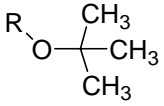
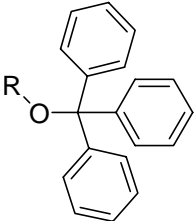
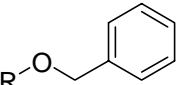
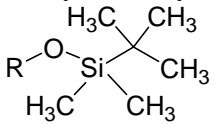
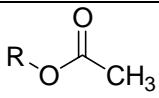
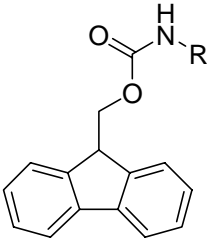
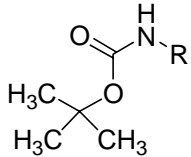
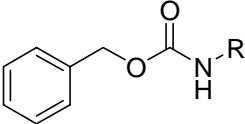
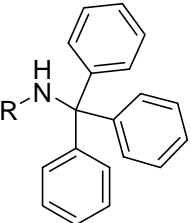
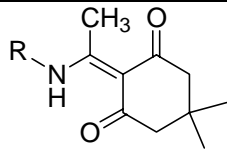
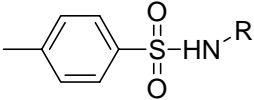
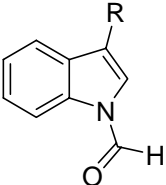


## Protection of Alcohols

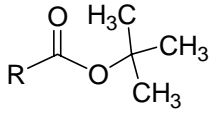
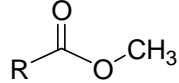
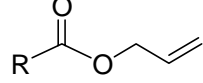
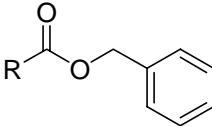
Protecting Group	Formation	Deprotection	Notes
Ethers			
t-butyl 	•	•	<ul style="list-style-type: none"> <li>• Stable to base</li> <li>• Stable to mild acid</li> </ul>
Tryl 	•	•	<ul style="list-style-type: none"> <li>• Stable to base</li> <li>• Orthogonal; deprotection possible vs O-tBu</li> </ul>
4,4'-dimethoxytrityl	•	•	<ul style="list-style-type: none"> <li>• Used for oligonucleotide synthesis</li> </ul>
Benzyl 	•	•	<ul style="list-style-type: none"> <li>• Stable to base</li> <li>• Stable to acid</li> </ul>
t-butyl dimethylsilyl 	•	•	<ul style="list-style-type: none"> <li>• Stable to base</li> <li>• Stable to mild acid</li> </ul>
Esters			
Acetate 	•	•	<ul style="list-style-type: none"> <li>• Stable to acid</li> </ul>

## Protection of Amines

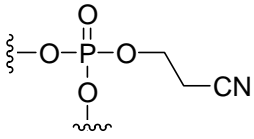
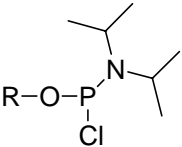
Protecting Group	Formation	Deprotection	Notes
Carbamates			
FMOC, 9-fluorenylmethyl 	•	•	<ul style="list-style-type: none"> <li>Stable to acid</li> </ul>
BOC, t-butyl 	•	•	<ul style="list-style-type: none"> <li>Stable to base</li> <li>Stable to mild acid</li> </ul>
Z, CBZ, benzyl carbamate 	•	•	<ul style="list-style-type: none"> <li>quite stable to acid and mild base</li> </ul>
N-alkyl/aryl			
Trt, N-triphenylmethyl, trityl 	•	•	<ul style="list-style-type: none"> <li>Stable to base</li> <li>Orthogonal; deprotection possible vs Boc carbamate and t-butyl ethers/esters</li> </ul>

