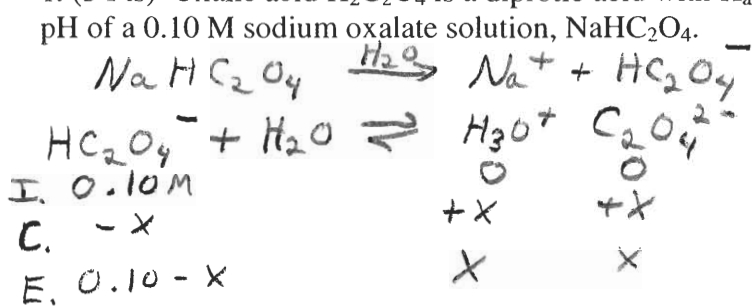


Show all work to receive credit.

1. (5 Pts) Oxalic acid $H_2C_2O_4$ is a diprotic acid with $K_{a1} = 5.6 \times 10^{-2}$ and $K_{a2} = 5.1 \times 10^{-5}$. Determine the pH of a 0.10 M sodium oxalate solution, $NaHC_2O_4$.



$$K_{a2} = \frac{[H_3O^+][C_2O_4^{2-}]}{[HC_2O_4^-]}$$

$$5.1 \times 10^{-5} = \frac{x^2}{0.10 - x} \approx \frac{x^2}{0.10}$$

$$x = [H_3O^+] = 0.00226$$

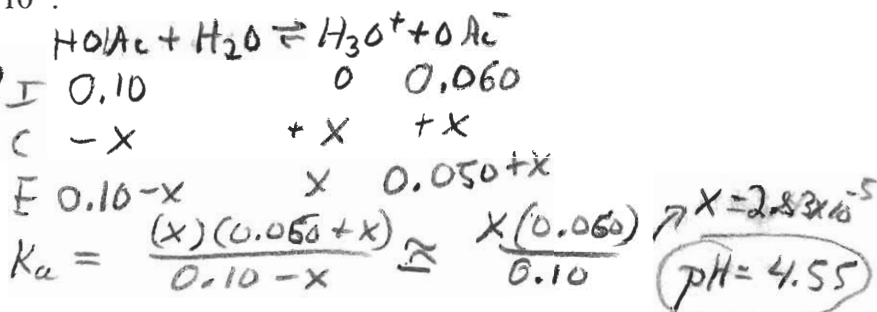
pH = 2.65

2. (5 Pts) Determine the pH of a solution that is 0.10 M in acetic acid, CH_3COOH and 0.060 M in sodium acetate, CH_3COONa . K_a of acetic acid is 1.7×10^{-5} .

Buffer solution

$$pH = -\log 1.7 \times 10^{-5} + \log \frac{0.060}{0.10}$$

pH = 4.55



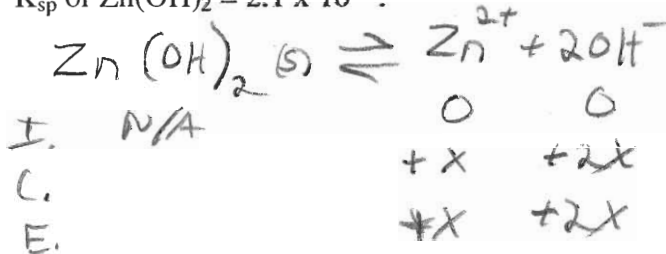
3. (5 Pts) If 0.030 moles of NaOH were added to 1.00 L of the solution in problem number 2, what would be the resulting pH?

Since NaOH reacts with HOAc to form more OAc^- :

$$pH = -\log 1.7 \times 10^{-5} + \log \frac{0.060 + 0.030}{0.10 - 0.030}$$

pH = 4.88

4. (5 Pts) Determine the concentration of $Zn(OH)_2$ in a saturated solution of zinc hydroxide at 25°C. K_{sp} of $Zn(OH)_2 = 2.1 \times 10^{-16}$.

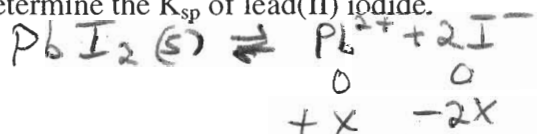


$$K_{sp} = [Zn^{2+}][OH^-]^2$$

$$2.1 \times 10^{-16} = [x][2x]^2 = 4x^3$$

$$x = [Zn^{2+}] = [Zn(OH)_2] = \underline{\underline{3.74 \times 10^{-6}}}$$

5. (5 Pts) The concentration of iodide ion in a saturated solution of PbI_2 was found to be 0.00236 M. Determine the K_{sp} of lead(II) iodide.



$$2x = 0.00236 = [I^-]$$

$$x = 0.00118 = [Pb^{2+}]$$

$$K_{sp} = [Pb^{2+}][I^-]^2$$

$$= [0.00118][0.00236]^2$$

$$K_{sp} = \underline{\underline{6.57 \times 10^{-9}}}$$