans. ***(c)***

For the induction of flowering in plants, photoperiod stimulus is percieved by the leaves of plants. As a result, floral hormones are produced in the leaves which are then translocated to the apical part and subsequently cause the initiation of floral primordial growth.

67 Phytochrome is a **[NEET 2016, Phase II]**

(a) flavoprotein
(b) glycoprotein
(c) lipoprotein
(d) chromoprotein

Ans. ***(d)***

Phytochrome is a chromoprotein which exist in two forms, P_r and P_{fr}. These are inter-convertible. When plants get red right this protein gets converted into P_{fr} form P_r and *vice versa*. It controls the photoperiodism in the plants.

68 A few normal seedlings of tomato were kept in a dark room. After a few days they were found to have become white-coloured like albinos. Which of the following terms will you use to describe them? **[CBSE AIPMT 2014]**

(a) Mutated
(b) Embolised
(c) Etiolated
(d) Defoliated

Ans. ***(c)***

Etiolation is a process in which flowering plants are grown in partial or complete absence of light. Etiolation is mainly characterised by long and weak stem and smaller, sparse pale yellow colour of leaves due to the longer internodes. Thus due to this tomato seeding became white coloured.

69 Importance of day length in flowering of plants was first shown in **[CBSE AIPMT 2008]**

(a) *Lemna* (b) tobacco
(c) cotton (d) *Petunia*

Ans. ***(b)***

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 darkning.

On the basis of photoperiodic response to flowering plants have been divided into short day plants (tobacco), long day plant (e.g. wheat, hanbane), short long day plants. (e.g. *Campanula*), long short day plants (e.g. *Bryophyllum*) intermediate plants (e.g. wild kidney bean) and day neutral plants (e.g. cotton).

70 The wavelength of light absorbed by P_r form of phytochrome is **[CBSE AIPMT 2007]**

(a) 640 nm (b) 680 nm
(c) 720 nm (d) 620 nm

Ans. ***(b)***

When P_r absorbs red light (650-670 nm) it is converted into P_{fr} form and when P_{fr} absorbs far red light (730-735 nm) it is converted back into P_r form.

71 One set of a plant was grown at 12 hr day and 12 hr 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? **[CBSE AIPMT 2004]**

(a) Long-day
(b) Darkness neutral
(c) Day neutral (d) Short-day

Ans. ***(d)***

The condition shows that the plant require photo-period shorter than the critical day length. This plant needs uninterrupted dark period for flowering. Therefore, it is a short-day plant and these do not flower if the dark period is interrupted with flashes of light.

72 Which one is a long-day plant? **[CBSE AIPMT 2001]**

(a) Tobacco (b) *Glycine max*
(c) *Mirabilis jalapa* (d) Spinach

Ans. ***(d)***

Plants which require long-day photoperiod for flowering and a small dark period for vegetation are known as long-day plants, e.g. spinach.

73 Proteinaceous pigment which control activities concerned with light **[CBSE AIPMT 2001]**

(a) phytochrome (b) chlorophyll
(c) anthocyanin (d) carotenoids

Ans. ***(a)***

Phytochromes are the plant chromoproteins, containing protein pigment existing in two inter-convertible forms—P_r (absorbs red light- 660 nm) and P_{fr} (absorbs far red light-730 nm). It controls flowering, seed dormancy, etc.

74 The method that renders the seed coat permeable to water so that embryo expansion is not physically retarded, is **[CBSE AIPMT 2000]**

(a) vernalisation (b) stratification
(c) denudation (d) scarification

Ans. ***(d)***

In many plants, the seed coats are quite tough and provide mechanical resistance to the growth of the embryos. Scarification done by abrasion through machine, threshing, filing, etc this process is done to rupture or weaken the seed coat and promote germination.

75 The response of different organisms to environmental rhythms of light and darkness is called **[CBSE AIPMT 1998]**

(a) phototaxis (b) photoperiodism
(c) phototropism (d) vernalisation

Ans. ***(b)***

Photoperiodism is the term to denote a biological response to changes in the ratio of light and darkness in a 24 hrs cycle.

76 The pigment, that absorbs red and far-red light in plants, is **[CBSE AIPMT 1995, 2002]**

(a) xanthophyll (b) cytochrome
(c) phytochrome (d) carotene

Ans. ***(c)***

Phytochrome is a type of pigment which absorbs red or far-red light and its absorbing region is closely associated with protein. The phytochrome pigment is found to be present in two photoreversible forms P_r (P_{660}) and P_{fr} (P_{730}).

$$\underset{\text{(inactive)}}{P_r} \underset{\text{Far red}}{\overset{\text{Red light}}{\rightleftharpoons}} \underset{\text{(active)}}{P_{fr}}$$

77 What will be the effect on phytochrome in a plant subjected to continuous red light? **[CBSE AIPMT 1997]**

(a) Level of phytochrome decreases
(b) Phytochrome is destroyed
(c) Phytochrome synthesis increases
(d) Destruction and synthesis of phytochrome remain in equilibrium

Ans. *(b)*

Continuous exposure to red light causes (a) conversion of P_r-P_{fr} which is rapidly destroyed, (b) inhibition of synthesis of P_r. Thus, total amount of phytochrome is decreased.

78 If a tree, flowers thrice in a year (Oct., Jan. and July) in Northern India, it is said to be **[CBSE AIPMT 1997]**

(a) photosensitive but thermoinsensitive
(b) thermosensitive but photoinsensitive
(c) hoto and thermosensitive
(d) photo and thermoinsensitive

Ans. *(d)*

Since, flowering can take place during any part of the year, therefore, the plant is not sensitive to photoperiod and temperature.

79 In short-day plants, flowering is induced by **[CBSE AIPMT 1992]**

(a) photoperiod less than 12 hrs
(b) photoperiod below a critical length and uninterrupted long night
(c) long night
(d) short photoperiod and interrupted long night

Ans. *(b)*

In short-day plants, flowering is induced when the day length do not exceed a certain critical value, the day length required is less than a certain critical length. Short-day plants may be more correctly called long night plants as a certain minimum of uninterrupted dark period in 24 hrs is necessary for their flowering. Short-day plants will not flower if the dark period is less than a critical length.

80 Flowering dependent on cold treatment is **[CBSE AIPMT 1992]**

(a) cryotherapy
(b) cryogenics
(c) cryoscopy
(d) vernalisation

Ans. *(d)*

Vernalisation is a process of shortening of juvenile or vegetative phase and hastening flowering by a previous cold treatment.

81 Which one increases in the absence of light? **[CBSE AIPMT 1989]**

(a) Uptake of minerals
(b) Uptake of water
(c) Elongation of internodes
(d) Ascent of sap

Ans. *(c)*

In general intense light retards growth in plants. High light intensities induce dwarfening of the plant. Absence of light reduces the overall growth, photosynthesis, uptake of minerals and ascent of sap. However, the elongation of internodes is seen to occur in the absence of light.

82 Phytochrome is involved in **[CBSE AIPMT 1988]**

(a) phototropism
(b) photorespiration
(c) photoperiodism
(d) geotropism

Ans. *(c)*

Phytochrome is a chromoprotein (photosensitive pigment) that exists in two states, P_r (red) or P_{660} and P_{fr} (far red) or P_{730}.

Phytochrome is involved in photomorphogenetic responses, seed germination, bud dormancy, synthesis of gibberellin and ethylene and photoperiodism.