Announcements – Lecture XX – Tuesday, Nov 19th

1. **Lab 6 – Saturday, November 23rd, 1:00-4:00 pm – ISB 155/160 A-E**
   Lab Owl V– Deadline – Saturday, November 23rd, 11:59 pm

2. **Exam III – Tuesday, December 3rd – In Class – 12:45-2:15 pm**
   <u>3 or 4 questions will be taken from Lab Owls 3, 4 and 5.</u>
   Sunday, December 1st – Review , 3:00-5:00pm – ISB 135

3. **Final Exam – Tuesday, December 10th – Marcus 131 – 8:00-10:00 am**
   Sunday, December 8th – Review , 3:00-5:00pm – ISB 135

4. 
   iClicker:
   Choose any letter: A-E

A buffer solution made from HF and KF has a pH = 2.84.
Addition of OH- will cause –

1. Increase significantly
2. Increase slightly
3. Decrease significantly
4. Decrease slightly
5. Increase
6. Decrease

a) pH ? 2 Adding base … solution will become more basic

b) pOH ? 4 $[OH^-] \uparrow$ … $pOH = -\log_{10}[OH^-]$ will $\downarrow$

c) [HF] ? 6 $HF(aq) + OH^- = H_2O(l) + F^-$

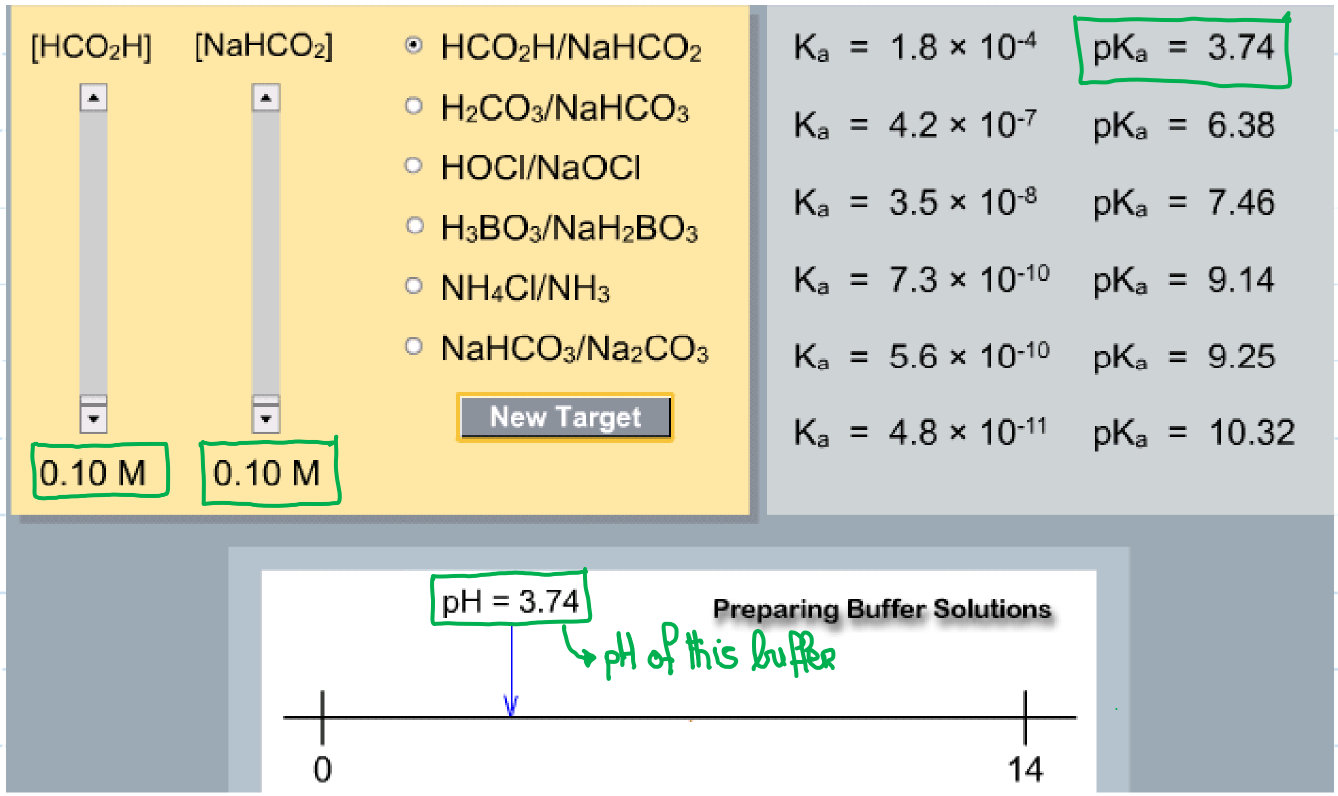
d) $[F^-]/[HF]$? 5 See (c) … $[HF]\downarrow$, $[F^-]\uparrow$ … $[F^-]/[HF]$, $\uparrow$

