15

Plant Growth and Development

Multiple Choice Questions (MCQs)

Q. 1 Ethylene is used for

(a) retarding ripening of tomatoes
(b) hastening of ripening of fruits
(c) slowing down ripening of apples
(d) Both (b) and (c)

Ans. *(b)* **Ethylene** is a gaseous hormone and is produced by the ripened fruits and also help in ripening of other unripened fruits. Other mentioned functions are not of ethylene.

Q. 2 Coconut water contains

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

Thinking Process

Coconut is a drupe fruit. It has edible endospermic layer.

Ans. *(c)* Coconut milk is the liquid endosperm in unripened fruit and is rich in plant hormone cytokinin. The other hormones are absent in coconut milk.

Q. 3 The affect of apical dominance can be overcome by which of the following hormone?

(a) IAA (b) Ethylene (c) Gibberellin (d) Cytokinin

Thinking Process

Various plant growth hormones are involved in the growth and development of the plant.

Ans. *(d)* Cytokinin is antagonistic to the action of auxin and thus overcome the phenomenon of apical dominance.

Whereas, IAA, helps in apical dominance, ethylene in ripening of fruits and gibberellin in overcoming bud and seed dormancy.

Q. 4 Match the following.

Columm I		Columm II	
A.	IAA	1.	Herring sperm DNA
B.	ABA	2.	Bolting
C.	Ethylene	3.	Stomatal closure
D.	GA	4.	Weed-free lawns
E.	Cytokinins	5.	Ripening of fruits

Codes

	A	B	C	D	E
(a)	4	3	5	2	1
(b)	5	3	4	2	1
(c)	4	1	4	3	2
(d)	5	3	2	1	4

Ans. *(a)*

A. **IAA-Weed free lawn** 2-4 D and synthetic indole acetic acid kill the broad leaf weeds Thus, used as weedicides.

B. **ABA-Stomatal closure** ABA is a stress hormone. Under water stressed conditions, it shuts down stomata to reduce the rate of transpiration.

C. **Ethylene,** a gaseous hormone is responsible for ripening of fruits.

D. **GA** Gibberellic acid does the phenomenon of bolting, *i.e.,* when sprayed on the plant, it increases the internodal region of stem, thus making a plant extremely tall.

E. **Cytokinin** was isolated from herring sperm DNA, for the first time.

Other option are incorrect.

Q. 5 The term synergistic action of hormones refers to

(a) when two hormones act together but bring about opposite effects
(b) when two hormones act together and contribute to the same function
(c) when one hormone affects more than one function
(d) when many hormones bring about any one function

Thinking Process

Growth and development of a plant is a complex process involving different plant hormones.

Ans. *(b)* Synergistic effect means when two hormones work together, they increase the effect or functioning of each other so, there will be enhanced effect of both the hormones.

Other options (a), (c) and (d) are stating is correct statements.

Q. 6 Apples are generally wrapped in waxed paper to

(a) prevent sunlight for changing its colour
(b) prevent aerobic respiration by checking the entry of O_2
(c) prevent ethylene formation due to injury
(d) make the apples look attractive

Ans. *(b)* Apples have lenticels on their skin so, they respire. They are wrapped in wax paper after harvesting so as to prevent the respiration and over ripening of the apples.

Other option do not support the reason for wrapping apple into waxed paper.

Q. 7 Growth can be measured in various ways. Which of these can be used as parameters to measure growth?

(a) increase in cell number (b) increase in cell size
(c) increase in length and weight (d) All of these

Ans. *(d)* All the said statements are true for growth in a living organism.

Q. 8 Plasticity in plant growth means that

(a) plant roots are extensible
(b) plant development is dependent on the environment
(c) stems can extend
(d) None of the above

Thinking Process

Plants have tremendous ability to adapt to the environment for their survival.

Ans. *(b)* The plants have the ability to change its phenotype according to the changes in environment. So, the plant growth show plasticity (ability to change/adapt according to environment).

Q. 9 To increase sugar production in sugarcanes, they are sprayed with

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

Ans. *(c)* Gibberellin spray on sugarcane induces the growth in the internodal area of the sugarcane plant. Larger is the area larger will the sugar content, as sucrose is the main constituent in the of sap of sugarcane stem.

Q. 10 ABA acts as antagonistic to

(a) ethylene (b) cytokinin (c) gibberellic acid (d) IAA

Thinking Process

Sometimes some phytohormones act opposite to each other but this act could be beneficial for the plant.

