

Posttranslational Modification of Proteins

- Proteolytic cleavage
- Phosphorylation
- Ubiquitinylation
- Glycosylation
- N- and C-terminal modifications
- Modification of individual amino acids (e.g., γ -carboxylation of glutamates)
- Addition of isoprenyl groups (e.g., farnesylation of Ras proteins)

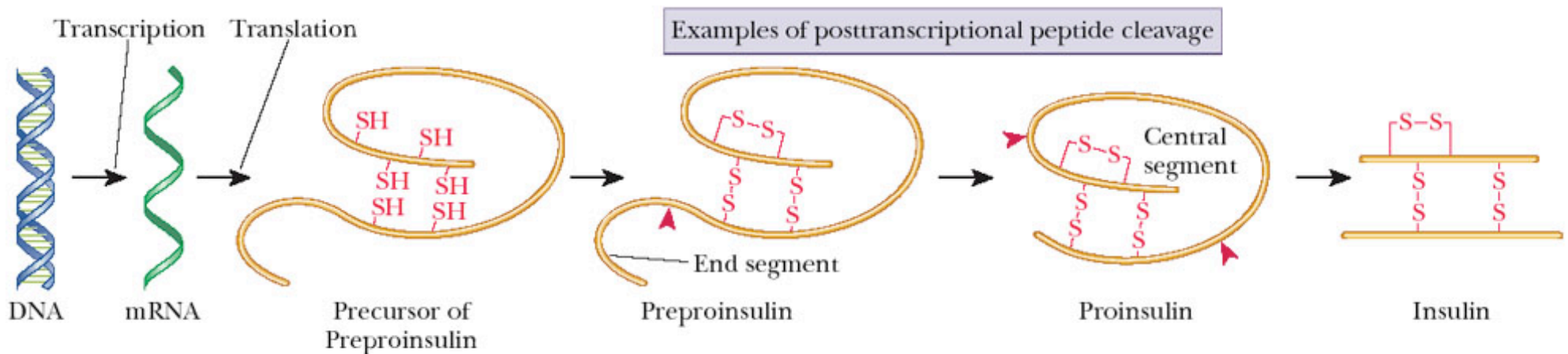


Diagram of the ubiquitin-proteasome degradation pathway

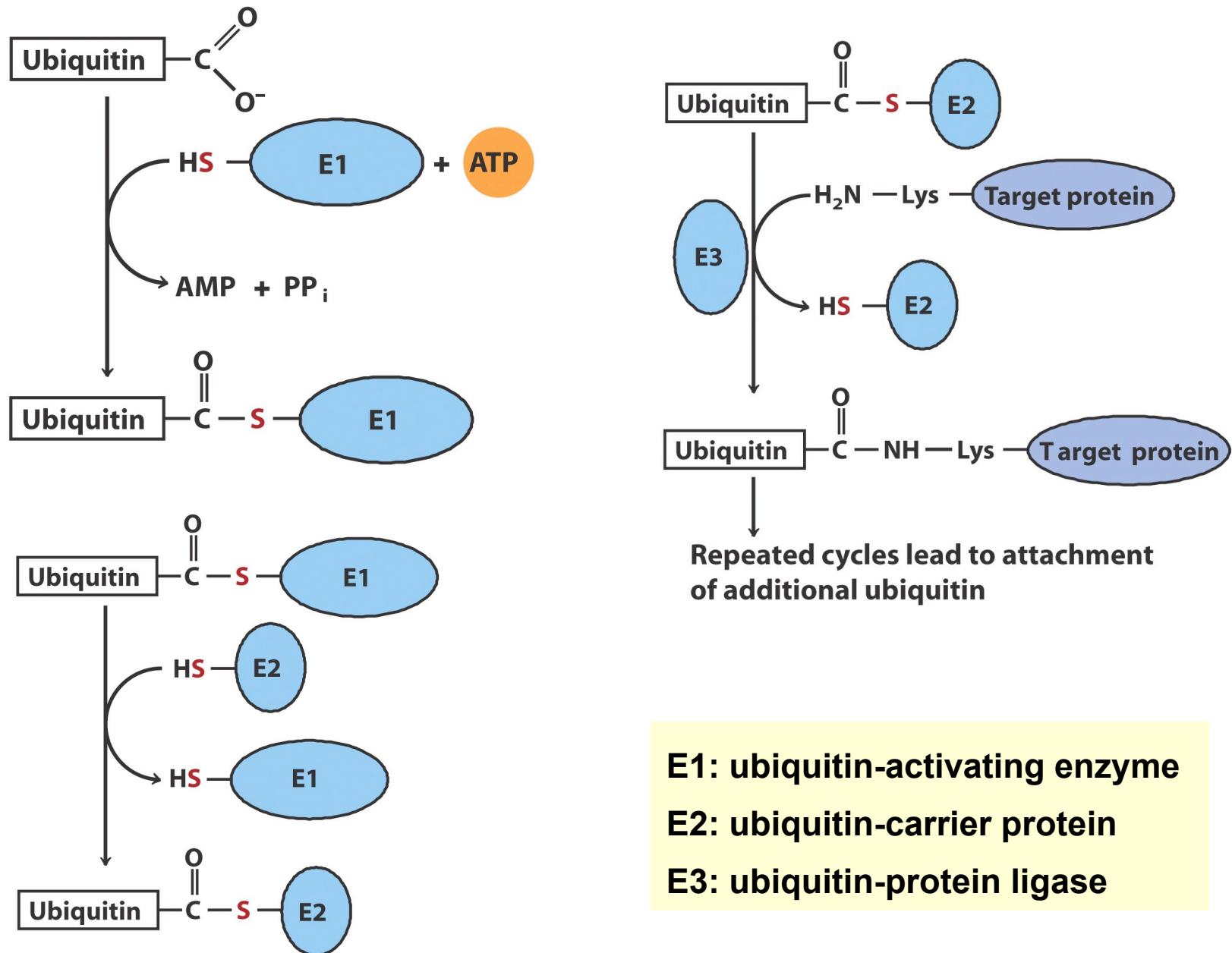
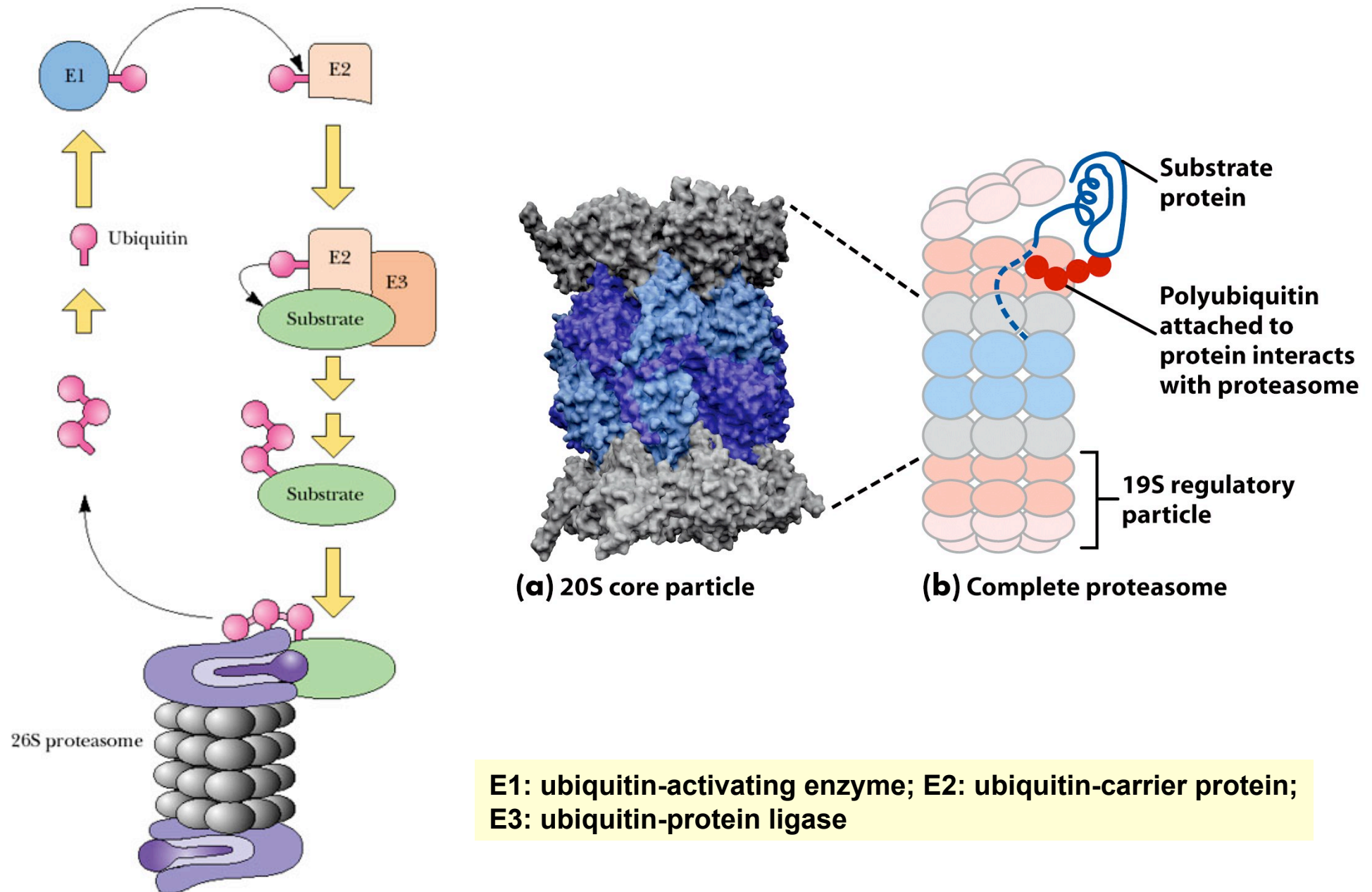


