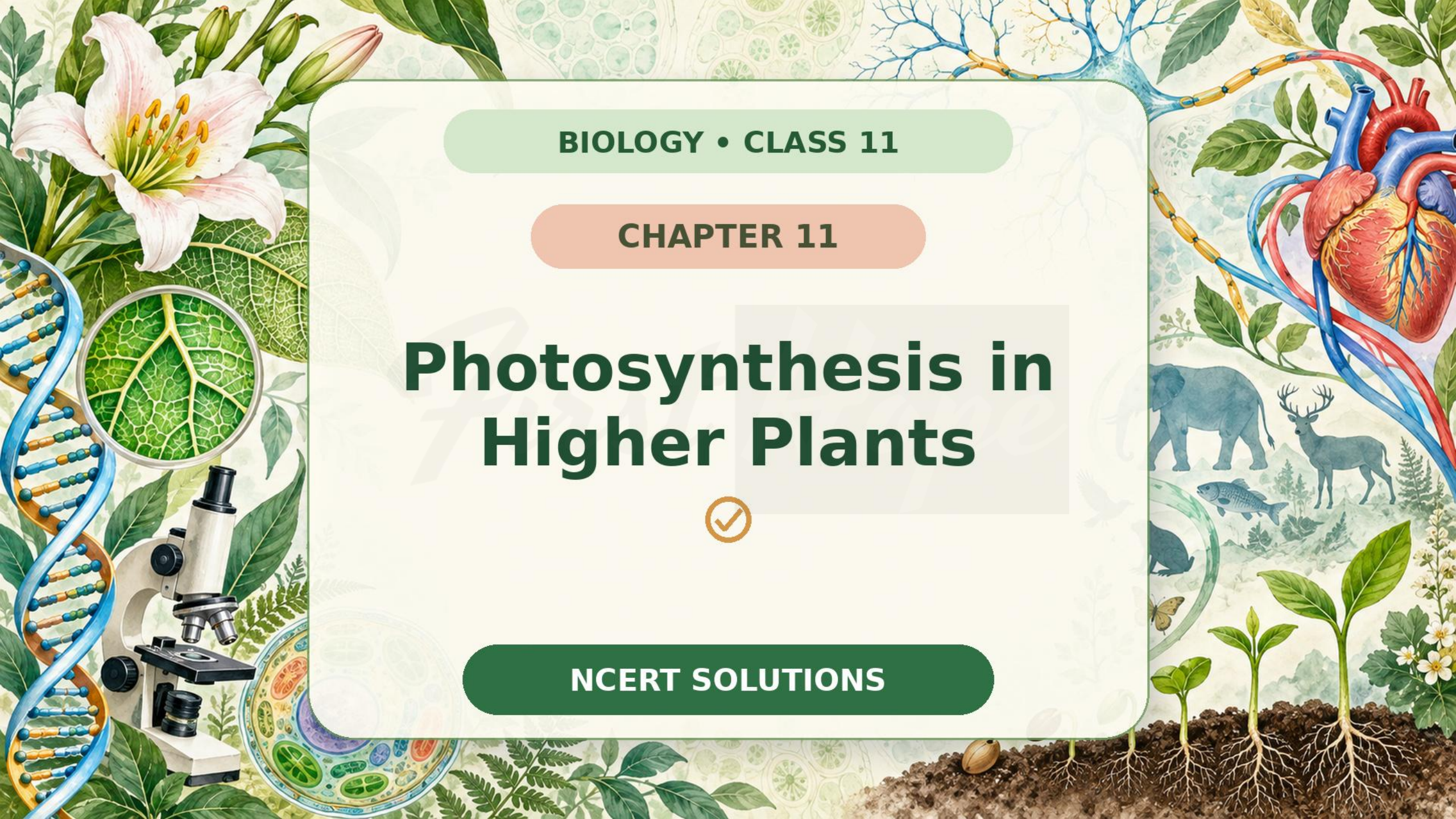


A vibrant collage of biological illustrations. On the left, a pink lily flower is in bloom, with green buds and leaves. Below it, a blue and orange DNA double helix is visible. A magnifying glass focuses on a green leaf's vein structure. A microscope is positioned in the lower-left corner. The background is filled with various green leaves and plant patterns. On the right, a detailed illustration of a human heart with red and blue blood vessels is shown. Below the heart, there are silhouettes of an elephant, a deer, and a fish. At the bottom, a small green plant with roots is growing out of a mound of brown soil.

