

General Chemistry w/ Doc M

Today section 15.8 - 15.10
Feb 15

Thursday Expt 5 MM of unknown weak acid
2/16

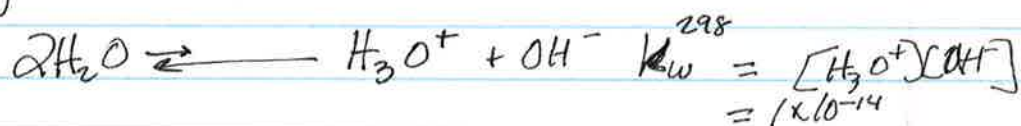
Friday Exam 2 Doors open at 10:45 or 9:15
2/17

Sunday 2/19 Review at 5 - 6:30 HTTC 108

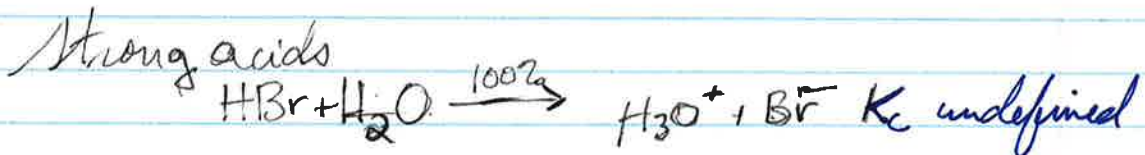
Monday 2/20 section 15.11 - 15.13

Exam: No eqn + data sheet
know all eqn's
arrhenius eqn is only exception

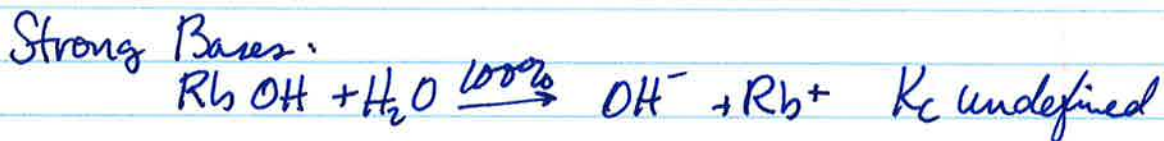
Water Equilibrium



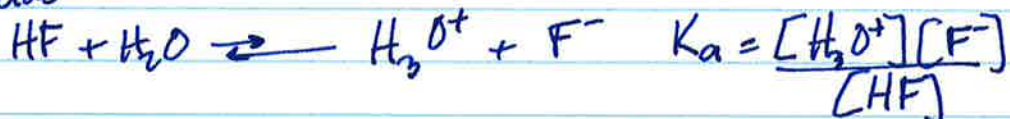
Strong acids



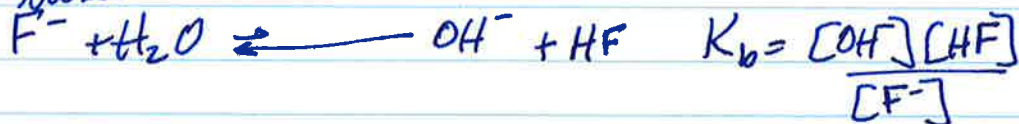
Strong Bases:



weak acids:

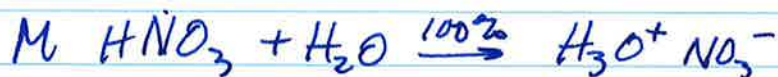


weak bases



What is the pH of a $7.1 \times 10^{-3} \text{ M}$ HNO_3 solution?

