



Chem 20 Unit D - Quantitative Analysis

pH Curves



Dec 17-3:26 PM



Dr. Martyn Poliakoff
Proudly Presents:

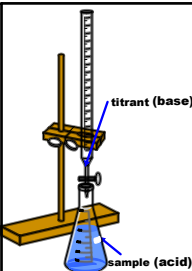
The Periodic Table Movie of the Day!!!

Dec 17-3:29 PM

POS Checklist:

- draw and interpret titration curves, using data from titration experiments involving strong monoprotic acids and strong monoprotic bases
- describe the function and choice of indicators in titrations
- identify equivalence points on strong monoprotic acid-strong monoprotic base titration curves and differentiate between the indicator end point and the equivalence point.
- predict the approximate equivalence point for a strong monoprotic acid-strong monoprotic base titration and select an appropriate indicator

Dec 18-7:42 AM



pH Curves

Let's pretend that we're titrating a base into an acid of unknown concentration.

Q) What would the pH of the sample start off as (approx.)?


Dec 14-11:34 AM

Q) As more base is added, what would happen to the pH?

Q) What is the final pH of the solution like when all of the acid has been neutralized?

Q) If we over-shot the endpoint, what would the pH be (approx.)?

Dec 17-3:35 PM

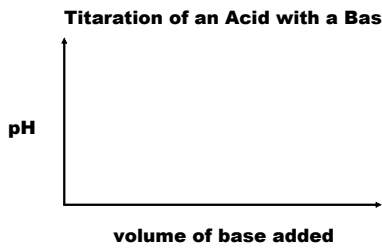


Susan B. Anthony

Mathy-Cathy Moment:

Make a sketch of pH vs. volume of base added for the questions we were just answering.

Titration of an Acid with a Base



Dec 17-3:37 PM

In an acid-base titration, the pH is constantly changing. This change can be shown using a **pH curve**.

We could make a graph of pH by measuring the pH with a device such as a pH meter.

http://www.chem.uoa.gr/applets/AppleTitration/App1_Titration2.html

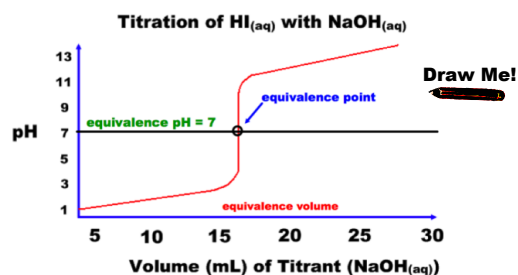


Dec 17-3:33 PM

For example, consider the titration of an acid of unknown concentration, $\text{HI}_{(\text{aq})}$ with a base of known concentration, $\text{NaOH}_{(\text{aq})}$.

Let's look at a pH curve for this reaction:

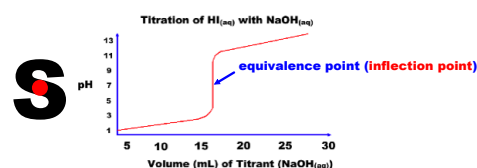
Dec 18-7:53 AM



- Because we are titrating base into acid, the pH starts off low and gradually gets higher.
- There is a point where the pH shoots vertically up. This is near the equivalence point volume.
- The curve continues past the equivalence point.

Dec 14-11:34 AM

- the equivalence point for this graph occurs where the curve starts to change direction. This is called the **inflection point**. An inflection point is like the centre part of the letter "S".



Dec 14-11:35 AM

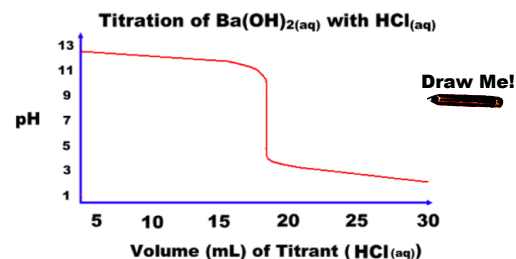
- the pH at the equivalence point is 7 because we are titrating a strong base with a strong acid. The net reaction for any strong acid and strong base is:



- the pH at the equivalence point for any strong acid/base reaction is 7.
- the pH of a weak acid/base reaction is some other number, but we don't deal with those in this course.

Dec 18-7:40 AM

Here is an example of another pH curve:

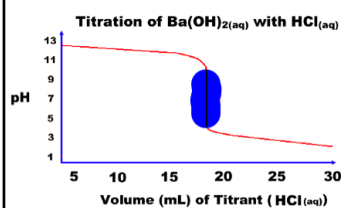


- Here, a base is being titrated with an acid.
- the equivalence pH is still pH = 7.

Dec 14-11:36 AM

Indicators and pH Curves

In order to detect the equivalence point, we must choose an appropriate indicator solution. This means picking an indicator whose pH range coincides with the equivalence point.



For example, bromothymol blue changes from yellow to blue about a pH of 6-7.3.

Practice: pg 339 #1-9

Dec 14-11:36 AM

Dec 14-11:37 AM