Question-1

What can induce bolting in a cabbage plant?

Solution:

Gibberellin.

Question-2

What does the sigmoid growth curve of a population mean?

Solution:

In biological organisations, growth occurs from the molecular level up to the ecosystem level. It can be measured at different levels, such as the growth of cells, organisms or populations. An S-shaped curve is obtained when length, area, volume, mass, number of cells or individuals are plotted against time. This is know as Sigmoid Curve. An analysis of this curve shows a lag phase during which slow growth occurs. This gradually attains a rapid growth, followed by a period of slow growth and ultimately a decline called stationary phase. Since the same pattern of growth is observed at all levels of organisations it is said to be universal.

Question-3

What is sigmoid growth curve?

Solution:

Sigmoid growth curve is the 'S' shaped growth curve obtained when the growth of one individual (a plant or plant organ) or a population is measured and plotted against time.

Question-4

What is differentiation?

Solution:

In the plant body, all the cells are derived from the single cell zygote. After division, the zygote undergoes some structural and functional changes, which are collectively called differentiation.

Question-5

Mention any three functions of auxins.

Solution:

The three functions of auxins are as follows:

(i) Auxins promote elongation and growth of stems and roots, and enlargement of many fruits.

(ii) Auxins promote cell division in vascular cambium.

(iii) Auxins promote root initiation.

Question-6

How does growth occur in plants?

Solution:

Growth occurs in plants by cell division and cell enlargement.

Question-7

What is seed dormancy? What are the causes for it?

Solution:

Some seeds do not germinate immediately after harvest even if placed under suitable conditions. During this period, the growth of seeds remains suspended. They are alive but with very slow metabolism and hence are said to be in the rest stage, inactive stage or dormant stage and the phenomenon is called dormancy of seeds.

Dormancy of seeds is caused by several factors. They are as follows:

(i) The seed coat being impermeable to water.

(ii) The seed coat being impermeable to oxygen.

(iii) Mechanically resistant seeds.

(iv) Immaturity of embryo.

(v) Light sensitive seeds.

(vi) Inhibitors like abscisic acid.

Question-8

Why do leaves shed seasonally?

Solution:

Because production of auxin is stopped by leaves.

Question-9

Discuss the role of growth regulators in parthenocarpy, flower thinning and bolting as well as root induction.

Solution:

Plant growth regulators are for promoting agriculture and horticulture. They play a vital role in the following aspects:

(i) Parthenocarpy: Growth regulators induce parthenocarpy in litchi and mango.

(ii) Flower thinning: Number of flowers is increased after spraying the plants with 2,4-D and NAA. E.g., pineapple and litchi.

(iii) Fruit ripening: Ethylene plays a significant role in ripening of fruits. E.g., banana, grapes, lemon, orange, etc.

(iv) Root induction: IBA induces roots on stem cuttings. E.g., rose, apple, bougainvillea.

(v) Bolting: Gibberellins cause plants to bolt and flower.

Question-10

Where are cytokinins produced?

Solution:

Cytokinins are produced in embryonic tissues particularly in fruit and seed.

Question-11

What is photoperiodism? How do you categorize angiosperms on the basis of their flowering response.

Solution:

Response of plants to increasing (long-day plants) or decreasing (short-day plants) day lengths, in terms of flowering, bulbing, tillering, etc. is called photoperiodism.

Angiosperms are classified into three categories on the basis of photoperiodism. They are:

(i) Short day plants (SDP)

(ii) Long day plants (LDP)

(iii) Day neutral plants (DNP)

(i) Short day plants (SDP): They require a relatively short day length than the critical period for flowering. E.g., chrysanthemum, soyabean, etc.

(ii) Long day plants (LDP): They require a relatively longer day length than the critical period for flowering. E.g., wheat, maize, radish, etc.

(iii) Day neutral plants (DNP): The flowering response in these plants remain unaffected by the length of the day. These plants are also called photoneutrals. E.g., cotton, pea, tomato and sunflower.

Question-12

What are the important features of growth in a plant?

Solution:

The growth follows a strict pattern forming a growth curve called the sigmoid curve (S-shaped). The growth in plants continue throughout life. It is unrestricted, the two in active growing regions of plant are located at stem apex and root tips. Initially in plants the growth is regular but after sometime it becomes irregular.

Question-13

What is the difference between phototropism and geotropism?