Enamine			
<p>Dde</p> 	•	•	<ul style="list-style-type: none"> <li>• Stable to acid</li> <li>• Stable to base</li> <li>• Orthogonal; deprotection possible vs Fmoc, Boc</li> </ul>
Imidazole Protection (eg. His)			
<p>Ts, p-toluenesulfonyl, tosyl</p> 	•	•	<ul style="list-style-type: none"> <li>• used for BOC chemistry</li> </ul>
<p>Tryl</p>	•	•	<ul style="list-style-type: none"> <li>• used for Fmoc chemistry</li> </ul>
Indole Protection (eg. Trp)			
<p>For, formyl</p> 	•	•	<ul style="list-style-type: none"> <li>• used for BOC chemistry</li> </ul>
<p>BOC</p>	•	•	<ul style="list-style-type: none"> <li>• used for Fmoc chemistry</li> </ul>

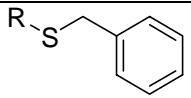
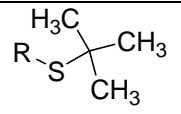
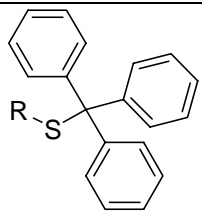
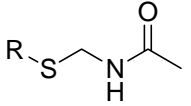
### Protection of Carboxylic Acids

Protecting Group	Formation	Deprotection	Notes
Esters t-butyl 	•	•	<ul style="list-style-type: none"> <li>• Stable to amine bases and mild basic hydrolysis</li> <li>• Must scavenge t-Bu cation for deprotection</li> </ul>
methyl 	•	•	•
allyl 	•	•	<ul style="list-style-type: none"> <li>• Stable to acid</li> <li>• Stable to amine bases</li> <li>• Orthogonal; deprotection possible vs O-tBu</li> </ul>
Benzyl 	•	•	<ul style="list-style-type: none"> <li>• fairly stable to acid and mild base</li> </ul>

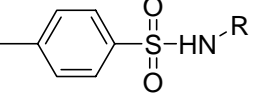
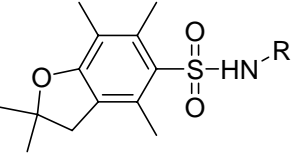
### Protection of Phosphates

Protecting Group	Formation	Deprotection	Notes
Phosphate esters			
Methyl, ethyl	•	•	•
benzyl	•	•	• Deprotection via normal Fmoc strategy
2-cyanoethyl 	•	•	<ul style="list-style-type: none"> <li>• Standard group for oligonucleotide synthesis</li> <li>• Stable to acid</li> <li>• Base labile</li> </ul>
amidate			
N,N-diisopropylamidite 	•	•	• Temp protecting group

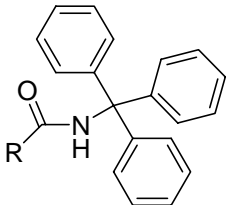
## Protection of Thiols

Protecting Group	Formation	Deprotection	Notes
<p>Thioethers</p> <p>Benzyl </p>	•	•	<ul style="list-style-type: none"> <li>• Stable to acid</li> <li>• Stable to base</li> <li>• Harsh deprotection conditions</li> <li>• cannot use Pd catalyst</li> </ul>
<p>t-butyl </p>	•	•	<ul style="list-style-type: none"> <li>• Stable to TFA</li> <li>• Stable to I<sub>2</sub> oxidation</li> </ul>
<p>Trityl (Trt) </p>	•	•	<ul style="list-style-type: none"> <li>• Stable to base</li> </ul>
thioacetal			
<p>Acetamidomethyl (Acm) </p>	•	•	<ul style="list-style-type: none"> <li>• Stable to TFA</li> <li>• Direct disulfide formation using I<sub>2</sub></li> </ul>

### Protection of Guanidines (eg. Arg)

Protecting Group	Formation	Deprotection	Notes
Sulfonamides Ts, p-toluenesulfonyl, tosyl 	•	•	• used for BOC chemistry
Pbf, pentamethyldihydrobenzofuran sulfonyl 	•	•	• used for Fmoc chemistry

### Protection of Amides

Protecting Group	Formation	Deprotection	Notes
Trityl (Trt) 	•	•	• used for Fmoc chemistry