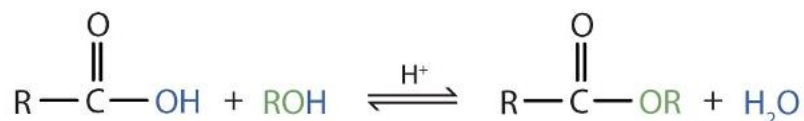


Chemistry 2, HW 23

One of the specific reactions for carboxylic compounds – esterification reaction



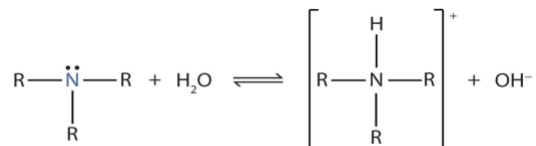
R in organic chemistry represent “the rest of the molecule, part of the molecule that is outside of the functional group (it can be any alkyl group, benzene ring etc.)

Esterification reaction – reaction between carboxylic acid and alcohol, the product is ester, the products have very distinct smell, it can smell like different fruits.

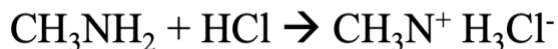
Amines:

Central atom is nitrogen. Amines are derivatives of ammonia (NH₃) where carbon atom replaces one, two, or three hydrogen atoms. The defining feature of amine; A nitrogen atom with a lone pair bonded to carbon-containing groups.





Amines are weak bases, they accept proton, they produce hydroxide ions in aqueous solution. Amines react with a strong acid, the products are amine salts.



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Amine table (pK values show that these substances are weak bases):

Amine	Name	Bp. °C	Mp. °C	Water solubility, g/100 ml	K_b in water*	pK_b †
NH ₃	ammonia	-33	-77.7	90 [‡]	1.8×10^{-5}	9.26
CH ₃ NH ₂	methanamine (methylamine)	-6.5	-92.5	1156	4.4×10^{-4}	10.64
CH ₃ CH ₂ NH ₂	ethanamine (ethylamine)	16.6	-80.6	∞	5.6×10^{-4}	10.75
(CH ₃) ₃ CNH ₂	1,1-dimethylethanamine (<i>tert</i> -butylamine)	46	-67.5	∞	2.8×10^{-4}	10.45
(CH ₃ CH ₂) ₂ NH	<i>N</i> -ethylethanamine (diethylamine)	55.5	-50	v. sol.	9.6×10^{-4}	10.98
(CH ₃ CH ₂) ₃ N	<i>N,N</i> -diethylethanamine (triethylamine)	89.5	-115	1.5 [‡]	4.4×10^{-4}	10.64
(CH ₃ CH ₂ CH ₂ CH ₂) ₃ N	<i>N,N</i> -dibutylbutanamine (tributylamine)	214		sl. sol.		
	azacyclohexane (piperidine)	106	-9	∞	1.6×10^{-3}	11.20
	azabenzene (pyridine)	115	-42	∞	1.7×10^{-9}	5.23
	cyclohexanamine	134	-18	sl. sol.	4.4×10^{-4}	10.64
	benzenamine (aniline)	184.4	-6.2	3.4 [‡]	3.8×10^{-10}	4.58
H ₂ NCH ₂ CH ₂ NH ₂	1,2-ethanediamine (ethylenediamine)	116	8.5	sol.	8.5×10^{-5}	9.93

*Usually at 20–25°. †The pK_b values refer to the dissociation of the conjugate acid RNH_3^+
 $+ H_2O \xrightleftharpoons{K_a} RNH_2 + H_3O^+$, where $pK_b = -\log K_b = 14 + \log K_a$ (see Sections 8-1 and 23-7).

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Questions:

1. Name the functional group present in amines.
2. What is the difference between an amine and ammonia?
3. Why are small-chain amines more soluble in water than large-chain amines?
Hint: slide # 11 and polarity.
4. Description from HW 22 can help to solve the following problem:
A sample of a saturated monochloro-containing organic acid (C₁C_xH_yCOOH) weighing 1.89 g was burned. One of the combustion products can react with 57.75 mL of a 5.8 % silver nitrate (AgNO₃) solution (density 1.015 g/mL). Determine the possible structure of the acid (find x and y).