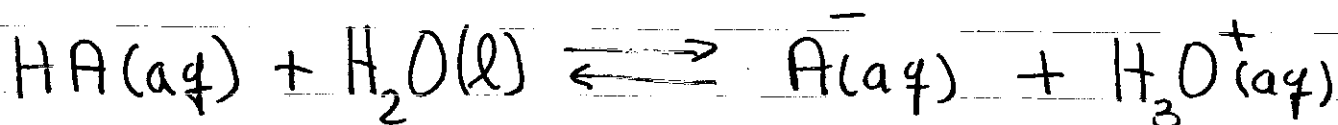


EQUILIBRIUM CONSTANTS

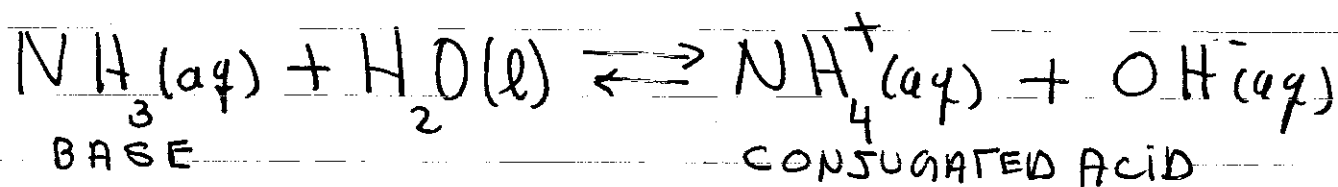
WEAK ACID



$$K_a = \frac{[\text{H}_3\text{O}^+][\text{A}^-]}{[\text{HA}]}$$

$K_a \equiv$ ACID IONIZATION CONSTANT

WEAK BASE



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



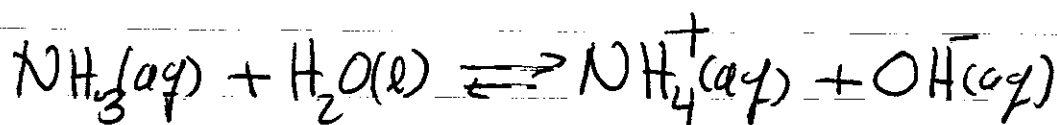
$$K_a = \frac{[\text{H}_3\text{O}^+][\text{NH}_3]}{[\text{NH}_4^+]}$$

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

PROBLEM = EXAMPLE 10.5 \rightarrow FIND pH.

0.0100 mol of NH_3 in 1.000 L ($T = 25^\circ\text{C}$)

$$K_b = 1.8 \times 10^{-5}$$



I	0.0100	—	0	≈ 0
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C	-y		+y	+y
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E	0.0100 - y		y	y
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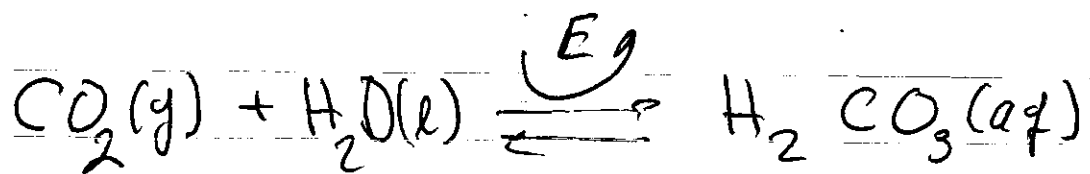
$$\frac{y^2}{0.0100 - y} = K_b = 1.8 \times 10^{-5}$$

