

Class: 11
Subject: Biology
Topic: Plant growth and development
No. of Questions: 25

Q1. What does the sigmoid growth curve of a population mean?

Sol. In biological organizations, 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 known 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 ad decline called stationary phase. Since the same pattern of growth is observed at all levels of organizations it is said to be universal.

Q2. What is sigmoid growth curve?

Sol. 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.

Q3. What is differentiation?

Sol. 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.

Q4. Mention any three functions of auxins.

Sol. 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.

Q5. How does growth occur in plants?

Sol. Growth occurs in plants by cell division and cell enlargement.

Q6. What is seed dormancy? What are the causes for it?

Sol. 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.

Q7. Why do leaves shed seasonally?

Sol. Because production of auxin is stopped by leaves.

Q8. Discuss the role of growth regulator in parthenocarpy, flower thinning and bolting as well as root induction.

Sol. 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 increase 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.

Q9. Where are cytokinins produced?

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

Q10. What is photoperiodism? How do you categorize angiosperms on the basis of their flowering response.

Sol. 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)

Sol.

- (i)** Short day plants (SDP): They require a relatively short day length than the critical period for flowering. E.g., chrysanthemum, soyabean, etc.
- (ii)** Day neutral plants (NDP): They require a relatively long 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.

Q11. What are the important features of growth in a plant?

Sol. 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 root tips. Initially in plants the growth is regular but after sometime it becomes irregular.

Q12. What is the difference between phototropism and geotropism?

Sol. 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 phototropic.	(v) Secondary roots and stem branches are phototropic.

Q13. Name the gaseous plant hormone and mention its three different kinds of action on plants.

Sol. 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.

Q14. What are phytohormones?

Sol. 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.

Q15. 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.

Sol. 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.

Q16. List the main uses of auxins.

Sol. Main uses 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.

Q17. Define apical dominance.

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

Q18. List any two inhibitory functions of auxins.

Sol. 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 of abscission.

Q19. What is vernalization?

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

Q20. What is the nature of substances, which control the growth in plants and animals?

Sol. 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.

Q21. What are the causes of seed dormancy?

Sol. 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.

Q22. What are the phytochromes?

Sol. These are natural growth substance 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 than one phytohormone and controlled by more than one phytohormones and their act either synergistically or antagonistically.

Q23. What are nastic movements? Give an example.

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

Q24. Can we alter the growth rate in an organism? If so, how?

Sol. 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.

Q25. Define growth, differentiation, development, dedifferentiation, redifferentiation, determinate growth, meristem and growth rate.

Sol. Growth: A permanent and irreversible increase in size of an organ or its part or even of an individual cell is called growth.

Differentiation: The process which leads to maturation of cells is called differentiation. During differentiation, a few or major changes happen in protoplasm and cell walls of the cells.

Development: All the changes which an organism goes through during its life cycle become parts of development. In case of a flowering plant, right from seed germination to seed bearing, each stage is a part of the development process.

Dedifferentiation: A differentiated cell can regain its capacity for cell division under certain conditions. This phenomenon is called dedifferentiation. Formation of interfascicular cambium and cork cambium from fully differentiated parenchyma cells is an example of dedifferentiation.

Redifferentiation: A dedifferentiated plant cell once again loses its capacity to divide and becomes mature. This phenomenon is called redifferentiation.

Determinate Growth: When growth stops after a certain phase, this type of growth is called determinate growth.

Meristem: The plant tissue which has the ability to divide is called meristematic tissue. The region with such tissues is called meristem.

Growth Rate: The increased growth per unit time is called growth rate.