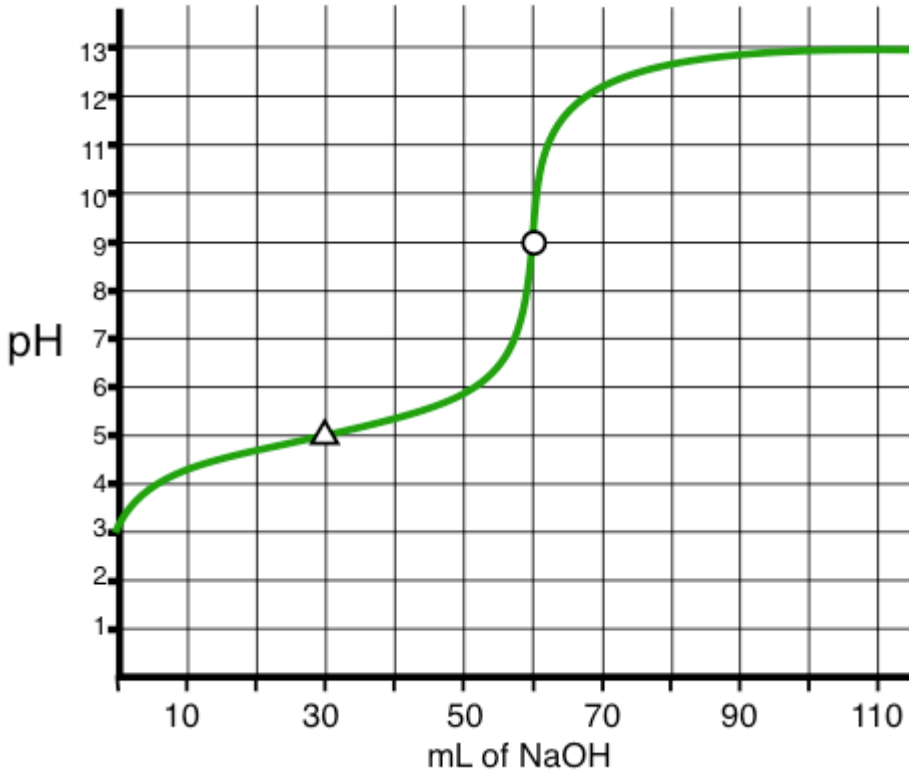
Titration Curves Practice

Curve 1



Analyte:

Titrant:

Volume of titrant used to reach equivalence point:

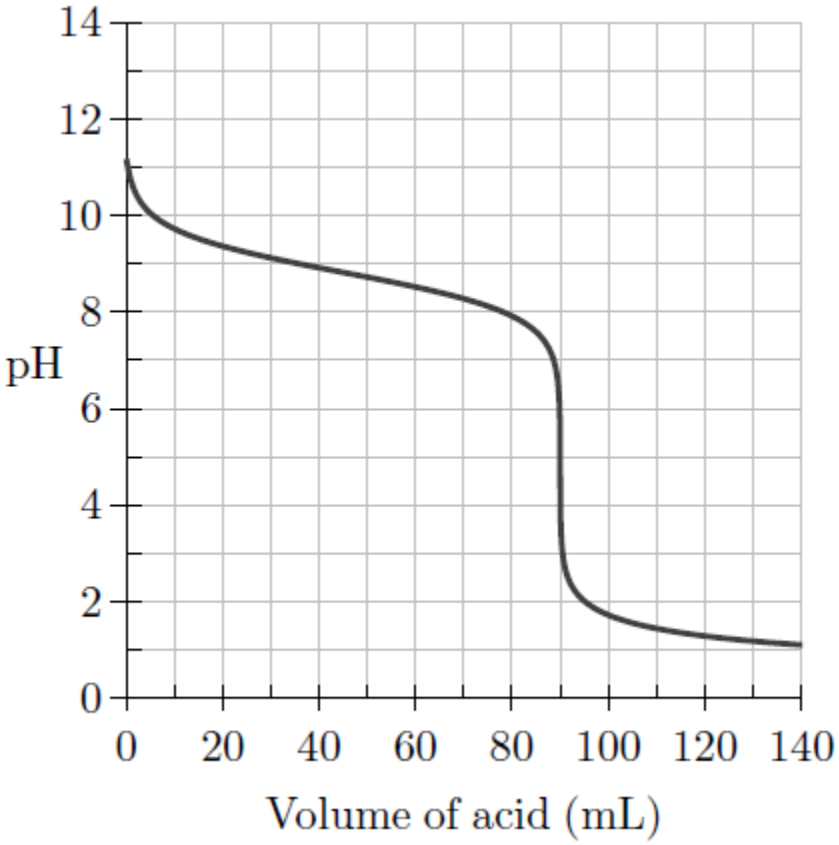
pH at equivalence point:

pKa of indicator:

