

FUNCTIONAL GROUPS

At the very beginning it was said that in spite of the huge variety of organic compounds, it is surprisingly simple to predict how they react using some basic principles. And we have already seen what those few fundamental tenets of organic chemistry are. But the reason why a huge molecule like cholesterol (a vital molecule in our body) would react mostly in the same way as a two carbon ethyl alcohol (a popular drink) is because they share the same functional group—an alcoholic OH group with which we will familiarize ourselves a bit later.

What is a functional group?

As the name clearly implies it is the part of the molecule which makes it ‘function’ the way it does. To give an analogy: think of a bus. The driver at the steering is the one responsible for the whole bus’ motion hence its function, the passengers filling up the bus but don’t really do anything towards the bus. Similarly if we consider the example of the ethyl alcohol and cholesterol, the driver here is the alcohol group (-OH) that both these molecules have in common. The major reactions that the OH group undergoes are the common reactions of both ethyl alcohol and cholesterol. So all the reactions like elimination, substitution, etc would be same for these molecules as the region of reactivity is the -OH. It does not matter if ethyl alcohol has a ‘passenger strength’ of 2 C and cholesterol several, arranged in a very, very different way.

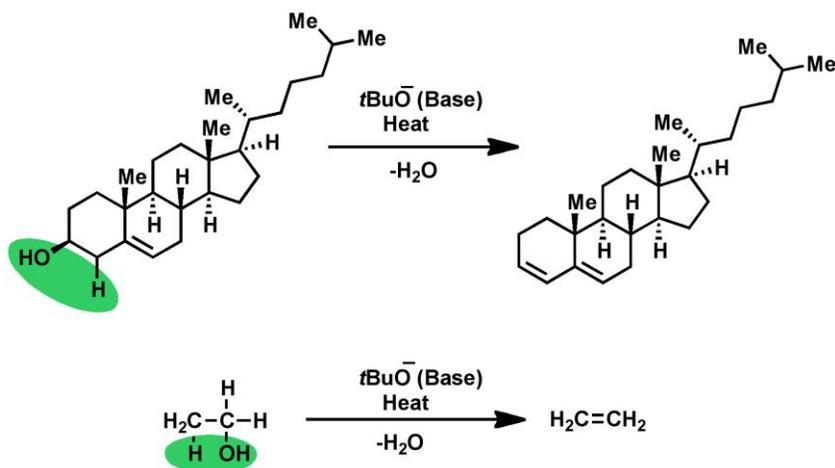
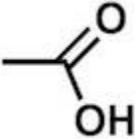
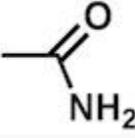
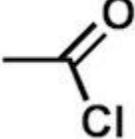
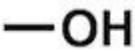
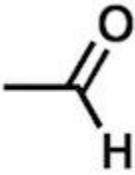
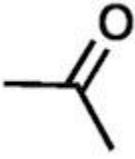
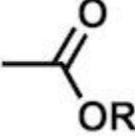
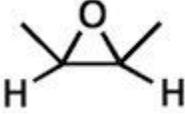
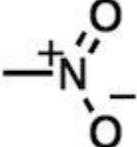
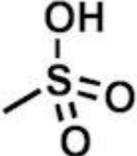
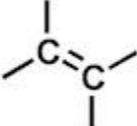


Figure 1. Common reactions for cholesterol and ethanol

List of functional groups in organic chemistry

The knowledge of some basic functional groups and how they react would give us tremendous leverage to tackle the problem of predicting chemical reactivity in organic chemistry. Following is the table of the common functional groups you will encounter in organic chemistry.

| Functional group | Structure | Prefix | Suffix |
|------------------|---|--------------|---------------|
| Carboxylic acid |  | Carboxy | -oic acid |
| Acid amide |  | Carbamoyl | -amide |
| Acid chloride |  | Chloroformyl | -oyl chloride |
| Alcohol |  | Hydroxy | -ol |
| Aldehyde |  | Formyl | -al |
| Ketone |  | Oxo | -one |
| Ester |  | Alkyl | carboxylate |

| Functional group | Structure | Prefix | Suffix |
|------------------|---|------------|-----------|
| Ether | —OR | Alkoxy | |
| Oxirane |  | Epoxy | |
| Halide | $\text{—X ; X = F, Cl, Br, I}$ | Halo | |
| Amine | —NH_2 | Amino | amine |
| Nitrile/ Cyanide | $\text{—C}\equiv\text{N}$ | Cyano | nitrile |
| Nitro |  | Nitro | |
| Nitroso | —N=O | Nitroso | |
| Azo | —N=N— | Azo | |
| Sulphonic acid |  | Sulpho | sulphonic |
| Sulphide | —S—R | Alkyl thio | |
| Thiol | —SH | Mercapto | thiol |
| Double bond |  | | -ene |
| Triple bond | $\text{—C}\equiv\text{C—}$ | | -yne |

Source : <http://padakshep.org/otp/subjects/chemistry/organic-chemistry/functional-groups/>