8.10 What Are Buffers? – Making an Optimal Buffer Solution – pH and pKa

See class web site to see whether this holds true for other buffer systems

Acid   C.Base (HCO_2^-)

When [acid] = [C.Base], the pH of the buffer is equal to the pKa of the acid.



When choosing a buffer system one usually selects one whose pKa is closest to the desired pH.

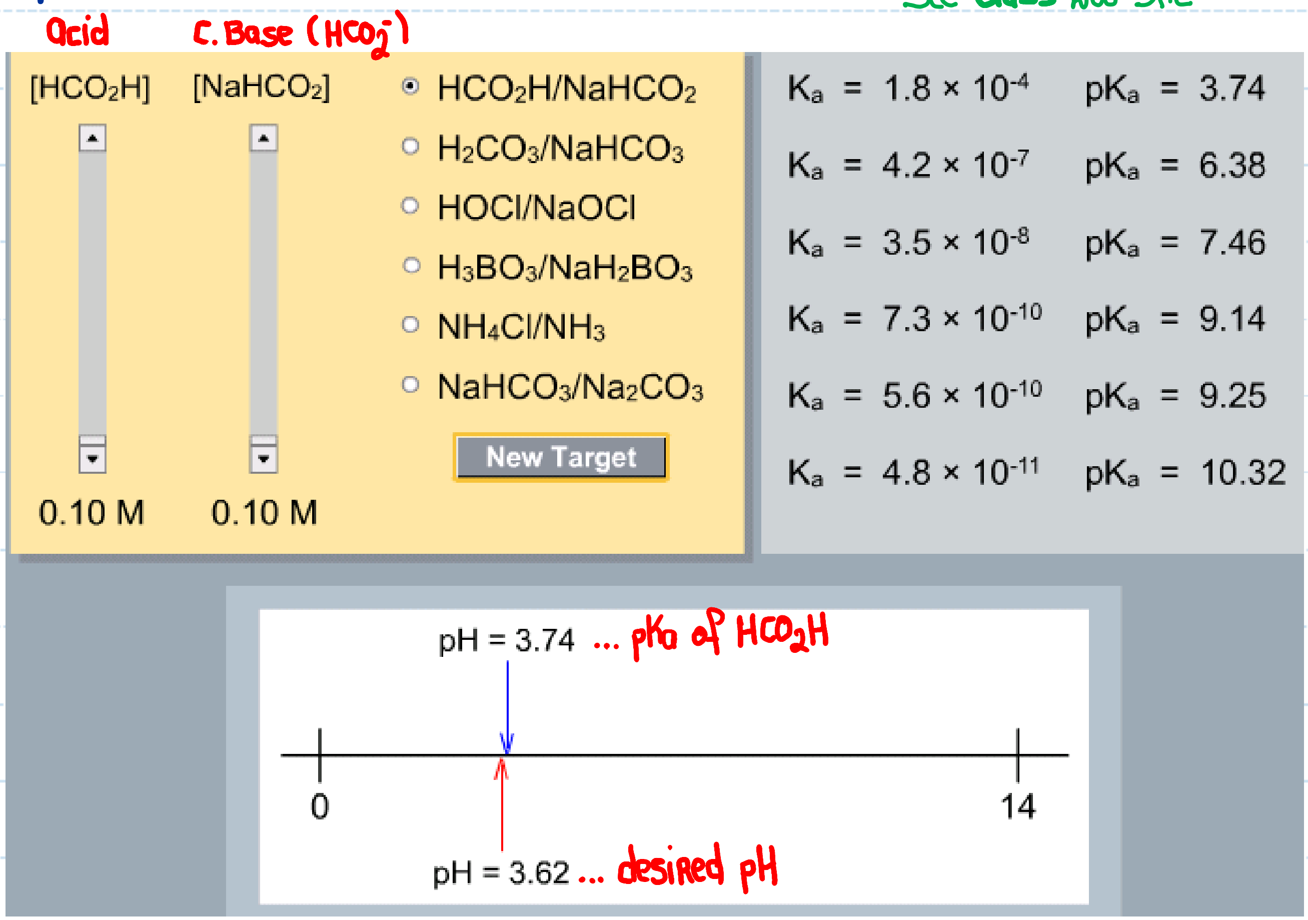
9.10 What Are Buffers? – Making an Optimal Buffer Solution

