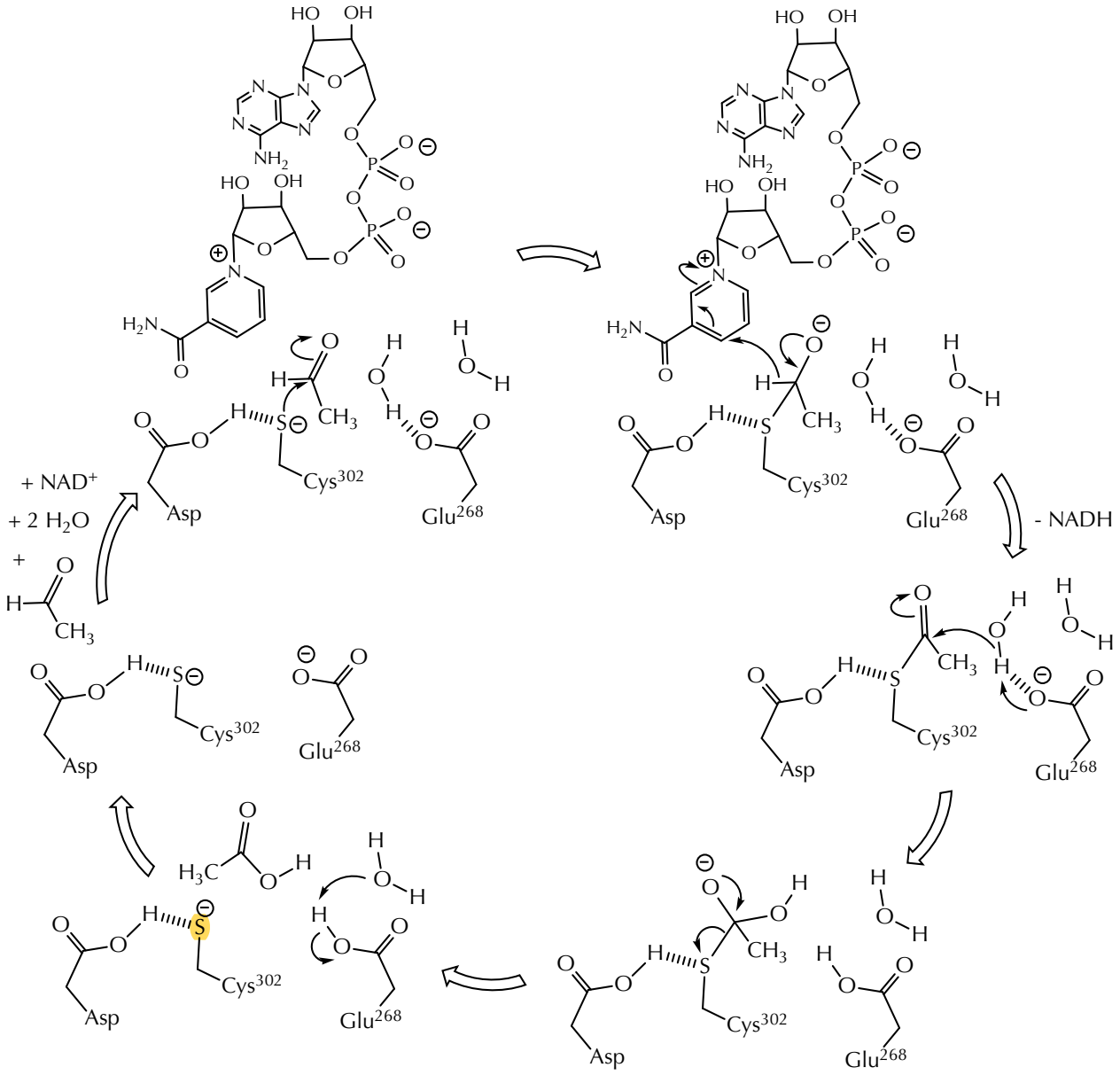
Figure 1838

Acetaldehyde dehydrogenase/NAD⁺ oxidation of acetaldehyde.



to NAD^+ to give an acyl-enzyme; and hydrolysis of the acyl-enzyme. The key functional groups at the active site are Cys^{302}, which adds to the aldehyde, and Glu^{268}, which deprotonates the water molecule that hydrolyzes the acetyl group from the enzyme to give the acetic acid product (which is typically excreted by the body in urine).

Ethanol consumption. These two oxidation reactions are relevant to the biochemistry that takes place when alcohol is consumed, as oxidation is the typical way that your body deals with organic compounds. The rate of the alcohol dehydrogenase oxidation (ethanol to acetaldehyde) is faster than the acetaldehyde dehydrogenase oxidation (acetaldehyde to acetic acid). If alcohol is consumed rapidly, acetaldehyde will begin to accumulate. Acetaldehyde is toxic, and it is responsible for part of the long-term liver damage that takes place after years of alcohol abuse. In the short term, acetaldehyde causes nausea, headaches, vomiting, skin inflammation, blurred vision, and increased heart and respiration rates, that is, many of the negative side effects from heavy and/or rapid alcohol consumption.