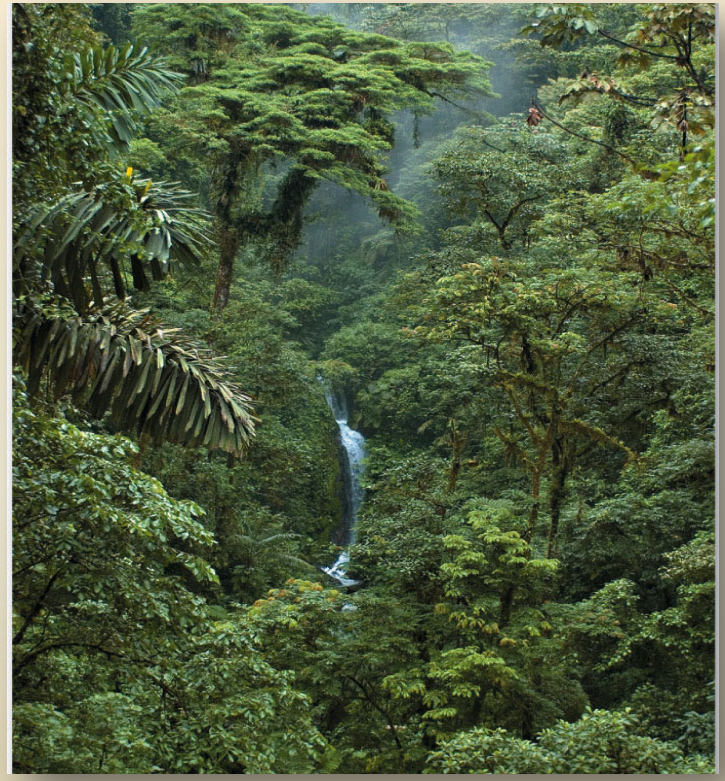
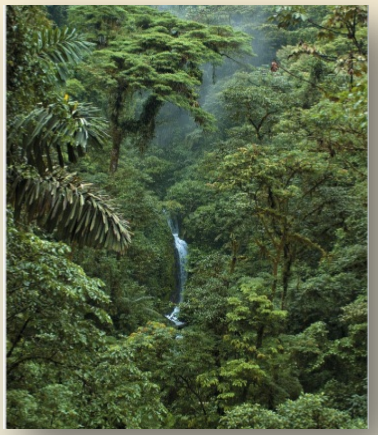
Photosynthesis: Light-Dependent Reactions



Forest Canopy Photosynthetic Pigments

Consider plants that occupy the top, middle, and ground canopies (layers) of a forest.



1. Would you expect the same photosynthetic pigments to be found in plant species that live in these different habitats? Why or why not?
2. Would you expect the ratio of chlorophyll a to b to be the same? Why or why not?
3. How would you test your hypothesis?

If H_2O is labeled with radioactive ^{18}O and ^{3}H, what molecule(s) will become radioactive as non-cyclic electron transport reactions are completed?

- A. O_2 only
- B. Both O_2 and ATP
- C. Both ATP and NADPH
- D. NADPH only
- E. Both O_2 and NADPH

Assume a thylakoid is somehow punctured so that the interior of the thylakoid is no longer separated from the stroma. This damage will have the most direct effect on which of the following processes?

- A. the synthesis of ATP
- B. the splitting of water
- C. the reduction of NADP+
- D. the absorption of light energy by chlorophyll
- E. the flow of electrons from photosystem II to photosystem I

How can you tell if a photosynthetic cell has cyclic electron transport only, but not non-cyclic electron transport system?

- A. You can't tell.
- B. Exposing it to light would result in splitting of H_2O.
- C. Exposing it to light would result in NADPH production.
- D. Exposing it to light would not result in ATP production.
- E. Exposing it to light would not result in O_2 release.

Which light reaction system would a chloroplast favour when plenty of light is available, but the cell contains low concentration of $NADP^+$?

A. Non-cyclic photophosphorylation

B. Cyclic photophosphorylation

Which light reaction system would a chloroplast favour when there is plenty of light, but the cell contains high concentration of $NADP^+$?

- A. Non-cyclic photophosphorylation
- B. Cyclic photophosphorylation

Comparison between non-cyclic and cyclic photophosphorylation

	Non-cyclic photophosphorylation	Cyclic photophosphorylation
Ultimate electron source	H_2O	Photosystem I
Is O_2 released?	yes (photolysis of water)	no
Terminal e- acceptor	NADP+	none
Form in which energy is temporarily captured	ATP (chemiosmosis) and NADPH	ATP (chemiosmosis)
Photosystem required	Photosystem I and II	Photosystem I only