

Plant Growth and Development — NEET MCQs with Solutions

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Q1. In geometric growth, if both daughter cells produced by mitosis retain the capacity to divide, the growth rate is:

- (A) Exponential, as cell number increases as 2, 4, 8, 16...
- (B) Arithmetic, as only one cell divides each cycle
- (C) Linear, as growth increments remain constant
- (D) Stationary, as resource competition limits division

Q2. Redifferentiation results in cells that:

- (A) Remain totipotent indefinitely
- (B) Continue to divide and generate new organ systems
- (C) Lose water content and collapse
- (D) Lose the capacity to divide and become permanently specialized again

Q3. The plateau (stationary phase) observed in the sigmoid growth curve occurs primarily because:

- (A) Meristems permanently lose their mitotic ability
- (B) The log phase has produced excess auxin that inhibits further growth
- (C) Cells in the elongation zone become vacuolated and stop dividing
- (D) Environmental resistance (limiting factors) equals the growth potential of the organism

Q4. During the sigmoid growth curve, the phase showing maximum absolute growth rate is:

- (A) Lag phase, where cells prepare for division
- (B) Stationary phase, where resources are fully available
- (C) Log (exponential) phase, where cells divide most rapidly
- (D) Decline phase, where growth permanently stops

Q5. The chemical nature of gibberellins is best described as:

- (A) Adenine derivatives
- (B) Indole compounds
- (C) Diterpenoid acids
- (D) Simple gaseous hydrocarbons

Q6. In the context of PGR discovery, Paal's experiment (1919) demonstrated that:

- (A) A substance from the coleoptile tip, when placed asymmetrically, causes curvature even in darkness
- (B) Light is necessary for auxin synthesis in the coleoptile tip
- (C) Auxin is destroyed by unilateral light exposure
- (D) The agar block can substitute for the coleoptile tip only in presence of light

Q7. Which of the following correctly pairs a PGR with its chemical nature?

- (A) Gibberellin — adenine derivative
- (B) Cytokinin — diterpenoid acid
- (C) Ethylene — indole compound
- (D) Auxin (IAA) — indole compound

Q8. Cytokinins are primarily associated with which physiological process?

- (A) Cell wall loosening and elongation
- (B) Cytokinesis and cell proliferation
- (C) Stomatal closure under drought
- (D) Internode elongation in stems

Q9. The first naturally occurring cytokinin isolated from plants was:

- (A) IAA from coleoptile tips
- (B) Kinetin from herring sperm DNA
- (C) Zeatin from immature maize kernels
- (D) GA₃ from Gibberella culture

Q10. Cytokinins are primarily synthesized in which plant organ and transported via which pathway?

- (A) Shoot apex; transported basipetally in phloem
- (B) Root apices; transported acropetally to shoots via xylem
- (C) Young leaves; transported laterally via cambium
- (D) Endosperm; transported to embryo via symplast

Q11. Gibberellins promote stem elongation primarily by stimulating:

- (A) Root hair proliferation
- (B) Stomatal closure in stem epidermis
- (C) Cell elongation and division in internodes
- (D) Chlorophyll degradation in stem

Q12. In apical dominance, the relationship between auxin and cytokinin is best described as:

- (A) Both synergistically suppress lateral buds
- (B) Both independently promote shoot elongation
- (C) Auxin suppresses lateral buds; cytokinin promotes their growth
- (D) Cytokinin maintains dormancy; auxin breaks it

Q13. Indole-3-acetic acid (IAA) is best described as:

- (A) The principal natural auxin in plants
- (B) A synthetic gibberellin derivative
- (C) The first cytokinin isolated
- (D) A gaseous growth inhibitor

Q14. Horizontal plagiotropic growth of the stem in dark-grown seedlings under ethylene is part of:

- (A) Triple response
- (B) Apical dominance
- (C) Bolting response
- (D) Parthenocarpy induction

Q15. Which hormone antagonizes gibberellin during seed dormancy maintenance?

- (A) Auxin
- (B) Ethylene
- (C) Absciscic acid
- (D) Cytokinin

Q16. Which of the following correctly explains why ethylene accelerates leaf senescence?

- (A) Ethylene inhibits auxin transport to leaves
- (B) Ethylene promotes degradative enzyme activity in leaf tissues
- (C) Ethylene blocks ABA receptors in mesophyll
- (D) Ethylene stimulates chloroplast division

Q17. Which of the following is NOT a component of the triple response?

- (A) Inhibition of stem elongation
- (B) Radial swelling of stem
- (C) Horizontal growth of stem
- (D) Increased internode elongation

Q18. A plant that flowers irrespective of photoperiod is termed:

- (A) Day neutral plant
- (B) Obligate long day plant
- (C) Facultative short day plant
- (D) Rosette plant

Q19. The hypothetical transmissible flowering stimulus produced in leaves in response to appropriate photoperiod is called:

- (A) Phytochrome
- (B) Florigen
- (C) Vernalin
- (D) Auxin

Q20. Which of the following best explains why photoperiodic perception occurs in leaves but flowering response occurs at the shoot apex?