Solution:

The difference between phototropism and geotropism are as follows:

Phototropism	Geotropism
(i) It is the response of plants to light.	(i) It is the response of plants to gravity.
(ii) The stem is positively phototropic to light and the root is negatively phototropic.	(ii) The stem is negatively geotropic but the root is positively geotropic.
(iii) It is due to unequal distribution of auxin under the influence of light.	(iii) It is due to unequal distribution of auxin under the influence of gravity.
(iv) Leaves are diaphototropic.	(iv) Secondary roots and stem branches are phagotropic.

Question-14

Name the gaseous plant hormone and mention it's three different kinds of action on plants.

Solution:

Ethylene is a gaseous plant hormone.

Effects of ethylene:

(i) Fruit growth and ripening-ethylene promotes fruit growth and its ripening.

(ii) Ethylene stimulates formation of abscission zone in leaves, flowers and fruits.

(iii) Ethylene application increases the number of female flowers and fruits in cucumber plants.

Question-15

What are phytohormones?

Solution:

Phytohormones are natural growth substances, which are synthesized in one part of a plant and are translocated to other parts where they exert their influence. They are required in minute quantities to regulate growth and differentiation. They can have either positive or negative effects in a process. The development processes are controlled by more than one Phytohormone and they act either synergistically or antagonistically.

Question-16

In most plants the terminal bud suppresses the development of lateral buds. What is this phenomenon called? Name the phytohormone that can promote the phenomenon.

Solution:

In most plants the terminal bud suppresses the development of lateral buds. This phenomenon is called apical dominance. Auxins are the phytohormones which can promote this phenomenon in plants. Example- NAA and 2,4- D etc.

Question-17

List the main uses of auxins.

Solution:

Main uses of auxins are following:

1. Rooting,
2. Flowering,
3. Prevents premature fruit drop,
4. Induces parthenocarpy, dormancy,
5. Breaks seed
6. Sweetening of fruit,
7. Apical dominance,
8. Promotes cell elongation,
9. Fruit enlargement,
10. Reactivates cambium,
11. Promotes cell elongation,
12. Inhibits abscission of leaf.

Question-18

Define apical dominance.

Solution:

The inhibition of growth of lateral buds in the presence of an apical bud is called apical dominance.

Question-19

List any two inhibitory functions of auxins.

Solution:

The auxins produced by apical buds have a dominating and inhibitory effect on the growth of lateral buds. The removal of apical buds allows the growth of lateral buds. It is pruning.

Abscission means the fall of leaves, flowers and fruits from the mature plant. Application of auxins can inhibit premature fall of plant organs or abscission.

Question-20

What is vernalization?

Solution:

The process of chilling treatment to induce flowering in plants is called vernalization.

Question-21

What is the nature of substances, which control the growth in plants and animals?

Solution:

In plants and animals the growth and differentiation is controlled by chemical substances called the hormones. These occur in extremely small quantities. They are transported from the site of their synthesis to the place of action. In animals these are produced in endocrine glands.

Question-22

What are the causes of seed dormancy?

Solution:

The causes for seed dormancy of seeds are due to rudimentary embryo, impermeable seed coats, mechanically resistant seed coats, physiologically immature embryos and by the presence of germination inhibitors, like abscisic acid, short chain fatty acid as well as coumarin and phenolic acids etc.

Question-23

What are the phytochromes?

Solution:

These are natural growth substances which are synthesized in one part of plant and are translocated to other parts where they exert their influence. They are required in minute quantities that regulate growth and differentiation. They can have either positive or negative effect in a process. Generally, development processes are controlled by more then one photohormone and controlled by more than one polyhormones and their act either synergistically or antognoistically.

Question-24

What are nastic movements? Give an example.

Solution:

Nastic movements are non-directional movements. For example, opening of a flower with a change in light intensity, sleeping movements in some leguminous plants.

Question-25

Can we alter the growth rate in an organism? If so, how?

Solution:

Yes, we can alter the rate of growth by making variations in the factors affecting growth. The factors, which affect growth are light and temperature. A plant grows quicker during the night than during day. During night the retarding or inhibiting action of light is absent and the rate of growth of a plant gradually increases until dawn, while during the day, the rate of growth gradually decreases until about sun set. In the case of temperature, during winter the growth of many plants becomes slow but during spring growth takes place very rapidly.

Question-26

State any three functions of indole acetic acid in plants.

Solution:

The three functions of Indole Acetic acid:

(i) It promotes growth and elongation of roots and stems and many fruits.

(ii) In many plants, Indole acetic acid promotes cell division and induces apical dominance.

(iii) It also induces parthenocarpy.

Question-27

Name a plant hormone that can never act alone. List any two activities of this hormone in conjunction with auxins.