Adjusting the pH of a Buffer

See class web site

Optimal pH

$\frac{[\text{Acid}]}{[\text{C. Base}]} \simeq 0.1 \text{ to } 10$



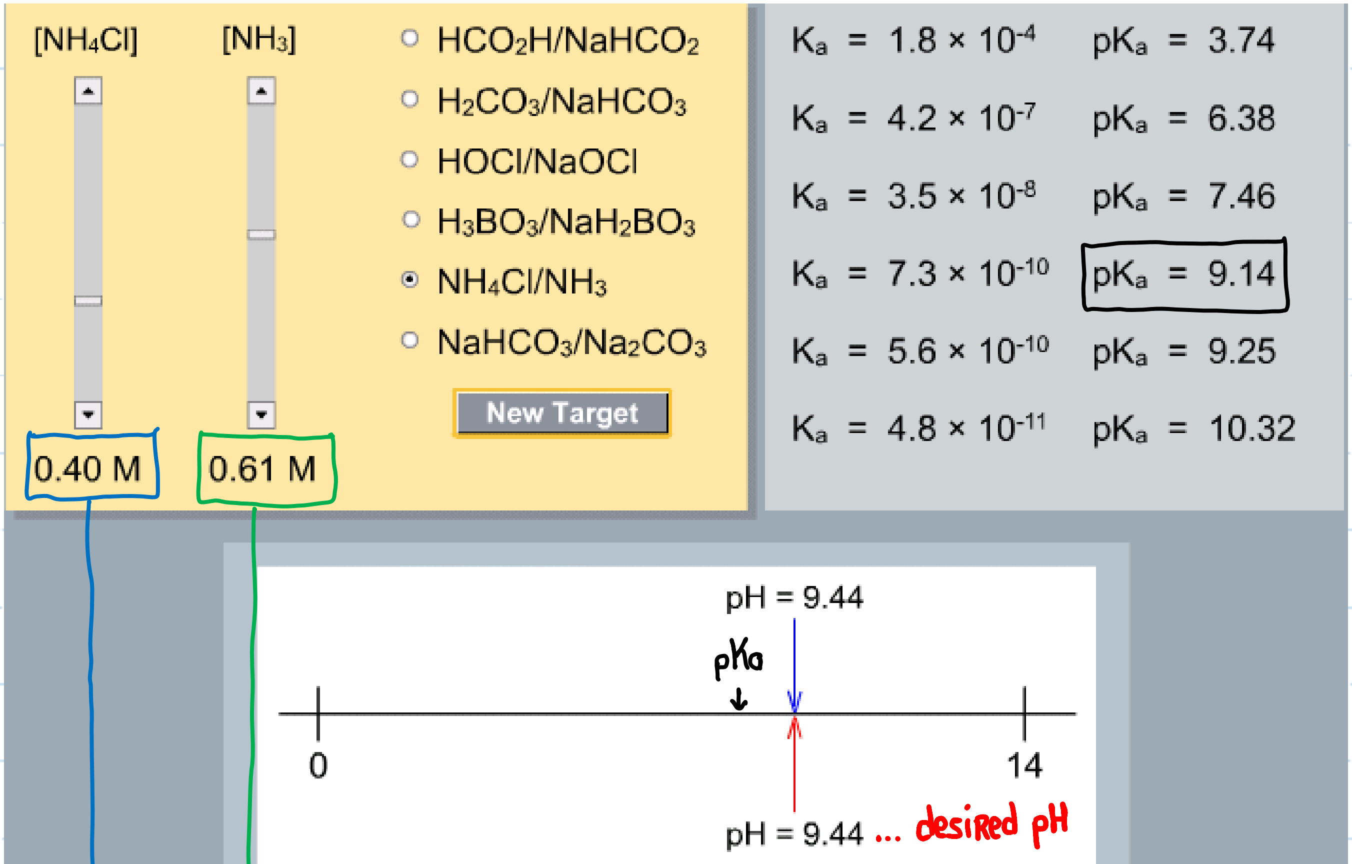
Since the desired pH is more acidic than the pKa ... increase the [ ] of the acid.

