Important Questions Class 11 Biology Chapter 13 Plant Growth and Development

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

Ans.

- Growth is a permanent and irreversible rise in the size of an organ, its parts, or even a single cell.
- Differentiation is the process by which cells from the root apical and shoot apical meristems, as well as the cambium, develop and execute specialized tasks.
- The term "development" refers to all the changes that an organism goes through during its life cycle, from seed germination to senescence.
- Under some conditions, permanent plant cells regain the ability to divide, a process known as dedifferentiation.
- Redifferentiation refers to the process through which dedifferentiated cells mature and lose their ability to divide.
- Determinate growth refers to growth that comes to a halt after a given stage
- In plants, meristems are specialized areas where active cell division occurs.
- Growth rate refers to the amount of growth per unit of time.

2 Why is not any one parameter good enough to demonstrate growth throughout the life of a flowering plant?

Ans: At the cellular level, growth is mostly due to a rise in the amount of protoplasm. The weight of the fresh tissue sample, the weight of the dry tissue sample, the variations in length, area, volume, and cell number determined over the growth phase are all used to measure protoplasm growth. As a result, no one metric can adequately represent growth across the life of a blooming plant.

3. Describe briefly:

1. Arithmetic growth
2. Geometric growth
3. Sigmoid growth curve
4. Absolute and relative growth rates

Ans.

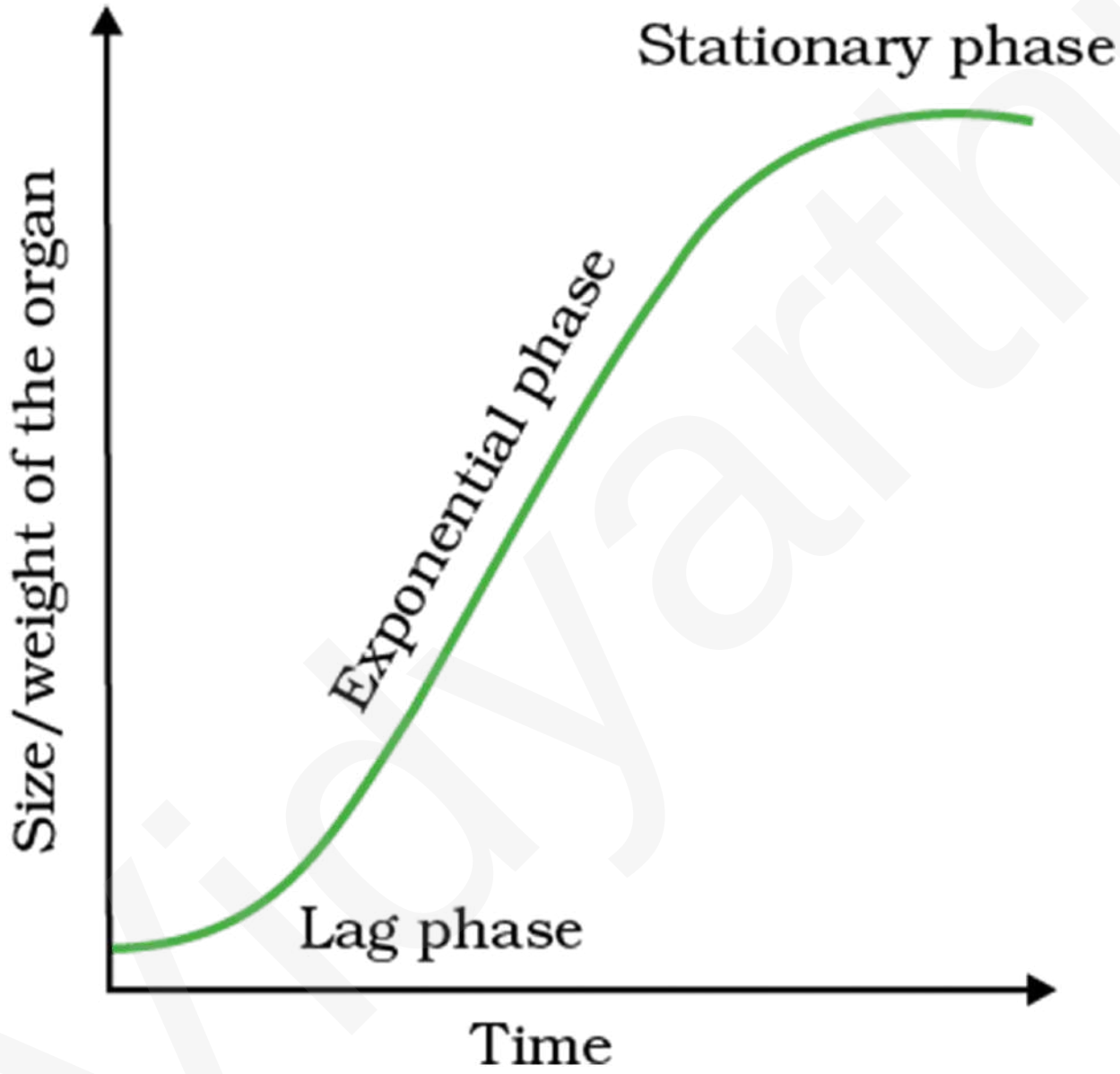
1. In arithmetic growth, only one daughter cell divides after mitotic cell division, while the other differentiates and develops. Arithmetic growth is defined as the elongation of roots at a constant pace. A linear curve is generated by charting the organ's length versus time. It can be stated mathematically as:

Lt=L0+r$L_t = L_0 + r$

As a result, Lt L_t denotes length at time ' tt, ' L0L_0 denotes length at time 0 , and rr denotes the rate per unit of time.

