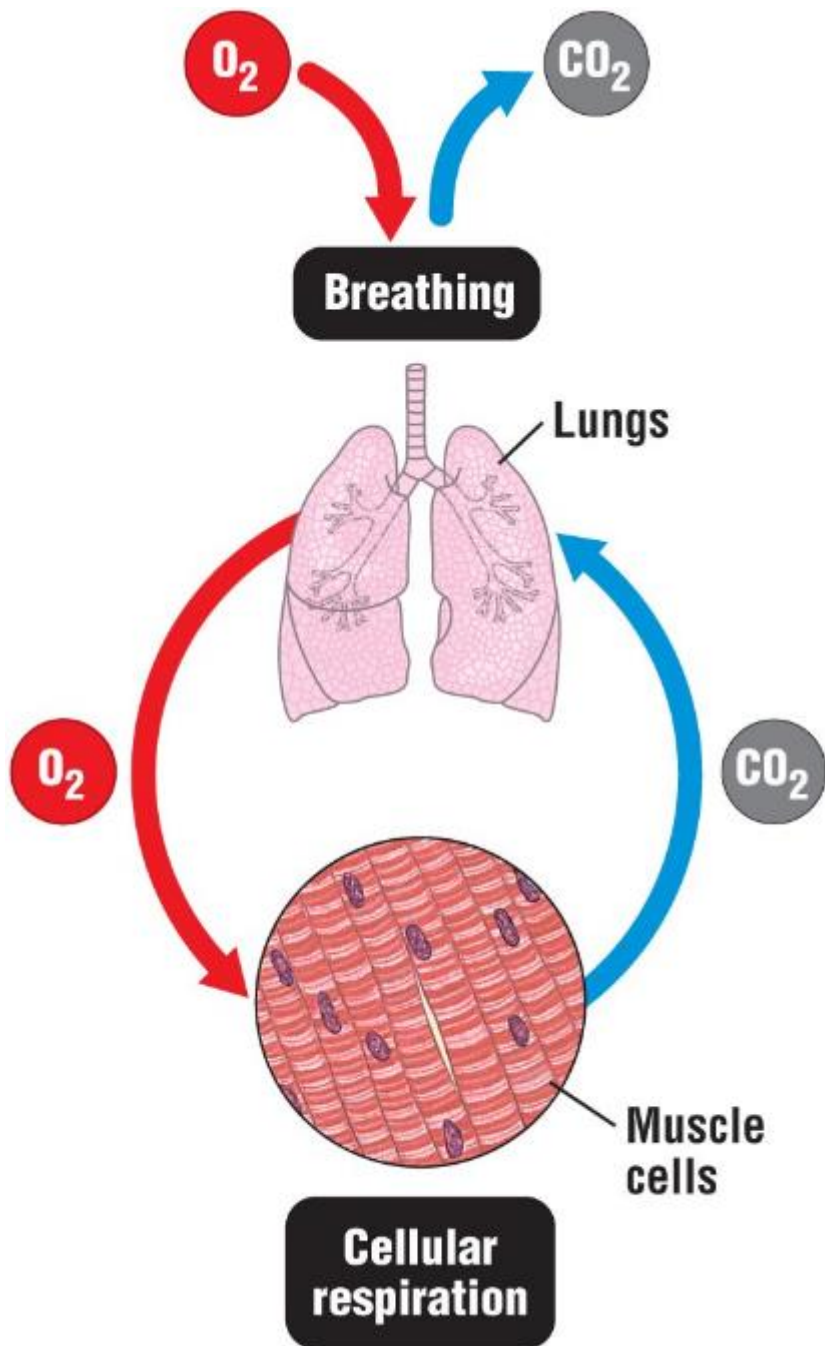


Cellular Respiration

Chapters 6

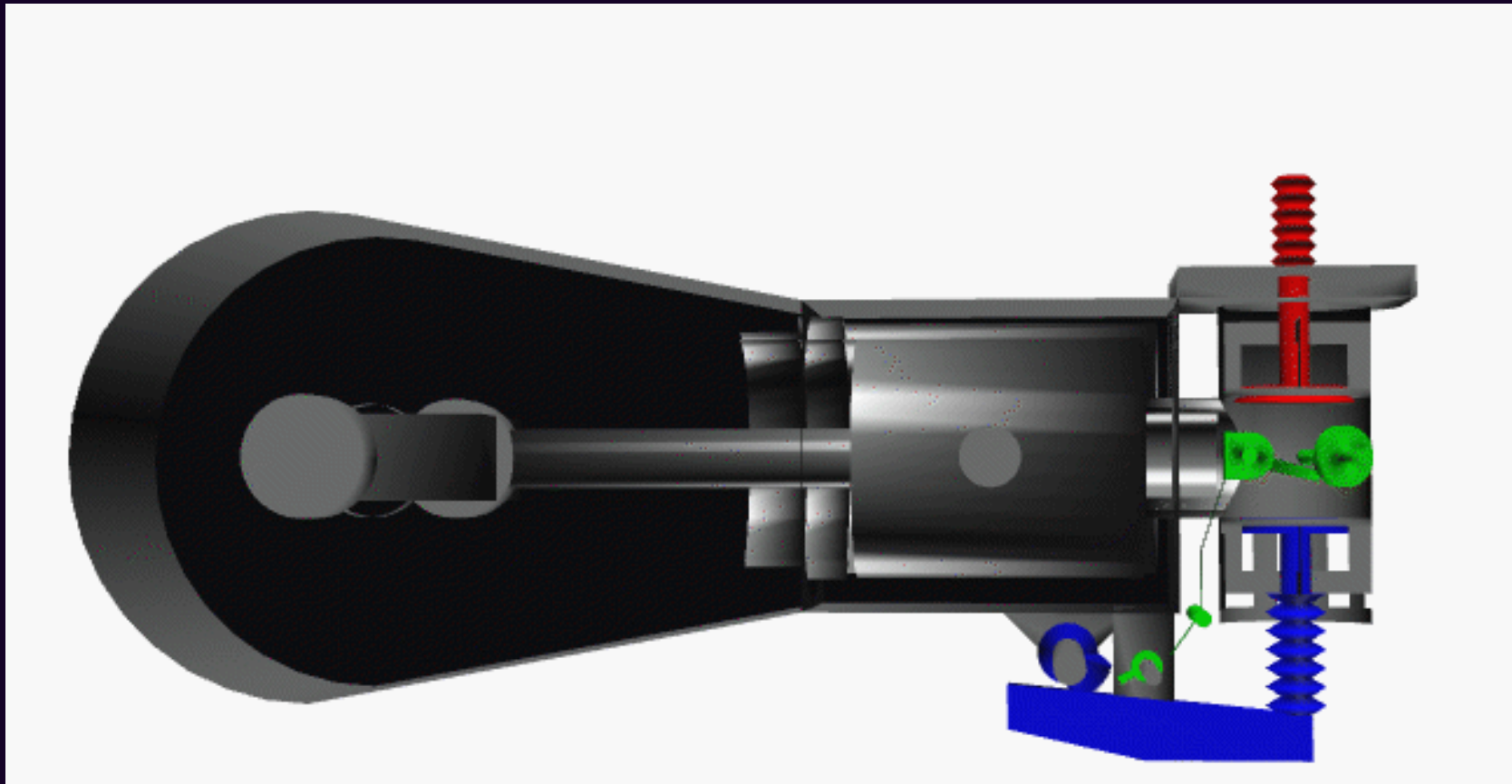


The same chemical equation represents both Combustion and Cellular Respiration of Glucose



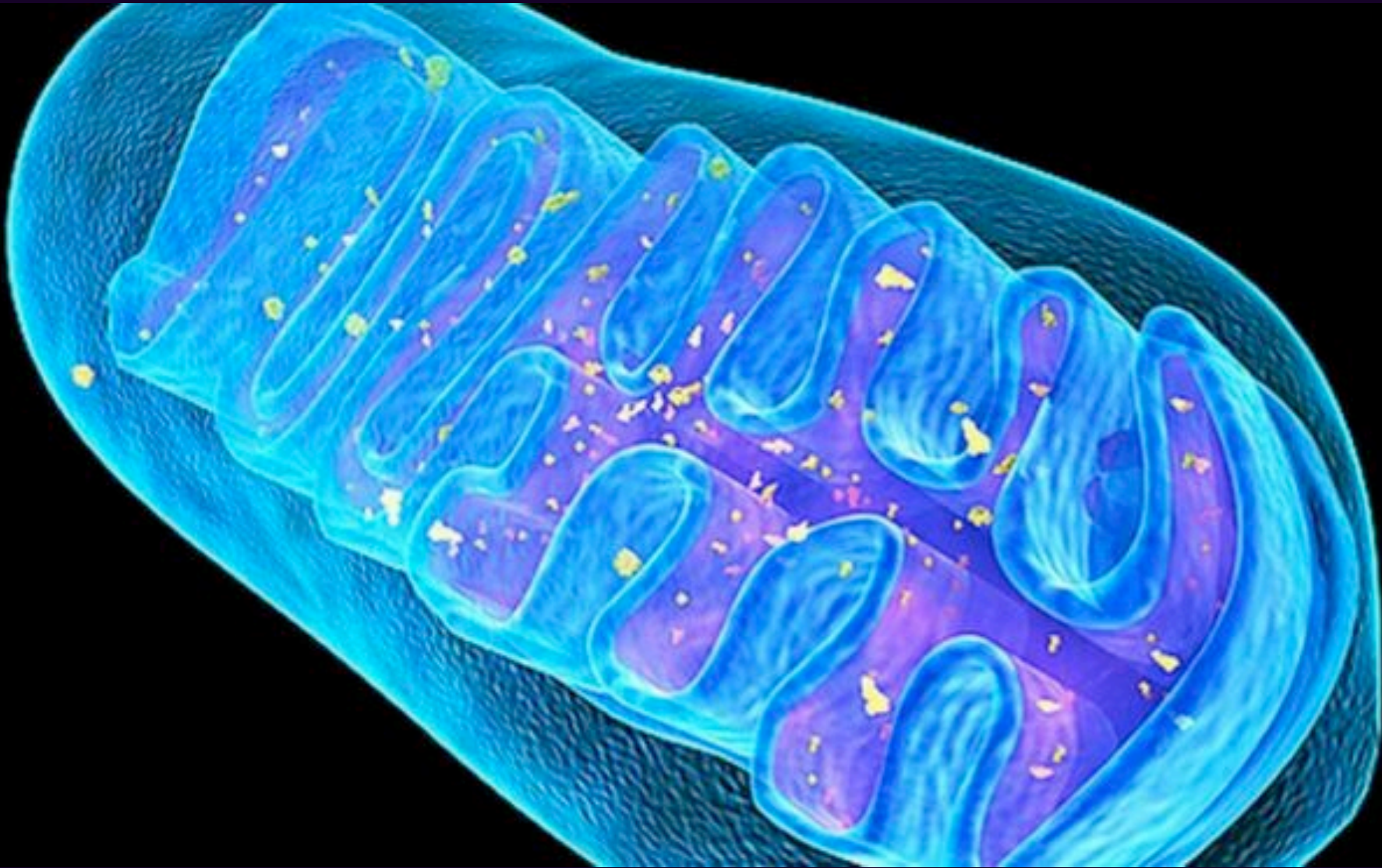
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Internal Combustion Engine burns fuel (gasoline) to do work