Ans. *(c)* Gibberellic acid ABA is stress hormone as it induces seed dormancy in plants. Whereas, gibberellic acid breaks down seed dormancy and induces seed germination so, both act opposite to each other, the refer are antagonistic to each other.

Q. 11 Monocarpic plants are those which

(a) bear flowers with one ovary (b) flower once and die
(c) bear only one flower (d) All of these

Ans. *(b)* Monocarpic plants flower once and die. The plants like *Bamboo* flower only once during their life cycle. Thus, these plants are called monocarpic plants.

Q. 12 The photoperiod in plants is perceived at

(a) meristem (b) flower (c) floral buds (d) leaves

Thinking Process

A typical photoperiod exposer is the requirement of the plants for flowering however, for some plant it is not necessary.

Ans. *(d)* Fully developed leaves receive the stimulus of light photoperiodism is the effect of light and its duration on the growth and development especially flowering in plants.

Even a single leaf as its part is part is capable of inducing photoperidism but very young leaves are insensitive to light. Other parts meristem flower and floral buds denot perceive the stimulus.

Very Short Answer Type Questions

Q. 1 Fill in the places with appropriate word/words.

(a) A phase of growth which is maximum and fastest is ..... .

(b) Apical dominance as expressed in dicotyledonous plants is due to the presence of more ..... in the apical bud than in the lateral ones.

(c) In addition to auxin, a ..... must be supplied to culture medium to obtain a good callus in plant tissue culture.

(d) ..... of a vegetative plants are the sites of photoperiodic perception.

Ans. **(a)** A phase of growth which is maximum and fastest is **exponential phase.**

(b) Apical dominance as expressed in dicotyledonous plants is due to the presence of more **auxins** in the apical bud than in the lateral ones.

(c) In addition to auxin, a **cytokinin** must be supplied to culture medium to obtain a good callus in plant tissue culture.

(d) **Leaves** of vegetative plants are the sites of photoperiodic perception.

Q. 2 Plant Growth Substances (PGS) have innumerable practical applications. Name the PGS you should use to

(a) increase yield of sugarcane

(b) promote lateral shoot growth

(c) cause sprouting of potato tuber

(d) inhibit seed germination

Thinking Process

Pytohormones have their effect on various developmental and physiological functions of the plants.

Ans. **(a)** Gibberellic acid increases the yield of sugarcane.

(b) Cytokinin spray on plants promote lateral shoot growth.

(c) The effect of ethylene on potato causes its sprouting.

(d) ABA - Abscissic acid inhibit the seed germination.

Q. 3 A primary root grows from 5 cm to 19 cm in a week. Calculate the growth rate and relative growth rate over the period.

Ans. Growth is dependent on three factors - initial size (W_0), rate of growth (r) and time interval (+) for which the rate of growth is retained.

$$W_1 = w_0\, e^{rt}$$

Where,

W_1 = final size,

W_0 = Initial size,

r = growth rate,

t = time,

e = base of natural logarithim.

$$19 = 5 \times (2.7)^{r \times 7}$$

$$\frac{19}{5} = (2.7)^{r \times 7}$$

$$3.8 = (2.7)^{r \times 7}$$

$$\log 3.8 = r \times 7 \times \log(2.7)$$
$$0.5798 = r \times 7 \times 0.4314$$
$$\frac{0.5798}{7 \times 0.4314} = r = 0.1907$$

$$\text{Relative growth rate} = \frac{\text{Growth in given time period}}{\text{Measurement at start of time period}}$$
$$= \frac{19}{5} = 3.8\,\text{cm}$$

Thus absotule growth rate is 0.1907 while relative growth rate is 3.8cm.

Q. 4 Gibberellins were first discovered in Japan when rice plants were suffering from bakane (the foolish seedling disease) caused by a fungus *Gibberella fujikuroi*.

(a) Give two functions of this phytohormone.

(b) Which property of gibberellin caused foolish seedling disease in rice?

Ans. **(a)** The hormone, gibberellin

(i) Produce the phenomenon of bolting, *i.e.,* the growth of the internodal region of stem in rosette plants.

(ii) Induces seed germination and break bud and seed dormancy.

(b) The rice seedling/plant show excessive growth in their internodal region when get infected with fungus *Gibberella fujikuroi*. This fungus produces excessive amount of plant hormone GA which makes plants taller than the normal plant foolishly and many result into death of the plant.