Volume of titrant used to reach half-equivalence point:

pKa of the acid:

Curve 2



Analyte:

Titrant:

Volume of titrant used to reach equivalence point:

pH at equivalence point:

pKa of indicator:

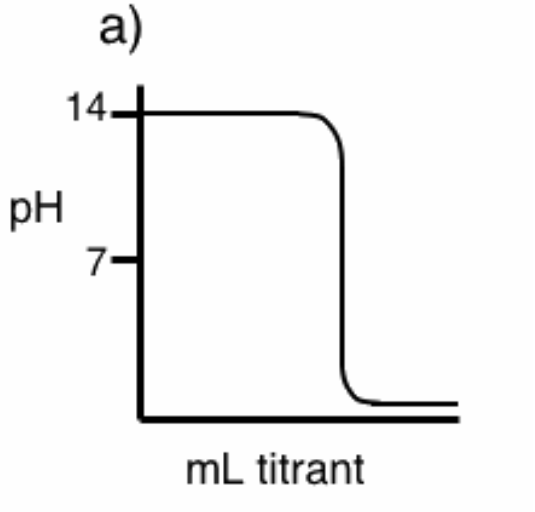
Volume of titrant used to reach half-equivalence point:

pKb of the base:

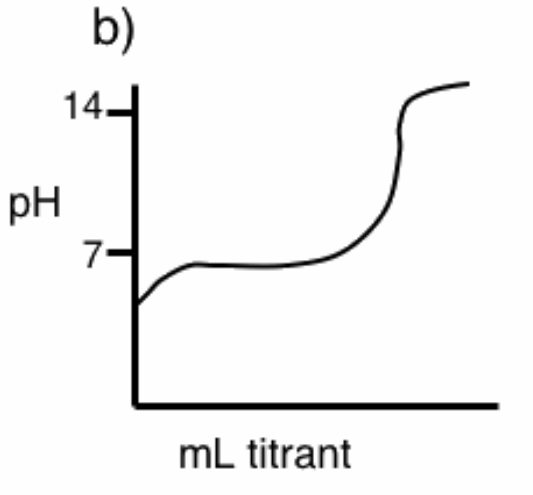
Match each type of titration below with the appropriate titration curve.

1. Weak acid titrated with strong base.
2. Weak base titrated with strong acid.
3. Diprotic acid titrated with strong base.
4. Strong base titrated with strong acid.

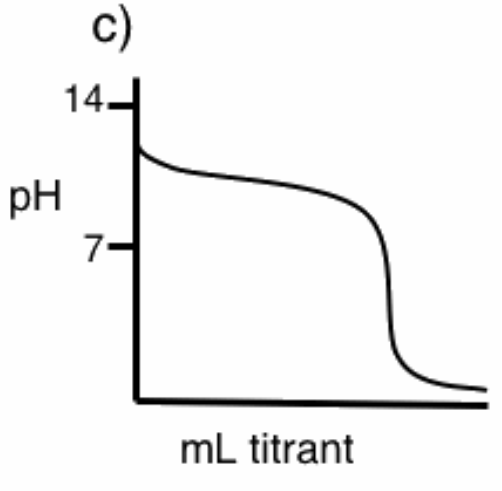
a)



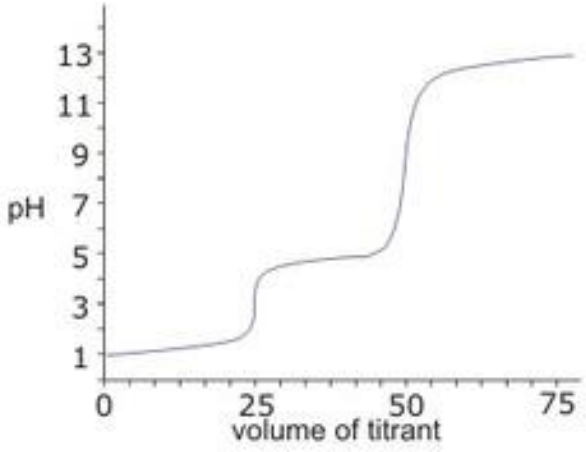
b)