$$y^2 \approx 1.00 \times 10^{-2} K_b$$

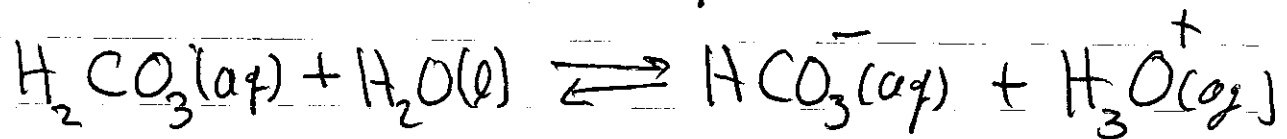
$$y = 4.15 \times 10^{-4} \Rightarrow [\text{OH}^-] = 4.15 \times 10^{-4} \text{ M}$$

$$[\text{H}_3\text{O}^+] = \frac{K_w}{[\text{OH}^-]} = \frac{1.00 \times 10^{-14}}{4.15 \times 10^{-4}}$$
$$= 2.41 \times 10^{-11} \text{ M}$$

$$\text{pH} = 10.618$$

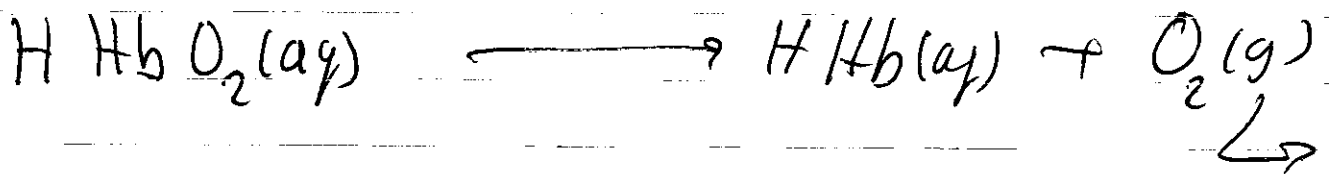
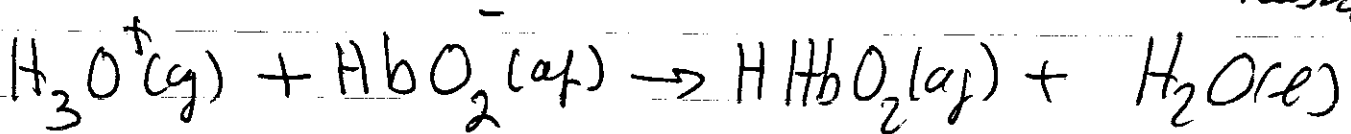
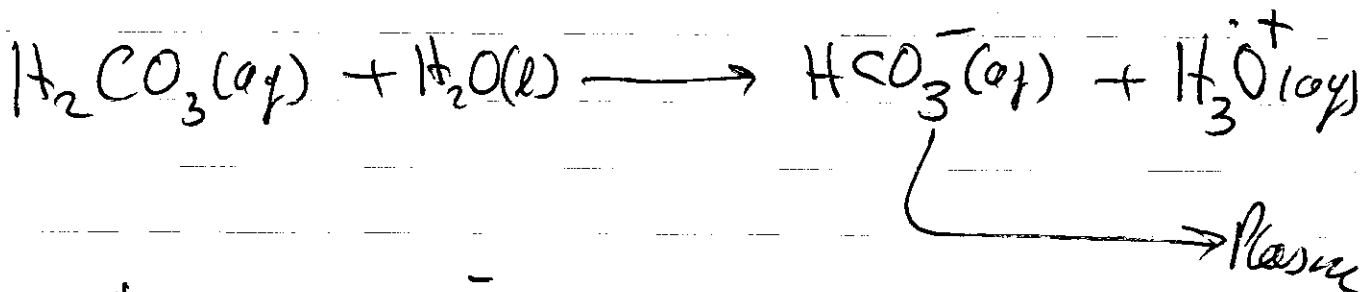
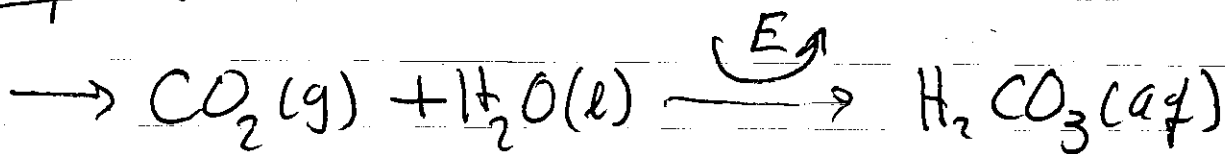


