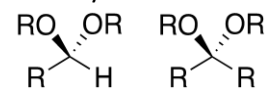


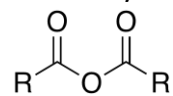
Functional Groups, A Short List

Oxygen-containing

Acetal/ketal



Acid anhydride

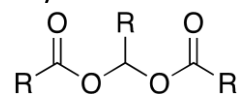


Acyl halide

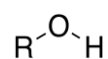


X = Cl, Br, I

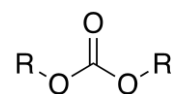
Acylal



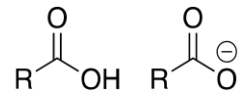
Alcohol



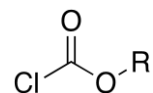
Carbonate



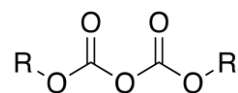
Carboxylic acid/carboxylate anion



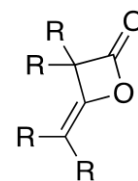
Chloroformate ester



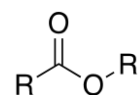
Dicarbonate



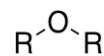
Diketene



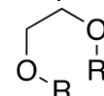
Ester



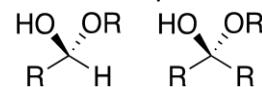
Ether



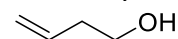
Ethylenedioxy- (crown ether)



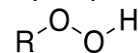
Hemiacetal/Hemiketal



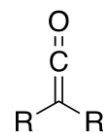
Homoallylic



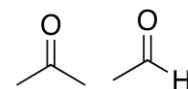
Hydroperoxide



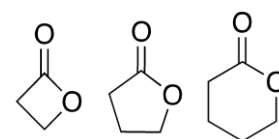
Ketene



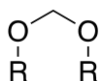
Ketone/aldehyde



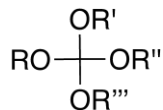
Lactone



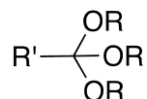
Methylenedioxy-



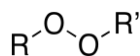
Orthocarbonate ester



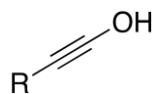
Orthoester



Peroxide

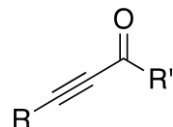


Ynol*



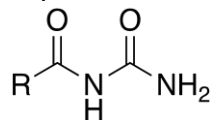
*Highly unstable, tautomer of ketene

Ynone

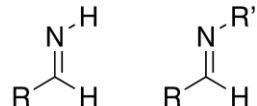


Nitrogen-containing

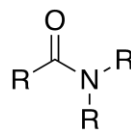
Acylurea



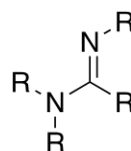
Aldimine (primary/secondary)



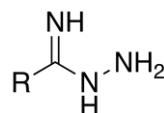
Amide



Amidine



Amidrazone



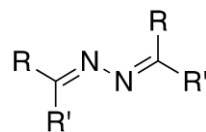
Amine



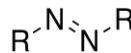
Azide



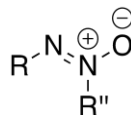
Azine



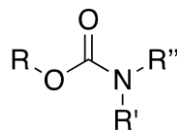
Azo group



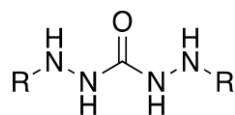
Azoxy



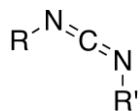
Carbamate



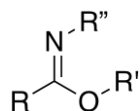
Carbazide



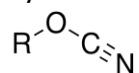
Carbodiimide



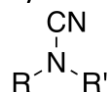
Carboximidate



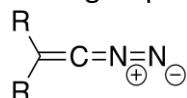
Cyanate



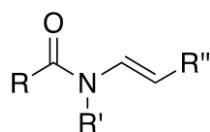
Cyanimide



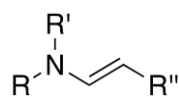
Diazo group



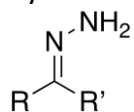
Enamide



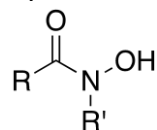
Enamine



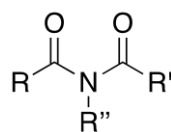
Hydrazone



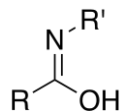
Hydroxamic acid



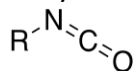
Imide



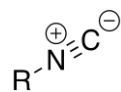
Imidic acid



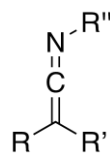
Isocyanate



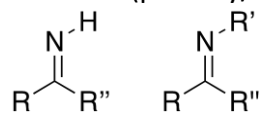
Isonitrile



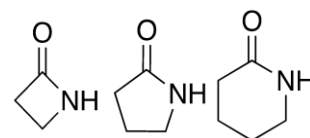
Ketenimine



Ketimine (primary/secondary)