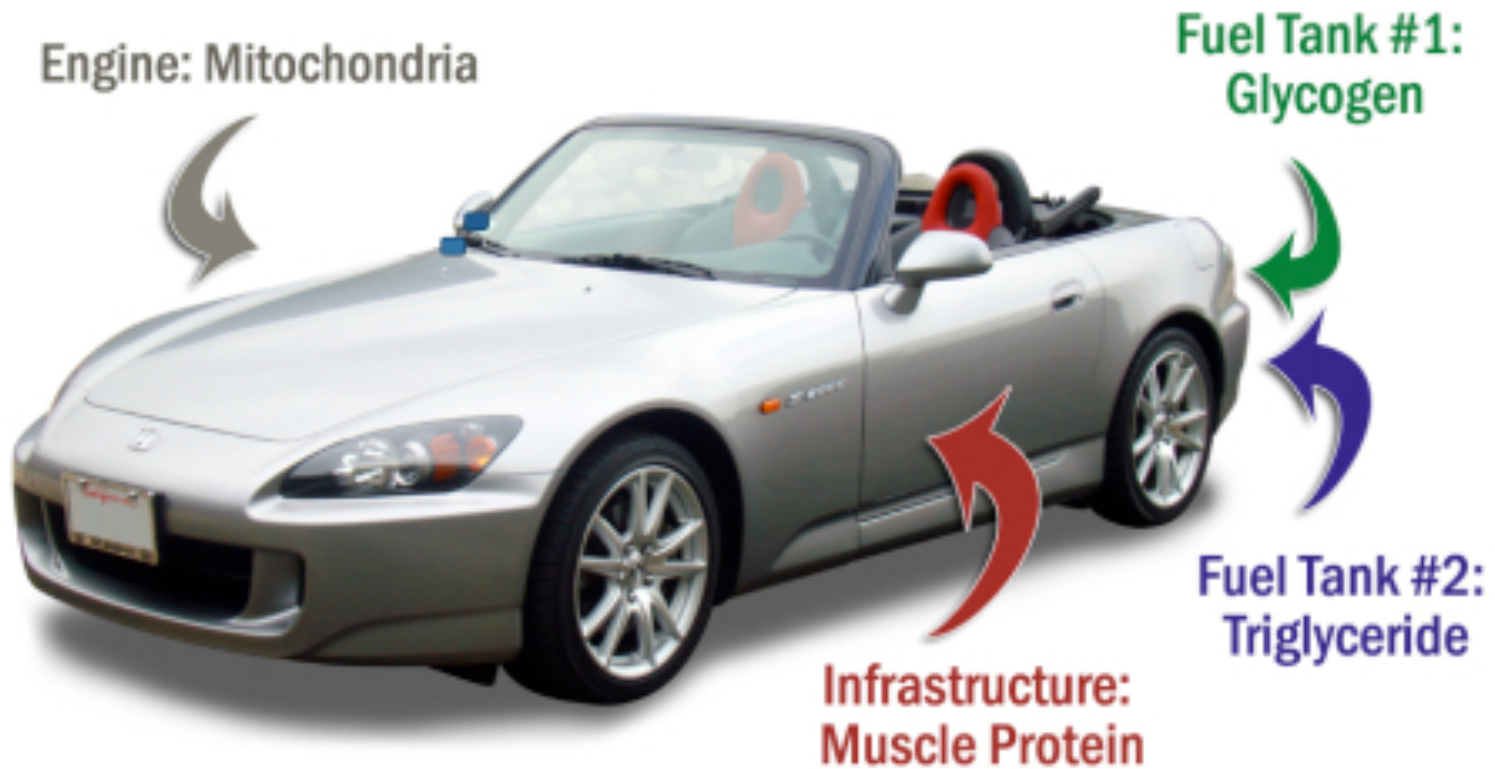


NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION

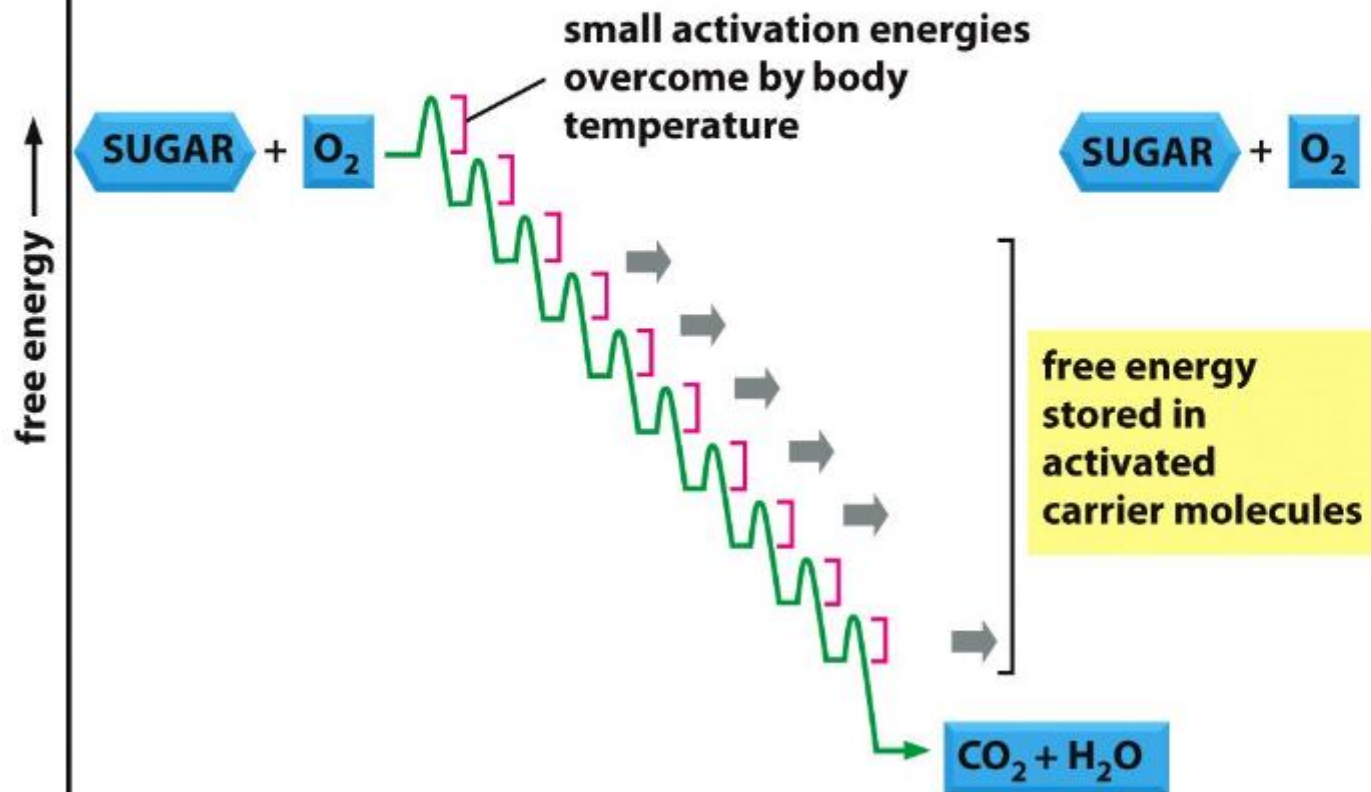
Mitochondrion also uses fuel (glucose)



