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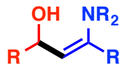
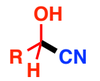
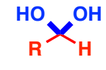
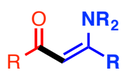
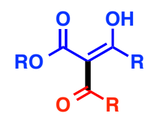
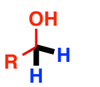
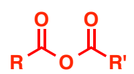
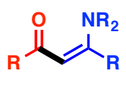
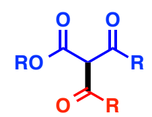
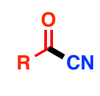
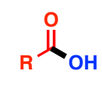
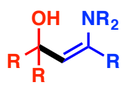
	1	2	3	4	5	6	7	8	9	10	11
	R–MgX ***Grignard***	 ***Ester enolate***	 ***Ketone enolate***	 ***Enamine***	 ***β–keto ester enolate***	R–NH$_2$ ***amine (primary amine)***	M–CN ***Cyanide***	R–OH/ R–OM ***alcohol/ alkoxide***	H$_2$O/ M–OH ***water/ hydroxide***	NaBH$_4$ ***Sodium borohydride***	LiAlH$_4$ ***Lithium aluminum hydride***
A	 ***Aldehyde***	 ***2° alcohol***	 ***Aldol Reaction***	 ***Aldol Reaction***	 ***Knoevenagel Condensation***	 ***Imine (aldimine)***	 ***Cyanohydrin***	 ***Acetal*** *Requires acid catalysis to form*	 ***Hydrate*** *(usu. thermodynaically disfavored, except for electron poor aldehydes) If aldehyde is enolizable, hydroxide can form enolate.*	 ***1° alcohol***	 ***1° alcohol***
		heating under basic conditions will lead to elimination of OH - ***Aldol condensation also note*** *that reaction can be reversible under basic conditions :* ***Retro-aldol reaction***									
B	 ***Acyl chloride***	 ***3° alcohol***	 ***β–keto ester***			 ***Amide (Schotten-Bauman reaction)***	 ***Acid nitrile***	 ***Ester***	 ***Carboxylic acid***	 ***1° alcohol***	 ***1° alcohol***
C	 ***Anhydride***	 ***3° alcohol***				 ***Amide***	 ***Acid nitrile***	 ***Ester***	 ***Carboxylic Acid***	*Borderline*	 ***1° alcohol***
D	 ***Ketone***	 ***3° alcohol***	 ***Aldol Reaction***	 ***Aldol Reaction***		 ***Imine (ketimine)***	 ***Cyanohydrin***	 ***Acetal*** *Requires acid catalysis*	 ***Hydrate*** *see above: even less favored than with aldehydes due to sterics*	 ***2° alcohol***	 ***2° alcohol***
		Note: best when ketones are identical or when only one can enolize (to avoid scrambling)									
E	 α, β **unsaturated ketone (enone)**	*Varies with conditions: 1,2 adduct is kinetic pdt.*	 ***Michael Reaction***	 ***Michael Reaction***							*Varies with conditions: 1,2 adduct is kinetic product, 1,4 adduct is thermodynamic.*
							Note: in both cases, very prone to the reverse reaction (elimination)		*Note: Easily reversible*		
F	 ***Ester***	 ***3° alcohol***	 ***β–keto ester: Claisen Condensation***	 ***1,3 diketone: Claisen Condensation***	*Borderline*	*Borderline*	 ***Amide***	NR	 ***Transesterification*** *Can be done under basic or acidic conditions.*	 ***Saponification*** *(basic conditions) Can also hydrolyze with aqueous acid*	NR	 ***1° alcohol***
G	 ***Carboxylic acid***	*Deprotonation*	*Deprotonation*	*Deprotonation*	*NR*	*Deprotonation*	 ***Usually requires dehydration agent (e.g. DCC)***	NR	 ***Fischer esterification*** *(requires acid, heat)*	—	NR	 ***1° alcohol***
H	 ***Amide***	*Deprotonation*	*1° and 2° amides: deprotonation 3°amides: NR*	*1° and 2° amides: deprotonation 3°amides: NR*	NR	NR	NR	NR	*Borderline reaction: requires strong acid, alcohol as solvent, heat*	 ***Amide Hydrolysis*** *Requires strong conc. acid, heat*	NR	 ***Amine***
I	 ***Alkyl halide***	Mix of addition /deprotonation	 ***Enolate Alkylation***	 ***Enolate Alkylation***	 ***Stork enamine reaction***	 *note: capable of alkylating a second time*	 ***Amine*** ***caution! product is a good nucleophile; multiple alkylations usually result***		 ***Williamson Ether Synthesis*** *requires basic conditions*	 *requires basic conditions*	NR	 ***Alkane***