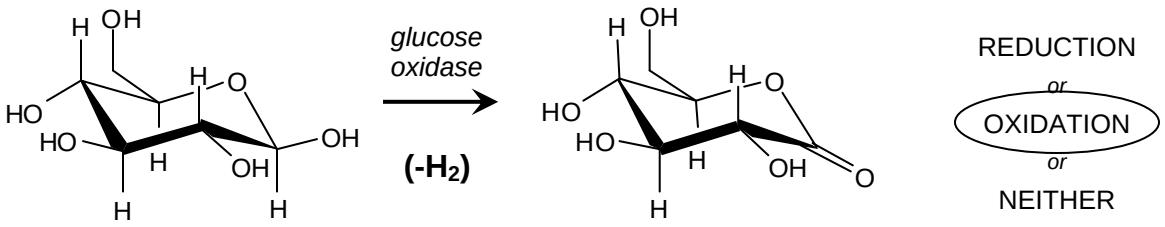
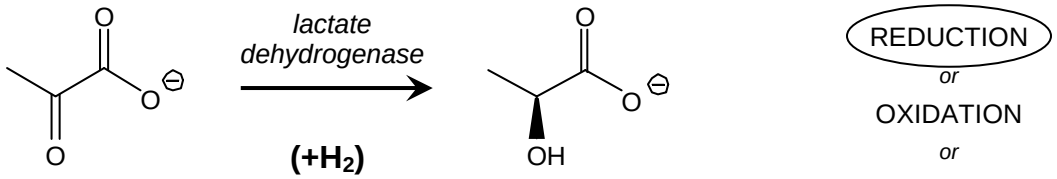
Chemistry 2331H Tuesday, November 26

Workshop 24 Solutions
Diagnostic Tests Based on Oxidation and Reduction



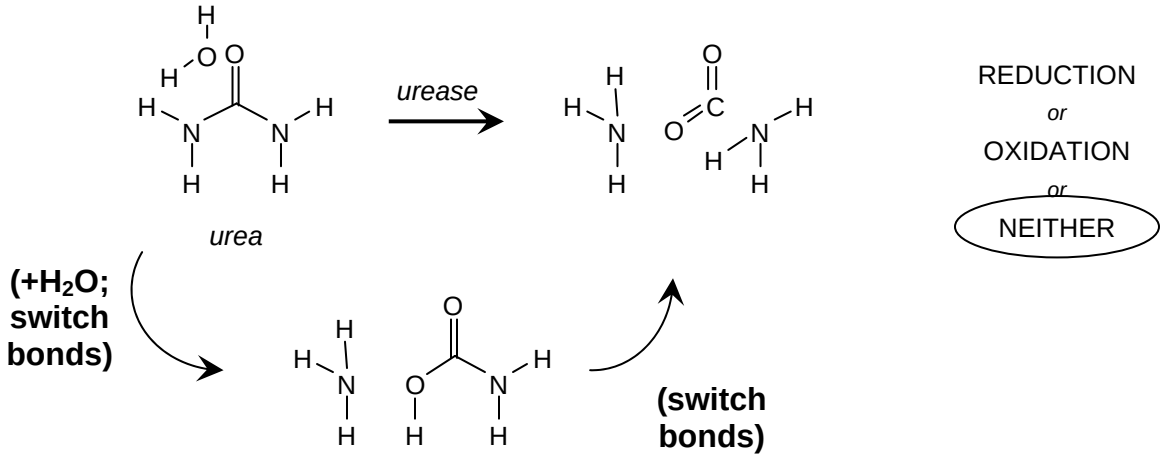
glucose *gluconolactone*

As you probably guessed from the Workshop instructions, this reaction is monitored by the most common glucose monitors on the market. A diabetes patient pricks the skin to produce a drop of blood, and then this drop is placed on a test strip that is basically an electrode coated with glucose oxidase and ferricyanide ion [$Fe(CN)_6^{3-}$] as an electrochemical reporter. Oxidation of glucose by the enzyme results in subsequent oxidation of the reporter, which is detected as a current at the electrode. Most of the sensors described in this worksheet work in a similar fashion.



