PLANT PHYSIOLOGY

Q1. Which pigment is primarily responsible for light absorption in photosynthesis?
(A) Chlorophyll a
(B) Carotenoids
(C) Phycocyanin
(D) Xanthophyll

Q2. The light-dependent reactions of photosynthesis occur in which part of the chloroplast?
(A) Thylakoid membrane
(B) Intermembrane space
(C) Outer membrane
(D) Stroma

Q3. What is the primary product of the Calvin cycle?
(A) ATP
(B) Oxygen
(C) Glyceraldehyde-3-phosphate (G3P)
(D) NADPH

Q4. Which molecule acts as the final electron acceptor in the light reactions?
(A) CO_2
(B) $NADP^+$
(C) O_2
(D) ADP

Q5. In C4 plants, CO_2 is first fixed into:
(A) 3-phosphoglycerate
(B) Ribulose-1,5-bisphosphate
(C) Oxaloacetate
(D) Glucose

Q6. The enzyme RuBisCO catalyzes the fixation of CO_2 to:
(A) Ribulose-1,5-bisphosphate
(B) Pyruvate
(C) Phosphoenolpyruvate
(D) Oxaloacetate

Q7. Photorespiration is a wasteful process because it:
(A) Produces extra ATP
(B) Increases photosynthesis rate
(C) Releases previously fixed CO_2
(D) Produces NADPH

Q8. CAM plants open their stomata primarily during:
(A) Dawn only
(B) Dusk only
(C) Nighttime
(D) Daytime

Q9. Which photosystem is responsible for splitting water molecules?

(A) Photosystem II
(B) Neither
(C) Both equally
(D) Photosystem I

Q10. The oxygen released during photosynthesis comes from:

(A) Carbohydrates
(B) CO_2
(C) Water
(D) Glucose

Q11. Transpiration pull is the driving force for water movement in:

(A) Phloem
(B) Cortex
(C) Xylem
(D) Epidermis

Q12. The cohesion-tension theory explains water movement through:

(A) Phloem vessels
(B) Companion cells
(C) Sieve tubes
(D) Xylem vessels

Q13. Root pressure is caused by:

(A) Active transport of ions into xylem
(B) Osmosis in phloem
(C) Gravity pulling water down
(D) Evaporation of water from leaves

Q14. Guttation occurs when:

(A) Stomata open at night
(B) Root pressure exceeds transpiration pull
(C) Transpiration exceeds water absorption
(D) Rainfall is excessive

Q15. The opening and closing of stomata is regulated by:

(A) Guard cells
(B) Trichomes
(C) Epidermal cells
(D) Mesophyll cells

Q16. Which ion is primarily responsible for stomatal opening?

(A) Na^+
(B) K^+
(C) Mg^{2+}
(D) Ca^{2+}

Q17. The Casparian strip in the endodermis prevents:

(A) Phloem loading
(B) Ion transport in leaves
(C) Apoplastic movement of water into xylem
(D) Water movement through symplast

Q18. Apoplastic transport refers to movement:

(A) Through cell walls and intercellular spaces
(B) Through tonoplast
(C) Through the cytoplasm
(D) Through plasmodesmata

Q19. Osmotic potential is always:

(A) Negative
(B) Variable (positive or negative)
(C) Positive
(D) Zero

Q20. Water potential of pure water at standard conditions is:

(A) -1 MPa
(B) 0 MPa
(C) 0.5 MPa
(D) +1 MPa

Q21. Phloem transport is best described by which theory?

(A) Pressure flow (mass flow) hypothesis
(B) Capillarity theory
(C) Root pressure theory
(D) Cohesion-tension theory

Q22. Sucrose is loaded into phloem by:

(A) Active transport
(B) Simple diffusion
(C) Facilitated diffusion only
(D) Osmosis

Q23. Which plant hormone promotes cell elongation and apical dominance?

(A) Cytokinin
(B) Gibberellin
(C) Auxin (IAA)
(D) Abscisic acid

Q24. Gibberellins were first isolated from which organism?

