Name_____

Pre-Laboratory Assignment

1. Calculate the equivalent mass of each of the following acids.

    a. $HC_2H_3O_2$

    b. $KHCO_3$

    c. H_2SO_3

2. Calculate the molarity of a solution of sodium hydroxide, NaOH, if 23.64 mL of this solution is needed to neutralize 0.5632 g of potassium hydrogen phthalate.

3. It is found that 24.68 mL of 0.1165 M NaOH is needed to titrate 0.2931 g of an unknown acid to the phenolphthalein end point. Calculate the equivalent mass of the acid.

4. The following data was collected for the titration of 0.145 g of a weak acid with 0.100 M NaOH as the titrant:

    a. Graph the data on the chart below.

Volume NaOH added, mL	pH
0.00	2.88
5.00	4.15
10.00	4.58
12.50	4.76
15.00	4.93
20.00	5.36
24.00	6.14
24.90	7.15
25.00	8.73
26.00	11.29
30.00	11.96

Change of pH During Titration of Weak Acid with NaOH

pH

Volume of 0.100 M NaOH in mL
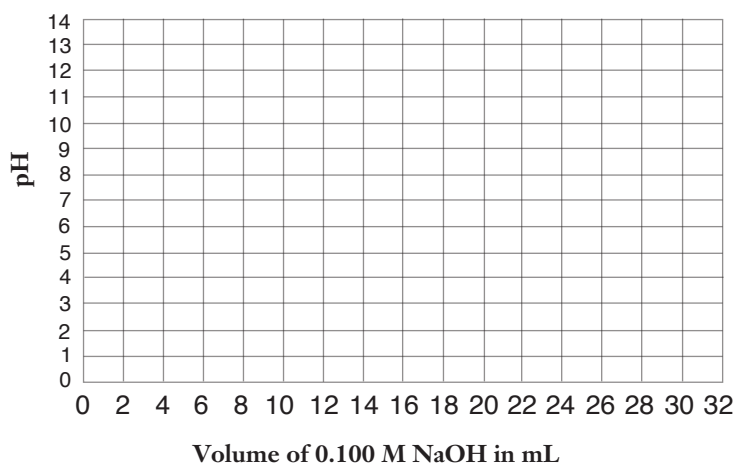
b. What is the pH at the equivalence point?

c. Give the K_a and pK_a value of the acid. Explain.

d. The following acid–base indicators are available to follow the titration. Which of them would be most appropriate for signaling the endpoint of the titration? Explain.

Indicator	Color Change		pH Transition Interval
	Acid Form	**Base Form**	
Bromphenol blue	Yellow	Blue	3.0–5.0
Bromthymol blue	Yellow	Blue	6.0–7.6
Thymol blue	Yellow	Blue	8.0–9.6

Standardization Data Table

	Trial 1	Trial 2	Trial 3
Mass KHP, g			
Final Volume, mL			
Initial Volume, mL			
Volume of NaOH added, mL			

Molarity NaOH (Average) _____ M

Equivalent Mass Data Table

	Trial 1	Trial 2
Mass Acid, g		
Final Volume, mL		
Initial Volume, mL		
Volume of NaOH added, mL		

Equivalent Mass (Average) _____ g/mol

pK_a Data Table

Mass of Unknown Acid _____

Standard NaOH Concentration _____

Initial Buret Reading _____

Initial pH _____

Buret Reading (mL)	pH	Buret Reading (Con't.)	pH

Post-Laboratory Review Questions

1. From the standardization data, calculate the molarity of the sodium hydroxide solution for each trial. Average the values and enter the average in the Standardization Data Table.

2. From the equivalent mass data, calculate the equivalent mass of the unknown acid for each trial. Average the values and enter the average in the Equivalent Mass Data Table.

3. Why is equivalent mass determined and not molar mass?

4. Why must the KHP and acid samples be dried? If they are not dried, how would the results change (high or low)?

5. Why must NaOH be standardized? Why can't an exact solution of NaOH be prepared?

6. From the graph of pH versus volume of NaOH, determine the pK_a of the unknown acid. Convert this value to K_a.

7. Why is the equivalence point in the titration of the unknown acid with sodium hydroxide not at pH 7?