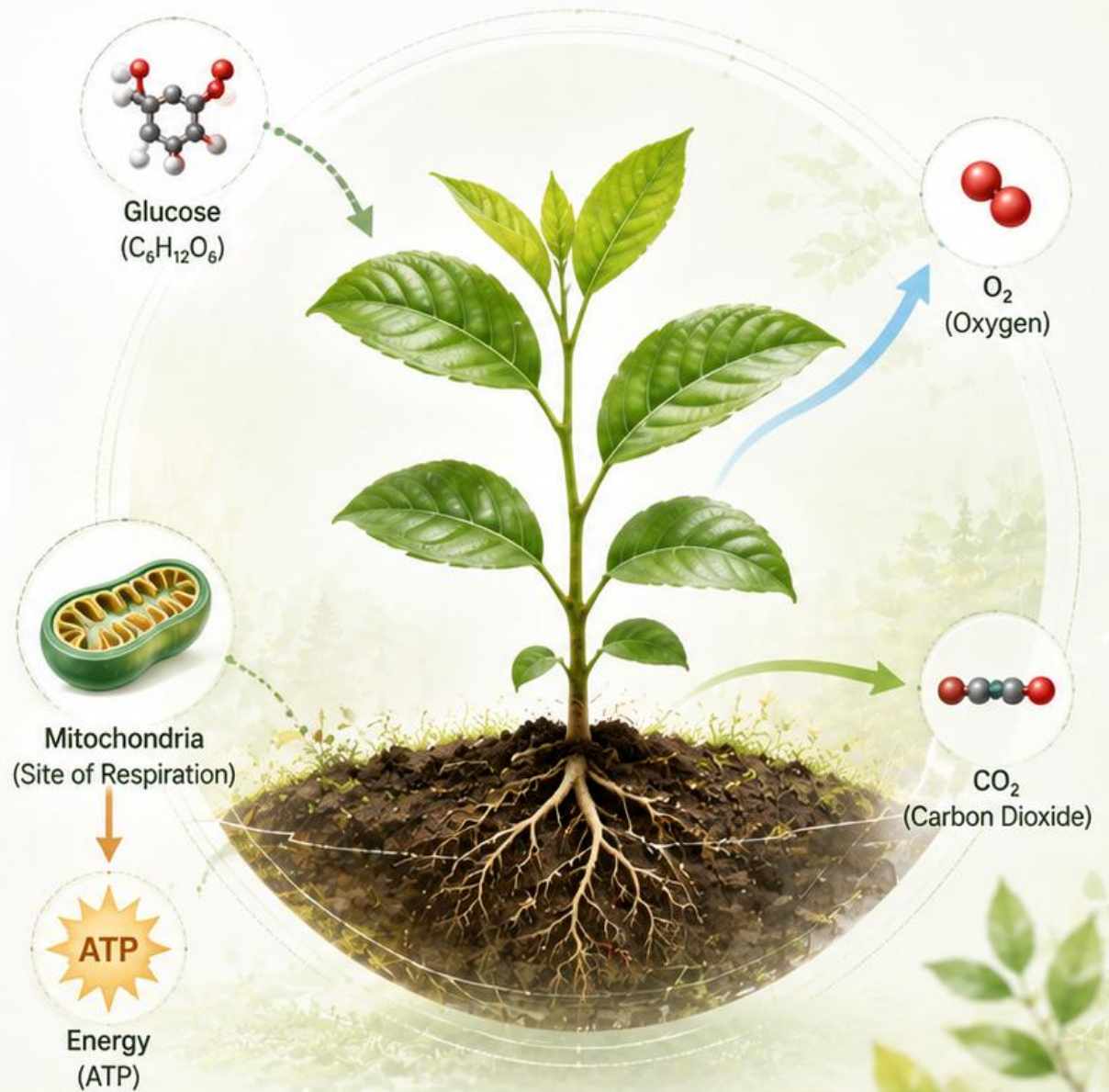


Chapter 12 : Respiration in Plants

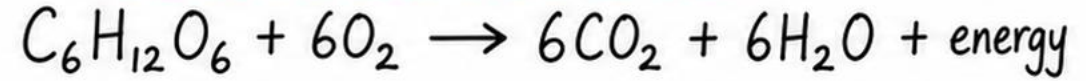
Biology Notes | Class 11



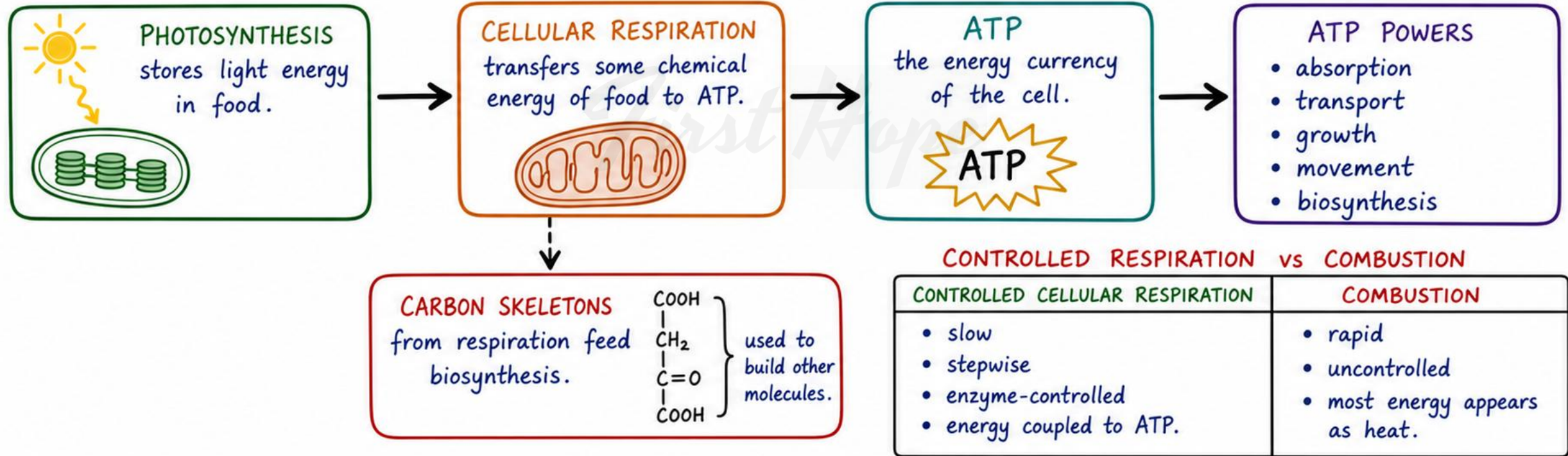
CELLULAR RESPIRATION: ENERGY RELEASE & ATP

- Definition: enzyme-controlled stepwise oxidation of respiratory substrates inside cells, breaking carbon-carbon bonds and trapping part of released energy in ATP.