E = Carbonic anhydrase

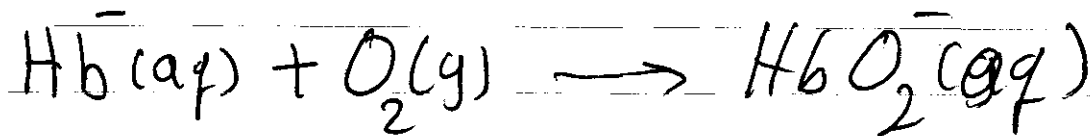
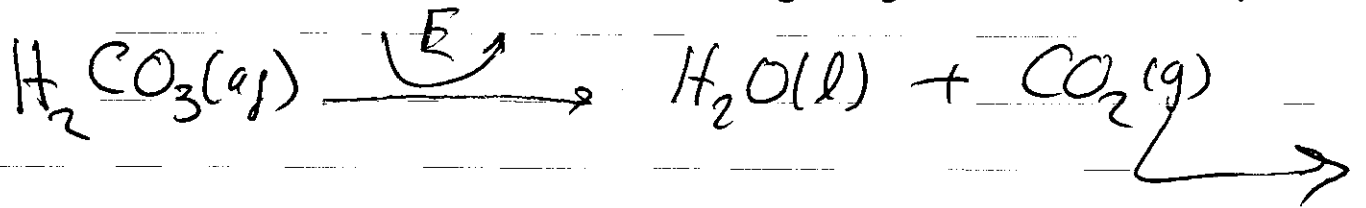
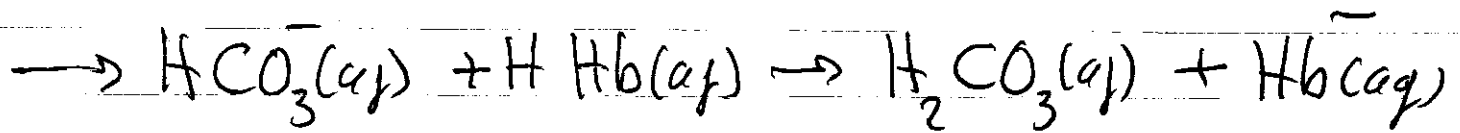