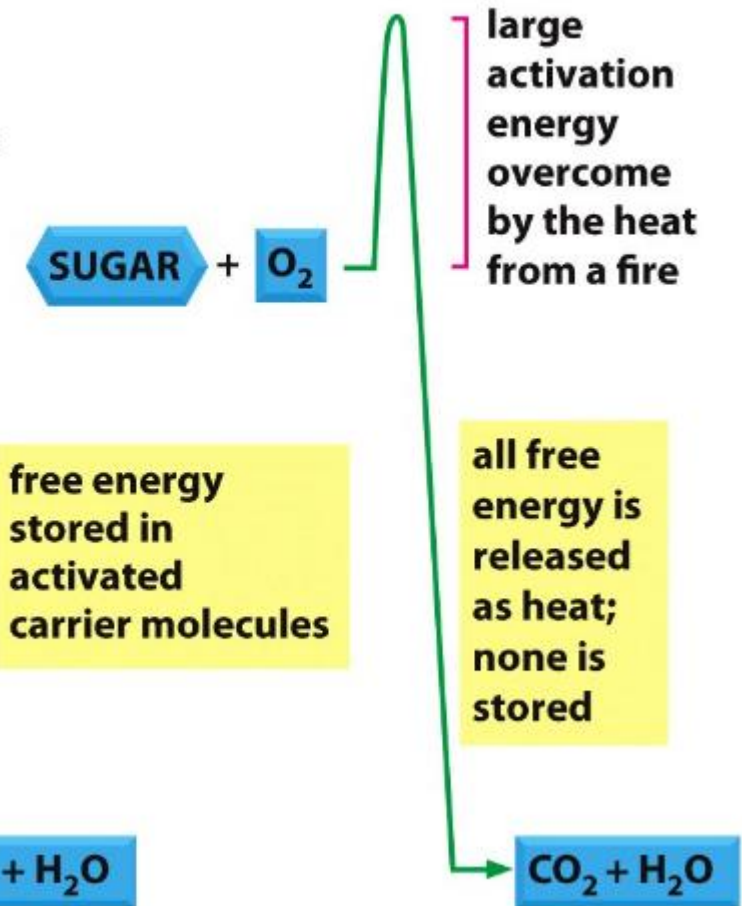
If cells functioned like a car...



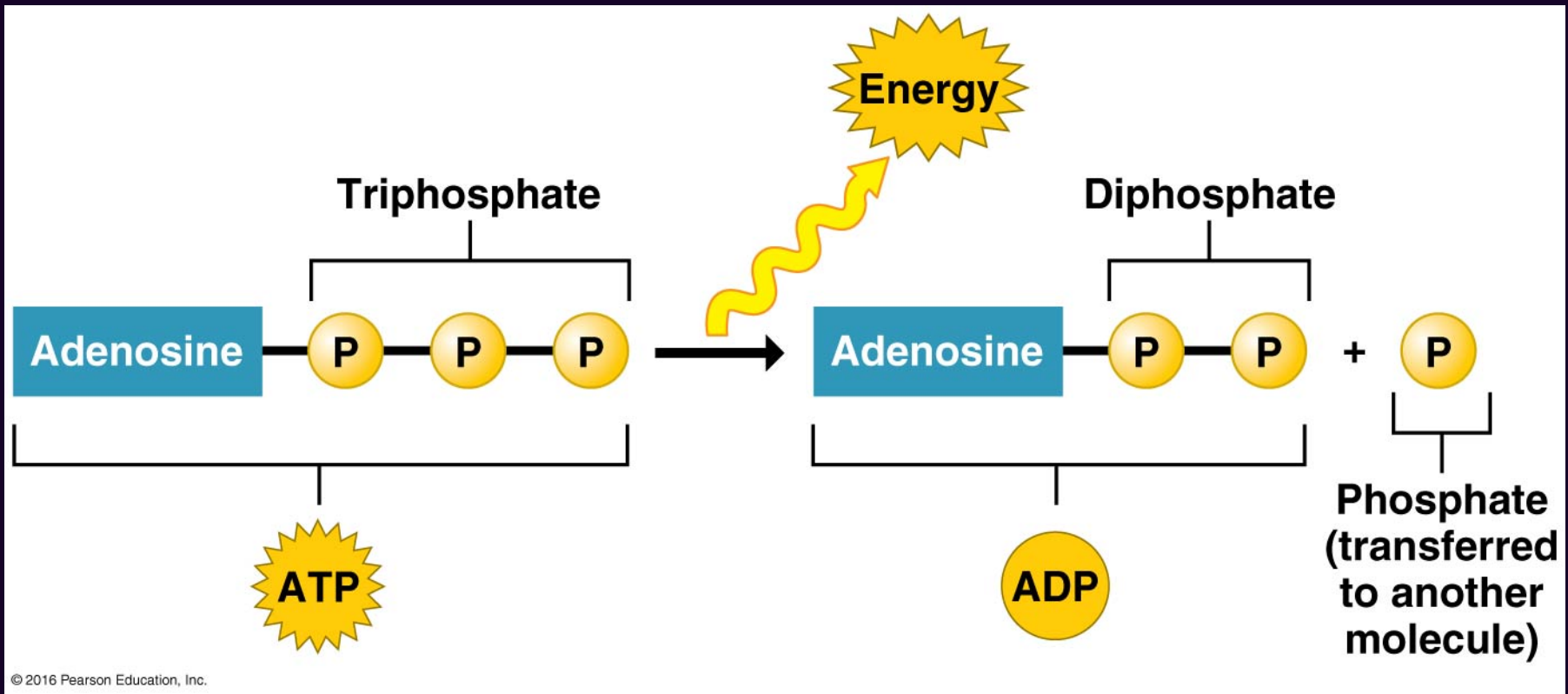
(A) STEPWISE OXIDATION OF SUGAR IN CELLS