- Usually carbohydrate/glucose; fats, proteins and organic acids may also serve under suitable conditions.

OVERALL AEROBIC NET EQUATION



many enzyme-controlled steps —
not one intracellular burn.



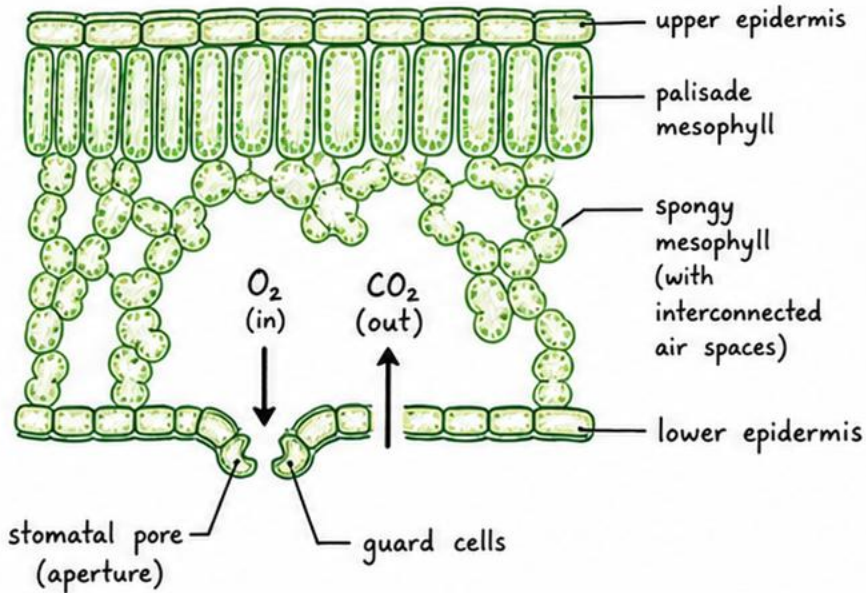
IMPORTANT ACCURACY NOTE

Energy flows through living systems. At each step, some energy is lost as heat and ultimately dissipated to the surroundings. Therefore, energy is not recycled.

