

15.S: Oxidation and Reduction Reactions (Summary)

Before moving on to the next chapter, you should be able to:

- Recognize when an organic molecule is being oxidized or reduced, and distinguish between redox and non-redox organic reactions.
- Draw complete mechanisms for the following reaction types, including the structure of the reactive part of the redox coenzyme (it is strongly recommended that you commit to memory the structures of the reactive parts of the nicotinamide and flavin coenzymes).
 - oxidation of an alcohol to an aldehyde or ketone
 - oxidation of an amine to an imine
 - oxidation of an aldehyde to a carboxylic acid derivative (usually a thioester or carboxylate)
 - oxidation of an alkane to an alkene at the α, β position relative to a carbonyl or imine
 - reduction of an aldehyde or ketone to an alcohol
 - reduction of an imine to an amine
 - reduction of a carboxylic acid derivative to an aldehyde
 - reduction of an α, β -conjugated alkene to an alkane
 - oxidation of two thiol groups to a disulfide in a disulfide-exchange type reaction
 - reduction of a disulfide group by flavin
 - flavin hydroperoxide-dependent hydroxylation, epoxidation, and Baeyer-Villiger reactions
 - reduction of FAD (or FMN) to $FADH_2$ (or $FMNH_2$) by $NAD(P)H$.
 - spontaneous oxidation of an alkene group in a biomolecule by hydrogen peroxide
 - reduction of hydrogen peroxide by glutathione peroxidase
- In addition, you should be able to draw complete mechanisms for hydrogenation-dehydrogenation and disulfide exchange reactions that we have not yet seen specific examples of, based on your understanding of the chemistry involved in these reaction types and organic reaction patterns in general. Several exercises and end-of-chapter problems provide opportunities practice with inferring and drawing mechanisms of less familiar redox reactions.
- Given a multistep pathway diagram, you should be able to recognize the transformations taking place and fill in missing intermediate compounds or reagents (problem 15.5 is an example of this type).
- You should be working on gaining proficiency at solving multi-step pathway elucidation problems, such as those at the end of this chapter's problem section.

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