

MULTIPLE CHOICE QUESTIONS

1. Ethylene is used for

- a. Retarding ripening of tomatoes
- b. Hastening of ripening of fruits
- c. Slowing down the ripening of apples
- d. Both b and c

Solution:

Option (b) is the answer.

2. Coconut water contains

- a. ABA
- b. Auxin
- c. Cytokinin
- d. Gibberellin

Solution:

Option (c) is the answer.

3. The effect of apical dominance can be overcome by which of the following hormone:

- a. IAA
- b. Ethylene
- c. Gibberellin
- d. Cytokinin

Solution:

Option (d) is the answer.

4. Match the following:

- | | |
|---------------|-----------------------|
| A. IAA | i. Herring sperm DNA |
| B. ABA | ii. Bolting |
| C. Ethylene | iii. Stomatal closure |
| D. GA | iv. Weed-free lawns |
| E. Cytokinins | v. Ripening of fruits |

Options:

- a A – iv, B – iii, C – v, D – ii, E – i
- b A – v, B – iii, C – iv, D – ii, E – i
- c A – iv, B – i, C – iv, D – iii, E – ii
- d A – v, B – iii, C – ii, D – i, E – iv

Solution:

Option (a) is the answer.

5. Apples are generally wrapped in waxed paper to

- a. Prevent sunlight from changing its colour
- b. Prevent aerobic respiration by checking the entry of O₂.
- c. Prevent ethylene formation due to injury

d. Make the apples look attractive

Solution:

Option (b) is the answer.

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

a. Increase in cell number

b. Increase in cell size

c. Increase in length and weight

d. All the above

Solution:

Option (d) is the answer.

7. The term synergistic action of hormones refers to

a. When two hormones act together but bring about the 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 anyone function.

Solution:

Option (b) is the answer.

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

Solution:

Option (b) is the answer.

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

a. IAA

b. Cytokinin

c. Gibberellin

d. Ethylene

Solution:

Option (c) is the answer.

10. ABA acts antagonistically to

a. Ethylene

b. Cytokinin

c. Gibberellic acid

d. IAA

Solution:

Option (c) is the answer.

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 the above

Solution:

Option (b) is the answer.

12. The photoperiod in plants is perceived at

- a. Meristem
- b. Flower
- c. Floral buds
- d. Leaves

Solution:

Option (d) is the answer.

VERY SHORT ANSWER TYPE QUESTIONS

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 the culture medium to obtain a good callus in plant tissue culture.
- d. _____ of vegetative plants are the sites of photoperiodic perception

Solution:

- a) Log phase or exponential phase.
- b) Auxins
- c) Cytokinin- kinetin, zeatin, and 6-benzyl amino purine
- d) Leaves

2. Plant growth substances (PGS) have innumerable practical applications. Name the PGS you should use to

- a. Increase the yield of sugar cane.
- b. Promote lateral shoot growth.
- c. Cause sprouting of potato tuber.
- d. Inhibit seed germination.

Solution:

- a. Increase the yield of sugar cane: Gibberellins
- b. Promote lateral shoot growth: Cytokinins
- c. Cause sprouting of potato tuber: Ethylene
- d. Inhibit seed germination: Abscisic acid

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.

Solution:

$$L1 = L0 + rt$$

$$19 - 5 = r \times 1$$

14cm per week

Relative growth rate = Change/Initial*100

$$19-5/5 \times 100$$

$$= 14/5 \times 100$$

$$= 280\%$$

4. Gibberellins were first discovered in Japan when rice plants were suffering from baltan (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?

Solution:

a) Gibberellins cause fruits to elongate and improve in its shape. It is also responsible to delay senescence. Spraying sugarcane crop with gibberellins increases the length of the stem, thus increasing the sugar production that increases the yield by almost 20 tonnes per acre.

b) Elongation of internodes is the property of gibberellin.

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

Solution:

Gibberellins promote the formation of male flowers on genetically female plants in Cannabis whereas ethylene promotes the formation of female flowers on genetically male plants.

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.

Solution:

Henbane: Long Day Plant (LDP)

Spinach: Long Day Plant (LDP)

Rice: Short Day Plant (SDP)

Strawberry: Short Day Plant (SDP)

Bryophyllum: Long Short Day plant (LSDP)

Sunflower: Day Neutral Plant (DNP)

Tomato: Day Neutral Plant (DNP)

Maize: Day Neutral Plant (DNP)

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?

Solution:

The plant growth regulator that can be applied to achieve this is ethylene (C₂H₄).

