Supramolecular ..

Acid-Base Eq ⑧ Calc. of ions from pH of salts.

① What is the molarity of NH_4NO_3 soln with pH 4.80. (K_b NH_3 = 1.8×10^{-5})

NH_4^+ is acid salt – need K_a.

$$NH_4^+ + H_2O \rightleftharpoons H_3O^+ + NH_3$$

	NH_4^+		H_3O^+	NH_3
I	x		0	0
C	-1.6×10^{-5}		$+1.6 \times 10^{-5}$	$+1.6 \times 10^{-5}$
E	$(x - 1.6 \times 10^{-5})$		(1.6×10^{-5})	(1.6×10^{-5})

$K_a = \frac{1 \times 10^{-14}}{1.8 \times 10^{-5}} = 5.8 \times 10^{-10}$

$pH = 4.80$

H_3O^+ = antilog -4.8

$= 1.6 \times 10^{-5} M$

$$K_a = 5.8 \times 10^{-10} = \frac{(1.6 \times 10^{-5})^2}{(x - 1.6 \times 10^{-5})}$$

$x = 0.46 M$

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② What is the molarity of a CH_3COONa solution of pH = 9.10. (K_a acetic acid = 1.8×10^{-5})

CH_3COO^- is weak base so need K_b. need OH^-

$$CH_3COO^- + H_2O \rightleftharpoons CH_3COOH + OH^-$$

	CH_3COO^-		CH_3COOH	OH^-
I	x		0	0
C	-1.26×10^{-5}		$+1.26 \times 10^{-5}$	$+1.26 \times 10^{-5}$
E	$(x - 1.26 \times 10^{-5})$		1.26×10^{-5}	1.26×10^{-5}

$K_b = \frac{1 \times 10^{-14}}{1.8 \times 10^{-5}} = 5.6 \times 10^{-10}$

$pOH = 14 - 9.10 = 4.9$

antilog $4.9 = [OH^-] = 1.26 \times 10^{-5}$

$$K_b = 5.6 \times 10^{-10} = \frac{(1.26 \times 10^{-5})^2}{x - 1.26 \times 10^{-5}}$$

$x = 0.29 M$

Superscripts --

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$$NH_4^+ + H_2O \rightleftharpoons H_3O^+ + NH_3$$

	NH_4^+		H_3O^+		NH_3
I	x		0		0
C	-1.6×10^{-5}		$+1.6 \times 10^{-5}$		$+1.6 \times 10^{-5}$
E	$(x - 1.6 \times 10^{-5})$		(1.6×10^{-5})		(1.6×10^{-5})

$$K_a = 5.8 \times 10^{-10} = \frac{(1.6 \times 10^{-5})^2}{(x - 1.6 \times 10^{-5})}$$

$$x = 0.46\,M$$

$K_a = \frac{1 \times 10^{-14}}{1.8 \times 10^{-5}} = 5.8 \times 10^{-10}$

$[H_3O^+]$ = antilog -4.8 $= 1.6 \times 10^{-5} M$

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	CH_3COO^-		CH_3COOH		OH^-
I	x		0		0
C	-1.26×10^{-5}		$+1.26 \times 10^{-5}$		$+1.26 \times 10^{-5}$
E	$(x - 1.26 \times 10^{-5})$		1.26×10^{-5}		1.26×10^{-5}

$$K_b = 5.6 \times 10^{-10} = \frac{(1.26 \times 10^{-5})^2}{x - 1.26 \times 10^{-5}}$$

$$x = 0.29\,M$$

$K_b = \frac{1 \times 10^{-14}}{1.8 \times 10^{-5}} = 5.6 \times 10^{-10}$

$pOH = 14 - 9.10 = 4.9$

antilog -4.9 $[OH^-] = 1.26 \times 10^{-5}$