

\* While I prefer you turn in a hard copy of the worksheet, I will accept scanned copies sent to my email address, joensj@fiu.edu

Section: (circle one)      M,W,F                      Tu,Tr

For problems involving calculations you must show your work for credit. Unless otherwise stated, you may assume  $T = 25.0\text{ }^{\circ}\text{C}$ .

1) Which of the following reactions goes essentially to completion?

- a) The reaction of a strong acid with a strong base
- b) The reaction of a strong acid with a weak base
- c) The reaction of a weak acid with a strong base
- d) Both b and c
- e) Both a and b and c

2) A particular buffer contains 0.0240 M of carbonic acid ( $\text{H}_2\text{CO}_3$ ), a weak acid, and 0.0150 M of hydrogen carbonate ion ( $\text{HCO}_3^-$ ) the conjugate base of carbonic acid. Note that  $K_{a1} = 4.2 \times 10^{-7}$  for carbonic acid.

a) What is the pH of the buffer solution? (HINT: This is an easy problem if you use the Henderson equation).

b) Give the reaction that occurs if a small amount of HCl, a strong monoprotic acid, is added to the system.

c) Give the reaction that occurs if a small amount of NaOH, a strong soluble base, is added to the system.

d) Based on your answers in b and c, explain why this system functions as a buffer system.

3) Potassium hydrogen phthalate ( $\text{C}_8\text{H}_5\text{KO}_4$ ,  $\text{MW} = 204.22 \text{ g/mol}$ ) is a soluble ionic compound, and is often used to find the concentration of strong base solutions by titration. When added to water, it dissolves by the process:



The anion,  $\text{C}_8\text{H}_5\text{O}_4^-$ , is a weak acid, and reacts with KOH, a strong soluble base



A 0.3145 g sample of potassium hydrogen phthalate is dissolved in water, and titrated with a sample of a stock solution of potassium hydroxide. After the addition of 37.18 mL of the KOH solution, the equivalence point of the titration is reached. Based on this information, find  $[\text{KOH}]$ , the concentration of potassium hydroxide in the stock solution.