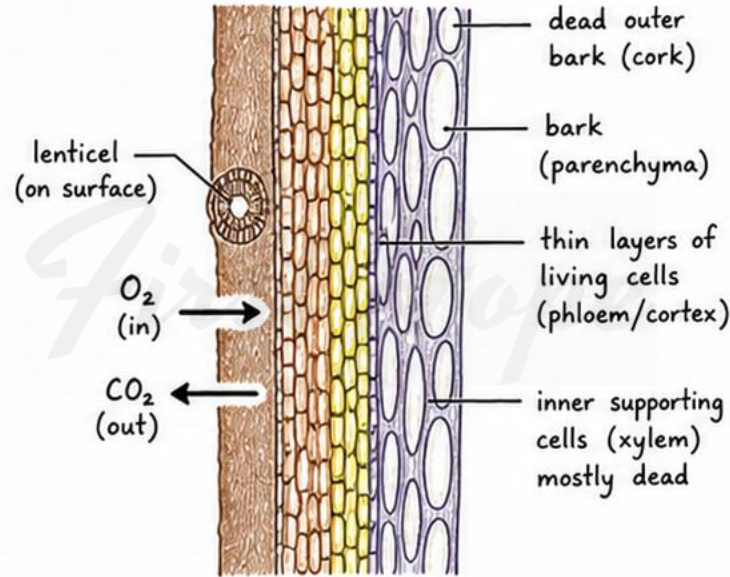
HOW PLANTS EXCHANGE RESPIRATORY GASES

- Plants respire continuously in all living cells — day and night. During respiration, O_2 is taken in and CO_2 is given out. Gas exchange occurs mainly by diffusion. Unlike animals, plants have no specialised respiratory organs.
- The following three organs exchange gases with their surroundings.

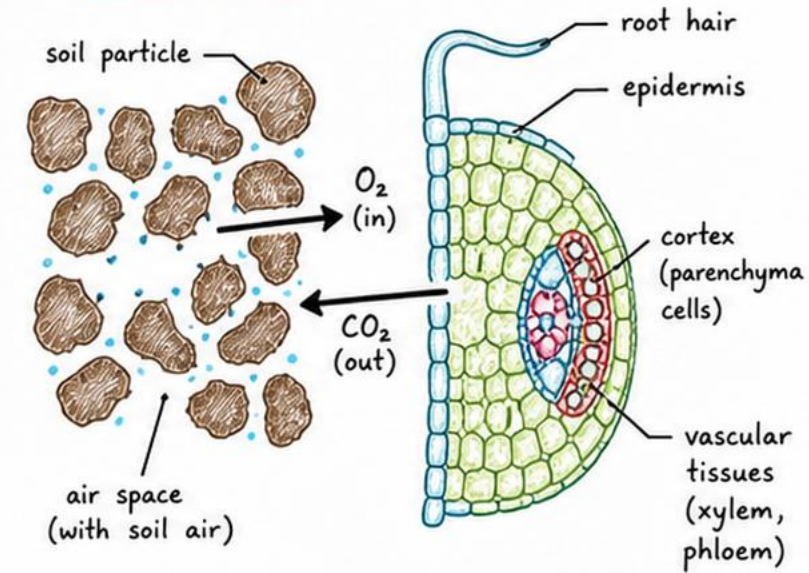
1) LEAF (cross-section)



2) WOODY STEM (in cross-section)



3) YOUNG ROOT (in cross-section)



WHY DIFFUSION IS SUFFICIENT IN PLANTS

- Each organ meets its own gas-exchange need. Little transport of gases occurs between organs.
- The respiratory demand of plants is relatively low.
- Living cells are located near a surface (stomata, lenticels, root surface/root hairs) or near internal air spaces.
- Loosely packed parenchyma provides an interconnected air-space network.
- Diffusion distances are short.