- (A) Leaves produce chlorophyll signals sent to apex
- (B) Phytochrome in leaves generates a transmissible florigen signal that travels to the shoot apical meristem
- (C) Roots detect night length and signal leaves
- (D) Shoot apex contains phytochrome that directly detects photoperiod

Q21. Which of the following is correctly identified as a short day plant?

- (A) Wheat
- (B) Spinach
- (C) Chrysanthemum
- (D) Barley

Q22. Reversal of the vernalisation effect by exposure to high temperature is called:

- (A) Photoperiodism
- (B) Devernalisation
- (C) Dormancy
- (D) Senescence

Q23. The primary ecological advantage of seed dormancy is:

- (A) Survival during unfavourable environmental conditions
- (B) Rapid induction of flowering
- (C) Continuous vegetative growth
- (D) Maximising water absorption rate

Q24. In positively photoblastic seeds, which factor is essential to break dormancy and trigger germination?

- (A) Red light exposure
- (B) High humidity
- (C) Acidic soil pH
- (D) Elevated nitrogen

Answer key and explanations

Q1. Answer: (A) Exponential, as cell number increases as 2, 4, 8, 16...

In geometric growth, each mitosis produces two dividing cells — producing an exponential increase (2→4→8→16). This is the initial phase in plants. Arithmetic growth (B) describes the pattern where only one daughter cell retains meristematic activity.

Q2. Answer: (D) Lose the capacity to divide and become permanently specialized again

After dedifferentiation allows cell division, the progeny cells undergo redifferentiation — maturing into specialized cells that permanently lose mitotic capacity. Option B confuses redifferentiation with continued meristematic activity.

Q3. Answer: (D) Environmental resistance (limiting factors) equals the growth potential of the organism

The stationary phase results from limiting factors (nutrients, space, water) matching the organism's growth potential — not meristem loss (A) or auxin inhibition (B). Vacuolation (C) is an elongation-phase event, not the cause of plateau.

Q4. Answer: (C) Log (exponential) phase, where cells divide most rapidly

The log phase represents the period of most rapid, exponential cell division. The stationary phase (B) is a common trap — it appears "maximum" because growth is sustained, but rate actually plateaus here due to limiting factors.

Q5. Answer: (C) Diterpenoid acids

Gibberellins are diterpenoid acids — a class of terpenoids. This distinguishes them from auxins (indole compounds), cytokinins (adenine derivatives), and ethylene (simple hydrocarbon). Option A is cytokinin's chemical nature — the most common swap error in NEET questions on this concept.

Q6. Answer: (A) A substance from the coleoptile tip, when placed asymmetrically, causes curvature even in darkness

Paal (1919) placed the isolated coleoptile tip asymmetrically on the decapitated stump and observed curvature in the dark — proving that the tip substance itself (not light) causes differential growth. This preceded Went's chemical isolation. Option C (Blaauw's hypothesis) is a tempting wrong answer.

Q7. Answer: (D) Auxin (IAA) — indole compound

IAA (indole-3-acetic acid) is an indole compound. Gibberellins are diterpenoids (not adenine derivatives). Cytokinins are adenine derivatives (not diterpenoids). Ethylene is a simple two-carbon compound ($\text{CH}_2=\text{CH}_2$). Options A, B, and C each swap the chemical nature between PGRs — a classic NEET-style cross-matching trap.

Q8. Answer: (B) Cytokinesis and cell proliferation

Cytokinins promote cytokinesis (cell division) and cell proliferation — their name derives from this function. Cell wall loosening and elongation are auxin/gibberellin effects. Stomatal closure is ABA's role. Option D is gibberellin's primary stem effect — a high-frequency confusion trap.

Q9. Answer: (C) Zeatin from immature maize kernels

Zeatin (6-(4-hydroxy-3-methylbut-2-enyl)aminopurine) was the first cytokinin isolated from a natural plant source — immature corn (maize) kernels. Kinetin was discovered earlier but from autoclaved herring sperm DNA, an artificial non-plant source. Option B is the most common wrong answer on this question.

Q10. Answer: (B) Root apices; transported acropetally to shoots via xylem

Cytokinins are mainly synthesized in root apices (meristematic regions) and transported upward (acropetally) to aerial parts via the xylem — the opposite direction to auxin's basipetal phloem transport. Option A reverses both site and pathway — the most frequent confusion on this concept.

Q11. Answer: (C) Cell elongation and division in internodes

Gibberellins promote both cell elongation and cell division in internodal regions, leading to dramatic stem lengthening (as seen in bolting). They do not affect chlorophyll degradation — Option D is an ABA/ethylene effect. Option B is false — gibberellins do not close stomata.