8. Where are the following hormones synthesized in plants?

a. IAA

b. Gibberellins

c. Cytokinins

Solution;

- a. IAA: in the tips of the shoot and apical buds
- b. Gibberellins: in young leaves and tips of roots
- c. Cytokinins: meristematic zones of the root

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

Solution:

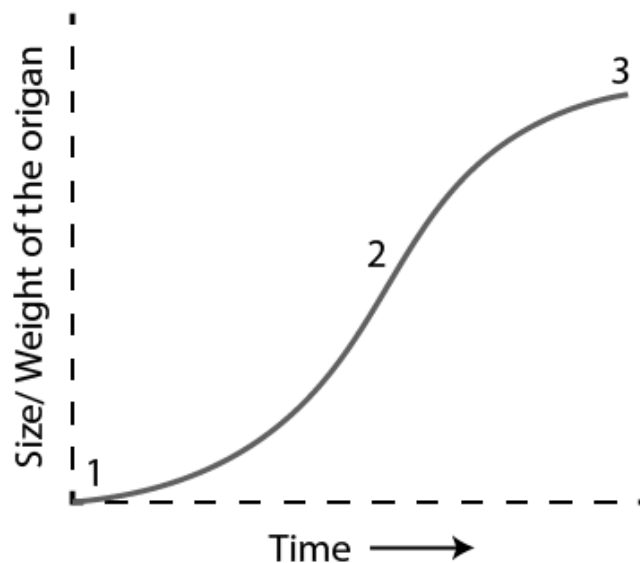
They are removing the shoot tips that result in the growth of lateral buds. This lateral bud growth is suppressed by the apical buds if the tip is not removed.

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

Solution:

- a) Photosynthesis: The process of photosynthesis occurs when green plants use light energy to convert carbon dioxide into carbohydrates.
- b) Photoperiodism: In photoperiodism, flowering is regulated in response to the day length exposure time or photoperiod.

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



Solution:

- 1: Lag phase
- 2: Log phase
- 3: Stationary phase

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

Solution:

Yes, unicellular organisms also grow. Characteristics of growth increase in the mass of the cell and an increase in cell number. It grows by dividing its cells or undergoing cell division by an increase in cell mass as well as an increase in several cells.

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

Solution:

The property of Gibberellin that causes foolish seedling disease in rice is the elongation of internodes.

SHORT ANSWER TYPE QUESTIONS

1. *Nicotiana tabacum*, a Short Day Plant, when exposed to more than a critical period of light fails to flower. Explain.

Solution:

A short day plant needs a prolonged dark period to flower because the chemical transformation undergoing this time will flower the plant. So it requires a short day exposure to light.

2. What are the structural characteristics of a? Meristematic cells near root tip b. The cells in the elongation zone of the root

Solution:

a) Meristematic cells near the root tip:

- large nucleus
- rich protoplasm
- vacuoles are less in number

b) The cells in the elongation zone of the root

- more number of vacuoles
- new cellulosic walls are deposited
- there is an increase in size

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 the plant, which can grow indefinitely.

Solution:

Yes, the growth pattern in plants differs from that in animals. Only the meristematic tissues can keep on dividing i.e. the meristems are the parts which grow indefinitely throughout the plant life.

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. Redifferentiation

Solution:

a) Differentiation: the cell of the apices of roots, apices of shoot and cambium can differentiate and mature so that they can perform specific functions.

b) De-differentiation: A differentiated cell can regain its capacity for cell division when placed under certain conditions

c) Redifferentiation: It is the phenomenon where the dedifferentiated cells lose the ability to divide.

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

- a. auxin precursors**
- b. anti-auxins**
- c. synthetic auxins**

Solution:

- a. Auxin precursors are responsible for the production of auxins.
- b. Anti auxin function as an inhibition of the action of auxin by competing for the same receptor.
- c. Synthetic auxins are some chemical compounds that have been synthesized from the laboratories and function as same as auxin.

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

Positive Roles of Ethylene :

Negative Role of Ethylene :

Positive Role of Abscisic acid:

Negative Role of Abscisic acid:

Solution:

(a) Positive Roles of Ethylene: Ripening of fruits

- When present in low concentration, it stimulates root meristem formation and promotes the growth of lateral roots.

(b) Negative Role of Ethylene:

- Ethylene is responsible for nullifying geotropism.

(c) Positive Role of Abscisic acid:

- During stress conditions, abscisic acid concentration increases in the leaves of the plant due to which stomata close preventing water loss via transpiration.

(d) Negative Role of Abscisic acid:

- It inhibits the growth of a plant and in turn, induces dormancy of buds.

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

Solution:

It becomes difficult to assign any effect seen to any single hormone because it can be a synergistic or an antagonistic effect as well. The synergistic effect when the two hormones come together and effects combined whereas the antagonistic effect is when hormone counters the effect of each other.

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.

Solution:

The mechanism underlying the phenomenon by which the terminal/apical bud suppresses the growth of lateral buds is known as apical dominance. To overcome this Decapitation or removal of the apical bud (shoot cutting) that inhibits the growth of the apical bud and promotes the growth of the lateral branches.

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?

Solution:

Plant hormones are found in the different tissues like the tip of the shoots, the tip of the roots, meristematic tissues, apical buds etc. These hormones are translocate to the site of activity by the vascular bundle tissues like xylem and phloem.