=> HCO₃⁻ / H₂CO₃ BUFFER

Capillaries



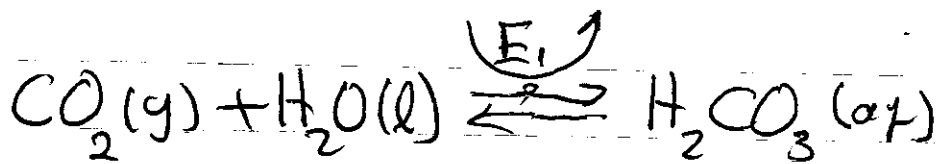
LUNGS



$\text{Hb}^-(\text{aq})$ high affinity for $\text{O}_2(\text{g})$

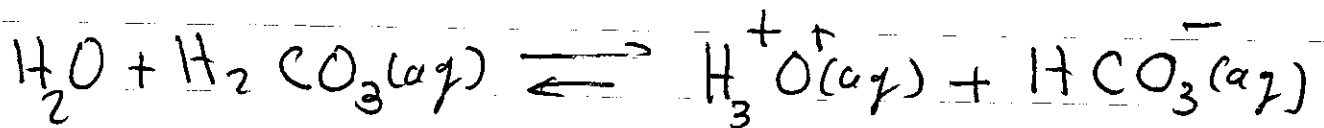
$\text{HbO}_2^-(\text{aq})$ very stable

$\text{H}^+\text{HbO}_2^-(\text{aq})$ low affinity for $\text{O}_2(\text{g})$

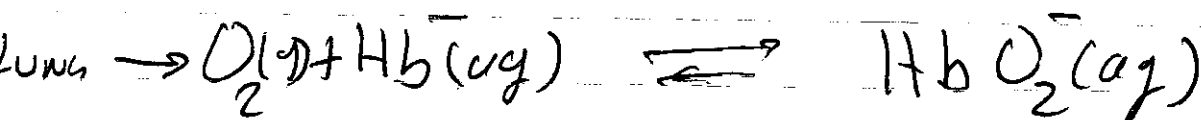
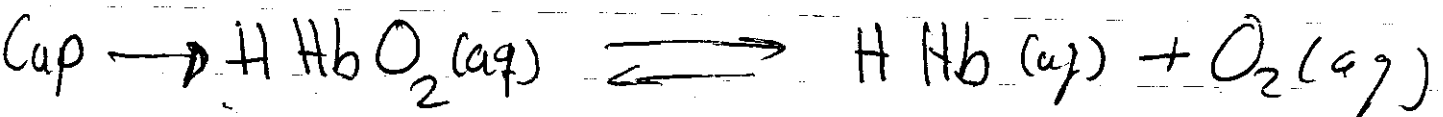
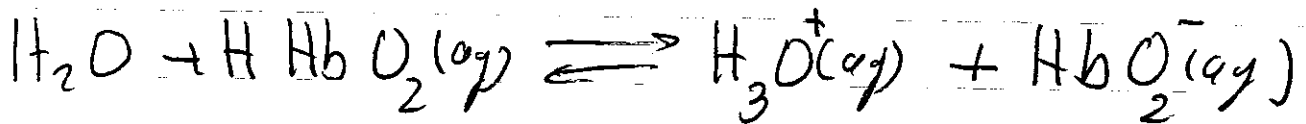
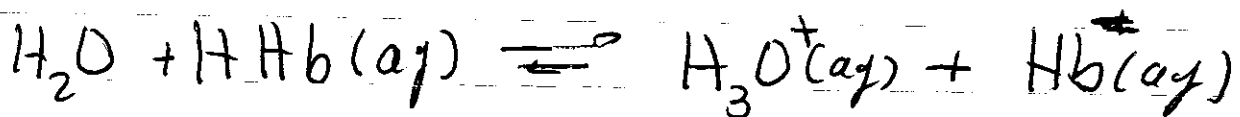


$E_1 = \text{Carbonic anhydrase}$

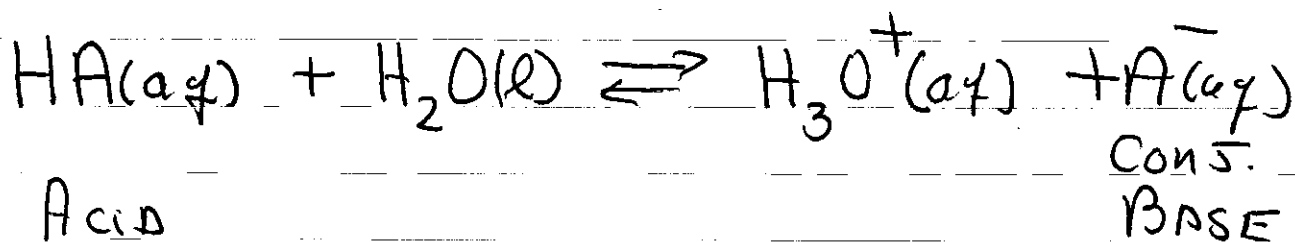
BUFFER $\text{HCO}_3^- / \text{H}_2\text{CO}_3$