DISTINCT SURFACES FOR GAS EXCHANGE

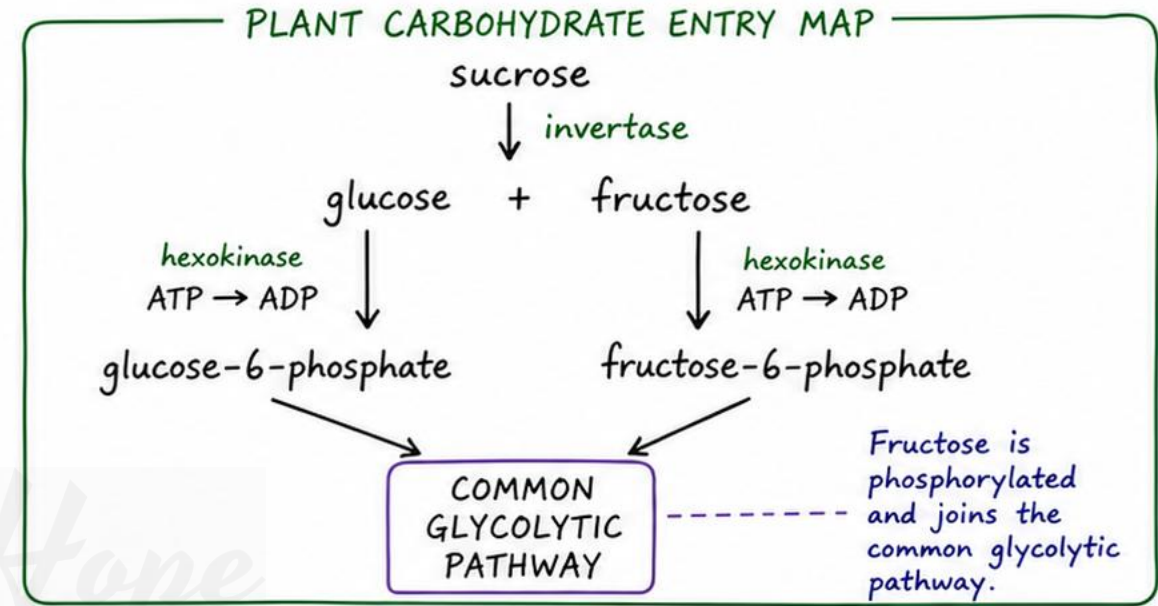
- Stomata — present on leaves and young green stems.
- Lenticels — present on woody stems (and roots).
- Root surface / root hairs — present on roots.

* In an illuminated green leaf, the observed net exchange of O_2 and CO_2 also depends on photosynthesis. The respiratory arrows shown in the diagrams above describe cellular respiration only.

GLYCOLYSIS: LOCATION, ENTRY & PURPOSE

- Definition: glycolysis, also called the EMP pathway (Embden-Meyerhof-Parnas), is a universal sequence of 10 enzyme-controlled reactions in the CYTOSOL.
- Core equation / flow:

$$1 \text{ glucose (6C)} \longrightarrow 2 \text{ pyruvate (3C each), partial oxidation.}$$
- Directly requires no O_2 .
- Shared first stage of aerobic respiration and fermentation.
- In anaerobic organisms, it can be the only ATP-producing respiratory stage.



① ENERGY INVESTMENT

- 2 ATP used

Glucose is phosphorylated twice using 2 ATP to form an activated 6-carbon molecule.

② SIX-CARBON CLEAVAGE

- two 3C molecules

The activated 6-carbon molecule is cleaved to yield two 3-carbon molecules, which continue through the pathway.

③ ENERGY PAYOFF

- 4 ATP made + 2 NADH

By substrate-level phosphorylation and oxidation of NAD^+ , ending in 2 pyruvate (3C each).

BALANCE (per glucose)

Gross:	4 ATP made	Products also:
Minus:	2 ATP used	• 2 NADH
Net:	<u>2 ATP</u> per glucose	• 2 pyruvate (3C each)

INPUTS → OUTPUTS (per glucose)

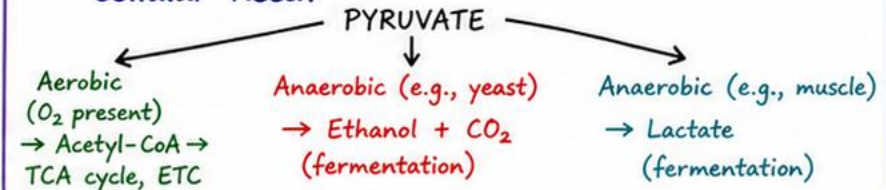
Inputs:

