

Organic Chemistry in a Nutshell

The study of some exercises such as those dealing with food dyes, reduction of vanillin, polymers and plastics, etc., is enriched by the knowledge of some relatively simple concepts from organic chemistry.

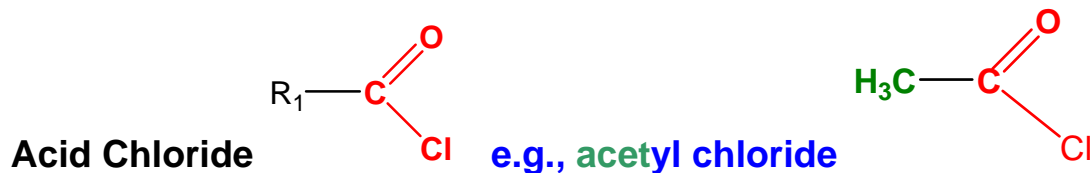
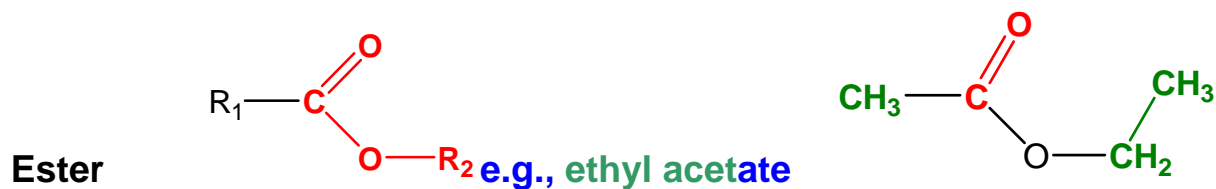
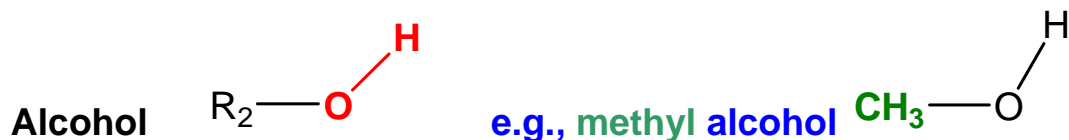
In particular, there are some common, recurring molecular fragments which determine the function and name of compounds that contain these fragments.

These are listed on the following pages which summarize some of the simplest organic “functional groups”.

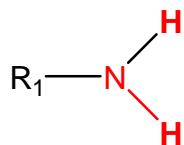
Knowledge about a small number of simple organic reactions is also helpful. We summarize these on the following pages.

Organic Functional Groups

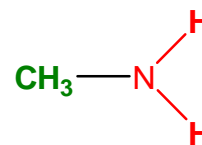
(R_1 and R_2 represent organic groups with no particular functionality). The names of the examples are mostly common (rather than systematic) names.



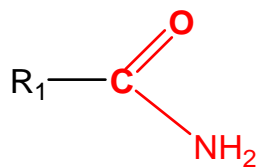
Amine



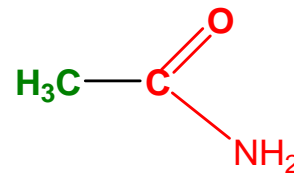
e.g., methyl amine



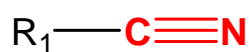
Amide



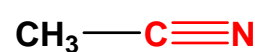
e.g., acetamide



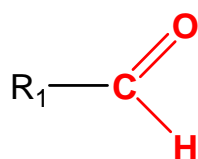
Nitrile



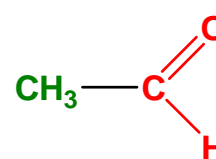
e.g., acetonitrile



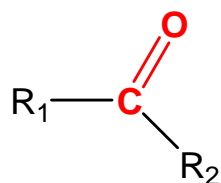
Aldehyde



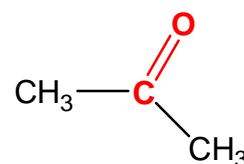
e.g., acetaldehyde



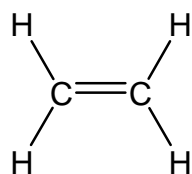
Ketone



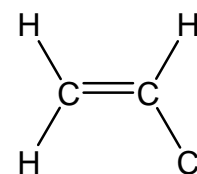
e.g., acetone



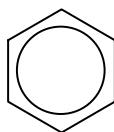
Some basic organic structures will recur in many of the substances used in the exercises.