Q. 5 Gibberellins promote the formation of ..... flowers on genetically ..... plants in *Cannabis* whereas ethylene promotes formation of ..... flowers on genetically ..... plants.

Ans. Besides some primary function, both gibberellins and ethylene have some special effect on some specific plants as

Gibberellin promotes the formation of male flower an genetically female plants while ethylene promotes formation as

Female flowers an genetically, male plants.

Q. 6 Classify the following plants into Long Day Plants (LDP), Short Day Plants (SDP) and Day Neutral Plants (DNP) *Xanthium*, henbane (*Hyoscyamus niger*), spinach, rice, strawberry, *Bryophyllum*, sunflower, tomato, maize.

Ans. **Long Day Plant** (LDP) Some plants require the exposure light for a longer period exceeding a well defined critical duration of light. Among the above given plant LDP are for flowering henbane, *Bryophyllum* and spinach.

Short Day Plants (SDP) Some plants flower when and these can blossom throughout the year. expos to light for a period less than well defined critical duration of light. *e.g.*, of SDP are. *e.g., Xanthium*, rice, strawberry.

Day Neutral Plants (DNP) The exposure to light does not affect the flowering in certain plants, *e.g.*, DNP, are sunflower, tomato, maize.

Q. 7 A farmer grows cucumber plants in his field. He wants to increase the number of female flowers in them. Which plant growth regulator can be applied to achieve this?

Thinking Process

Ethylene is a gaseous plant hormone. It is primarily responsible for ripening of fruits.

Ans. Ethylene is also responsible to play a major roll in determining the sex of monoecious flowers and is associated with the promotions of femaleness in plants thus the farmer must spray ethylene hormone on this cucumber crop to produce female flowers and to increase the yield (number of fruits produced).

Q. 8 Where are the following hormones synthesised in plants?

(a) IAA (b) Gibberellins

(c) Cytokinins

Ans. (a) **IAA** Indole acetic acid is the chemical name of auxin. It is synthesised at the growing apices of the plant, *e.g.,* shoot tip, leaf primordia and developing seeds.

(b) **Gibberellins** It plays an important role in seed germination of plants and is synthesised in the apical shoot buds, young leaves, root tips and developing seeds.

(c) **Cytokinins** This plays an important role in actively dividing cells and are synthesised mainly in roots, but syntheses also occurs in endosperm of seeds growing embryo and seeds etc.

Q. 9 In botanical gardens and tea gardens, gardeners trim the plants regularly so that they remain bushy. Does this practic have any scientific explanation?

Ans. The apical buds present in tea and other plants prevents the growth of lateral buds in them, by releasing auxin hormone. This phenomenon is called apical dominance, Trimming of tea garden and botanical garden removes the apical bud and allowing the lateral buds to grow laterally and give plants a dense bushy appearance.

The scientific explanation for this trimming method is that apical bud is removed thus results in the removal of auxin and phenomenon an of apical dominance is overcomed.

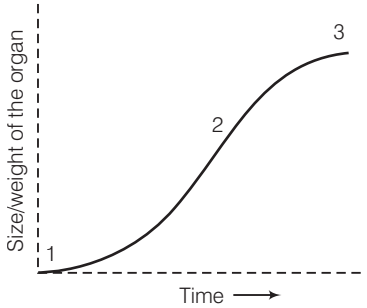
Q. 10 Light plays an important role in the life of all organisms. Name any three physiological processes in plants which are affected by light.

Ans. (i) **Photosynthesis** It is a totally light dependent process. Both quality and quantity affect the rate of the process resulting into total biomass accumulation by plants.

(ii) **Transpiration** It is loss of water by plant surface. Presence of light increases the temperature, thus affecting the rate of transpiration in plants.

(iii) **Flowering** The duration of light on plants effects the growth and development of plants, *e.g*., particularly flowering and this phenomenon is known as photo periodism. On the basis of photoperiodic response day flowering plants are categorised as long day, shert day and day neutral plants.

Q. 11 In the figure of sigmoid growth curve given below, label segments 1, 2 and 3.



Ans. 1. Lag phase-Growth is slow in this phase.
2. Exponential phase-shows rapid growth and maintains maximum growth for sometime.
3. Stationany phase-Growth diminishes and ultimately stops in this phase.