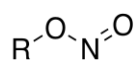
Lactam



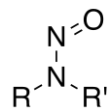
Nitrile (cyanide)

$\text{R}-\text{CN}$

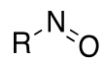
Nitrite



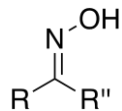
Nitrosamine



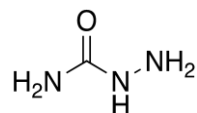
Nitroso



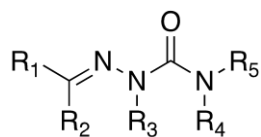
Oxime



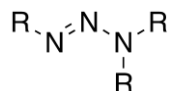
Semicarbazide



Semicarbazone

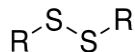


Triazene

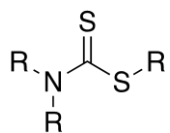


Sulfur-containing

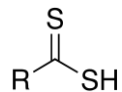
Disulfide



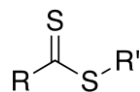
Dithiocarbamate



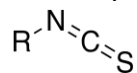
Dithiocarboxylic acid



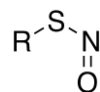
Dithiocarboxylic acid ester



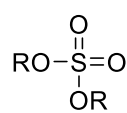
Isothiocyanate



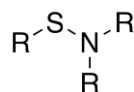
S-nitrosothiol



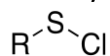
Sulfate



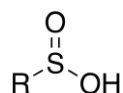
Sulfenamide



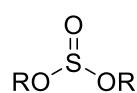
Sulfenyl chloride



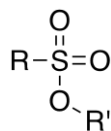
Sulfinic acid



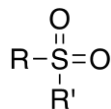
Sulfite



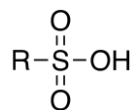
Sulfonate ester



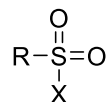
Sulfone



Sulfonic acid

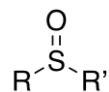


Sulfonyl

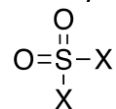


X = Cl, Br, I

Sulfoxide

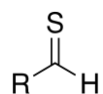


Sulfuryl

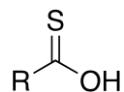


X = Cl, Br, I

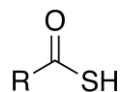
Thial



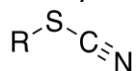
Thiocarboxylic acid (O)



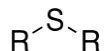
Thiocarboxylic acid (S)



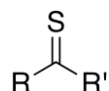
Thiocyanate



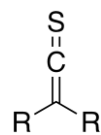
Thioether (sulfide)



Thioketone



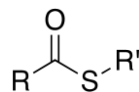
Thioketene



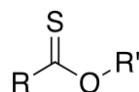
Thiol



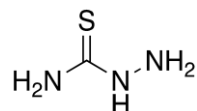
Thiolester



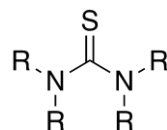
Thionoester



Thiosemicarbazide

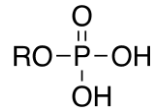


Thiourea

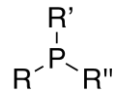


Phosphorus-containing

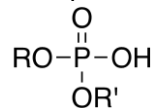
Phosphate



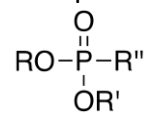
Phosphine



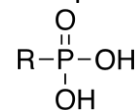
Phosphodiester



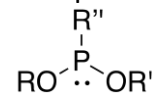
Phosphonate



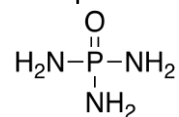
Phosphonic acid



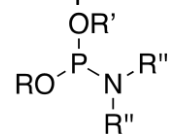
Phosphonite



Phosphoramidate

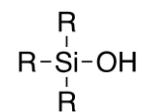


Phosphoramidite

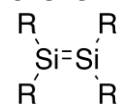


Silicon-containing

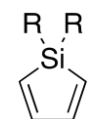
Silanol



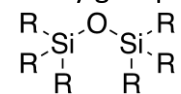
Silene



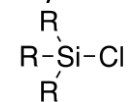
Silole



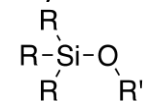
Siloxy group



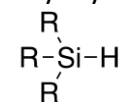
Silyl chloride



Silyl ether

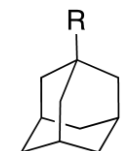


Silyl hydride

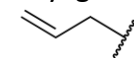


Alkyl groups

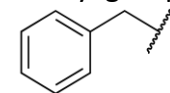
Adamantyl group



Allyl group



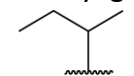
Benzyl group (-Bn)



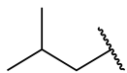
Butyl group



s-Butyl group



Isobutyl group



t-Butyl group



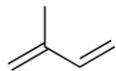
Crotyl group (*cis/trans*)