HEMOGLOBIN



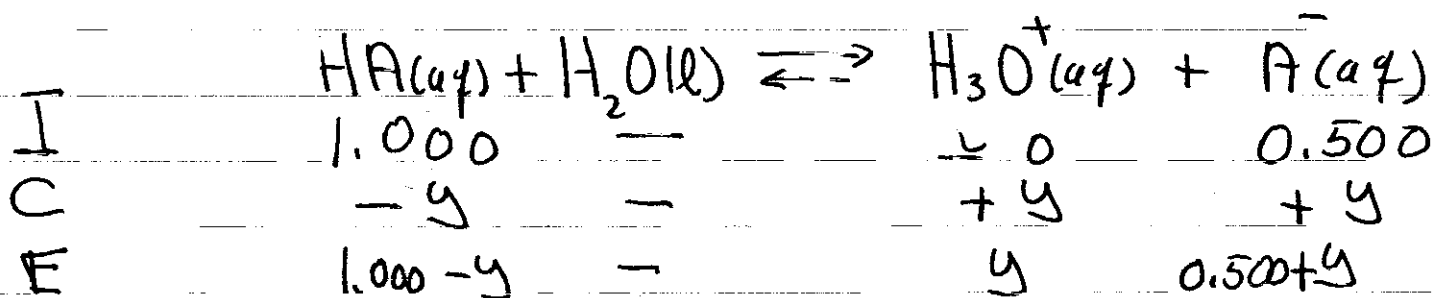
BUFFERS



BUFFER IS A SOLUTION OF

HA AND A SALT OF THE
CONJ. BASE NaA

CONSIDER 1.000 mol of HA
0.500 mol of NaA in 1.000 L



$$K_a = \frac{y(0.500+y)}{1.000-y} \approx \frac{0.500 \cdot y}{1.000}$$

$$y \ll 0.500 < 1.000$$

$$y \approx 2.000 K_a$$

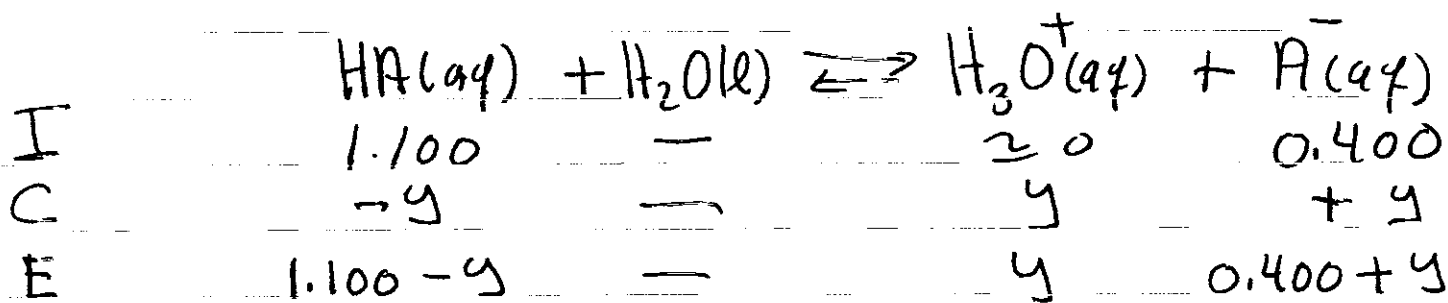
FOR ACETIC ACID $K_a = 1.76 \times 10^{-5}$

$$[H_3O^+] = 3.52 \times 10^{-5} M \gg 10^{-7} M$$

$$\boxed{pH = 4.453}$$

ADD 0.100 mol of HCl.

ASSUMPTION: TAKE ALL OF THE H_3O^+ FROM HCl AND COMBINE THEM WITH A^- TO FORM HA. NOW RECALCULATE THE pH.



$$K_a = \frac{(0.400 + y)y}{(1.100 - y)} \approx \frac{0.400 \cdot y}{1.100}$$

$$y \approx \frac{1.100}{0.400} K_a = 4.84 \times 10^{-5} \quad \boxed{pH = 4.315}$$