(A) Higher plants
(B) Bacteria
(C) Fungi (Gibberella fujikuroi)
(D) Algae

Q25. Cytokinins primarily promote:

(A) Dormancy
(B) Root elongation
(C) Cell division (cytokinesis)
(D) Fruit ripening

Q26. Abscisic acid (ABA) is often called the:

(A) Flowering hormone
(B) Ripening hormone
(C) Growth hormone
(D) Stress hormone

Q27. Ethylene is unique among plant hormones because it is:

(A) A lipid
(B) A gaseous hormone
(C) A protein
(D) A polysaccharide

Q28. The triple response in seedlings is induced by:

(A) Ethylene
(B) Cytokinin
(C) Gibberellin
(D) Auxin

Q29. Which hormone is responsible for breaking seed dormancy?

(A) ABA
(B) Auxin
(C) Ethylene
(D) Gibberellin

Q30. Brassinosteroids are structurally similar to:

(A) Animal steroid hormones
(B) Amino acids
(C) Nucleotides
(D) Fatty acids

Q31. Photoperiodism refers to the response of plants to:

(A) Light quality
(B) Temperature
(C) Relative lengths of day and night
(D) Light intensity

Q32. Short-day plants flower when the night length is:

(A) Long (exceeds critical night length)
(B) Variable
(C) Short
(D) Equal to day length

Q33. The pigment responsible for photoperiodism is:

(A) Phytochrome
(B) Carotenoid
(C) Chlorophyll
(D) Anthocyanin

Q34. Phytochrome exists in two interconvertible forms. The active form is:

(A) Pfr (far-red-absorbing)
(B) Pr (red-absorbing)
(C) Neither
(D) Both are equally active

Q35. Vernalization is the process by which:

(A) Seeds germinate in spring
(B) Leaves change color in autumn
(C) Prolonged cold promotes flowering
(D) Roots grow deeper in winter

Q36. The photoperiodic signal is perceived in:

(A) Flowers
(B) Roots
(C) Stems
(D) Leaves

Q37. Florigen (hypothetical flowering hormone) is now identified as:

(A) FT protein (FLOWERING LOCUS T)
(B) Cytokinin
(C) Gibberellin
(D) Auxin

Q38. Which of the following is a long-day plant?

(A) Soybean
(B) Spinach
(C) Cocklebur
(D) Chrysanthemum

Q39. Seed germination is inhibited by which hormone?

(A) Abscisic acid
(B) Auxin
(C) Cytokinin
(D) Gibberellin

Q40. The process of phototropism involves movement of auxin towards the:

(A) Shaded side
(B) Apex
(C) Base
(D) Light-exposed side

Q41. Geotropism in roots is:

(A) Neutral
(B) Light-dependent
(C) Positive (towards gravity)
(D) Negative

Q42. Turgor pressure in plant cells results from:

(A) Plasmolysis
(B) Entry of water by osmosis
(C) Loss of water
(D) Deplasmolysis

Q43. Plasmolysis occurs when a plant cell is placed in:

(A) Hypotonic solution
(B) Hypertonic solution
(C) Distilled water
(D) Isotonic solution

Q44. Which macronutrient is a key component of chlorophyll?

(A) Iron
(B) Potassium
(C) Magnesium
(D) Calcium

Q45. Nitrogen fixation by free-living bacteria is carried out by:

(A) Nitrosomonas
(B) Pseudomonas
(C) Nitrobacter
(D) Azotobacter

Q46. The enzyme nitrogenase requires which metal cofactor?

(A) Manganese
(B) Copper
(C) Zinc
(D) Molybdenum

Q47. Mycorrhizal associations primarily help plants absorb:

(A) Nitrogen
(B) Carbon dioxide
(C) Phosphorus
(D) Potassium

Q48. Which mineral deficiency causes chlorosis?

(A) Calcium deficiency
(B) Potassium deficiency
(C) Iron or Magnesium deficiency
(D) Phosphorus deficiency

Q49. Nitrate assimilation in plants involves reduction of NO_3^- to:

(A) NH_4^+ (ammonium)
(B) Urea
(C) N_2 gas
(D) NO_2 only

Q50. Legumes form nitrogen-fixing symbiosis with:

(A) Azotobacter
(B) Anabaena
(C) Frankia
(D) Rhizobium

Q51. Respiration that occurs in the absence of oxygen is called:

(A) Anaerobic respiration (fermentation)
(B) Chemosynthesis
(C) Photorespiration
(D) Aerobic respiration

Q52. The net ATP yield from glycolysis (per glucose) is:

(A) 2 ATP
(B) 30 ATP
(C) 4 ATP
(D) 36-38 ATP

Q53. Pyruvate decarboxylation occurs in the:

(A) Mitochondrial matrix
(B) Nucleus
(C) Chloroplast stroma
(D) Cytosol

Q54. The Krebs cycle produces how many NADH per acetyl-CoA?