Q. 12 Growth is one of the characteristic of all living organism? Do unicellular organism also grow? If so, what are the parameters?

Ans. Growth is the main character which distinguish living organisms from non-living. All living organism grow in number and then accumulate biomass and grow in size as well.

The growth is exhibited by all living organisms in terms of increase in number of cells as well as increase in size and length of each cell.

In unicelluar organism, show growth and the growth is synchronous with reproduction. Unicellular organism when divide they produce offsprings (reproduction) *i.e*., each cell accumulate (synthesise) protoplasm and increase in size but up to a limit and divide to from two cells.

Q. 13 The rice seedlings infected with fungus *Gibberella fujikuroi* is called foolish seedlings? What was the reason behind it?

Ans. The fungus *Gibberella fuijkuroi* when infects rice plant, it causes increase in internodal area of rice so, that the rice plant become foolishly tall as compored to normal ones. This is because this fungi produces GA in considerably higher amounts which causes over growth of rice plants thus, causing foolish disease.

Short Answer Type Questions

Q. 1 *Nicotiana tobacum*, a short day plant, when exposed to more than critical period of light fails to flower. Explain.

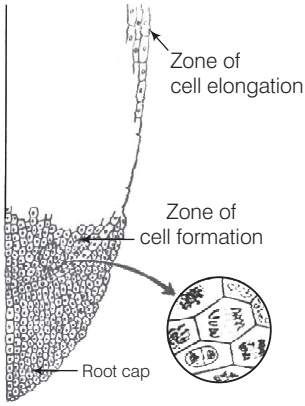
Ans. Short day plants are those plants that flower only when the photoperiod (exposure to duration of light) is below critical period. Tobacco, being a short day plant is unable to show flowering when exposed to light above than the critical period.

Q. 2 What are the structural characteristics of

(a) meristematic cells near root tip

(b) the cells in the elongation zone of the root

Ans. (a) **Meristematic cells near root tip** The cells of this region are called Root Apical Meristems (RAM) and are in active state of division, thus their number increases continuously. The cells of this region are thin walled with dense cytoplasm and large nucleus. They have the ability to divide and self perpetuate.



Root tip showing zone of cell formation

(b) **The Cells in the Elongation Zone of the Root** This region is situated just above the meristematic zone. In the cells of this zone, a large number of small vacuoles develop and later these vacuoles fuse to form one large central vacuole filled with cell sap. The cells are elongated in this region.

Q. 3 Does the growth pattern in plants differ from that in animals? Do all the parts of plant grow indefinitely? If not, name the regions of plant, which can grow indefinitely.

Ans. **Growth in plants** is of indeterminate type, *i.e.,* plant grow through out their life because of presence of meristematic tissues present in specific parts of plant *i.e*., apical intercalary and lateral. These tissue has ability to divide continuously and contribute to localised plant growth.

Growth in animals They have limited growth period after which further growth of their body stops.

All the parts of the plant do not grow indefinitely. The root apex and shoot apex having apical meristematic tissues keep growing, thus contributing to the elongation of plant axis-(height).

Q. 4 Explain in 2-3 lines each of the following terms with the help of examples taken from different plant tissues.

(a) Differentiation (b) De-differentiation

(c) Re-differentiation

Ans. (a) **Differentiation** is permanent in size, structure, composition and function of cells, tissue or organs. For example the meristematic tissues in plants gives rise to new cells which mature and get differentiated into special tissue or an organ of the plant, *e.g*., cells, distal to root apical meristem form root cap, cell of the periphery form epiblema, followed by cortex, endodermis, pericycle and vascular.

(b) **De-differentiation** is the process of despecialisation of differentiated cells so that they again become differentiated and able to divide. *e.g*., in dicot stem, the cortical cells get de-differentiated and become meristematic to form cambium (interfascicular cambium, and fascicular cambiums).

(c) **Re-differentiation** The cambium cells thus formed, again re-differentiate to form secondary cortex cells secondary xylem and phloem elements and phelloderm in case of secondary growth of woody dicot plants.

Q. 5 Auxins are growth hormones capable of promoting cell elongation. They have been used in horticulture to promote growth, flowering and rooting. Write a line to explain the meaning of the following terms related to auxins.

(a) Auxins precursors (b) Anti-auxins

(c) Synthetic auxins

Ans. Auxin is an important plant phytohormone required for the growth and development of every plant in its life cycle.

