Lecture 4b

Last time:

calculations using buffer equation

pH titration curve

Today

Calculations for pH curve diprotic acids

K_{sp} equilibrium

Review: 4-5 pm today

Field trip to LA COUNTY SANITATION WATER DISTRICT

WHEN: July 27, 2009 - Monday

TIME: 2:15-3:30 pm-visit treatment plant

WHERE: 1965 So. Workman Mill Road, Whittier, CA

(closest exit: Crossroads at 60 Fwy, just east of 605 Fwy)

WHAT: Visit San Juan Creek Water Quality Laboratory.

EXTRA CREDIT? Yes. 15-25 points

Pls. sign up if you are interested.

Buffer equation

Known as the Henderson-Hasselbalch equation, the buffer equation is used to approximate the pH of a buffer.

Once you master it, it is a quick way to determine pH

It will come in handy in determining the pH titration curve.

The buffer equation is: $pH = pK_a + log\ \{[base]/[acid]\}$

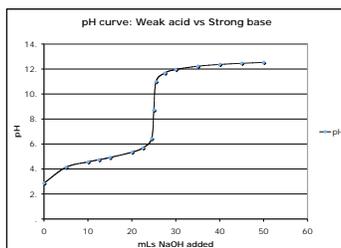## Weak acid vs strong base: 4 regions of pH titration curve:

Region I: No base is added. Solution is "pure weak acid". pH is determined by K_a equilibrium.

Region II: buffer region: weak acid and conjugate base present. Use buffer equation.

Region III: equivalence point: Solution is "pure weak base". pH determined using K_b equilibrium.

Region IV: after equiv. Pt: Solution is "strong base" solution. pH is obtained by first determining pOH of the strong base.

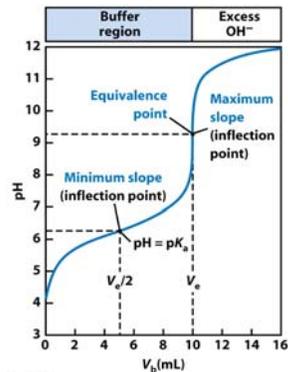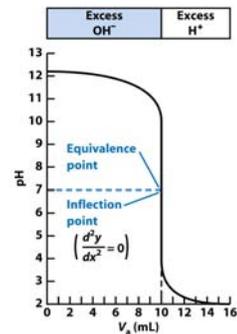Practice drawing pH titration curves.

Practice graphing pH titration curves
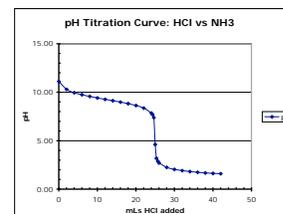
Graphing the pH curve:

It's important to recognize the various regions of the graph. And how to draw it with minimum of points.


Figure 11-2
Quantitative Chemical Analysis, Seventh Edition
© 2007 W. H. Freeman and Company

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pH curve for strong acids vs strong bases has no Ka buffering region

Figure 11-1
Quantitative Chemical Analysis, Seventh Edition
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pH indicators: phenolphthalein (Phph)

pH indicators : example phenolphthalein is a weak acid

$$HPhph \underset{colorless}{<===>} H^+ + \underset{pink\text{-}red}{Phph^-}$$
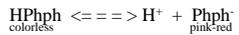
At its pK_a it changes color. If its pK_a is at the center of the equivalence point inflection, then it is ideally suited for the titration…

Colorless phenolphthalein
pH < 8.0

Pink phenolphthalein
pH > 9.6

Figure 11-9
Quantitative Chemical Analysis, Seventh Edition
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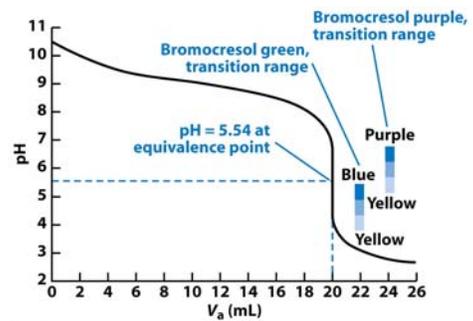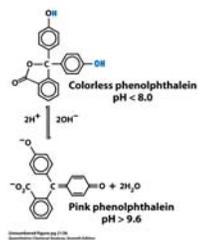
You draw it for the following:

a) weak base (analyte) vs Strong acid (titrant)

b) Strong acid (analyte) vs strong base (titrant)

c) Strong base (analyte) vs strong acid (titrant)

Titration curve for diprotic acid vs strong base.

What is the general shape?