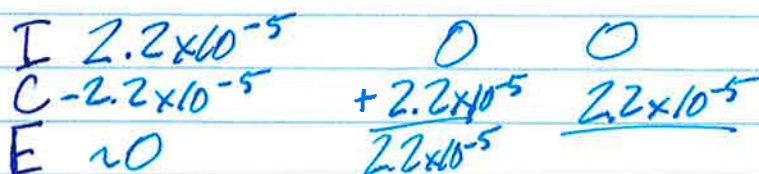
HNO_3 is a strong acid



$$[\text{H}_3\text{O}^+] = 7.1 \times 10^{-3}$$

$$\begin{aligned} \text{pH} &= -\log [\text{H}_3\text{O}^+] \\ &= -\log (7.1 \times 10^{-3}) \\ &= \underline{\underline{2.15}} \end{aligned}$$

What is the pH of a $2.2 \times 10^{-5} \text{ M}$ NaOH sol'n?



$$\begin{aligned} [\text{OH}^-] &= 2.2 \times 10^{-5} \\ \text{pOH} &= -\log (2.2 \times 10^{-5}) = 4.66 \end{aligned}$$

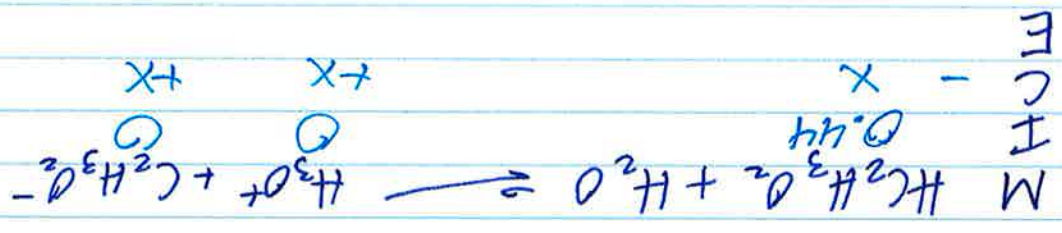
$$[H_3O^+] = 0.00281$$

$$0.44 = 2.4 \times 10^{-4} > 0$$

11480 make it of [H+]E \rightarrow 400, then X is very small

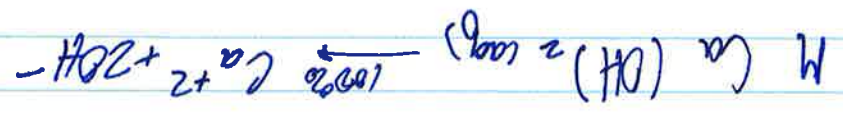
$$1.8 \times 10^{-5} = \frac{x^2}{0.44} \Rightarrow x = 0.00281$$

$$K_a = \frac{[H_3O^+][C_2H_3O_2^-]}{[C_2H_3O_2]} = \frac{1.8 \times 10^{-5}}{0.44 - x} = \frac{0.44 - x}{x \cdot x}$$



What is the pH of a 0.44 M $H_2C_2H_3O_2$ solution? $K_a = 1.8 \times 10^{-5}$ given

E	≈ 0
C	-3.5×10^{-4}
I	3.5×10^{-4}
	0
	0
	$+3.5 \times 10^{-4}$
	$\frac{3.5 \times 10^{-4} \times 2}{7.0 \times 10^{-4}}$



$$pH = 14 - pOH = 14 - 4.66 = 9.34$$

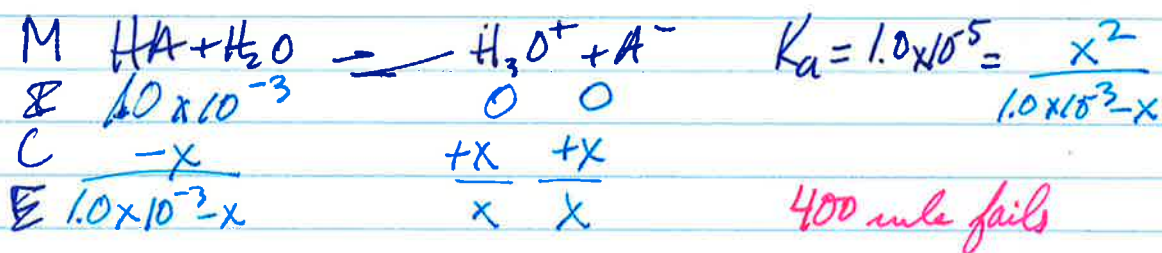
$$-\log(0.00281) = 2.55 = \text{pH}$$

400 mL

$$\frac{[\text{HA}]}{K_a} = \frac{1.0 \times 10^{-2}}{1.0 \times 10^{-5}} = 1000 \quad \text{400 mL passes}$$

$$= \frac{1.0 \times 10^{-3}}{1.0 \times 10^{-5}} = 100 \quad \text{400 mL fails}$$