2. In most systems, the first growth is modest and is referred to as the lag phase, after which it accelerates at an exponential rate and is referred to as the log or exponential phase. Following mitotic cell division, both child cells retain the ability to divide and continue to do so. However, when nutrition availability is limited, growth slows and eventually stops, resulting in a stationary phase. A sigmoid curve emerges from the graph of geometric growth.

3. In a natural setting, a sigmoid curve is a feature of living organisms. The lag phase, the log phase or exponential phase of rapid expansion, and the stationary phase are the three phases of this curve.



Graph of Exponential Growth

The following is an example of exponential growth:

W1=W0eπ$W_1 = W_0 e^{\pi}$

W1=W_1 = final dimensions (weight, height, number etc.)

W0=W_0 = the starting size at the start of the period

r=r = the rate of growth

t=t = growth period

e = = natural logarithms' base

4. The absolute growth rate is the measurement and comparison of total growth per unit time.

The relative growth rate is the growth of a system per unit time represented on a common foundation, such as per unit beginning parameter.

4. List five main groups of natural plant growth regulators. Write a note on the discovery, physiological functions, and agricultural/horticultural applications of any one of them.

Ans. Natural plant growth regulators are divided into five categories:

(i) Auxins

(ii) Gibberellic acid

(iii) Cytokinins

(iv) Ethylene

(v) Abscisic acid

Auxins have been discovered, have physiological activities, and are used in agriculture and horticulture.

Discovery: Charles Darwin and Francis Darwin made the first observations about auxin effects when they noticed that the coleoptiles of canary grass responded to unilateral illumination by growing towards the light source (phototropism). Following a series of trials, it was determined that the coleoptile's tip was the source of the transmittable effect that caused the entire coleoptile to bend. F.W. Went isolated auxin from the tips of coleoptiles of oat seedlings.

Physiological Functions:

- They regulate the proliferation of plant cells.
- They are responsible for the apical dominance phenomena.

- They regulate vascular cambium division and xylem differentiation.
- They cause parthenocarpy and prevent leaf and fruit abscission.

Horticulture Application:

- They aid in the establishment of roots in stem cuttings, a popular method of plant multiplication.
- Weedicide 2-4 D is used to kill broadleaf, dicotyledonous weeds.
- They cause tomatoes to go into parthenogenesis.
- It promotes flowering in plants, such as pineapples.

5. What do you understand about photoperiodism and vernalization? Describe their significance.

Ans. Photoperiodism refers to a plant's response to day/night cycles. The hormonal substance responsible for flowering is thought to be produced in the leaves before traveling to the shoot apices and transforming them into flowering apices. Photoperiodism aids in the study of flowering in diverse crop plants in relation to the time of light exposure.

There are certain plants whose flowering is quantitatively or qualitatively influenced by low temperatures. Vernalization is the word for this phenomenon. It specifically refers to a time of low temperature that promotes blossoming. It delays precocious reproductive development in the late stages of the growing season, giving the plant enough time to mature.

6. Why is Abscisic acid also known as a stress hormone?

Ans. Abscisic acid promotes plant tolerance to diverse stressors by stimulating the closing of stomata in the epidermis. As a result, it's also known as the stress hormone. It encourages seed dormancy and assures seed germination when conditions are favorable. It aids desiccation resistance in seeds. It also aids in the induction of dormancy in plants at the conclusion of the growing season and promotes leaf, fruit, and flower abscission.

7. Both growth and differentiation in higher plants are open. Comment

Ans. The higher plants can develop indefinitely throughout their lives. The presence of meristems at specific sites throughout the plant's body gives it this power. These meristems' cells can divide and self-perpetuate. As a result, increased plant growth is possible. In addition, after a few rounds of cell division, some of these cells inevitably undergo differentiation. As a result, the distinction is also open.

8. ‘Both a short day plant and a long day plant can flower simultaneously in a given place’. Explain

Ans. Some plants' flowering is influenced by the lengths of light and dark phases. If both the short-day and long-day plants are given an adequate photoperiod, they can flower at the same time.

9. Which one of the plant growth regulators would you use if you are asked to:

1. Induce rooting in a twig
2. Quickly ripen a fruit
3. Delay leaf senescence
4. Induce growth in axillary buds
5. ‘Bolt’ a rosette plant 4
6. Induce immediate stomatal closure in leaves.

Ans.

1. Auxins
2. Ethylene
3. Cytokinins
4. Cytokinins
5. Gibberellins
6. Abscisic acid

10. Would a defoliated plant respond to a photoperiodic cycle? Why?

Ans. No, because the leaves are the locations of sensing of light/dark duration, a defoliated plant will not respond to the photoperiodic cycle. As a result, the plant would not respond to light if it lacked leaves.

11. What would be expected to happen if:

1. GA3GA_3 is applied to rice seedlings
2. Dividing cells stop differentiating
3. A rotten fruit gets mixed with unripe fruits
4. You forget to add cytokinin to the culture medium.

Ans.

1. When GA3GA_3 is administered to rice seedlings, the internode lengthens, and the height of the rice seedlings increases.
2. Plant organs such as leaves, and stems will not form if dividing cells stop differentiating.
3. If decaying fruits are mixed with unripe fruits, the ethylene released by the rotten fruits will speed the unripe fruits' ripening.
4. Cell division, growth, and differentiation will be slowed if cytokinin is not added to the culture media.