

Name: _____

Blk: _____ Date: _____

Chemistry 12
ACID BASE PART II Lesson # 18 CONTINUED

THERE ARE THREE TYPES OF TITRATIONS:

1. strong Acid / Strong Base (vice versa)
2. weak acid / STRONG BASE
3. weak base / STRONG ACID

In a chemistry laboratory a titration between HCl and NaOH was carried out and the following DATA was collected. Use this data to graph "pH vs Volume of Base".

Volume of NaOH added (L)	[H ⁺] after NaOH addition	pH	pOH
0.0000	1.000	0.00	14.00
0.2500	0.600	0.22	13.88
0.5000	0.333	0.48	13.62
0.7500	0.143	0.85	13.15
0.9000	5.26 x 10 ⁻²	1.28	12.72
0.9900	5.03 x 10 ⁻³	2.30	11.70
0.9990	5.00 x 10 ⁻⁴	3.30	10.70
0.9999	5.00 x 10 ⁻⁵	4.30	9.70
1.0000	1.00 x 10 ⁻⁷	7.00	7.00
1.0001	5.00 x 10 ⁻⁵	9.70	4.30
1.0010	5.00 x 10 ⁻⁴	10.70	3.30
1.0100	4.98 x 10 ⁻³	11.70	2.30
1.1000	4.76 x 10 ⁻²	12.68	1.32
1.2500	0.111	13.05	0.95
1.5000	0.200	13.30	0.70
1.7500	0.273	13.44	0.56
2.0000	0.333	13.52	0.48

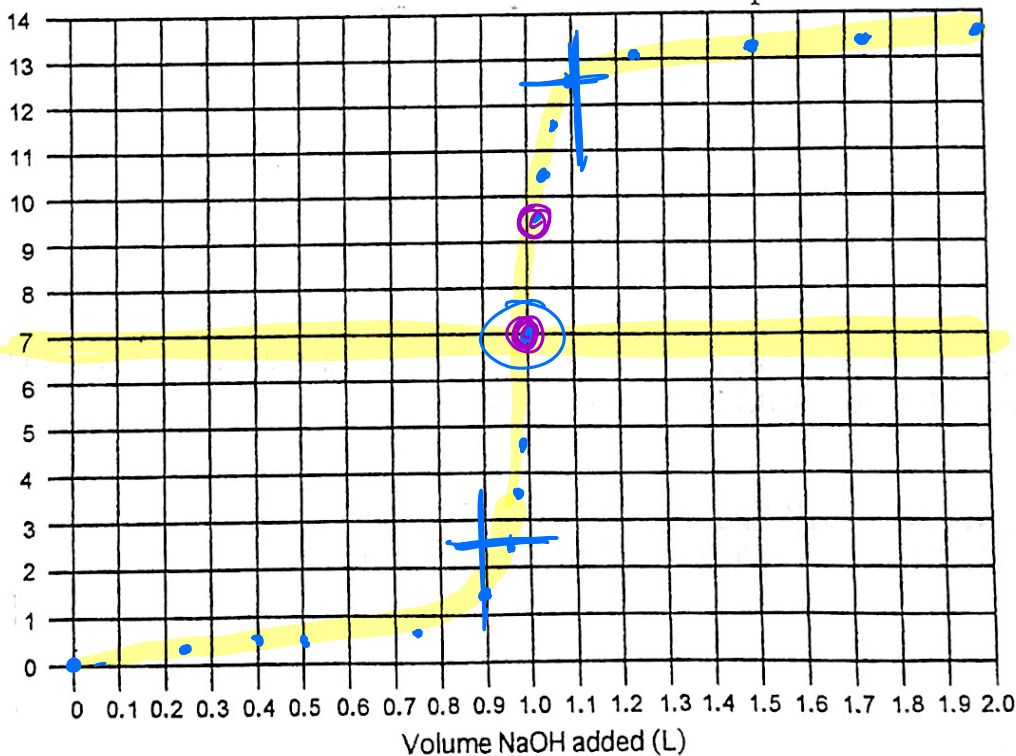
a. At what pH range is the pH changing most rapidly?

pH 3 to 12

b. Was the solution acidic, basic or neutral at the equivalence point?

pH = 7 (neutral)

c. A chem student choose 9.1 phenolphthalein as the indicator for this titration. Why did the student get good results even though the pKa value differs from the pH value which "should exist"?