BIOLOGY • CLASS 11

CHAPTER 11

Photosynthesis in Higher Plants



NCERT SOLUTIONS

EXERCISE SOLUTIONS: QUESTIONS 1-2

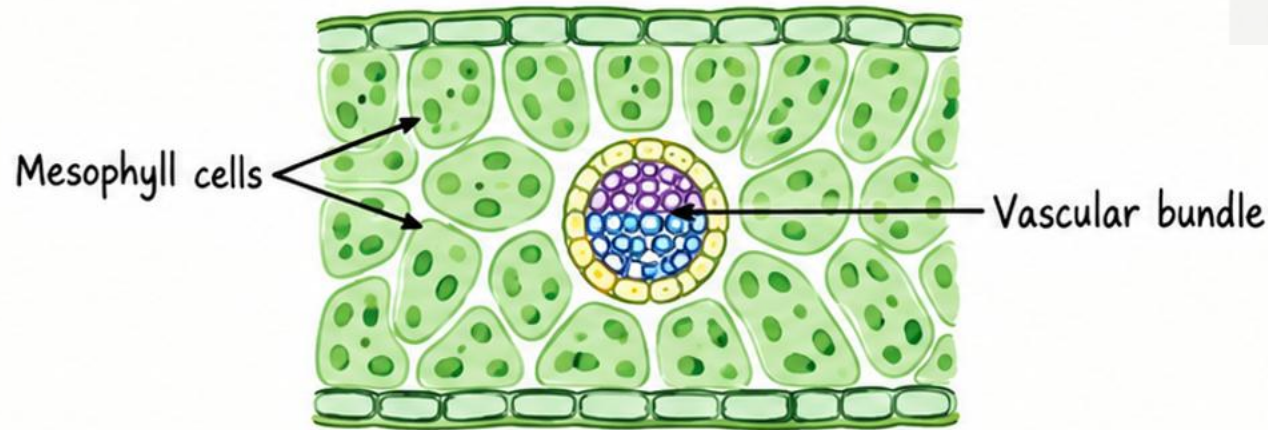
1. By looking at a plant externally, can you tell whether it is C_3 or C_4 ? Why and how?

Answer: No.

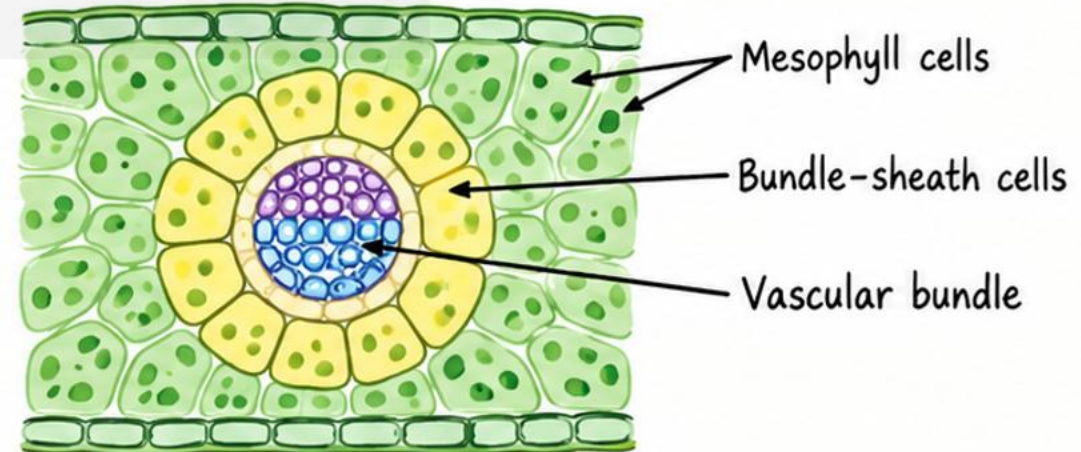
C_3 and C_4 plants do not have a dependable external feature that always separates them. The difference lies mainly in their internal leaf anatomy and pathway of CO_2 fixation; therefore external appearance alone is not enough.

