

Titration Questions and Problems Set 1

1. What determines the pH found at the equivalence point of a titration?

2. **Predict** the pH found at the equivalence point for each of the following titrations, and choose an appropriate indicator:

Indicator	pH Range
Thymol Blue	1.2 – 2.8
Bromophenol Blue	3.0 – 4.6
Methyl Red	3.1 – 4.4
Chlorophenol Blue	4.8 – 6.4
Bromothymol Blue	6.0 – 7.6
Cresol Red	7.2 – 8.8
Phenolphthalein	8.3 – 10.0

(a) strong acid + strong base _____

(b) strong acid and weak base _____

(c) weak acid and strong base _____

(d) weak acid and weak base _____

3. Write a balanced neutralization reaction for each of the examples listed in question 2.

(a)

(b)

(c)

(d)

4. a) Write a balanced equation for the titration of a 25mL sample of 0.2M HF with 0.2M KOH.

b) List the ions or molecules present at the equivalence point of the titration, and predict the pH of the solution at the equivalence point.

c) Calculate the pH at the equivalence point.

5. Consider the titration of a 20mL sample of 0.10M formic acid, HCOOH, ($K_a=1.8 \times 10^{-4}$) with 0.10M NaOH.

a) Write the balanced equation for the reaction between HCOOH and NaOH.

b) Calculate the pH of the formic acid solution before the start of the titration.

c) List the ions or molecules present in your dish when 10mL of the NaOH have been added to the solution of HCOOH.
What kind of solution is this?

d) Calculate the pH of the resulting solution when 10mL of the NaOH have been added to the 20mL sample of HCOOH.

e) List the ions or molecules present when the equivalence point of the titration has been reached.

f) Calculate the K_b of formate, HCOO⁻.

g) Calculate the volume of the solution in your dish at the equivalence point of the titration of HCOOH with NaOH.

h) Calculate the pH at the equivalence point of the titration of the HCOOH with NaOH.

i) List the ions or molecules present when the 25mL of the NaOH have been added to the 20mL HCOOH sample.

k) Calculate the pH of the solution formed when 25mL of the NaOH have been added to the 20mL HCOOH sample.