JENPAS UG 2025 Plant Physiology & Anatomy Questions and Solutions PDF

Question	Options	Correct Answer	Step-by-Step Explanation
Which pigment is primarily responsible for capturing light energy during the light-dependent reactions of photosynthesis?	a) Chlorophyll a b) Chlorophyll b c) Carotenoids d) Xanthophyll	a	Step 1: Photosynthesis consists of both light-dependent and light-independent phases. Step 2: Chlorophyll a is the primary pigment in photosystems I and II, directly absorbing light for electron excitation. Step 3: Chlorophyll b and carotenoids are accessory pigments; xanthophyll is a carotenoid type. Thus, a is correct.
In the Calvin cycle, which enzyme catalyses CO_2 fixation with RuBP?	a) Rubisco b) PEP carboxylase c) ATP synthase d) Cytochrome oxidase	a	Step 1: The Calvin cycle fixes CO_2 into organic molecules. Step 2: Rubisco catalyses the reaction between CO_2 and RuBP to form 3-PGA. Step 3: PEP carboxylase (C4 plants), ATP synthase (photophosphorylation), and cytochrome oxidase (respiration) are unrelated. Hence, a is correct.
What is the primary function of stomata in transpiration?	a) Facilitate gas exchange and water vapour loss b) Absorb soil minerals c) Store carbohydrates d) Provide structural support	a	Step 1: Transpiration is water vapour loss from leaves. Step 2: Stomata allow CO_2 entry and O_2 exit for photosynthesis, enabling water vapour escape. Step 3: Options b, c, and d relate to roots, parenchyma, and collenchyma/sclerenchyma. Thus, a is correct.

Which factor does NOT directly affect transpiration rate?	a) Soil pH b) Humidity c) Wind speed d) Temperature	a	Step 1: Transpiration depends on environmental factors like vapour pressure. Step 2: Low humidity, high wind, and temperature increase evaporation. Step 3: Soil pH affects nutrient uptake indirectly, not transpiration. Hence, a is correct.
Meristematic tissues are characterised by which feature?	a) Thin-walled cells with active division b) Thick lignified walls c) Large vacuoles for storage d) Chloroplasts for photosynthesis	a	Step 1: Meristematic tissues drive plant growth. Step 2: They have thin cellulose walls, dense cytoplasm, and divide actively. Step 3: Options b, c, and d describe sclerenchyma, parenchyma, and chlorenchyma. Thus, a is correct.
Which tissue transports water and minerals from roots to shoots?	a) Xylem b) Phloem c) Epidermis d) Cortex	a	Step 1: Vascular tissues include xylem and phloem. Step 2: Xylem conducts water/minerals upward via transpiration pull. Step 3: Phloem transports nutrients; epidermis and cortex have other roles. Hence, a is correct.
In C4 plants, initial CO_2 fixation occurs in which cells?	a) Mesophyll cells b) Bundle sheath cells c) Guard cells d) Epidermal cells	a	Step 1: C4 photosynthesis minimises photorespiration. Step 2: CO_2 is fixed into oxaloacetate in mesophyll cells by PEP carboxylase. Step 3: Bundle sheath cells host the Calvin cycle; guard/epidermal cells don't fix CO_2. Thus, a is correct.

Guttation in plants is primarily due to which phenomenon?	a) Root pressure b) Transpiration pull c) Capillary action d) Osmotic diffusion	a	Step 1: Guttation is water exudation from leaf hydathodes. Step 2: It occurs under high humidity via root pressure. Step 3: Transpiration, capillary action, and osmosis are secondary mechanisms. Hence, a is correct.
Parenchyma tissues can be specialised for which function?	a) Photosynthesis in leaves (chlorenchyma) b) Water conduction c) Lignified support d) Sieve tube formation	a	Step 1: Parenchyma is a simple tissue with living cells. Step 2: Chlorenchyma (parenchyma with chloroplasts) performs photosynthesis. Step 3: Options b, c, and d describe xylem, sclerenchyma, and phloem. Thus, a is correct.
Companion cells in phloem are primarily involved in:	a) Loading/unloading sugars b) Water conduction c) Gas exchange d) Cell division	a	Step 1: Phloem includes sieve tubes and companion cells. Step 2: Companion cells support sieve tubes by loading/unloading sucrose. Step 3: Options b, c, and d relate to xylem, stomata, and meristems. Hence, a is correct.
During photosynthesis, water splitting (photolysis) occurs in which photosystem?	a) Photosystem II b) Photosystem I c) Calvin cycle d) Electron transport chain	a	Step 1: Light-dependent reactions involve photosystems I and II. Step 2: Photolysis in PSII provides electrons, releasing O2. Step 3: PSI reduces NADP+; Calvin cycle and ETC are separate. Thus, a is correct.

Which is a pull factor in the cohesion-tension theory of transpiration?	a) Evaporation from leaf surfaces b) Active root pumping c) Soil water potential d) Guttation pressure	a	Step 1: Cohesion-tension theory explains xylem water movement. Step 2: Leaf evaporation creates tension, pulling water up. Step 3: Root pressure, soil potential, and guttation are secondary. Hence, a is correct.
Collenchyma tissues provide flexible support in which plant part?	a) Growing stems and petioles b) Mature woody stems c) Root endodermis d) Leaf veins only	a	Step 1: Collenchyma has unevenly thickened walls. Step 2: It supports young, growing stems and petioles. Step 3: Options b, c, and d describe sclerenchyma, endodermis, and vascular tissues. Thus, a is correct.
Vessel elements in xylem differ from tracheids by:	a) Perforation plates for efficient flow b) Living cells with nuclei c) Sugar transport d) No secondary walls	a	Step 1: Xylem includes tracheids and vessels. Step 2: Vessels have perforation plates for faster water flow. Step 3: Both are dead; sugars via phloem; both have walls. Hence, a is correct.
Phloem translocation of sugars follows which principle?	a) Mass flow hypothesis b) Root pressure ascent c) Capillary rise d) Active diffusion only	a	Step 1: Phloem moves sugars from the source to the sink. Step 2: The Mass flow hypothesis involves pressure-driven sap movement. Step 3: Other options relate to xylem or minor mechanisms. Thus, a is correct.