Glucose, 2 NAD^+ , 2 ADP + 2 P_i

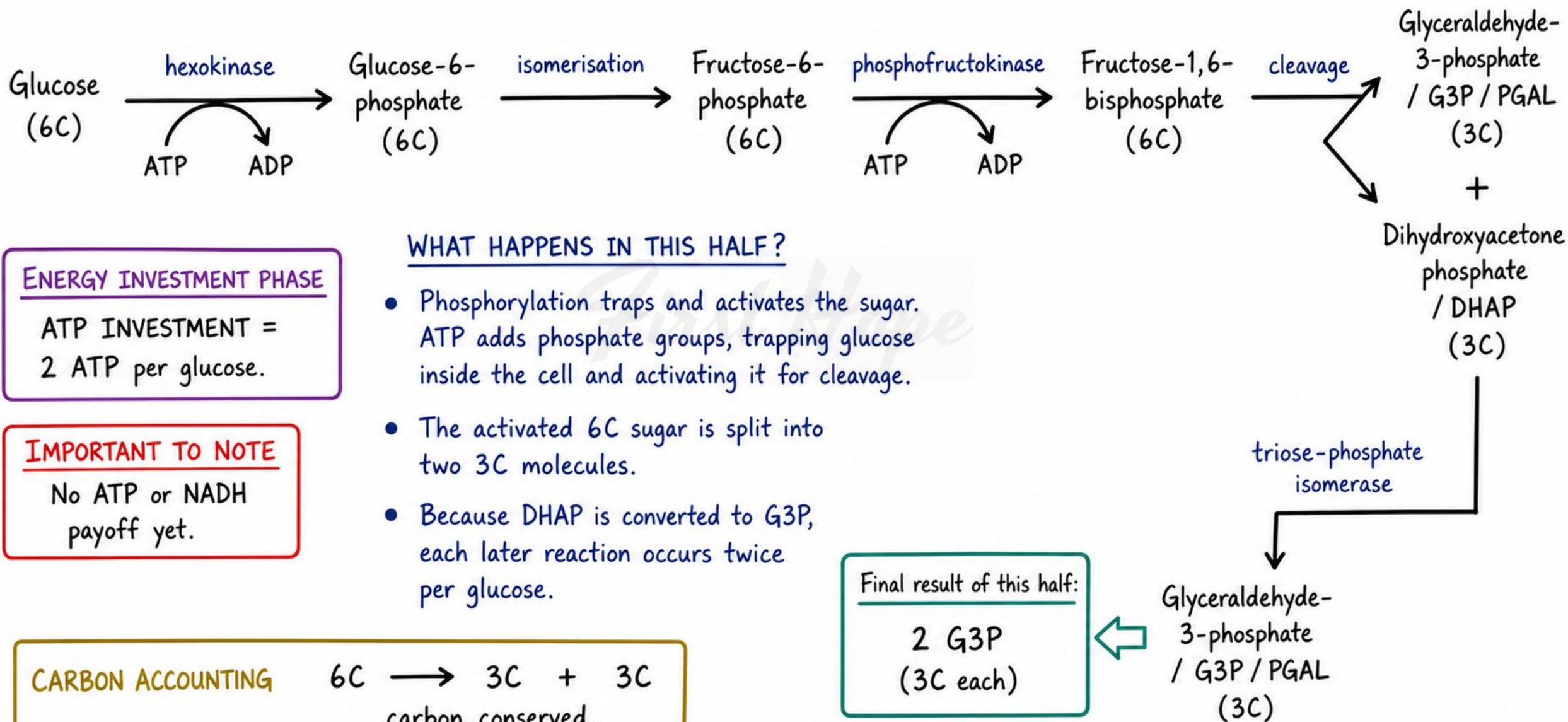
Outputs:

2 pyruvate, 2 ATP (net), 2 NADH + 2 H^+ , 2 H_2O

Pyruvate fate depends on oxygen availability, organism and cellular need.



GLYCOLYSIS: INVESTMENT & SIX-CARBON CLEAVAGE



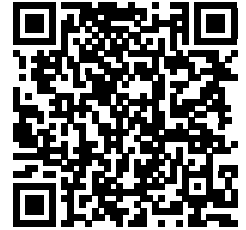


FREE PREVIEW

[Click here to visit our website](#)

SCHOOL NOTES & NCERT SOLUTIONS

Complete notes and
NCERT solutions are
available on
FirstHope app only.



[Scan or click here](#)

Click here to get the app

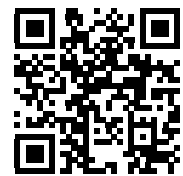


Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram



[Scan or click here](#)

@FirstHope_CBSE_Notes

Instagram

@firsthope.school

[Click here to follow >](#)

YouTube channel

@firsthope.school

[Click here to watch >](#)

FirstHope website

firsthope.co.in

[Click here to visit our website >](#)

CBSE / Class 9 / Class 10 / Class 11 / Class 12

Preview notes and NCERT solutions. Full PDFs in the FirstHope app.