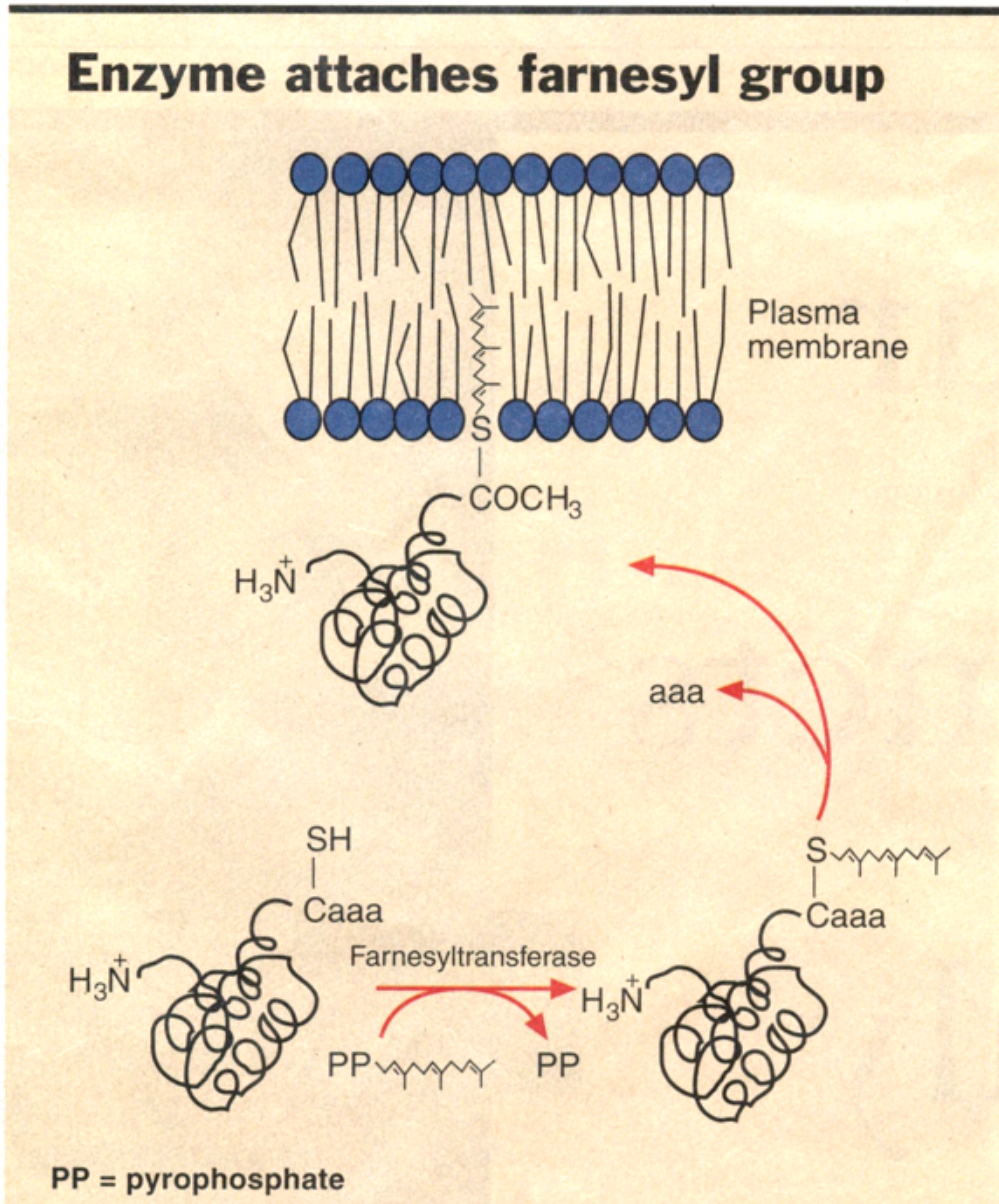
Diagram of the **ubiquitin**-proteasome degradation pathway