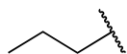
Ethyl group



Isoprene



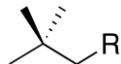
Propyl group



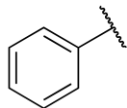
Isopropyl group



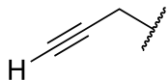
Neopentyl group



Phenyl group (-Ph)



Propargyl group

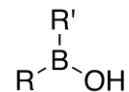


Vinyl group

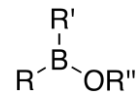


Boron-containing

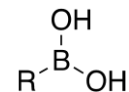
Borinic acid



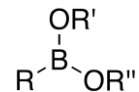
Borinic ester



Boronic acid

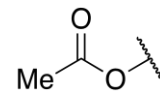


Boronic ester

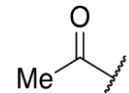


Miscellaneous

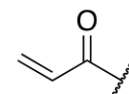
Acetoxy (-OAc)



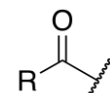
Acetyl group (-Ac)



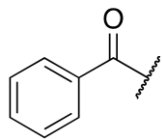
Acryloyl group



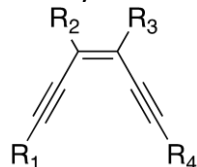
Acyl group



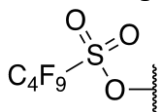
Benzoyl group (-Bz)



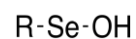
Eneidyne



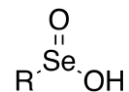
Nonaflate group



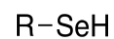
Selenenic acid



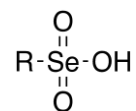
Seleninic acid



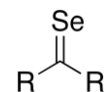
Selenol



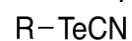
Selenonic acid



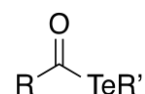
Selone



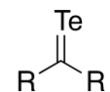
Tellurocyanate*



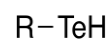
Telluroester*



Telluroketone*

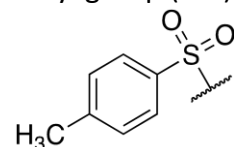


Tellurol*

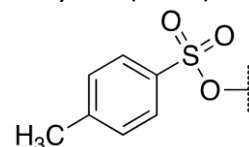


*Tellurium-containing functional groups are highly unstable

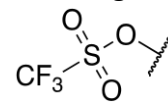
Tosyl group (-Ts)



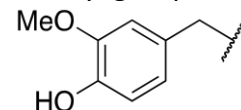
Tosylate (-OTs)



Triflate group (-Tf)



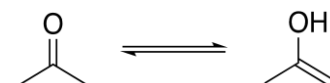
Vanillyl group



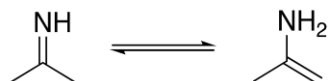
Functional groups featuring tautomerism

Tautomerization of some of the functional groups found in the notes

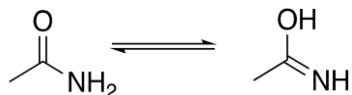
Keto-enol tautomerization



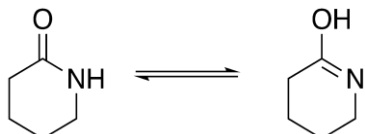
Imine-enamine tautomerization



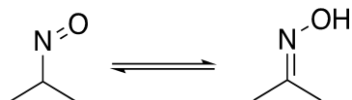
Amide-imidic acid tautomerization



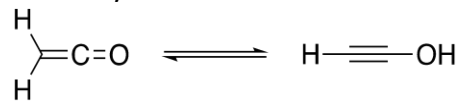
Lactam-lactim tautomerization



Nitroso-oxime tautomerization

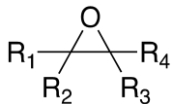


Ketene-ynol tautomerization

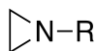


Heterocycles

Epoxide (oxirane)



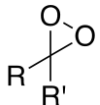
Aziridine



Episulfide / Thiirane



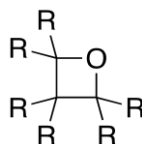
Dioxirane



Azetidine



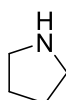
Oxetane



Oxolane / Tetrahydrofuran



Pyrrolidine / Azolidine



Tetrahydrothiophene



Oxole / Furan



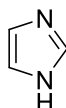
Azole / Pyrrole



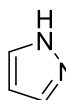
Thiophene



Imidazole



Pyrazole



Isoxazole



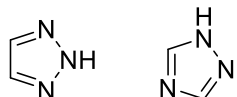
Oxazole



Thiazole



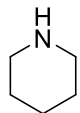
Triazole (1,2,3 and 1,2,4)



Tetrahydropyran



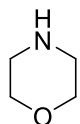
Piperidine / azinane



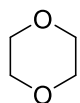
Tetrahydrothiopyran



Morpholine



Dioxane



Pyridine



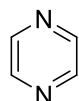
Pyrimidine



Pyridazine



Pyrazine



Pyran



4H-Pyran