(A) 2
(B) 3
(C) 4
(D) 6

Q55. The electron transport chain in plant mitochondria uses which final electron acceptor?

(A) CO_2
(B) O_2
(C) NAD^+
(D) FAD

Q56. Cyanide-resistant respiration in plants involves:

(A) Complex III
(B) ATP synthase
(C) Complex I
(D) Alternative oxidase (AOX)

Q57. Fermentation in plants produces ethanol and:

(A) Water
(B) O_2
(C) Lactic acid
(D) CO_2

Q58. The pentose phosphate pathway produces:

(A) NADPH and ribose-5-phosphate
(B) Sucrose
(C) Acetyl-CoA
(D) Pyruvate and ATP

Q59. The chemiosmotic theory of ATP synthesis was proposed by:

(A) Mitchell
(B) Calvin
(C) Warburg
(D) Krebs

Q60. In oxidative phosphorylation, ATP is synthesized by:

(A) ATP synthase (complex V)
(B) Glycolysis
(C) Substrate-level phosphorylation
(D) Photophosphorylation

Q61. During seed germination, the primary energy reserve mobilized is:

(A) RNA
(B) Starch or oils depending on species
(C) Protein only
(D) DNA

Q62. Growth in plants is primarily due to:

(A) Increase in cell size only
(B) Differentiation only
(C) Increase in cell number only
(D) Both cell division and cell elongation

Q63. The meristematic cells in plants are characterized by:

(A) Large vacuoles
(B) Thin cell walls and dense cytoplasm
(C) Absence of nucleus
(D) Presence of chloroplasts

Q64. Apical meristems are responsible for:

(A) Primary growth (elongation)
(B) Lateral bud formation
(C) Increase in girth
(D) Secondary growth

Q65. Senescence in leaves is accelerated by:

(A) Gibberellin
(B) Auxin
(C) Ethylene and ABA
(D) Cytokinin

Q66. The 'stay-green' trait in plants is associated with delayed breakdown of:

(A) Chlorophyll
(B) DNA
(C) Starch
(D) Cell wall

Q67. Abscission of leaves is controlled primarily by:

(A) High auxin : low ethylene ratio
(B) High cytokinin
(C) High gibberellin
(D) Low auxin : high ethylene ratio

Q68. Which type of movement is nastic?

(A) Non-directional movement in response to stimulus
(B) Directional movement in response to external stimulus direction
(C) Movement towards gravity
(D) Movement towards light

Q69. Thigmomorphogenesis refers to plant responses to:

(A) Mechanical stimuli (touch/wind)
(B) Drought stress
(C) Temperature changes
(D) Light quality

Q70. Plants close their stomata during drought mainly due to:

(A) Increased CO_2
(B) Decreased light
(C) Increased cytokinin
(D) Increased ABA synthesis

Q71. Heat shock proteins in plants function as:

(A) Enzymes
(B) Molecular chaperones protecting proteins
(C) Transport proteins
(D) Structural proteins

Q72. Osmoprotectants such as proline accumulate in plants under:

(A) Cold stress only
(B) Nutrient excess
(C) Water or salt stress
(D) High light stress

Q73. Reactive oxygen species (ROS) in plants are neutralized by:

(A) RuBisCO
(B) Cytochrome oxidase
(C) Nitrogenase
(D) Catalase and superoxide dismutase

Q74. Which process allows plants to acclimate to cold temperatures?