(a) **Auxin Precursors** are raw materials required to initials synthesis of auxins. IAA is synthesised from tryptophan, adenine compounds and derivatives of carotenoids.

(b) **Anti-Auxins** are compounds that inhibit action of auxins, *e.g*., p-chlorophenoxy isobutyric acid (PCIB), TIBA.

(c) **Synthetic Auxin** These are synthesised not by plants but artificially by man, *e.g.,* 2-4 D (weedicide), NAA, dicamba and IBA, (Indole Butyric Acid) which are natural as well as synthetic auxin.

Q. 6 The role of ethylene and abscissic acid is both positive and negative. Justify the statement.

Ans.

Hormone	Positive Effects	Negative Effects
Ethylene	✦ Promotes horizontal/transverse growth.	✦ Inhibits longitudinal growth.
	✦ Makes stem positively geotropic.	✦ Decreases sensitivity to gravity. *i.e.,* root become apogeotropic
	✦ Promotes apical dominance.	✦ Enhances senescence of leaves and flowers, fruits.
	✦ Breaks seed and bud dormancy.	✦ Prolongs dormancy of lateral buds.
	✦ Enhances fruits ripening and root initiation.	✦ Mediates formation of ABA under water stressed conditions.
Abscissic Acid	✦ ABA is used as anti transpirant, by reducesing water requirement and during irrigation (by partial closure of stomata).	✦ Promotes abscission of flower and fruits.
	✦ Also, induces flowering and root initiation in some plants.	✦ Stimulates senescence of leaves by stopping protein and RNA synthesis.
	✦ Used in prolonging dormancy of buds and seeds.	✦ Promotes bud and seed dormancy. Retards cambial activity by stopping mitosis in vascular strands and cambium.
	✦ Increases resistance of plants, to cold and other types of stresses thus also known as stress hormone.	✦ Act as antagonist to gibberellins and counteracts the effect of other growth hormones (IAA and cytokinin).
		✦ Inhibits seed germination and growth of embryos in them.

Q. 7 While experimentation, why do you think it is difficult to assign any affect seen to any single hormone?

Ans. **Phytohormones** are synthesised by plant cells, itself and individually. These are auxin, GA, ABA ethylene and cytokinin. There is not a separate system of their translocation in plants. So, their effects on plants are also inter mixed. *e.g.,* many effects of auxins GA shows the same function. Similarly, ethylene and ABA support each other for many roles in plants.

Secondly, effects of phytohormone *in vitro* and *in vivo* will also be different.

Q. 8 What is the mechanism underlying the phenomenon by which the terminal/apical bud suppresses the growth of lateral buds? Suggest measures to overcome this phenomenon.

Ans. The phenomenon by which apical bud suppress the growth of lateral buds is known as apical dominance. It is caused due to release of plant hormone auxin from apical duds.

It can be overcome either by the spray of cytokinin, that promotes the growth of lateral buds or by trimming of bushes which remove apical buds and allow lateral buds to grow.

Q. 9 In animals, there are special glands secreting hormones, whereas there are no glands in plants. Where are plant hormones formed? How are the hormones translocated to the site of activity?

Ans. The plant hormones are synthesised by the plant cells individually accordingly and when needed. Few hormones are specifically synthesised at a particular plant part, like auxin synthesised in growing shoot apices.

Ethylene is emitted by ripened fruits. Cytokinin is found in dividing cells. Unlike plants animal being more advanced, and organised they have proper hormone secreting glands and organs.

In both plant and animals these are transported through the transport system of their body. In plants, hormones are translocated via xylem and phloem to the site of activity.

Q. 10 Many discoveries in science have been accidental. This is true for plant hormones also. Can you justify this statement by giving an example? Also what term is used for such accidental findings?

Ans. Discovery of plant hormone gibberellins was made by chance. It happened by chance in rice fields. A few plants of rice were observed, which were unusually taller than the normal ones. Scientific investigation revealed, that these were infected with a fungus, known as *Gibberella fufikuroi*.

This fungus releases a plant hormone gibberellic acid in excess concentrations which made the plant to grow unusually tall. This compound was later known as gibberellin is hormones present in all plants.

The term used for accidental finding is Serendipity which means fortunate happenstance. It was coined by **Horace Walpole** in 1754. He explained it as making discoveries, by accident and sagacity, of things, which were hot in quest of.

