

Bioenergetics

there are other phosphate-containing compounds that contain high energy bond
cleaving phosphate releases a significant amount of energy

Substrate level phosphorylation:

- metabolism reaction that results in the production of ATP or GTP by the transfer of a phosphate group from a higher energy compound to a low energy compound

What is substrate level phosphorylation and what are its requirements?

↳ Substrate level phosphorylation is the process of removing phosphate from a high energy phosphate compound and adding a phosphate to a low energy phosphate compound using ATP. Removing the phosphate from the high energy compound breaks a high energy bond, which produces ATP. The ATP can then drive the phosphorylation of low energy compounds.

This process requires compounds with higher energy phosphates than ATP because the reaction is unfavorable, so it needs to be driven by the release of phosphate from another reaction.

↳ produces ATP

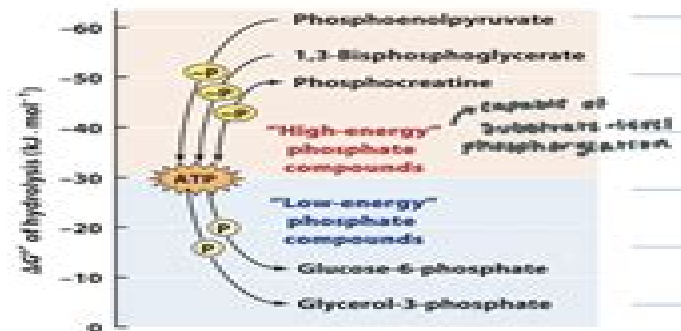
→ Substrate level phosphorylation

MAKING ATP

→ adenylate kinase

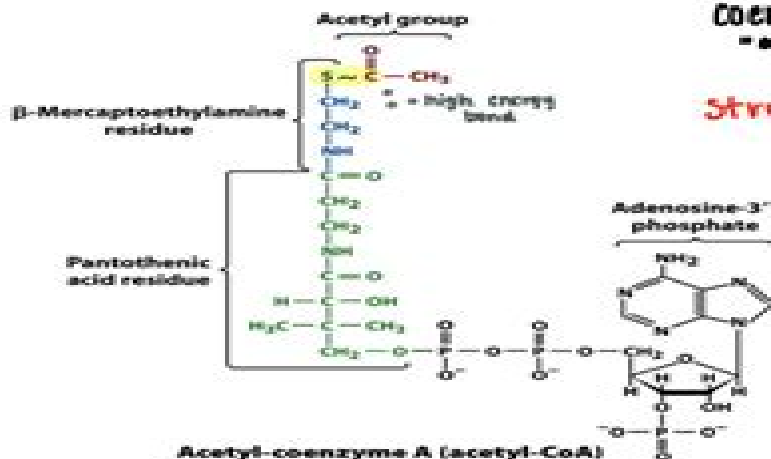
↳ phototrophs: photophosphorylation produces ATP using energy from sunlight

↳ chemotrophs: oxidative phosphorylation produces ATP by oxidizing organic compounds



Acetyl-CoA

= a high energy thioester important to metabolism



Coenzymes: bind to active sites of enzymes to assist "assistant" in catalysis (in active site but not substrate)

Structure → composed of...

(sort of) ADP

vitamin B5 (pantothenate)

β-mercaptoethylamine residue

acetyl group

Thio-ester bond = high energy



acetyl detaches hydrolytically

thioesters undergo less resonance stabilization, creating a greater difference in free energy

hydrolysis of thioester is very exergonic, making it a more favorable reaction

high energy b/c not resonance stabilized - unstable

acetyl transfer can add its acetyl to compounds (breaking C-C bonds) and serves as a cofactor for protein acetylation

Acetyl Delivery: useful because it allows for catabolism → building up molecules by adding C-C bonds

Bioenergetics Study Guide

**Denise Guinn, Rebecca Brewer, Rachel
C. Lum**



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