B/c 9.1 is in the rapid pH change zone that phenolphthalein is acceptable

pH

The graph that you have just plotted is typical of all titration curves. The Equivalence point is observed of the rapid pH change

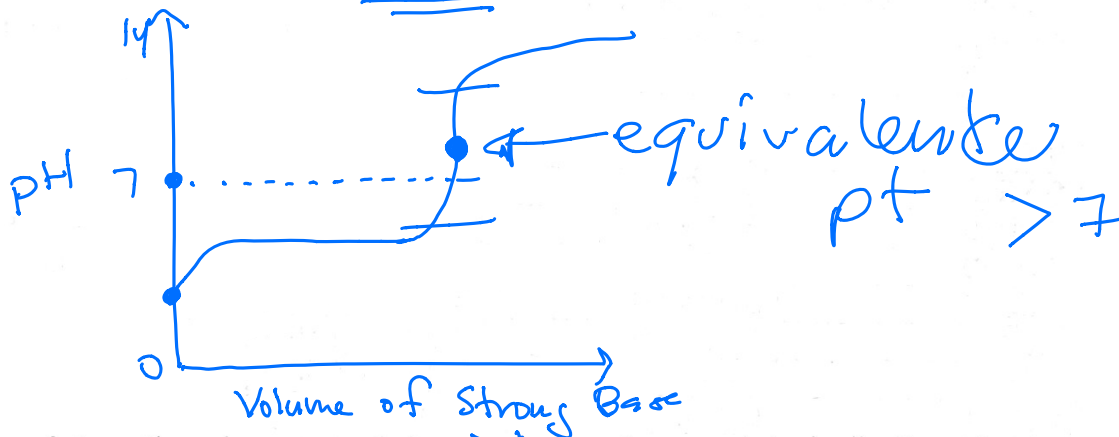
STRONG ACID/BASE
in the middle

To select an INDICATOR for any type of titration the pka should coincide with the equivalence point of the titration.

For a STRONG ACID/STRONG BASE titration the equivalence point is reached at a pH of 7, therefore the following indicators are acceptable:

Bromothymol blue (6.8) phenol red (7.3)
Neutral red (7.4)

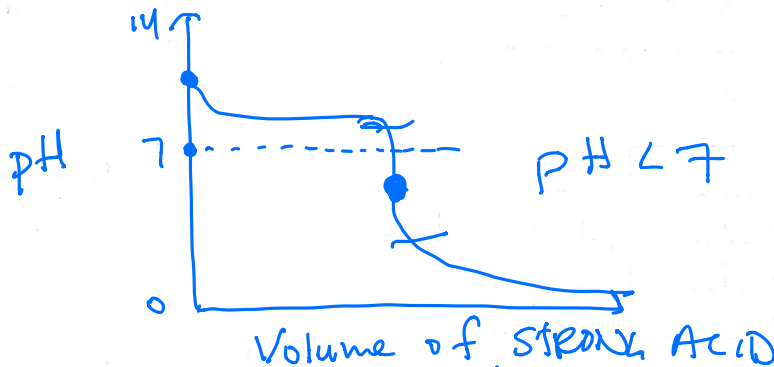
Below is the TITRATION CURVE for a weak acid/ STRONG BASE titration:



The equivalence point on the above graph is > 7. Appropriate Indicators to use for a weak acid/STRONG BASE titration include:

Thymol blue (8.8) phenolphthalein (9.1)
Thymolphthalein (10.0)

Below is the TITRATION CURVE for a weak base/ STRONG ACID titration:



The equivalence point on the above graph is < 7. Appropriate Indicators to use for a weak base/STRONG ACID titration include:

Bromocresol green (4.6) methyl red (5.4)
Chlorophenol red (6.0)