Ex



$$1.0 \times 10^{-5} (1.0 \times 10^{-3} - x) = x^2$$

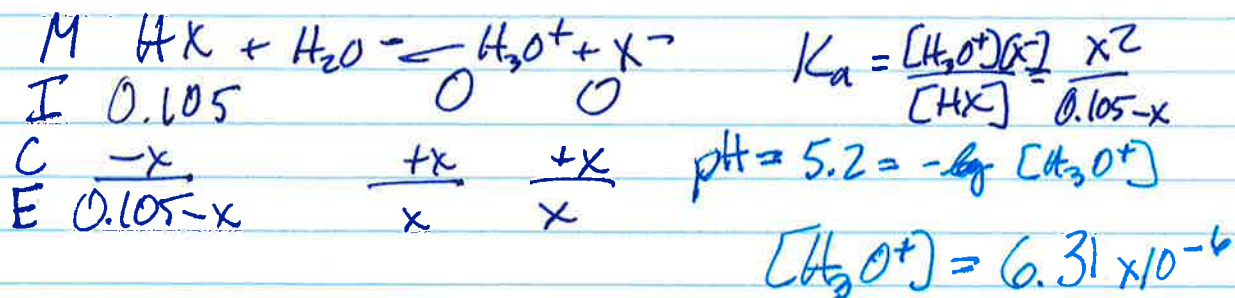
$$1.0 \times 10^{-8} - 1.0 \times 10^{-5} x - x^2 = 0$$

$$a = -1$$

$$b = -1.0 \times 10^{-5}$$

$$c = 1.0 \times 10^{-8}$$

Suppose a 0.105 M HX sol'n has a pH of 5.2
What is K_a ?



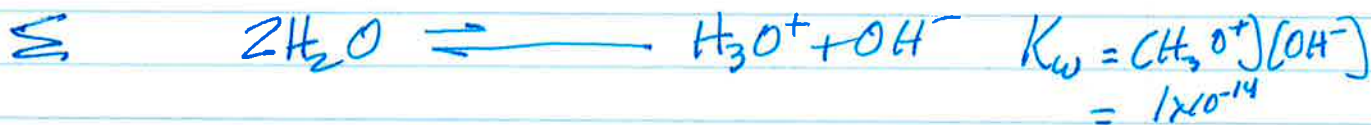
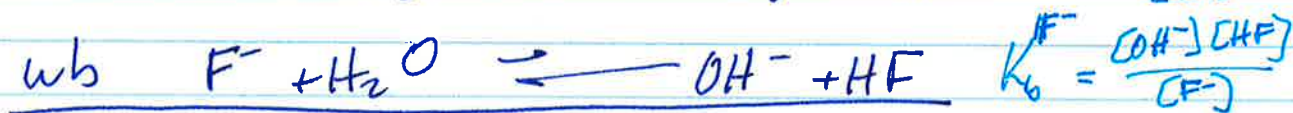
$$x = 6.31 \times 10^{-6}$$

$$K_a = \frac{(6.31 \times 10^{-6})^2}{0.105 - 6.31 \times 10^{-6}} = 3.79 \times 10^{-10}$$

% dissociation

$$100\% \times \frac{x}{[HA]_i} = 100\% \times \frac{0.00281}{0.44} = 0.64\%$$

(from acetic acid example)



$$K_a^{\text{HF}} \times K_b^{\text{F}^-} = \frac{[\text{H}_3\text{O}^+][\text{F}^-][\text{OH}^-][\text{HF}]}{[\text{HF}][\text{F}^-]}$$

$$= [\text{H}_3\text{O}^+][\text{OH}^-] = K_w$$