Q. 11 To get a carpet-like grass lawns are mowed regularly. Is there any scientific explanation for this?

Thinking Process

Apical dominance is overcome when apex of the growing plant is removed. It causes lateral branches of the plant to grow faster giving the plants a bushy appearance.

Ans. Regular mowing (cutting at apex) of lawn grass removes the apical portion of the plant which causes the lateral branches to grow faster. As the apical buds inhibits growth of lateral buds by releasing auxin, the phenomenon called apical dominance.

Because of mowing of the grass, it becomes bushy and growth is faster. So, as to make evenness of the grass (carpet-like) in the lawn this practice is followed regularly to overcome the problem of apical dominance.

Q. 12 In a slide showing different types of cells can you identify which type of the cell may be meristematic and the one which is incapable of dividing and how?

Ans. *The meristematic cells can be identified of the basis of the following characteristics*

(i) Cell have thin cellulose wall and dense cytoplasm with large nucleus.
(ii) Plasmodesmal connections are more numerous among meristematic cells.
(iii) Cell division, *i.e.*, mitosis and its various stages are distinctly visible.
(iv) Chromosomes of cells replicate and divide into two homologous chromatids.

All these features contribute to open ended growth where structure is never complete in meristematic regions.

Whereas, cells incapable of divinding show features such as

(i) attains particular shape, size and thickening.

(ii) Undergoes structural and physiological differentiation.

(iii) Different types of cell are formed such as epidermis, cortex, vascular tissues.

Q. 13 A rubber band stretches and reverts back to its original position. Bubble gum stretches, but it would not return to its original position.
Is there any difference between the two processes? Discuss it with respect to plant growth (hint elasticity (reversible) plasticity (irreversible).

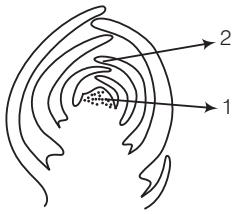
Ans.

Elasticity	Plasticity
The elasticity is stretchability of the plant cells or products, *e.g.,* rubber/latex etc. The elastic substances can revert back to its original form in relaxed state. *e.g.*, stretching of rubber.	Different pathways in response to environment or phases of life to form different kinds of structure is called plasticity. The plastic substances and phenomenon of plasticity are not reversible, *i.e.*, irreversible. *e.g.*, difference in shapes of leaves produced in air and those produced in water in buttercup. This is also known as heterophylly.

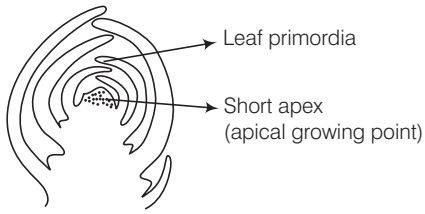
Q. 14 Label the diagram

A. This is which part of a dicotyledonous plants?

B. If we remove part 1 from the plant, what will happen?



Ans. *Representation the labelling of the given diagram is as follows*



A. The plant part in the given diagram is growing shoot apex.

B. Removal of shoot apex will help to overcome the apical dominance. Thus, the lateral buds grow faster, giving rise to branches and give the plant a bushy appearance.

Q. 15 Both animals and plants grow. Why do we say that growth and differentiation in plants is open and not so in animals? Does this statement hold true for sponges also?

Ans. *Growth and differentiation in plant and animals can be explained as follows*

Growth in Plants	Growth in Animals
Plant growth is indeterminate, *i.e.,* cells can divide and enlarge continuously for life time.	Animal growth is determinate *i.e.,* till finite period, they mature and stop growing externally.
Growth is open due to presence of meristematic cells which keep dividing, *i.e.,* growing and replacing new organs.	Cell division is distributed through-out the body of organism to replace old and damaged cells, rather localised at specific regions.
Structure in plants at tips or meristematic zones is never complete, owing to open ended tips or apices.	After a specific time period *i.e.,* embryonic, the growth rate is reduced in juvenile phase and ceases in maturity.
Plant growth is in a modular fashion, *i.e.,* grows longitudinally, laterally and in grith.	

Sponges are exception to this. They show open growth as every cell of their body can give rise to an individual and their growth and differentiation is continuous is their life cycle.

Q. 16 Define parthenocarpy. Name the plant hormone used to induce parthenocarpy.

Thinking Process

Seedless fruits are developed in some plants. Certain phytohormone induce development of fruit without fertilisation.

