

glucose broken back down, its stored energy caught as ATP along the way

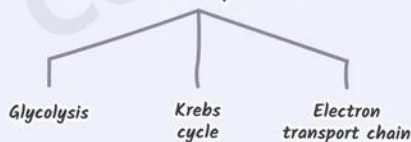


Cellular respiration, the overall picture



- the oxidative breakdown of food, mainly glucose, to release the chemical energy stored in it, trapping some of that energy as ATP
- every living cell respire, all the time, day and night, unlike photosynthesis which needs light
- aerobic respiration needs oxygen and releases carbon dioxide and water; it runs in three connected stages that hand off the substrate from one to the next

Cellular respiration



the three stages of aerobic respiration; each one hands its product on to the next

Three stages, one location each

Glycolysis

in the cytoplasm; glucose split down to pyruvate, no oxygen needed yet

Krebs cycle

in the mitochondrial matrix; pyruvate fully oxidised to carbon dioxide

Electron transport chain

on the inner mitochondrial membrane; most of the ATP is made here

Glycolysis, the common first step

- one 6-carbon glucose molecule is split, through a sequence of enzyme-catalysed steps, into two molecules of the 3-carbon compound pyruvic acid
- the net yield per glucose is 2 ATP and 2 NADH; this net figure already accounts for the 2 ATP spent early on to prime the pathway
- glycolysis itself needs no oxygen, and is the ONE stage shared by both aerobic respiration and anaerobic fermentation

Krebs cycle, complete oxidation

- before entering the Krebs cycle, each pyruvate is first oxidised to a 2-carbon acetyl group and combined with coenzyme A, releasing one carbon dioxide and one NADH per pyruvate
- the resulting acetyl-CoA feeds into the Krebs cycle in the mitochondrial matrix, where it is fully oxidised: each turn releases 2 carbon dioxide, and generates 3 NADH, 1 FADH₂ and 1 ATP (as GTP)
- since one glucose gives two pyruvate, the cycle turns twice per glucose, so all of these yields per turn are doubled over the whole molecule