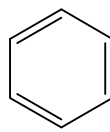
Ethylene (left) whose mono-substituted derivatives are often called vinyl compounds, e.g., vinyl chloride (right)



Benzene, represented by

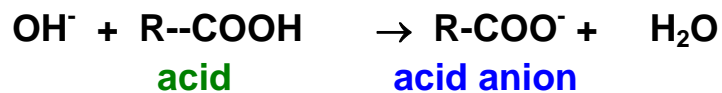


or

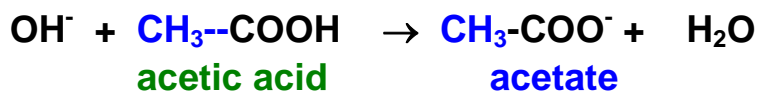


Organic Reactions

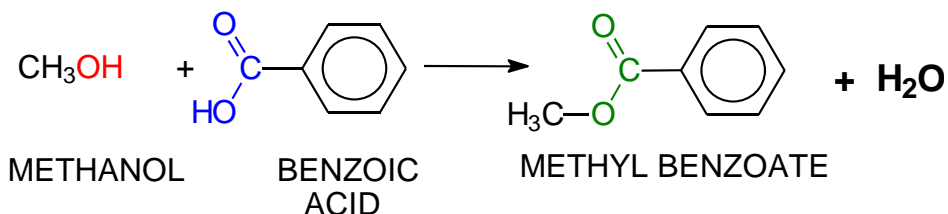
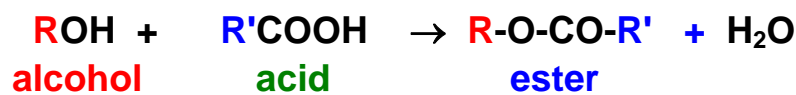
Organic acids can react with inorganic bases such as sodium hydroxide to produce salts, just like their inorganic counterparts.



e.g.,



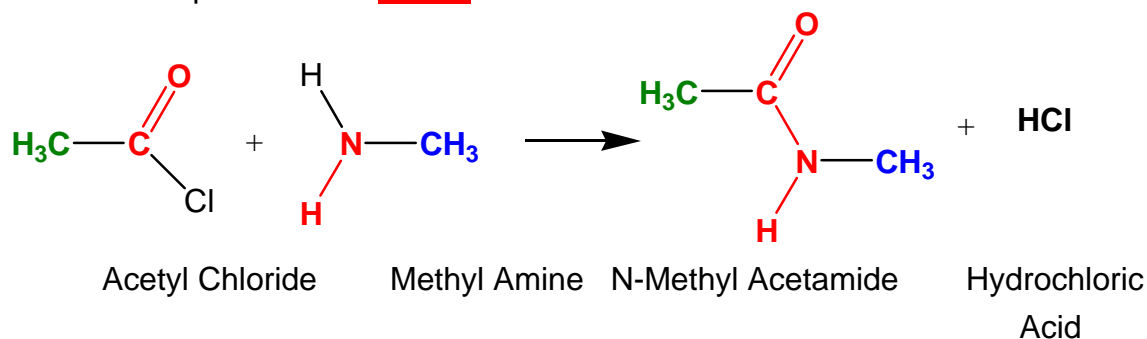
A second organic analog of a neutralization reaction is the reaction of an organic acid with an organic alcohol. The result is the formation of an ester.



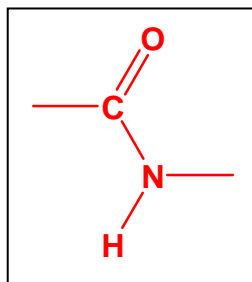
e.g.,

Another type of reaction is that between an amine (an ammonia molecule in which one or more of the hydrogen atoms is replaced by an organic group), with an acid chloride.

The reaction produces an amide. Viz.



Note particularly the arrangement of atoms



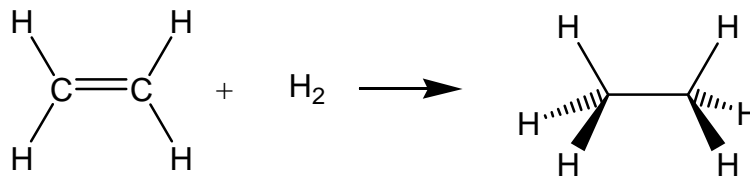
– an **amide linkage**

Also, note the elimination of a molecule of HCl in the above example.

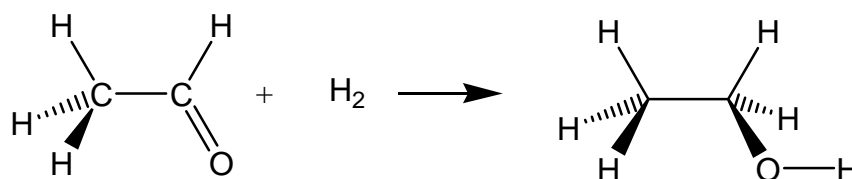
Oxidation and Reduction

Oxidation and reduction reactions also have meaning in organic chemistry. In unsaturated compounds, they can often be identified by examining whether the reaction results in hydrogen atoms being added or removed across a multiple bond.

E.g.,



represents the *reduction* of ethylene to ethane.



Is the *reduction* of acetaldehyde to ethanol.

The addition of hydrogen can be accomplished by catalytic addition of hydrogen gas or by other reagents such as metal hydrides, e.g., sodium borohydride NaBH₄.