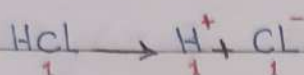


Ionic Equilibrium

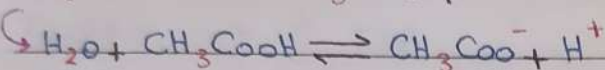
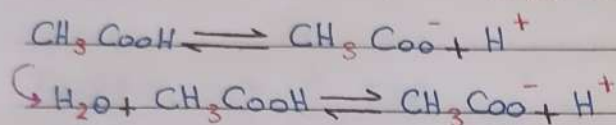


الاتزان الألكتروليتي:

حمض قوي قاعدة قوية

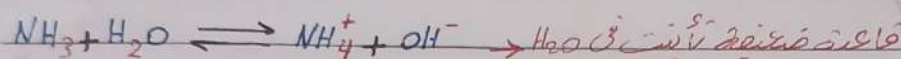
Ex: $\text{CH}_3\text{COOH} \rightleftharpoons \text{CH}_3\text{COO}^- + \text{H}^+$ \rightarrow اتزان غير أيوني

الكلاوريت قوي أي تام التآين



Ex: قاعدة ضعيفة

ملوش ثابت اتزان ع تام التآين



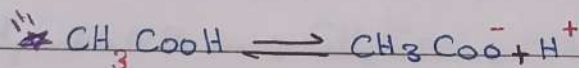
$$K_a = \frac{[\text{CH}_3\text{COO}^-][\text{H}^+]}{[\text{CH}_3\text{COOH}]}$$

ثابت اتزان الحمض

$$K_b = \frac{[\text{NH}_4^+][\text{OH}^-]}{[\text{NH}_3]}$$

ثابت اتزان القاعدة

Ex: The dissolution constant K_a of 0.2 M weak acid in which Hydrogen ion equal 4×10^{-4} M is



$$K_a = \frac{[\text{CH}_3\text{COO}^-][\text{H}^+]}{[\text{CH}_3\text{COOH}]}$$

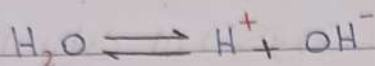
$$[\text{CH}_3\text{COO}^-] = [\text{H}^+] = x \rightarrow 4 \times 10^{-4}$$

$$\therefore K_a = \frac{(4 \times 10^{-4})^2}{0.2} = 8 \times 10^{-7}$$

Subject: _____

Date: ____ / ____ / ____

Ionization of water



$$K = \frac{[\text{H}^+][\text{OH}^-]}{[\text{H}_2\text{O}]}$$

$$K_w = K[\text{H}_2\text{O}] = [\text{H}^+][\text{OH}^-] = 1 \times 10^{-14}$$

$$\therefore [\text{H}^+] = [\text{OH}^-] = 1 \times 10^{-7}$$

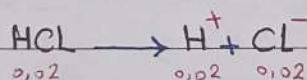
$$\log [\text{H}^+] + \log [\text{OH}^-] = \log [10^{-14}]$$

$$\therefore P_H + P_{OH} = 14$$

$$P_H = -\log [\text{H}^+]$$

$$P_{OH} = -\log [\text{OH}^-]$$

Ex: what are $[\text{H}^+]$ and $[\text{OH}^-]$ in 0.02 M HCl



$$\therefore [\text{H}^+] = 0.02$$

Indicators

W.O.A \rightarrow *color change*

W.O.B \rightarrow *color change*

\rightarrow change its color with P_H

Subject: _____

Date: ____ / ____ / ____

Ex: w.o.A Ph.Ph

↳ Phenol Phthalene

acid → Colorless / Base → Red or Pink

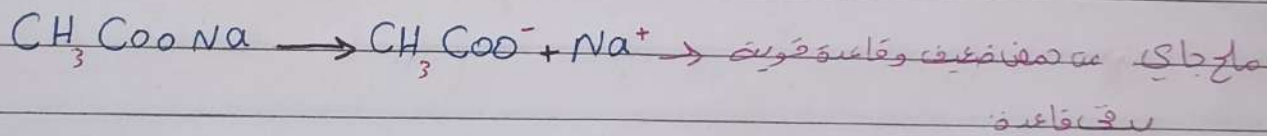
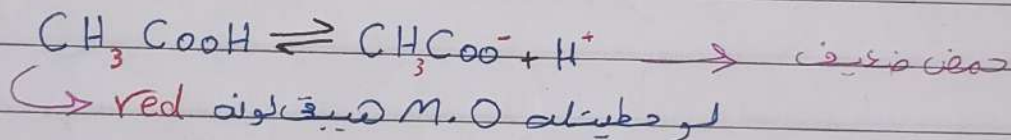
Ex: w.o.B M.O

↳ Methylene orange

acid → Red / Base → Yellow



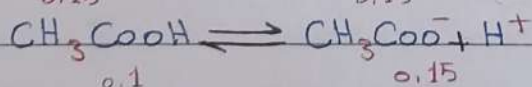
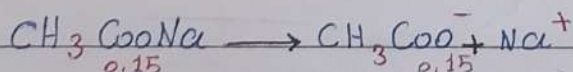
Common ion effect



Ex: 0.1 CH_3COOH 0.15 CH_3COONa

what is the conc of H^+ ?

$$(K_a = 1.8 \times 10^{-5})$$



! لزودت CH_3COO^- يبقى
! H^+ هتقل يبقى هيتحول من
! red إلى yellow

$$K_a = \frac{0.15 [\text{H}^+]}{0.1} = \rightarrow \text{H}^+ \text{ هتكون زجيب}$$

$$\rightarrow 1.8 \times 10^{-5}$$