$[HCO_2H] \uparrow$, pH $\downarrow$

$[HCO_2^-] \uparrow$, pH $\uparrow$

8.10 What Are Buffers? – Making an Optimal Buffer Solution
Buffer Capacity

NH_4^+ (acid)   C. Base



→ Maximum concentration of OH^- that can be removed.

↳ Maximum concentration of H_3O^+ that can be removed

8.10 What Are Buffers? – Identifying Buffer Solutions

How many of the following aqueous solutions are buffers? 3!

a) 0.24 M HI + 0.18 M NaI — X ... HI is a strong acid

d) 0.10 M CH_3COOH + 0.18 M CH_3COOK — ✓ ... Weak acid and its conjugate base

c) 0.27 M NH_4Br + 0.31 M NH_3 — ✓ ... Weak acid and its conjugate base

b) 0.34 M NH_4NO_3 + 0.39 M $NaNO_3$ — X ... NO_3^- is not the conjugate base of NH_4^+

d) 0.10 M HCl + 0.21 M NaF — ✓!

SA + WB = 100%

$$H_3O^+ + F^- = H_2O(l) + HF(aq)$$

0.1M   0.21M =   0.1M

0.11M

After reaction 0.1M HF and 0.11M F^- remain!

(d)

A 1L solution contains 0.25 mol of NaCN and 0.15 mol of HCN.

1. Increase significantly
2. Increase slightly
3. Decrease significantly
4. Decrease slightly
5. Increase
6. Decrease

a) Addition of 0.1 mol of HCl will case the [HCN] to –

5. $H_3O^+ + CN^- = HCN(aq) + H_2O(l)$

b) Addition of 0.1 mol of HCl will case the pOH to –

2. pH ↓ slightly with the addion of H_3O^+ ... pH + pOH = 14 ... pOH ↑ slightly

c) Addition of 0.1 mol of NaOH will case the [HCN] to –

6. $OH^- + HCN(aq) = H_2O(l) + CN^-$

d) Addition of 0.2 mol of NaOH will case the pH to –

1. Buffer capacity exceeded ... pH will increase significantly.