(A) Photorespiration
(B) Vernalization only
(C) Cold hardening (cold acclimation)
(D) Thermoperiodism

Q75. Antifreeze proteins in plants prevent:

(A) Ice nucleation and ice crystal growth
(B) Protein synthesis
(C) Stomatal opening
(D) Chlorophyll degradation

Q76. The Z-scheme of photosynthesis describes:

(A) CAM pathway
(B) Carbon fixation pathway
(C) Non-cyclic photophosphorylation electron flow
(D) Cyclic photophosphorylation only

Q77. Cyclic photophosphorylation produces:

(A) Only NADPH
(B) O2 and ATP
(C) Both ATP and NADPH
(D) Only ATP

Q78. In non-cyclic electron flow, electrons ultimately come from:

(A) CO2
(B) NADPH
(C) Water
(D) Glucose

Q79. The Q cycle in the electron transport chain involves:

(A) RuBisCO
(B) Cytochrome b6f complex
(C) Photosystem I
(D) ATP synthase

Q80. Starch synthesis in leaves occurs primarily in:

(A) Vacuoles
(B) Nucleus
(C) Chloroplasts
(D) Mitochondria

Q81. Sucrose is the primary form in which carbon is transported in phloem because:

(A) It cannot be metabolized
(B) It is the smallest sugar
(C) It is non-reducing and chemically stable
(D) It dissolves in oils

Q82. The loading of sucrose into phloem uses which type of transport?

(A) Osmosis
(B) Endocytosis
(C) Simple diffusion
(D) H+/sucrose symporter (active transport)

Q83. Unloading of assimilates at sink tissues can be:

(A) Only apoplastic
(B) Through xylem
(C) Both apoplastic and symplastic
(D) Only symplastic

Q84. The signal for transition from vegetative to reproductive growth is called:

(A) Floral stimulus or florigen
(B) Fruit ripening signal
(C) Seed dormancy signal
(D) Vernalization signal

Q85. Phytochrome is a:

(A) Chlorophyll-binding protein
(B) Flavoprotein
(C) Chromoprotein with a tetrapyrrole chromophore
(D) Carotenoid-protein

Q86. Blue-light responses in plants are mediated by:

(A) Chlorophyll a
(B) Carotenoids
(C) Cryptochrome and phototropin
(D) Phytochrome

Q87. UV-B perception in plants involves the receptor:

(A) Phytochrome
(B) Phototropin
(C) UVR8
(D) Cryptochrome

Q88. In grafting experiments, the florigen signal can pass through the:

(A) Xylem only
(B) Graft union (phloem)
(C) Roots
(D) Stomata

Q89. The critical night length in photoperiodism is the:

(A) Maximum light period allowed
(B) Minimum light required
(C) Total 24-hour period
(D) Minimum dark period required for flowering

Q90. Ethylene promotes fruit ripening by:

(A) Increasing chlorophyll synthesis
(B) Reducing respiration
(C) Decreasing sugar content
(D) Activating cell wall-degrading enzymes and color change

Q91. Which hormone delays senescence and promotes cell division in tissue culture?

(A) Ethylene
(B) Auxin alone
(C) Cytokinin
(D) ABA

Q92. Adventitious roots are best induced by:

(A) Auxin (IAA/IBA)
(B) ABA
(C) Cytokinin
(D) Gibberellin

Q93. Seed dormancy is primarily maintained by:

(A) High auxin levels
(B) High gibberellin levels
(C) High ABA levels
(D) High cytokinin levels

Q94. The aleurone layer in cereals responds to gibberellin by producing:

(A) Alpha-amylase
(B) Lipase
(C) Protease only
(D) Sucrose

Q95. Which of the following is classified as a micronutrient (trace element) in plants?

(A) Boron
(B) Phosphorus
(C) Nitrogen
(D) Calcium

Q96. Iron is required in plants primarily for:

(A) DNA replication
(B) Cell wall synthesis
(C) Cytochrome synthesis and electron transport
(D) Osmotic adjustment

Q97. Deficiency of boron causes:

(A) Death of growing points (meristems)
(B) Interveinal chlorosis
(C) Stunted roots only
(D) Yellowing of old leaves

Q98. Potassium in plants plays a key role in:

(A) Nitrogen fixation
(B) Lignin synthesis
(C) Photosynthesis pigment formation
(D) Stomatal movement and enzyme activation

Q99. Which element is required for calcium pectate formation in the middle lamella?

(A) Potassium
(B) Magnesium
(C) Calcium
(D) Sulfur

Q100. The transpiration ratio (water use efficiency inverse) is higher in:

(A) C4 plants
(B) C3 plants
(C) All are equal
(D) CAM plants

Q101. Which process is responsible for upward movement of water against gravity in tall trees?

(A) Cohesion-tension mechanism
(B) Osmosis in xylem
(C) Capillarity alone
(D) Root pressure alone