Lesson 23: Titration curves

text: 351-364

what to know:

-acid-base titrations, related terms and diagrams, §8-6
-equilibrium (qualitative only) of polyprotic acids, §8-7
-concept of Lewis acid and bases, §8-8

questions:

1.Which would neutralize the most 0.100 M NaOH solution, 25.00 mL of 0.200 M HCl or 25.00 mL of 0.200 M $HC_2H_3O_2$?

2. Indicate whether the following aqueous solutions would have pHs <7, 7 or >7.

K_b for ammonia is 1.8×10^{-5} K_a for H§ is 1×10^{-19} K_a for formic acid, HFo, is 1.8×10^{-4}

a. 0.50 M NH_4NO_3	<7	7	>7
b. 0.50 M KCN	<7	7	>7
c. 0.50 M $(NH_4)_2S$	<7	7	>7
d. 0.50 M $Al(NO_3)_3$	<7	7	>7
e. mixture of 25 mL of 0.10 M $Ba(OH)_2$ and 25 mL of 0.05 M H_2SO_4	<7	7	>7
f. mixture of 25 mL of 0.10 M $Ba(OH)_2$ and 25 mL of 0.10 M H_2SO_4	<7	7	>7
g. mixture of 25 mL of 0.050 M $Ba(OH)_2$ and 25 mL of 0.10 M H_2SO_4	<7	7	>7
h. mixture of 25 mL of 0.10 M NaOH and 25 mL of 0.10 M H_2SO_4	<7	7	>7
i. mixture of 25 mL of 0.30 M formic acid (HFo) and 25 mL of 0.10 M NaOH	<7	7	>7
j. mixture of 25 mL of 0.30 M formic acid (HFo) and 25 mL of 0.30 M NaOH	<7	7	>7
k. mixture of 25 mL of 0.30 M formic acid (HFo) and 25 mL of 0.50 M NaOH	<7	7	>7
l. mixture of 25 mL of 0.30 M formic acid (HFo) and 25 mL of 0.50 M NaFo	<7	7	>7
m. mixture of 25 mL of 0.30 M HCl and 25 mL of 0.50 M NaFo	<7	7	>7
n. mixture of 25 mL of 0.50 M HCl and 25 mL of 0.50 M NaFo	<7	7	>7
o. 0.50 M NaFo	<7	7	>7

3.Which of the solutions in 2 above are buffers?

4.Which species which are present in 2.j above. HFo Fo^- H^+ OH^- H_2O

5.Given an indicator with a K_a of 1.0×10^{-5}, where the HIn species is red and the In^- species is yellow.

a. What color is the indicator in a pH 5.0 solution? red orange yellow
b. What color is the indicator in a pH 10 solution? red orange yellow
c. At what minimum pH will the indicator be about as yellow as it can be? pH 4 pH 5 pH 6
d. Would this indicator be appropriate for a HCl-NaOH titration? yes no

6.If phosphoric acid, H_3PO_4, has pK_a values of about 2, 7 and 12, what species would be present in the highest concentration in human blood at a pH of 7.4?