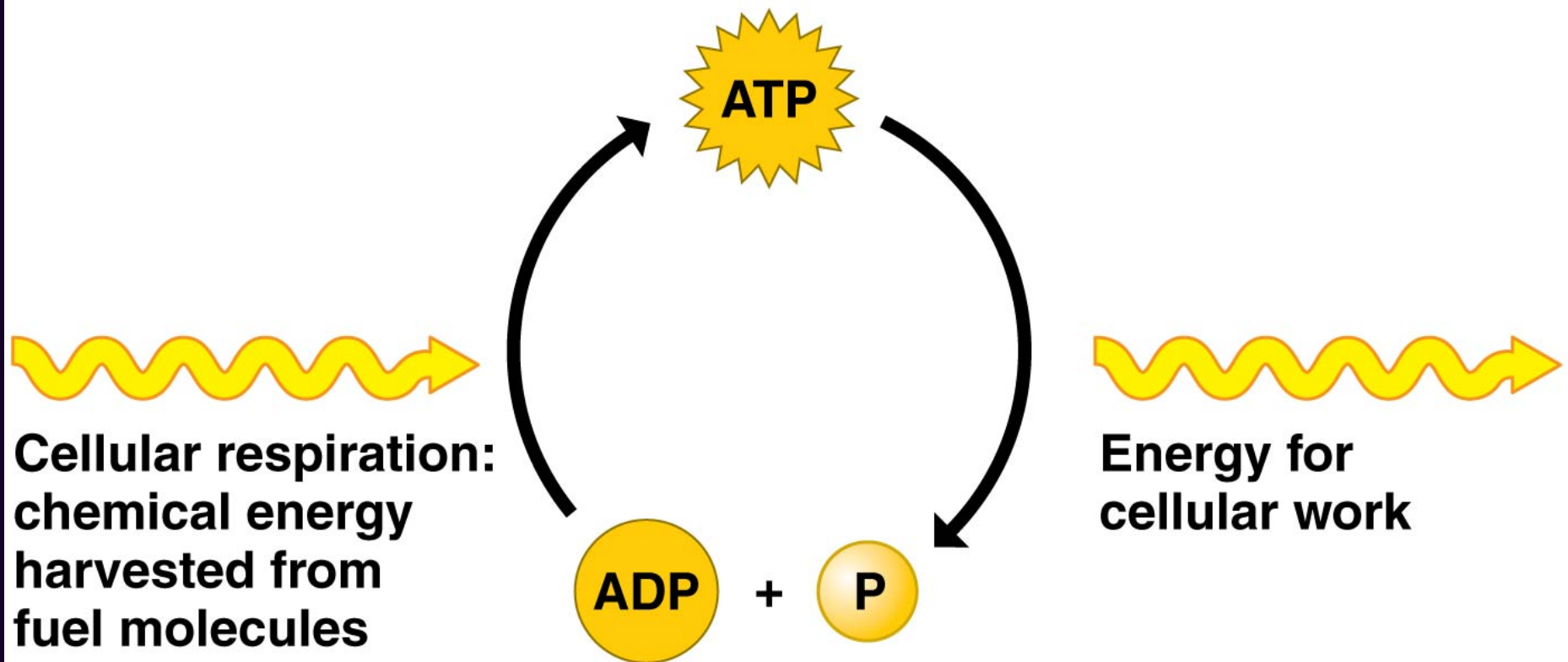
(B) DIRECT BURNING OF SUGAR



ATP is the “energy currency” of the cell

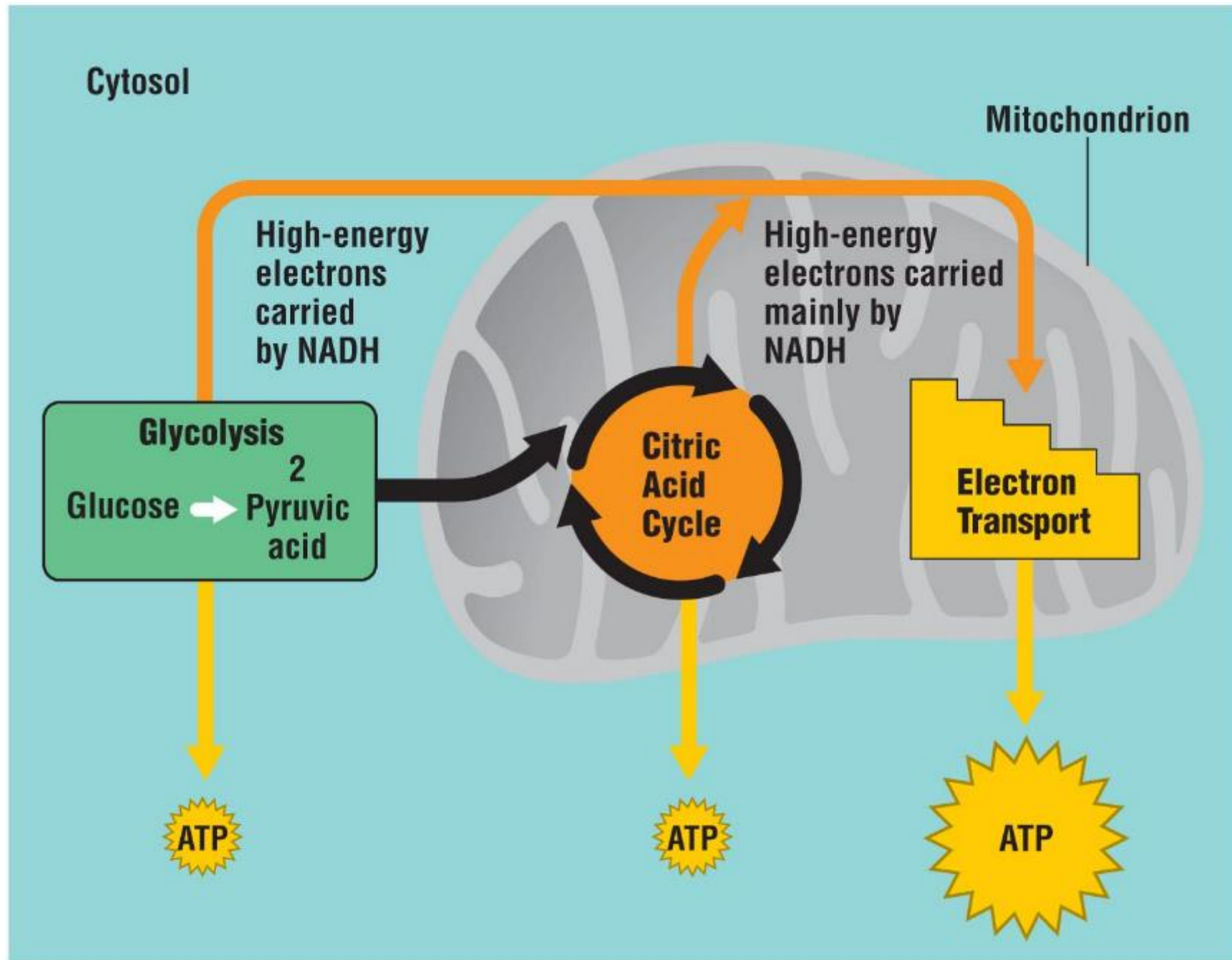


ATP stock is replenished by cellular respiration



This ATP production happens in three stages

- Stage 1 : Glycolysis
- Stage 2 : The Citric Acid Cycle
- Stage 3 : Electron Transport



Nuts and Bolts of Aerobic Cellular Respiration

ATP is made in two ways:

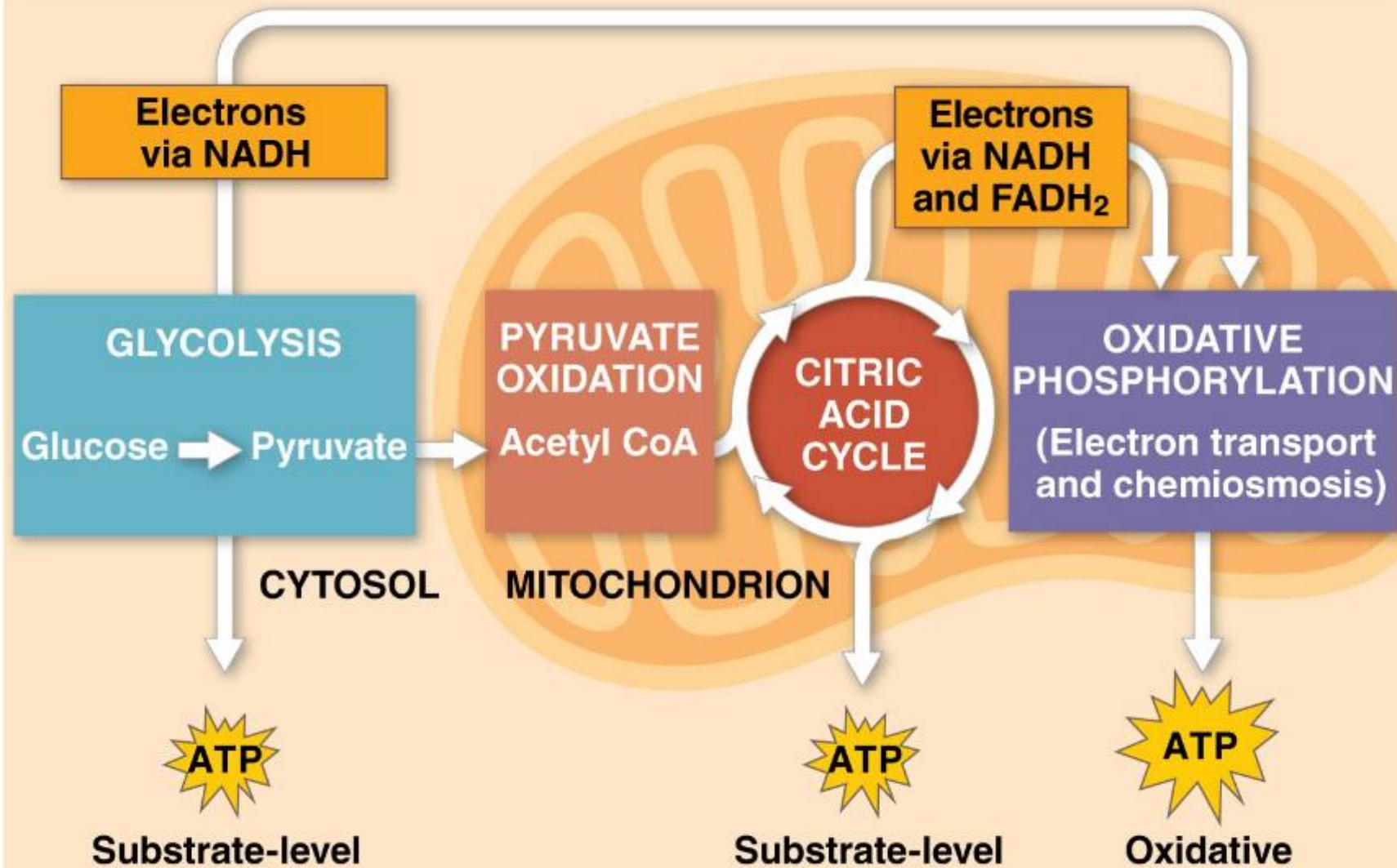
- By direct phosphorylation (“substrate-level phosphorylation”)
- By an indirect way of tapping energy of electrons (“oxidative phosphorylation”)