Q12. Answer: (C) Auxin suppresses lateral buds; cytokinin promotes their growth

Auxin from the apical bud inhibits lateral bud outgrowth (apical dominance). Cytokinin, synthesized in roots and transported up, counteracts auxin and promotes lateral bud growth. This antagonistic interaction explains why decapitation + cytokinin application maximally releases lateral buds. Option D reverses the roles — a PYQ-style trap.

Q13. Answer: (A) The principal natural auxin in plants

IAA is the most common and principal naturally occurring auxin in higher plants, synthesized from tryptophan in shoot apices and young leaves. It is an indole compound, not a gibberellin or cytokinin. Option D confuses IAA with ethylene.

Q14. Answer: (A) Triple response

The triple response (horizontal growth, stem swelling, inhibited elongation) is the defining ethylene response in etiolated seedlings. Bolting (C) is GA-induced rapid internode elongation.

Q15. Answer: (C) Abscissic acid

ABA maintains dormancy while gibberellin breaks it — they are functional antagonists in seed germination control. Cytokinin (D) promotes growth and cell division, not dormancy.

Q16. Answer: (B) Ethylene promotes degradative enzyme activity in leaf tissues

Ethylene upregulates hydrolytic and oxidative enzymes that break down proteins and chlorophyll, driving senescence. Auxin transport inhibition (A) promotes abscission — a related but distinct process.

Q17. Answer: (D) Increased internode elongation

Ethylene inhibits elongation — it shortens internodes and causes radial swelling. Increased internode elongation is the effect of gibberellins, making it the classic distractor here.

Q18. Answer: (A) Day neutral plant

Day neutral plants (tomato, cucumber, cotton) flower based on developmental age, not photoperiod. Rosette plant (D) describes a growth form seen in some LDPs — it is not a photoperiod response category.

Q19. Answer: (B) Florigen

Florigen is the proposed flowering hormone synthesized in leaves and transported to the shoot apex to induce floral initiation. Vernalin (C) is a similar hypothetical substance linked to vernalization — placed here as an ELITE-level distractor.

Q20. Answer: (B) Phytochrome in leaves generates a transmissible florigen signal that travels to the shoot apical meristem

Leaves contain phytochrome which on appropriate photoperiodic induction produces florigen, transported via phloem to the shoot apex where floral meristem differentiation is initiated. The apex (D) is the response site, not the perception site.

Q21. Answer: (C) Chrysanthemum

Chrysanthemum is a classic SDP. Wheat (A) and barley (D) are LDPs — this pairing is a standard NEET trap. Spinach (B) is also an LDP.

Q22. Answer: (B) Devernalisation

Devernalisation occurs when plants subjected to high temperature after cold treatment lose their acquired flowering competence. Photoperiodism relates to day-length response. Dormancy and senescence are unrelated reversal processes.

Q23. Answer: (A) Survival during unfavourable environmental conditions

Dormancy prevents germination during adverse seasons, ensuring seeds survive until conditions are favourable. It does not accelerate flowering or growth. Water absorption is a germination process, not a dormancy function.

Q24. Answer: (A) Red light exposure

Positively photoblastic seeds (e.g., lettuce) require light — specifically red light acting via phytochrome — to break dormancy. High humidity, soil pH, and nitrogen are not the primary triggers for light-sensitive seed germination.

Plant growth regulators and key terms

Topic	Key fact
Arithmetic vs geometric growth	Arithmetic: one daughter cell keeps dividing (e.g. root elongating at a constant rate); geometric: both keep dividing, giving a sigmoid curve (lag, log, stationary phases)
Dedifferentiation	Mature cells regain the ability to divide, e.g. interfascicular cambium and cork cambium

Auxin discovery	Charles and Francis Darwin (canary grass coleoptile); F.W. Went isolated auxin from Avena coleoptile tips
Auxins	Natural: IAA, IBA; synthetic: NAA, 2,4-D (weedicide for dicot weeds); cause apical dominance, parthenocarpy in tomato, rooting of cuttings
Gibberellin discovery	E. Kurosawa — bakanae (foolish seedling) disease of rice caused by Gibberella fujikuroi
Gibberellins	More than 100 known (GA_3 best known); bolting in cabbage and beet; increase sugarcane yield; speed up malting
Cytokinin discovery	Skoog and Miller — kinetin from autoclaved herring sperm DNA; zeatin from corn kernels and coconut milk
Cytokinins	Promote cell division, overcome apical dominance, delay leaf senescence
Ethylene	Gaseous; ripens fruits, triple response in seedlings, promotes flowering in pineapple; ethephon releases ethylene
Absciscic acid	Stress hormone; closes stomata; induces seed dormancy; antagonist of gibberellins
Photoperiodism	Short-day, long-day and day-neutral plants; photoperiod is sensed by leaves; hypothetical signal: florigen
Vernalisation	Low-temperature treatment promotes flowering, e.g. winter wheat, barley, rye and biennials like sugarbeet, cabbage, carrot