2. By looking at which internal structure can you tell whether a plant is C_3 or C_4 ? Explain.

Answer: Examine a transverse section of the leaf. A C_4 leaf shows Kranz anatomy: each vascular bundle is surrounded by a ring of large bundle-sheath cells containing many chloroplasts, and mesophyll cells form a ring around them. A typical C_3 leaf lacks this distinct Kranz arrangement.



C_3 leaf – no Kranz anatomy



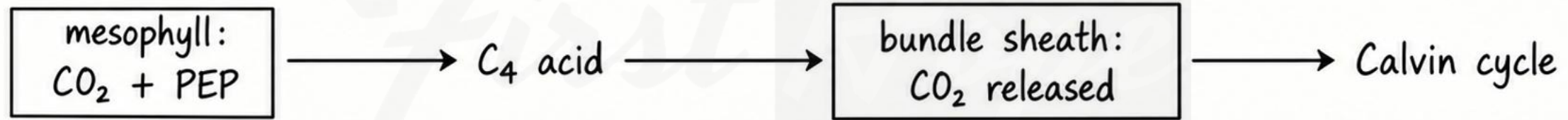
C_4 leaf – Kranz anatomy

EXERCISE SOLUTIONS: QUESTIONS 3-4

3. Very few cells in a C_4 plant carry out the Calvin pathway, yet C_4 plants are highly productive. Why?

Answer:

- Mesophyll cells first fix CO_2 with PEP carboxylase into a four-carbon compound.
- This compound carries CO_2 to bundle-sheath cells, where it releases CO_2 around RuBisCO.
- The high local CO_2 concentration suppresses photorespiration.
- Energy and carbon are therefore used efficiently, especially in high light and high temperature.



4. Why does RuBisCO carry out more carboxylation in C_4 plants although it acts as both carboxylase and oxygenase?

Answer:

C_4 plants concentrate CO_2 in bundle-sheath cells. PEP carboxylase fixes CO_2 in mesophyll cells and the C_4 acids release it beside RuBisCO. Bundle-sheath conditions also keep O_2 comparatively low. The high $CO_2:O_2$ ratio favours the carboxylase activity of RuBisCO and greatly reduces oxygenation and photorespiration.

EXERCISE SOLUTIONS: QUESTIONS 5-7

5. Could a plant rich in chlorophyll b but lacking chlorophyll a carry out photosynthesis? Why are accessory pigments present?

Answer: No. Chlorophyll a forms the reaction centres and directly performs the primary photochemical reactions. Chlorophyll b and other accessory pigments absorb additional wavelengths and transfer the energy to chlorophyll a. They broaden light absorption and also protect chlorophyll a from photo-oxidation.

6. Why does a leaf kept in the dark become yellow or pale green? Which pigment is more stable?

Answer: Without light, chlorophyll synthesis stops and existing chlorophyll breaks down. The yellow carotenoid pigments become visible. Therefore carotenoids are more stable than chlorophyll under these conditions.

7. Which leaves are darker green—those on the shady side or sunny side—and why?

Answer: Leaves on the shady side are generally darker green. In weak light they develop more chlorophyll, especially relatively more chlorophyll b, and often larger light-harvesting systems so that they can absorb available light efficiently. Sun leaves receive abundant light and need less chlorophyll per unit light captured.

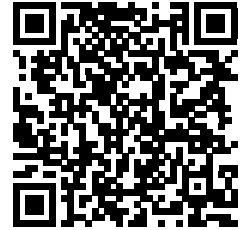


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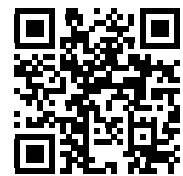


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