FR Practice #1 (2010B #5, 10 points)

Volume of Titrant Added (mL)
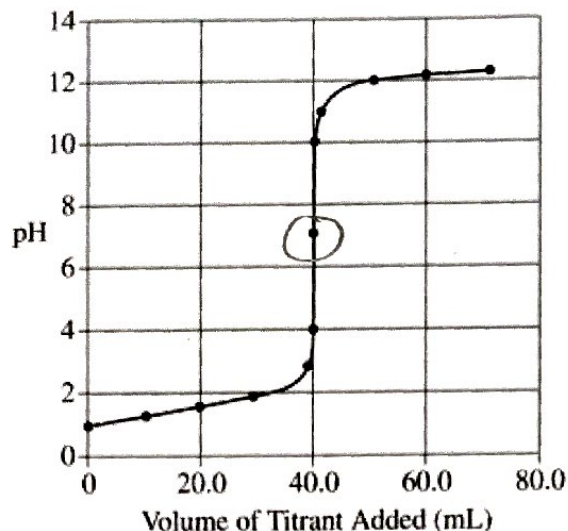
1. A solution of 0.100 *M* HCl and a solution of 0.100 *M* NaOH are prepared. A 40.0 mL sample of one of the solutions is added to a beaker and then titrated with the other solution. A pH electrode is used to obtain the data that are plotted in the titration curve shown above.

    a. Write the net ionic equation for the reaction of HCl(aq) and NaOH(aq). (1 point)

    b. Identify the solution that was initially added to the beaker. Explain your reasoning. (1 point)

    c. On the titration curve above, circle the point that corresponds to the equivalence point. (1 point)

    d. At the equivalence point, how many moles of titrant have been added? (1 point)

    e. The same titration is to be performed again, this time using an indicator. Use the information in the table below to select the best indicator for the titration. Explain your choice. (2 points)

Indicator	pH Range of Color Change
Methyl violet	0 – 1.6
Methyl red	4 – 6
Alizarin yellow	10 – 12

    f. What is the difference between the equivalence point of a titration and the end point of a titration? (1 point)

    g. On the grid provided on the next page, sketch the titration curve that would result if the solutions in the beaker and buret were reversed (i.e., if 40.0 mL of the solution used in the buret in the previous titration were titrated with the solution that was in the beaker). (3 points)
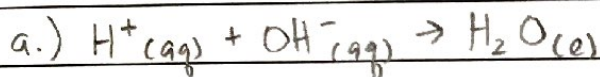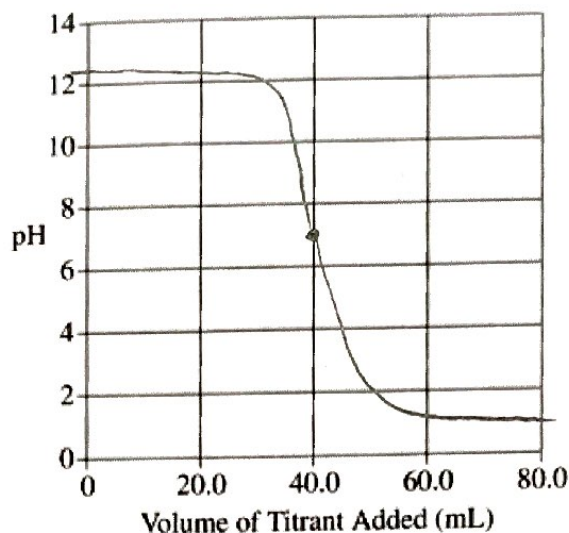
part (g)

1 pt: { starting pH
between 12-14
and
ending pH < 2 }

1 pt: eq. pt @
(40.0, 7)

1 pt: overall shape
of curve

pH vs Volume of Titrant Added (mL)

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a.) $H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(\ell)}$

b.) The sol'n initially added to the beaker was 0.100 M HCl,
b/c the initial pH was 1 (the pH of 0.100 M HCl).

c.) (see graph: point, 40.0, 7)

d.) 0.100 M NaOH × 0.0400 L = $\boxed{0.00400 \text{ mol NaOH}}$

e.) Methyl red would be the best choice, b/c its color change will
occur closest to the equivalence point @ pH = 7.
⌐point in a titration when
f.) equivalence point: moles of added titrant are stoichiometrically
equal to the moles of analyte present in the sol'n being titrated

end point: the point in a titration when the indicator changes color
(if the indicator is correctly chosen this should happen close to
the equivalence point)

g.) (see graph above)