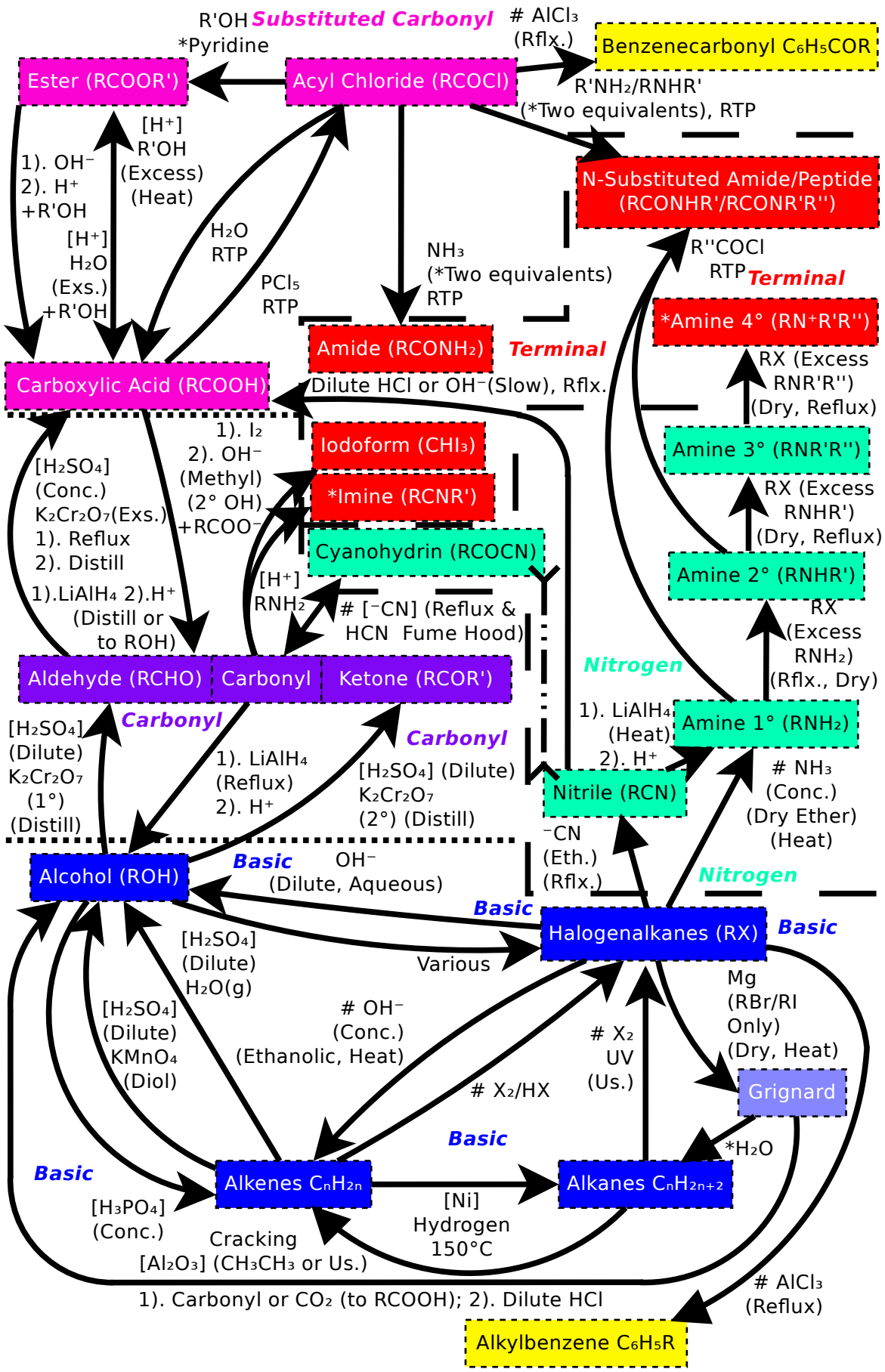
Substituted Carbonyl
R'OH
*Pyridine
AlCl₃
(Rflx.)
Benzenecarbonyl C₆H₅COR
Ester (RCOOR')
Acyl Chloride (RCOCl)
R'NH₂/RNHR'
(*Two equivalents), RTP
[H⁺]
R'OH
(Excess)
(Heat)
1). OH⁻
2). H⁺
+R'OH
N-Substituted Amide/Peptide
(RCONHR'/RCONR'R'')
[H⁺]
H₂O
(Exs.)
+R'OH
H₂O
RTP
PCl₅
RTP
NH₃
(*Two equivalents)
RTP
R''COCl
RTP
Terminal
*Amine 4° (RN⁺R'R'')
Amide (RCONH₂)
Terminal
Carboxylic Acid (RCOOH)
Dilute HCl or OH⁻(Slow), Rflx.
RX (Excess
RNR'R'')
(Dry, Reflux)
1). I₂
2). OH⁻
(Methyl)
(2° OH)
+RCOO⁻
Iodoform (CHI₃)
Amine 3° (RNR'R'')
[H₂SO₄]
(Conc.)
K₂Cr₂O₇(Exs.)
1). Reflux
2). Distill
*Imine (RCNR')
RX (Excess
RNHR')
(Dry, Reflux)
Cyanohydrin (RCOCN)
Amine 2° (RNHR')
1).LiAlH₄ 2).H⁺
(Distill or
to ROH)
[H⁺]
RNH₂
[⁻CN] (Reflux &
HCN Fume Hood)
RX
(Excess
RNH₂)
(Rflx., Dry)
Aldehyde (RCHO)
Carbonyl
Ketone (RCOR')
Nitrogen
1). LiAlH₄
(Heat)
2). H⁺
Amine 1° (RNH₂)
[H₂SO₄]
(Dilute)
K₂Cr₂O₇
(1°)
(Distill)
Carbonyl
1). LiAlH₄
(Reflux)
2). H⁺
Carbonyl
[H₂SO₄] (Dilute)
K₂Cr₂O₇
(2°) (Distill)
Nitrile (RCN)
NH₃
(Conc.)
(Dry Ether)
(Heat)
⁻CN
(Eth.)
(Rflx.)
Alcohol (ROH)
Basic
OH⁻
(Dilute, Aqueous)
Nitrogen
Basic
Halogenalkanes (RX)
Basic
[H₂SO₄]
(Dilute)
H₂O(g)
Various
Mg
(RBr/RI
Only)
(Dry, Heat)
[H₂SO₄]
(Dilute)
KMnO₄
(Diol)
OH⁻
(Conc.)
(Ethanolic, Heat)
X₂
UV
(Us.)
X₂/HX
Grignard
Basic
*H₂O
Basic
Alkenes CₙH₂ₙ
Alkanes CₙH₂ₙ₊₂
[H₃PO₄]
(Conc.)
[Ni]
Hydrogen
150°C
Cracking
[Al₂O₃] (CH₃CH₃ or Us.)
1). Carbonyl or CO₂ (to RCOOH); 2). Dilute HCl
AlCl₃
(Reflux)
Alkylbenzene C₆H₅R