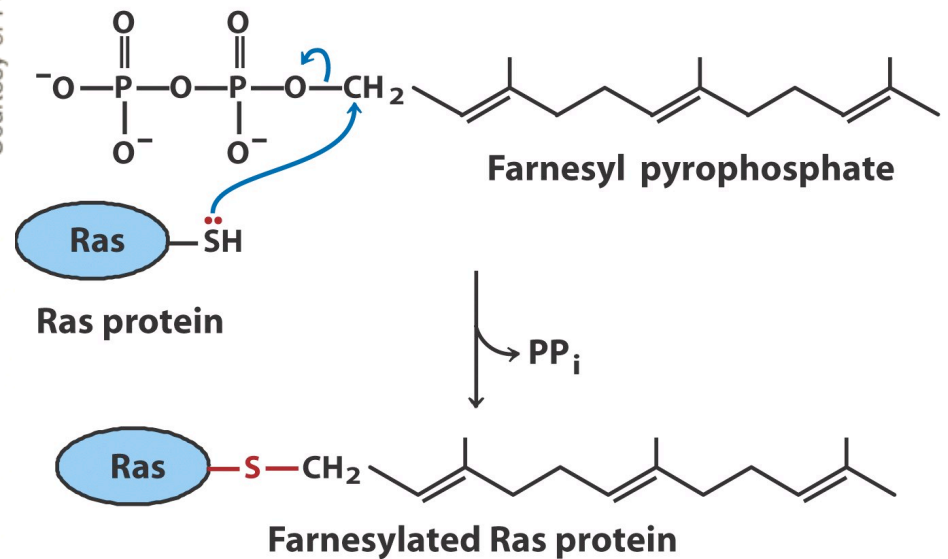
E1: ubiquitin-activating enzyme; E2: ubiquitin-carrier protein; E3: ubiquitin-protein ligase