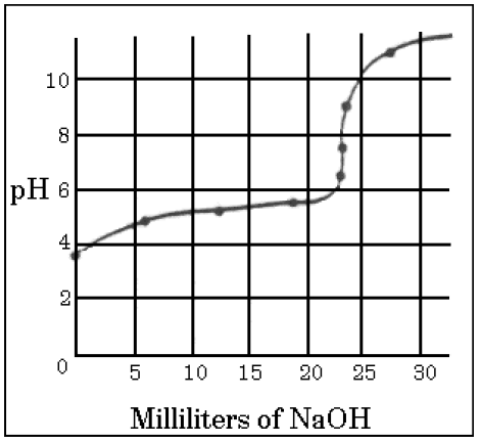
c)



d)



Titration FRQ's



1. A 30.00 milliliter sample of a weak monoprotic acid was titrated with a standardized solution of NaOH. A pH meter was used to measure the pH after each increment of NaOH was added, and the curve to the right was constructed.

   (a) Explain how this curve could be used to determine the molarity of the acid.

   (b) Explain how this curve could be used to determine the dissociation constant K_a of the weak monoprotic acid.

   (c) If you were to repeat the titration using an indicator in the acid to signal the endpoint, which of the following indicators should you select? Give the reason for your choice.

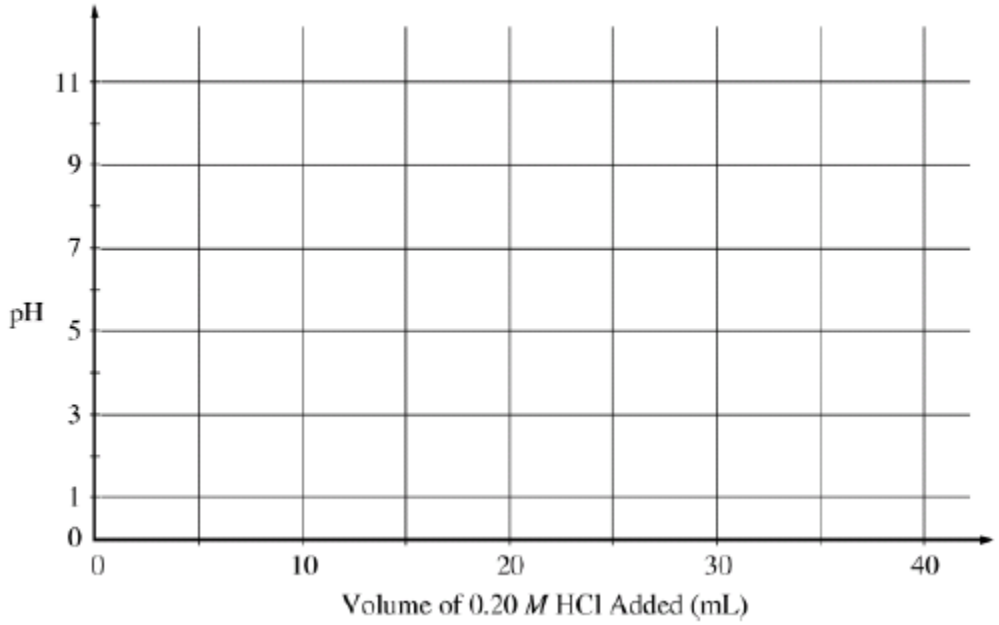
Methyl red	$K_a = 1 \times 10^{-5}$
Cresol red	$K_a = 1 \times 10^{-8}$
Alizarin yellow	$K_a = 1 \times 10^{-11}$

   (d) Sketch the titration curve that would result if the weak monoprotic acid were replaced by a strong monoprotic acid, such as HCl of the same molarity. Identify differences between this titration curve and the curve shown above.

2. A volume of 30.0 mL of 0.10 M $NH_3(aq)$ is titrated with 0.20 M HCl(aq). The value of the base-dissociation constant, K_b, for NH_3 in water is 1.8×10^{-5} at 25°C.

(a) Write the net-ionic equation for the reaction of $NH_3(aq)$ with HCl(aq).

(b) Using the axes provided below, sketch the titration curve that results when a total of 40.0 mL of 0.20 M HCl(aq) is added dropwise to the 30.0 mL volume of 0.10 M $NH_3(aq)$.



(c) From the table below, select the most appropriate indicator for the titration. Justify your choice.

Indicator	pK_a
Methyl Red	5.5
Bromothymol Blue	7.1
Phenolphthalein	8.7

(d) If equal volumes of 0.10 M $NH_3(aq)$ and 0.10 M $NH_4Cl(aq)$ are mixed, is the resulting solution acid, neutral, or basic? Explain.