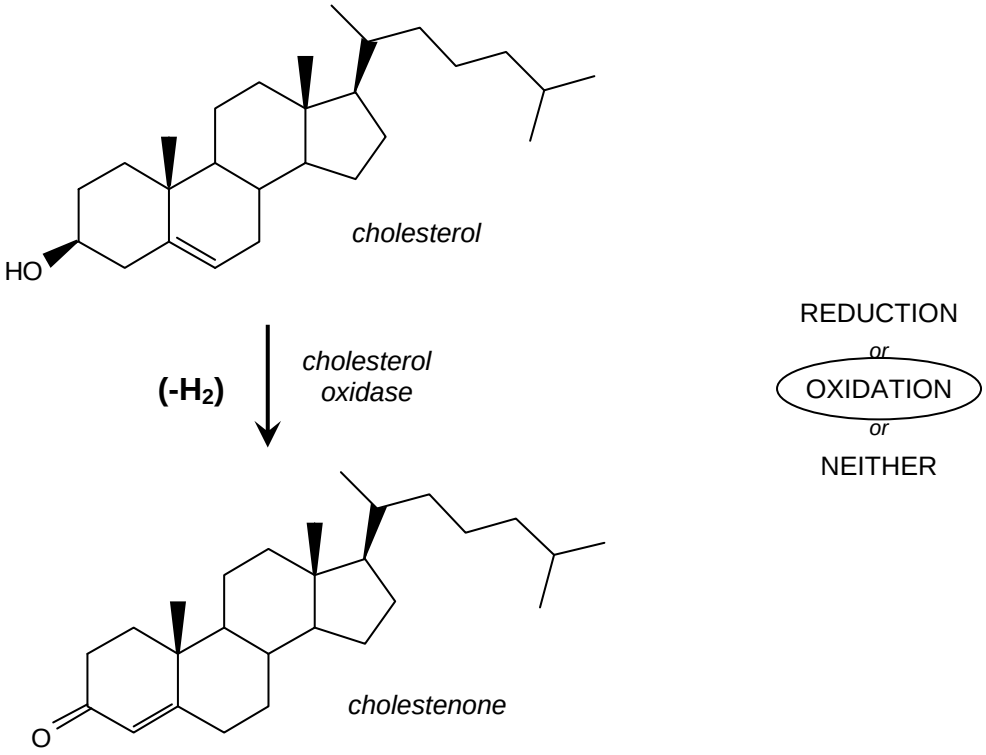
pyruvate *lactate*

Lactate and pyruvate are common metabolites that are present in a small range of ratios. If the detected ratio of these two molecules is out of this range, the patient (usually an infant) may have a metabolic disorder.

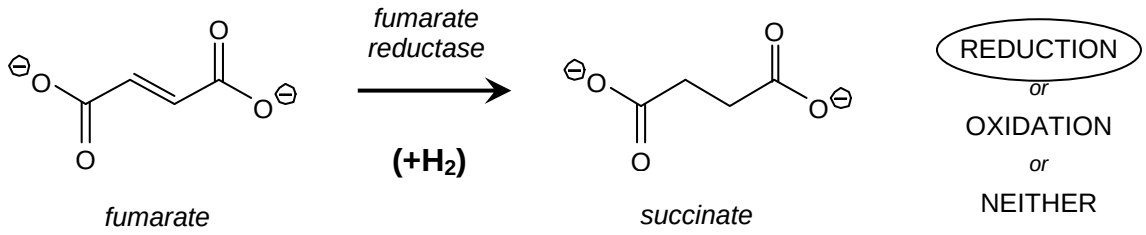


urea

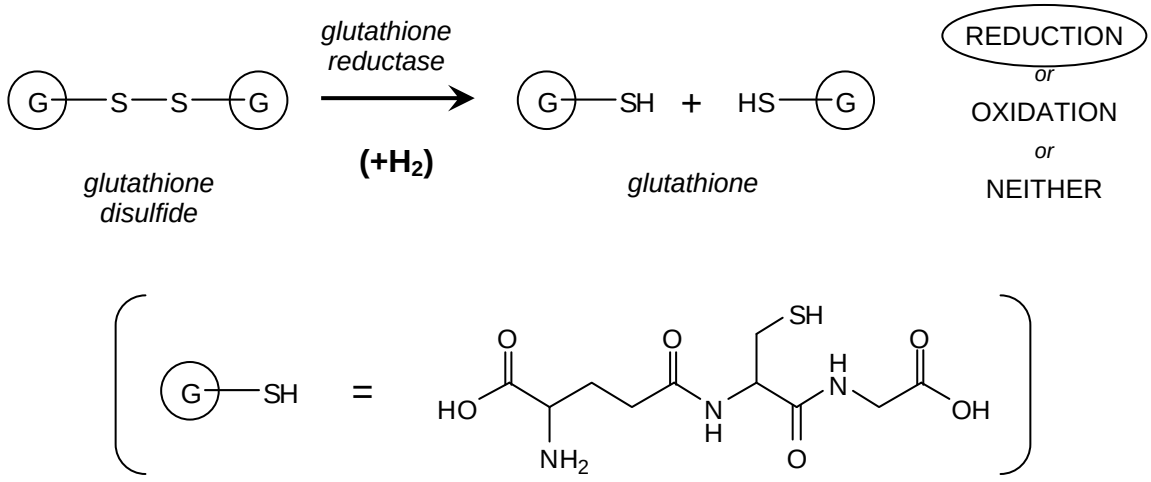
Diagnostics for urea are actually used to test for the presence of active urease enzyme. The successful transformation of urea can indicate a gastrointestinal or urinary tract infection, because these pathogens use urease to neutralize the acid present in these environments.



Used to test for total cholesterol.



Fumarate and succinate are metabolites in the citric acid cycle. Abnormal levels of these molecules indicate a metabolic disorder.



Glutathione is nearly always found in its reduced form (GSH) inside cells, where it protects against oxidative damage. Dead cells fail to produce GSH, and so the ratio of GSSG to GSH in a cell culture indicates the degree of cell death.