Farnesylation of Ras Proteins

Enzyme attaches farnesyl group

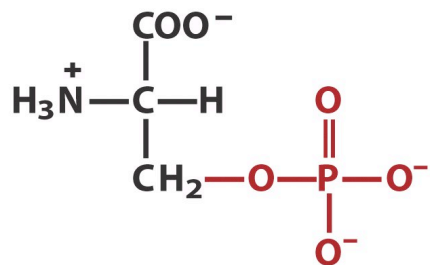


Courtesy of Patrick J. Casey, Duke University

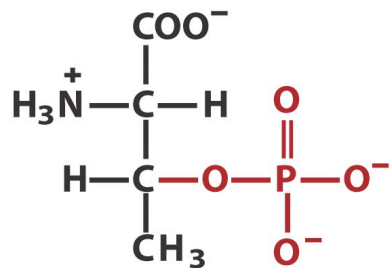


Protein Phosphorylation

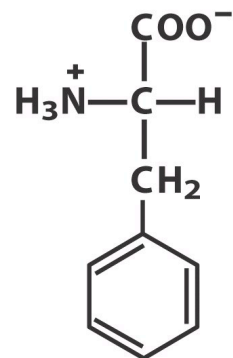
Phosphorylated Amino Acids



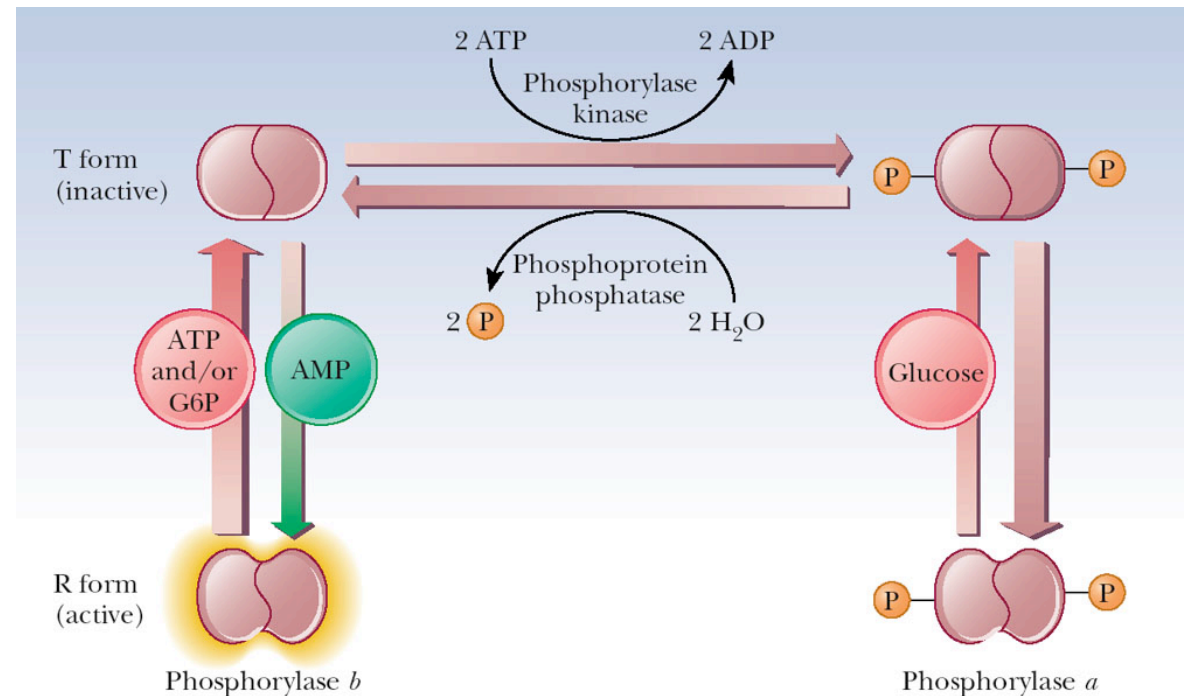
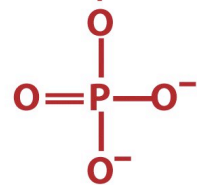
Phosphoserine



Phosphothreonine



Phosphotyrosine



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Glycogen phosphorylase activity is subject to covalent modification (**phosphorylation**) and allosteric control

Vitamin K-dependent γ -Carboxylation of Prothrombin and Factors VII, IX and X