Nuts and Bolts of Aerobic Cellular Respiration

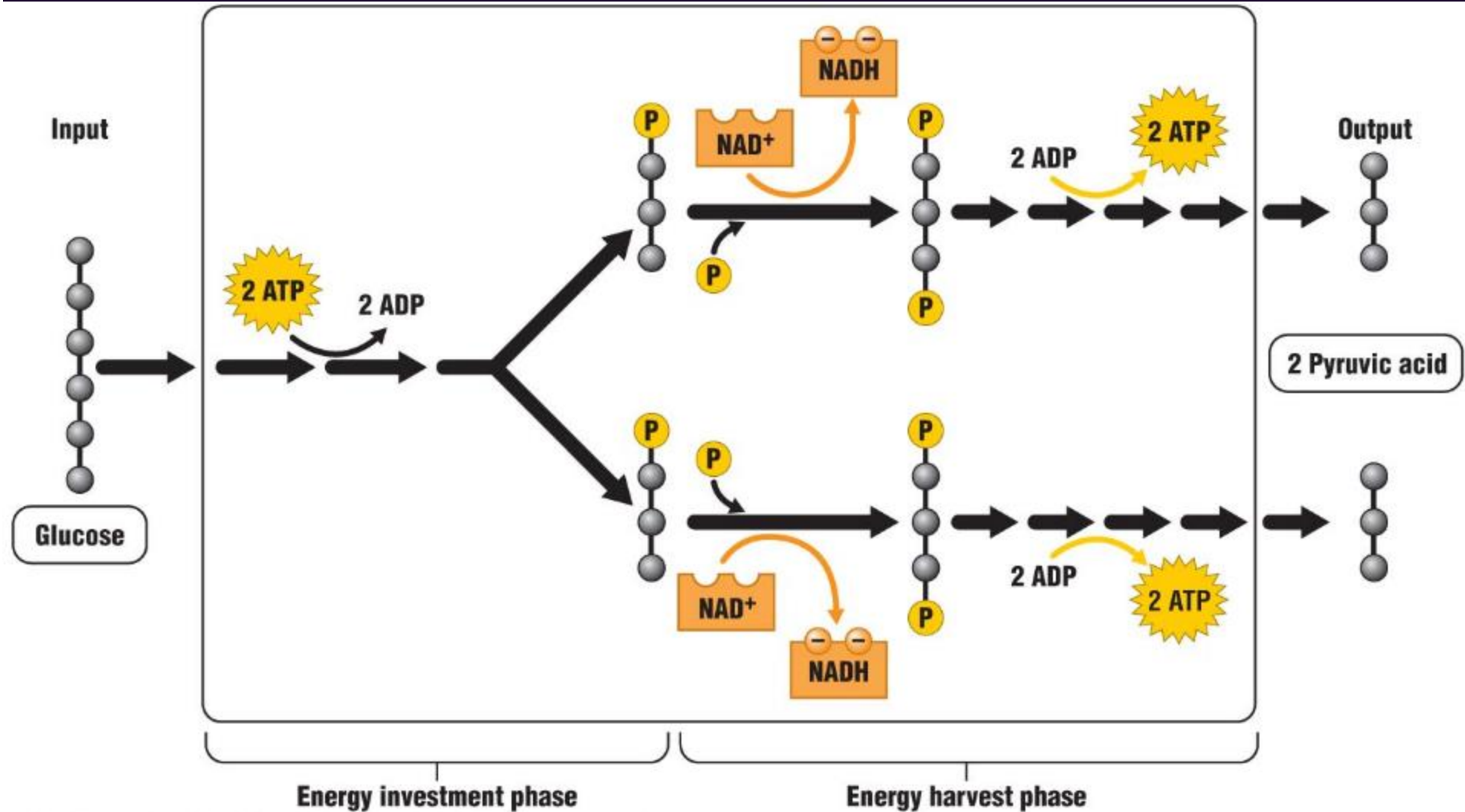
High-energy electrons are carried by:

- NADH (oxidized form: NAD^+)
- FADH_2 (oxidized form: FAD)

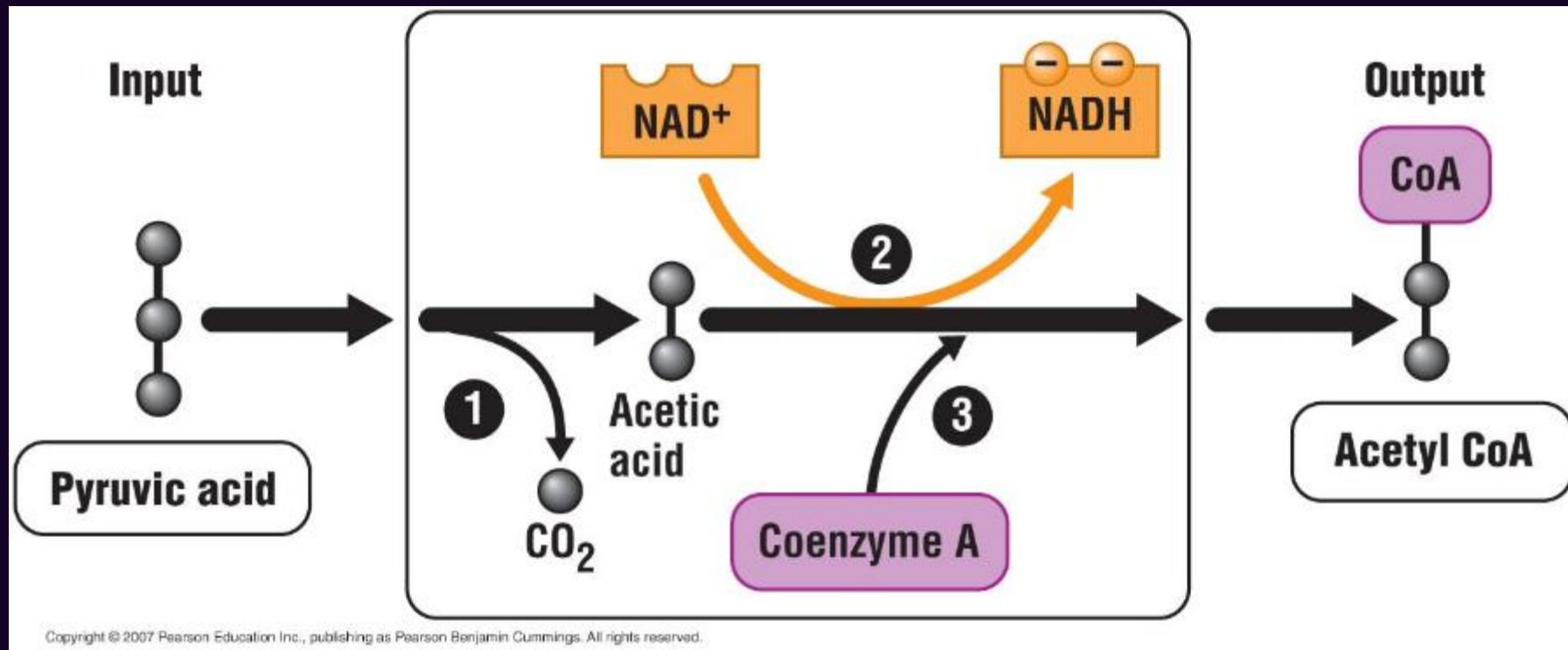
These molecules are called “electron carriers”