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?

Solution:

The foolish seedling disease of rice was caused by the fungal pathogen *Gibberella fujikuroi*. The symptoms of which were first reported by Kurosawa who noticed that uninfected rice developed these symptoms when gibberellins were added.

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

Solution:

The process of Decapitation of plants leads to the inactivation of axillary buds and promotes the growth of lateral buds giving a carpet like an appearance.

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?

Solution:

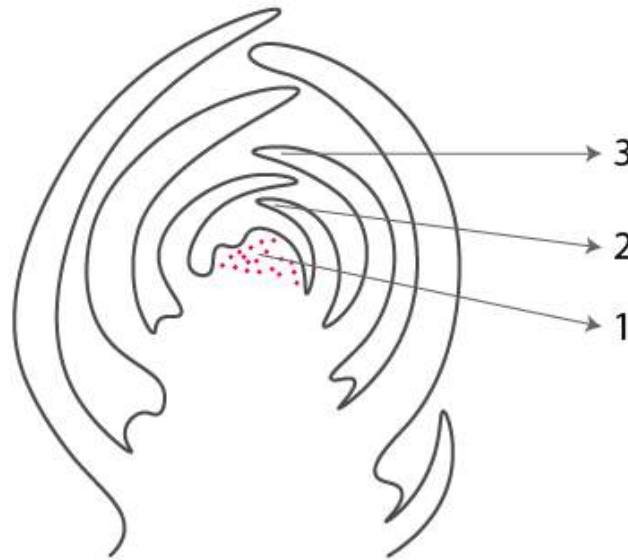
On protoplasm, the meristematic cells are rich in and possess large conspicuous nuclei. Their cell wall is thin and comprises cellulose and also has fewer vacuoles.

13. A rubber band stretches and reverts 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))

Solution:

A rubber band stretched and reverts to its original position due to the property of elasticity where the form gets reversed. Bubble gum would not return to its original position after getting stretched because of the phenomenon of plasticity. It is irreversible. Plants will follow the various paths in response to the different phases of life in the environment. Eg: Heterophyll in cotton.

14. Label the diagram



- a. This is which part of a dicotyledonous plant?**
b. If we remove part 1 from the plant, what will happen?

Solution:

- a) This is the shoot apex meristem of a dicotyledonous plant.
b) If part 1 is removed from the plant, then the apical bud is inhibited while there is the growth of lateral buds.

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

Solution:

Because the plant growth and differentiation of certain parts like the meristematic tissues of the meristems present in different locations of the plant body is an active site of cell division where growth is indefinite.

- 16. Define parthenocarpy. Name the plant hormone used to induce parthenocarpy.**

Solution:

An artificially induced development of fruit without undergoing any fertilization is known as parthenocarpy. The plant hormone used to induce parthenocarpy is Gibberellin

- 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?**

Solution:

Parthenocarpy can be done for this. Growth hormones can induce parthenocarpy like Gibberellins and auxins inducing parthenocarpy in tomatoes

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

Solution:

To get rid of the weeds efficiently, it can be selectively killed using plant growth hormone regulator

called auxins.

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

a. Why do you think this happens?

b. How is this advantageous to the plant?

Solution:

a. This means that the plant enters the vegetative growth phase. A flowering hormone called florigen is synthesized during this phase.

b. The vegetative phase prepares the plants for the reproductive phase so that it can bear structures like fruits and seeds.

20. Fill in the blanks:

a. Maximum growth is observed in _____ phase.

b. Apical dominance is due to _____

c. _____ hormone initiate rooting

d. Pigment involved in Photoperception in flowering plants is

Solution:

a. Exponential

b. Apical dominance is due to the presence of auxins

c. Auxins hormone initiates rooting.

d. Pigment involved in Photoperception in flowering plants is phytochrome.

LONG ANSWER QUESTIONS

1. Some varieties of wheat are known as spring wheat while others are called winter wheat. The 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?

Solution:

If planted in spring would normally fail to flower or produce mature grain within a span of a flowering season so they are sown in autumn. Then they germinate and seedlings come out on winter season. Some plants need an optimum temperature to flower. This is called vernalisation where low temperature is required for the flowering.

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 flowering under low temperature?

c. Which plant hormone can replace the cold treatment?

Solution:

a) When they are planted in autumn, they take their time to germinate and over the winter season. On the spring season, the normal growth resumes and harvested on next summer mid.

b) Promotion of flowering under low temperature is called vernalization.

c) The plant hormone that can replace the cold treatment is called gibberellin.

3. Name a hormone which

- a. is gaseous**
- 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**

Solution:

- a. is gaseous: ethylene
- b. is responsible for phototropism: auxin
- c. induces femaleness in flowers of cucumber: ethylene
- d. is used for killing weeds (dicots): auxins
- e. induces flowering in long-day plants: Gibberellin