Ans. **Parthenocarpy** is the process where fruit develop without fertilisation and so, it does not contain seed. This can also be induced artificially by spraying auxin and gibberellins in certain plants like, grapes, papaya, etc.

Q. 17 While eating watermelons, all of us wish it was seedless. As a plant physiologist can you suggest any method by which this can be achieved.

Ans. The process of parthenocarpy produce the seedless fruits. This is a process in which fruits are developed without fertilisation, so, seeds are not formed in the fruit. Artificially parthenocarpy can be induced by spraying auxin and gibberellin to produce seedless watermelans.

Q. 18 A gardener finds some broad-leaved dicot weeds growing in his lawns. What can be done to get rid of the weeds efficiently?

Ans. The broad leaved dicot weeds can be killed and eliminated by the spray of weedicide 2-4 D, (a kind of plant phytohormone auxin). This will make the lawn free of weeds and will help the gardener, to make the lawn weed free.

Q. 19 On germination a seed first produces shoots with leaves, flowers appear later,

A. Why do you think this happens?

B. How is this advantageous to the plant?

Ans. A. As soon as seed germinates, the plant enters into vegetative growth period. This period takes light stimulus (a critical length of light exposed to different plant, *i.e.*, photoperiod) and synthesise the florigen (a flowering hormone) which induce flowering.

B. The vegetative growth period prepares the plant to bear reproductive structures like flower, fruits and seeds, and allows it to grow, mature and reproduce.

Q. 20 Fill in the blanks

A. Maximum growth is observed in .....phase.

B. Apical dominance is due to ..... .

C. ..... initiate rooting .

D. Pigment involved in photoperception in flowering plants in..... .

Ans. A. Exponential

B. Auxin

C. Cytokinin

D. Phytochrome.

Long Answer Type Questions

Q. 1 Some varieties of wheat are known as spring wheat while others are called winter wheat. Former variety is sown and planted in spring and is harvested by the end of the same season. However, winter varieties, if planted in spring, fail to flower or produce mature grains within a span of a flowering season. Explain, why?

Thinking Process

The chilling treatment to wheat seed prior to sowing reduces the vegetative growth period of wheat plant and induces flowering at an early time.

Ans. Some annual food plants such as wheat do not flower, unless they experience a low temperature. They remain vegetative during spring (warm period) but grow further to bear flowers and fruits after receiving low temperature (in winter).

The low temperature in winter prevents precocious reproductive development in autumn, thus enabling the plant to reach vegetative maturity before reproductive phase.

Thus, when spring varieties are planted in spring, they flower and bear fruits prion to end of growing season. But, if the winter varieties are planted in spring, they fail to flower and produce mature grains before the end of growing season, as they could not perceive low temperature of winters.

Q. 2 It is known that some varieties of wheat are sown in autumn but are harvested around next mid summer.

A. What could be the probable reason for this?

B. What term is used for this promotion of lowering under low temperature?

C. Which plant hormone can replace the cold treatment?

Ans. **A.** Annual winter wheat plants take one year full growing season for the completion of their vegetative growth period and then initiate flowers and fruits. This is because after they form seedlings in autumn, they receive low temperature throughout winter, which enables them to reach vegetative maturity. They resume growth in spring and bear flowers and grains towards mid-summer.

B. The chilling or cold treatment of seeds to reduce flowering is called vernalisation. It is a process of shortening of the juvenile or vegetative phase and hastening flowering by a previous cold treatment. This stimulus of vernalisation is perceived only by the meristematic cells. *e.g.,* shoot tip, embryo tip, root apex, developing leaves, etc.

C. GA or **gibberellic** acid treatment can replace cold treatment and can induce flowering early by reducing vegetative growth period in many long-day plants.

Q. 3 Name a hormone which

A. is gaseous in nature

B. is responsible for phototropism

C. induces femaleness in flowers of cucumber

D. is used for killing weeds (dicots)

E. induces flowering in long day plants.

Ans. **A.** Ethylene is a hormone which is gaseous in nature.

B. Auxin (synthetic auxin 2-4 D) is responsible for phototropism and geotropism in plants.

C. Ethylene causes feminising effect. External supply of very small quantity of ethylene can increase the number of female flowers and hence fruits as in cucumber.

D. Synthetic auxin (2-4 D) kills broad leaved dicot weeds, hence used as weedicides.

E. Gibberellins, induces flowering in long-day plants.