Key

	One-way reaction. Conditions/reagents near arrow head.
	Reversible reaction. Conditions/reagents for each direction near relevant arrow head.
	Nitrile group on cyanohydrins (hydroxynitrile) undergoes same reactions as a 'normal' nitrile.
	Oxidation/reduction line. Going up the page past it is an oxidation, going down the page is a reduction.
	Group seperation line. Groups are "Basic": useful starting organic groups; "Carbonyl" carbonyl compounds; "Substituted Carbonyl": carbonyl groups substituted with other groups e.g. carboxylic acids and "Nitrogen": nitrogen containg compounds. Group names are in bold-italics.
Alcohol (ROH)	Group name and formula.
[H_2SO_4]	Sulphuric acid catalyses the reaction.
1). $LiAlH_4$ (Reflux) 2). H^+	First add lithium aluminium hydride and heat under reflux, then add a source of H^+ ions, e.g. dilute HCl.
+R'OH	An alcohol is another organic product produced by the reaction.
R	Alkyl group. R' and R'' show two other distinct alkyl groups.
X	Halogen.
Eth.	Ethanolic.
Conc.	Concentrated.
Exs.	Excess.
Rflx.	Heat under reflux.
RTP	Room temperature and pressure.
Dry	Dry ether.
(Methyl) (2° OH)	Reaction occurs for methyl 2° alcohol and ethanol as well as methyl 2° ketones and ethanal (indicated) (from the iodoform reaction).
*Pyridine	Reaction/group/reagent not required knowledge.
(Us.)	Reaction is unselective - produces a large number of different products
#	Reaction mechanism should be learnt.

Assumptions/Intentional Omissions

All reactions carried out with $AlCl_3$ or $LiAlH_4$ should be conducted under dry conditions e.g. by using dry ether.

Any reactions with "(Distill)" listed should be conducted by heating the reagents and then distilling. Likewise for any reactions with "(Reflux)" listed the reaction should be completed by heating under reflux.

Version Information/Licence

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