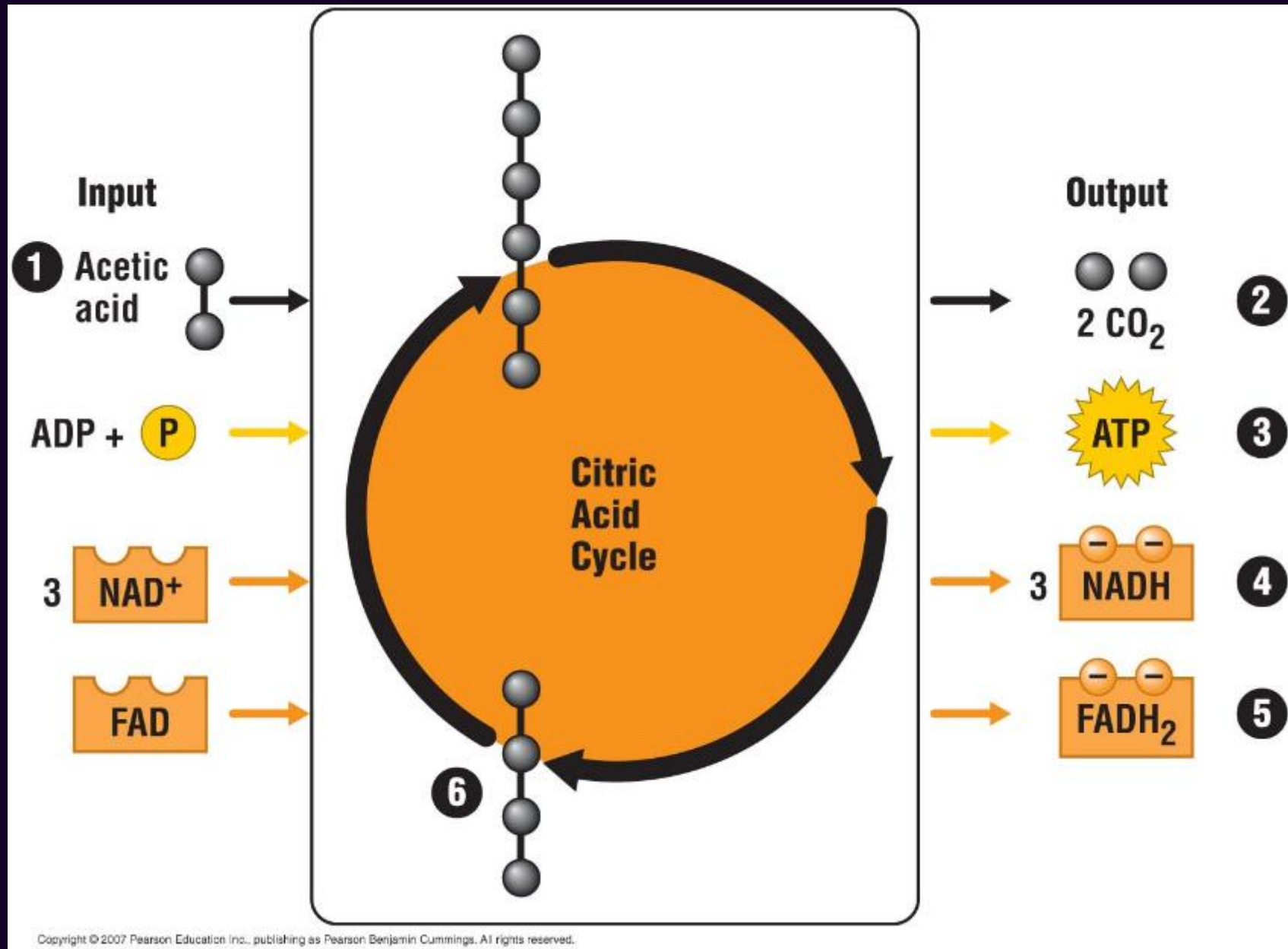
Glycolysis at a glance



Connecting glycolysis and TCA cycle



TCA Cycle at a glance



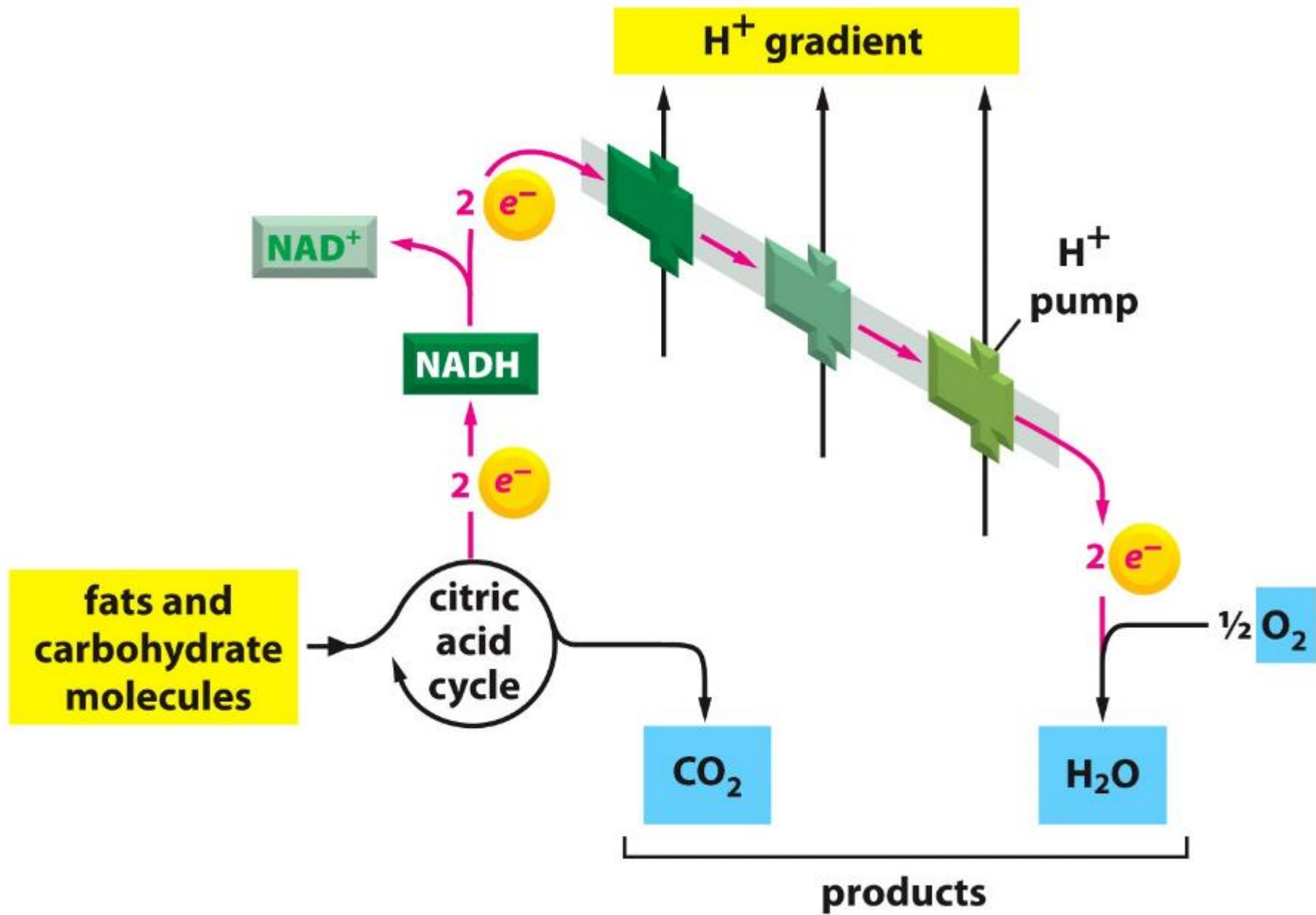
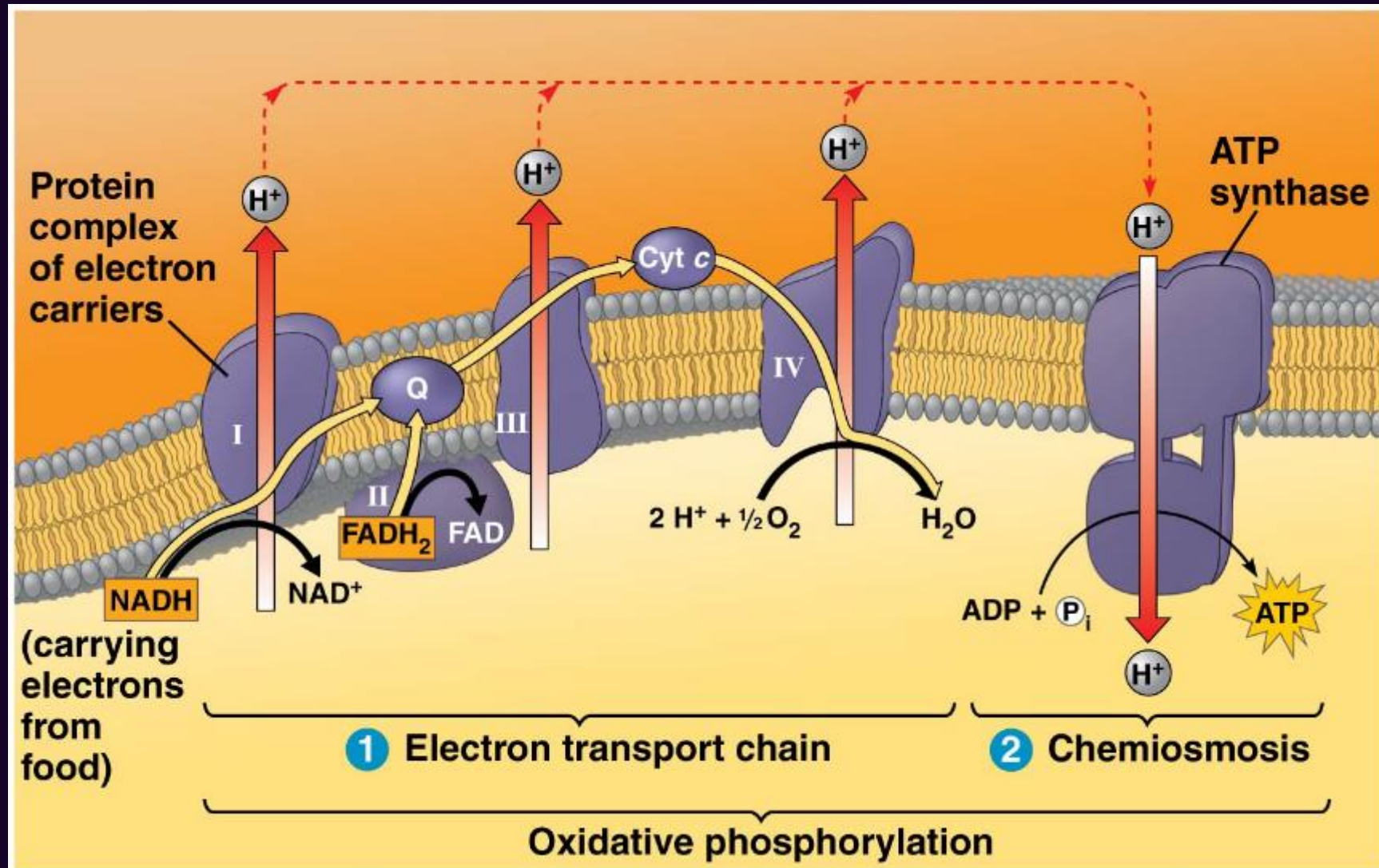
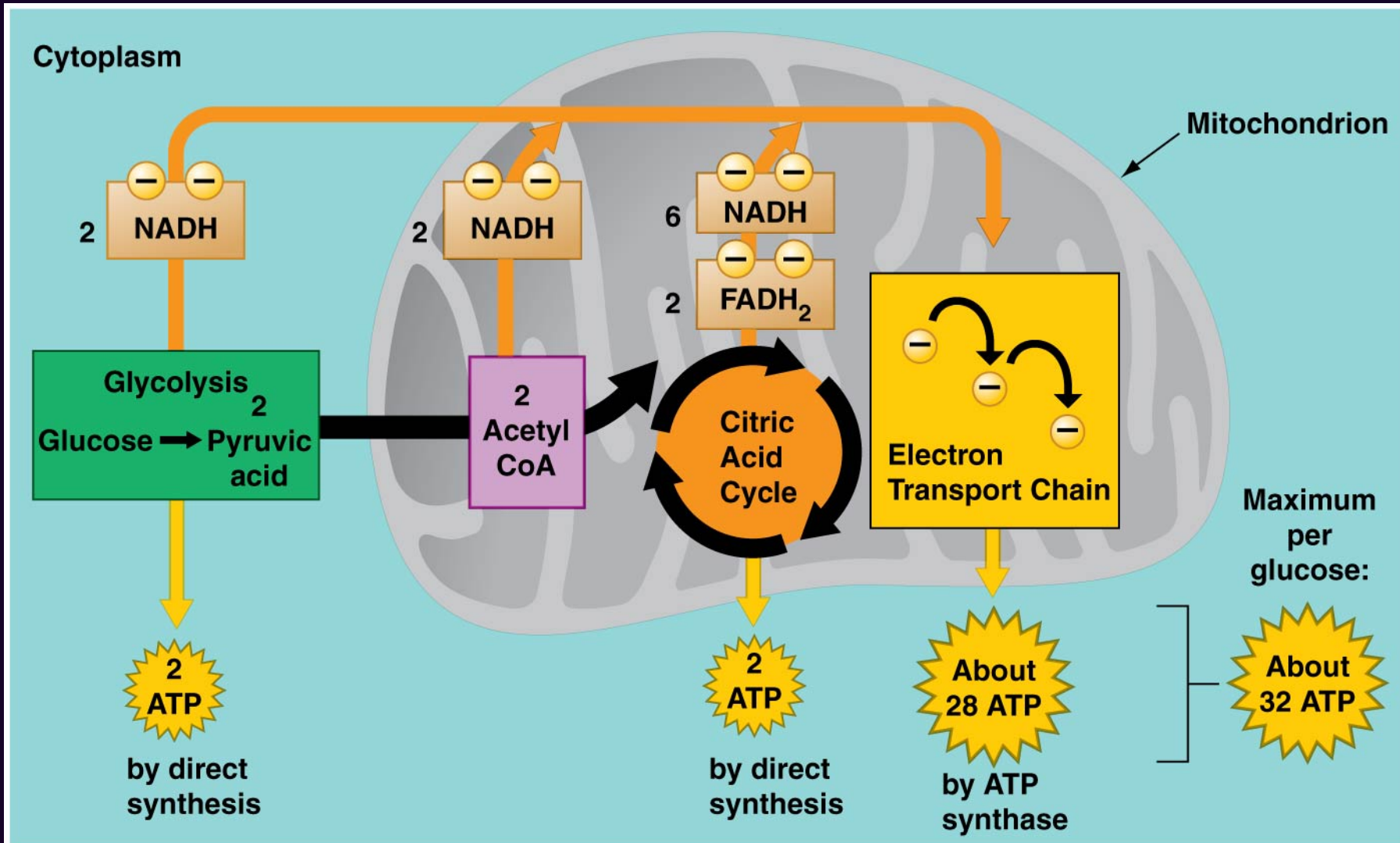


