

Revised August 2011

HONORS WORKSHEET 12d: Titration Curves



1. Using the data in the results section, and the instructions below, enter the titration data and plot two graphs using Microsoft Excel.

- **Enter the data**

Log on as usual and launch Microsoft Excel

Type the data into the empty spreadsheet following these directions carefully

In cell A1 type ***Titration of solution A***

In cell A2 type ***Volume of 0.1M NaOH added (mL)***

In cell B2 type ***pH***

In cell C1 type ***Titration of solution B***

In cell C2 type ***Volume of 0.1M HCl added (mL)***

In cell D2 type ***pH***

Using the results section on page 2

In cells A3-A21 type in the volume data from titration A

In cells B3-B21 type in the pH value data from titration A

In cells C3-C25 type in the volume data from titration B

In cells D3-D25 type in the pH value data from titration B

- **Create Titration Curve A**

Highlight (by clicking and dragging over) the cells A3-B21

Click on "Insert" on the toolbar

Click on "Scatter" in "Charts" section and click on "Scatter with Smooth Lines" type

By clicking on "Layout" on the toolbar it is possible to add a title and axes labels etc.

Title: ***Titration of Solution A***

x-axis: ***Volume of 0.1M NaOH added***

y-axis: ***pH***

- **Create Titration Curve B**

Highlight (by clicking and dragging over) the cells C3-D25

Click on "Insert" on the toolbar

Click on "Scatter" in "Charts" section and click on "Scatter with Smooth Lines" type

By clicking on "Layout" on the toolbar it is possible to add a title and axes labels etc.

Title: ***Titration of Solution B***

x-axis: ***Volume of 0.1M HCl added***

y-axis: ***pH***

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Results

A student has two unknown solutions (A & B), and must determine if each is either a strong or a weak acid or base. He starts by using a pH meter to determine the initial pH of each solution. He finds that solution A has a pH of 1.00, and since it is acidic, he decides to titrate 25.0 mL of the A against a standard 0.100 M NaOH solution. He records the pH of the sample as he titrates.

Solution B has an initial pH of 11.13, and since it is basic he titrates 25.0 mL of this solution against 0.100 M HCl. He records the pH as he titrates. The results of these experiments are recorded below.

Titration of Solution A with NaOH	
Volume of 0.100 M NaOH added (mL)	pH
0	1.00
5	1.18
10	1.37
15	1.60
20	1.95
21	2.06
22	2.20
23	2.38
24	2.69
25	7.00
26	11.29
27	11.59
28	11.75
29	11.87
30	11.96
35	12.22
40	12.36
45	12.46
50	12.52

Titration of Solution B with HCl	
Volume of 0.100 M HCl added (mL)	pH
0	11.13
1	10.64
2	10.32
3	10.13
4	9.98
5	9.86
10	9.44
15	9.08
20	8.66
21	8.54
22	8.39
23	8.20
24	7.88
25	5.28
26	2.70
27	2.40
28	2.22
29	2.10
30	2.00
35	1.70
40	1.52
45	1.40
50	1.30

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4. What is the difference between the terms **strength** (strong or weak) and **concentration** (dilute or concentrated) when referring to acids?

5. Complete the titration curves below. In each case the base is added to a starting volume of 25.0 mL of the weak acid, each have the *same concentration* and react in a 1:1 ratio.