Solution:

Cytokinin is a plant hormone, which can never act alone. All growth processes are regulated by one or more phytohormones. In conjunction with auxins, cytokinin stimulates cell division in non-meristematic tissues. They control cell differentiation.

Question-28

Explain apical dominance. Name the hormone that controls it.

Solution:

Apical Dominance: It is defined as "the inhibition of growth of lateral buds into the branches in the presence of an apical bud". Apical Dominance is under the control of auxins. IAA (Indole acetic acid) is the principal auxin found in all the plants. Lateral buds start their development when apical bud is removed (see the figure). The process is again reversed if you apply IAA to the decapitulate apex of plant.

Question-29

Which among the following is a long day plant? Why is it so called? Sugar beet, Sugarcane, Tomato.

Solution:

Sugar beet is a long day plant. It is called long day plant because it responds to night shorter than the critical dark period. Long day plants are also called short night plants. long day plants (LDP) require a relatively longer day length than critical period for flowering.

Question-30

Which part of the plant produces gibberellin? State two functions of this hormone.

Solution:

Gibberellin is said to be a weak acidic phytohormone. It is produced specially in growing young root tips, shoot tips, floral buds, apical leaves etc.

Functions of gibberellin hormones are:

(i) Bolting and flowering

(ii) Elongation of stem.

Question-31

What is Bioassay?

Solution:

Bioassay is the evaluation of the effect of a substance on a living organism under controlled conditions.

Question-32

Differentiate between short day plants and long day plants.

Solution:

Short day plants	Long day plants
1. Plants flower under photoperiods of less than critical day length.	1. Plants flower under photoperiods of more than critical day length.
2. Interruption during light period does not inhibit flowering.	2. Interruption during light period inhibits flowering.
3. Flowering is inhibited if long dark period is interrupted midway by a flash of light	3. Flowering occurs if dark period is interrupted by light.
4. Long continuous and uninterrupted dark period is critical for flowering.	4. Light period is critical for flowering.
5. Several plants flower under continuous dark if light is supplemented with sucrose.	5. Several plants flower continuous light. The dark period is not at all required.
6. Flowering does not occur under alternating cycles of short day and short light periods (i.e. 3-hrs light/3 hrs. dark or 6-hrs light/6 hrs dark).	6. Flowering occurs under alternating cycles of short day followed by still short dark periods (i.e. 8 hrs light/ 4 hrs dark).
7. Inhibition of flowering under long-day condition is not because the photoperiods are long but it is because the dark periods are too short. E.g. Chrysanthemum, Dahlia, Hemp.	7. Inhibition of flowering under short-day conditions is not because the photo-periods are short but it is because the dark periods are too long. E.g. Onion, wheat and carrot.

Question-33

Explain the biological meaning of growth.

Solution:

Growth is a permanent and irreversible increase in the form and mass of an organism. The quantity of protoplasm increases and this increase is the result of division, elongation and differentiation of the growing cells. To sustain growth, the rate of anabolic processes must exceed that of catabolic processes. As a result of exceeding anabolic processes, there is permanent accumulation of materials, which is utilized by the organisms for building up new tissues.

Question-34

Differentiate between senescence, ageing and death in plants.

Solution:

Senescence	Ageing	Death
1. It refers to all collective, progressive and deteriorative process which ultimately leads to complete loss of organization and function.	1. It includes all the chemical and structural changes, which occur during the life span of a plant or its organ.	1. It is the ultimate termination of functional life of plant part.
2. It includes only degenerative and deteriorative changes in a plant or its parts.	2. It is sum total or metabolic changes that occur in plant or its parts.	2. It is a regular feature of the annual cycle of plants, which is usually preceded by senescence.
3. Senescence occurs as a result of ageing and leads to death.	3. Ageing is a permanent feature of all living organisms.	3. Death is a permanent feature of all living organisms.

Question-35

Discuss the role of interaction between growth regulators in the growth and development of plants, giving suitable examples.

Solution:

Growth hormones (phytohormones). Most of the physiological activities and growth in plants are regulated by the action and interaction of some chemical substances in them called as hormones and by certain naturally occuring inhibitors e.g. abscissic acid, phenols and flavonols.

(i) Each phytohormone has its own specific function even then these do not act singly.

(ii) All growth processes are regulated by one or more photohormones acting synergistically or antagonistically.

(iii) Interaction between auxins and cytokinins in the control of growth and differentiation in plant tissue culture, and between abscissic acid and gibberellins in seed germination.

The process of growth and differentiation are controlled internally by a

Question-36

What is vivipary? Give an example.

Solution:

Vivipary means germination of seed within the fruit while still attached to mother plant. Example – Rhizophora.