Figure 14-6 *Essential Cell Biology* (© Garland Science 2010)

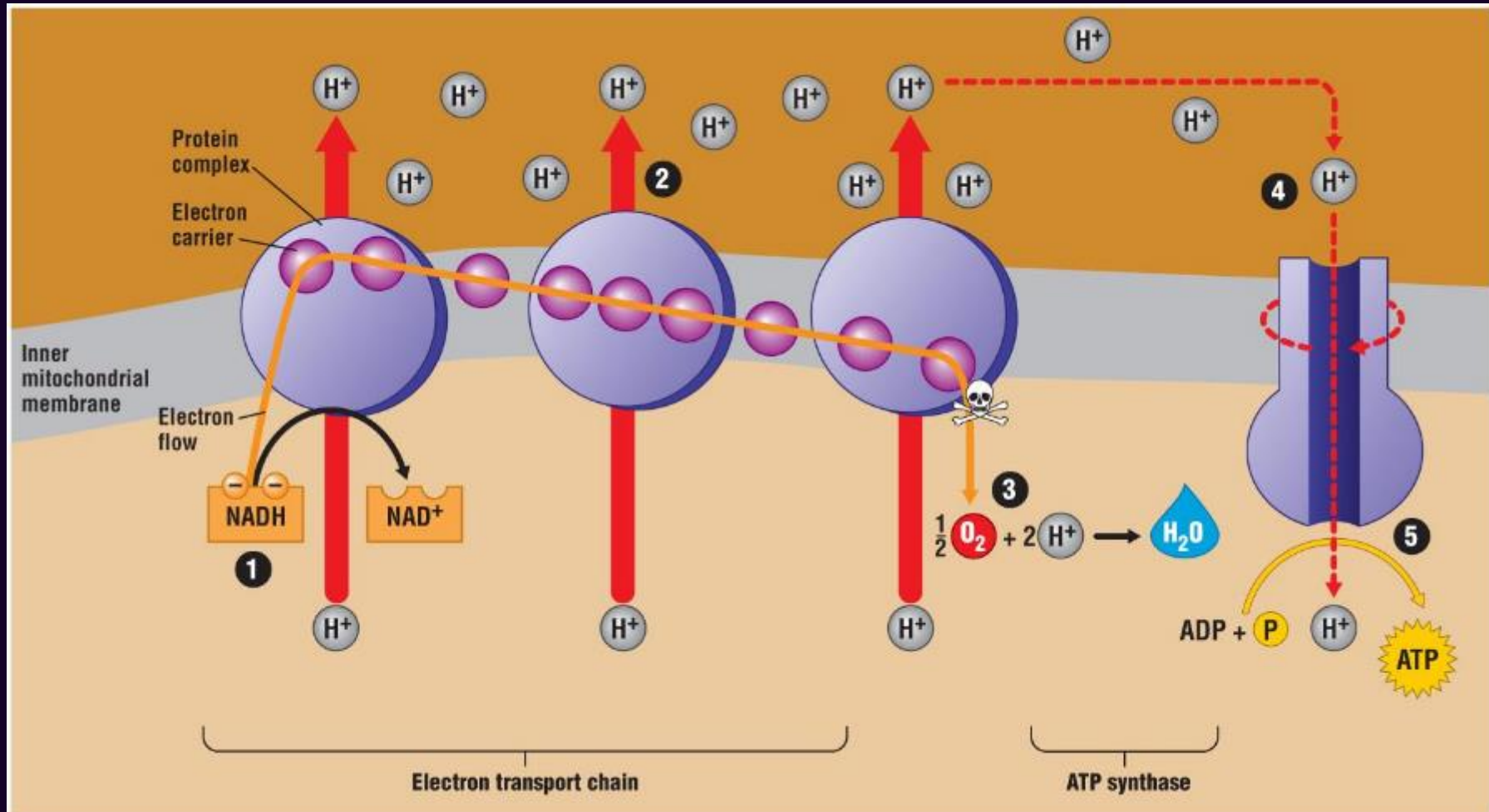
Oxidative Phosphorylation



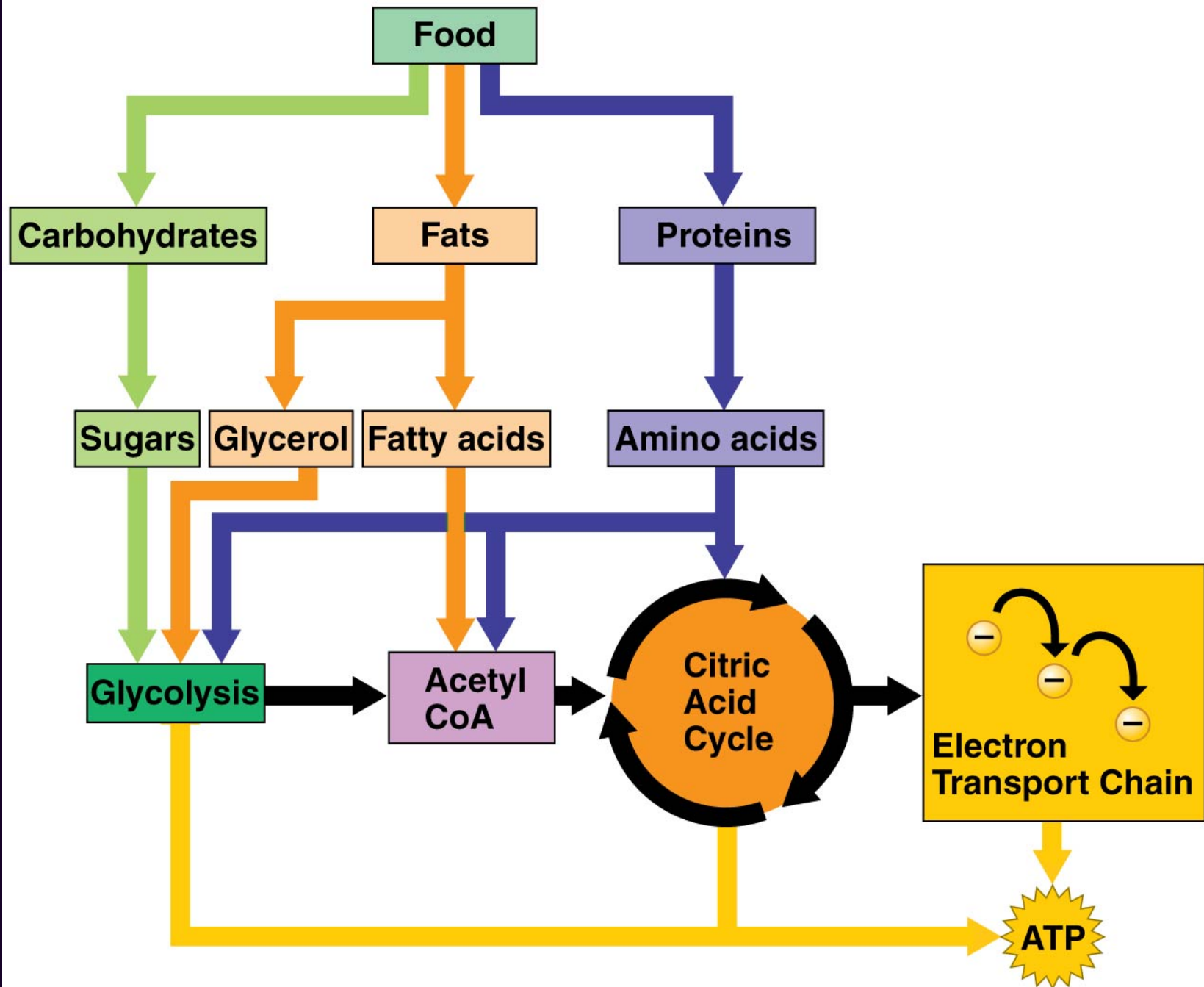
Energy Yield of Respiration



Cyanide kills a person by blocking an enzyme in the last step of the ETC

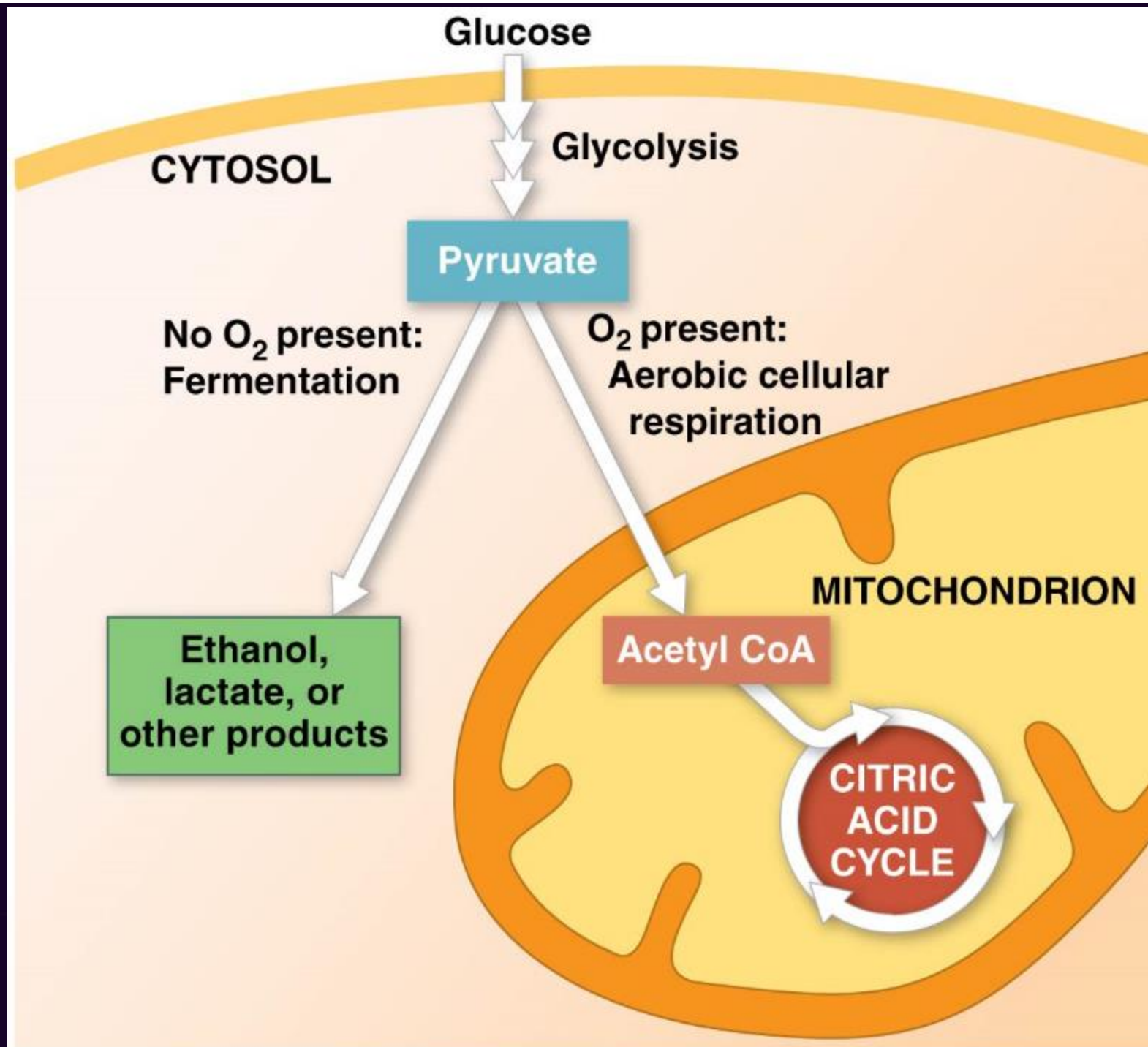


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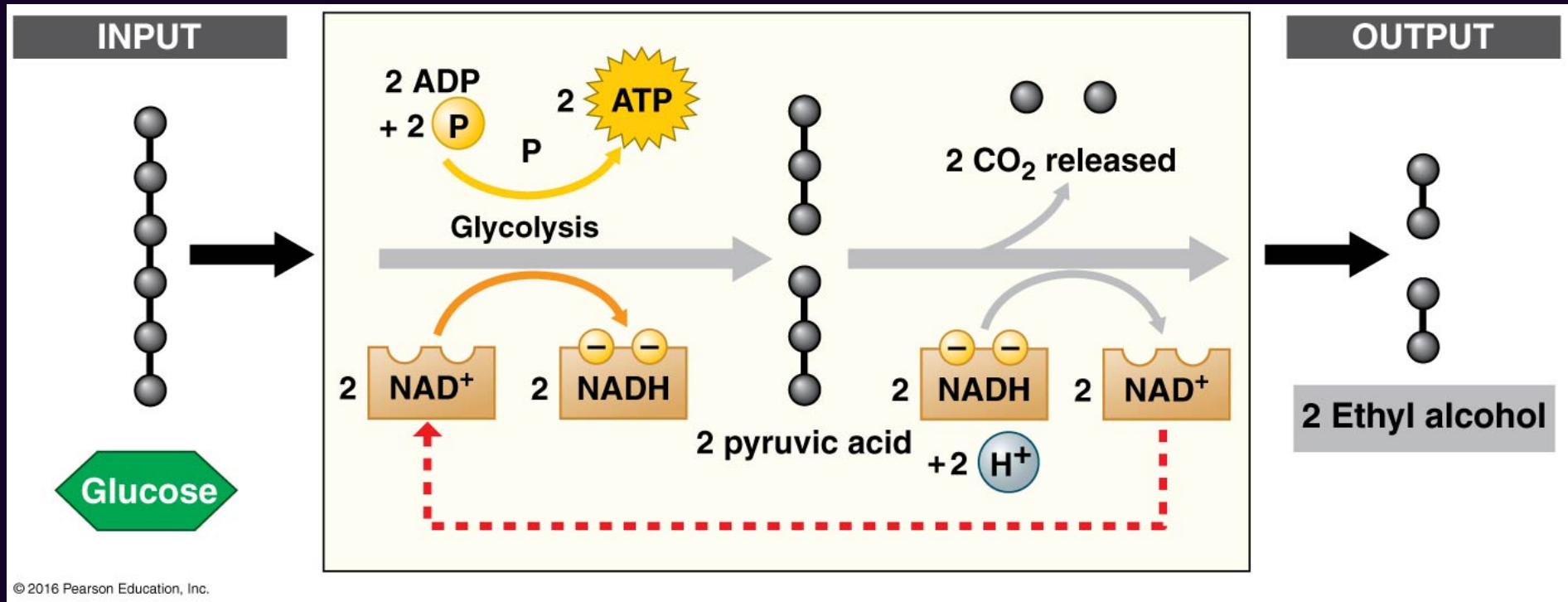


What happens during oxygen deficiency?

- Cells work under anaerobic conditions for some time and perform anaerobic respiration
- Increase the rate of glycolysis to continue to produce at least the scant number of 2 ATPs (cf. 32 ATPs)
- Need for oxidizing NADH (to NAD^+) in order to continue running glycolysis – “fermentation”



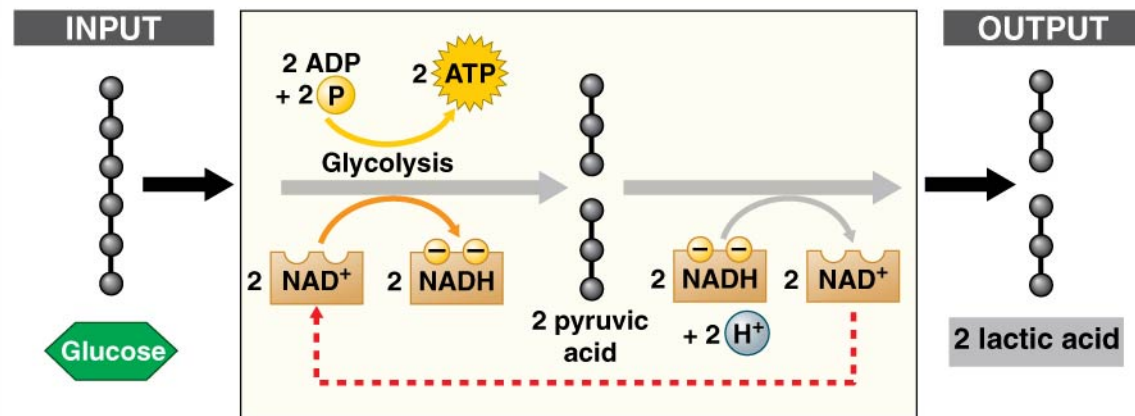
Ethanol Fermentation



Products of Ethanol Fermentation



Lactic acid Fermentation



Products of Lactic acid Fermentation

