**Quiz 2**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. An aqueous solution at 25 °C has a hydronium ion concentration of 5.8 x 10-9 M.
   1. What is the hydroxide ion concentration (8 points)?
   2. Is the solution acid, basic, or neutral? \_\_\_\_\_\_\_\_\_Basic
   3. Calculate the pH of the solution.
   4. Calculate the pOH of the solution.
2. Why is there more than one definition of acid-base behavior? Which definition is right (4 points)?

There is no single correct definition; we use the definition that is best for a particular situation.

1. Why is a spectrophotometer used to help determine the Ka of phenolphthalein (3 points)?

A spectrophotometer is necessary for phenolphthalein, as there is no discernible intermediate color. This is due to the fact that the only absorbing species in the visible spectrum is the In- in phenolphthalein.

1. Without doing any calculations, determine which if the solution will be acidic, basic, or neutral (4 points).
   1. 0.0100 M in hydrochloric acid and 0.0100 M in potassium hydroxide

The strong acid and the strong base have equal concentrations and will completely neutralize each other resulting in a **neutral solution**.

* 1. 0.0100 M in hydrofluoric acid and 0.0100 M in potassium bromide

The weak acid will produce an **acidic solution**. K+ is the counterion of a strong base and is pH-neutral. Br- is the conjugate base of a strong acid and is pH-neutral.

* 1. 0.0100 M in ammonium chloride and 0.0100 M CH3NH3Br

NH4+ and CH3NH3+ are the conjugate acids of weak bases and will produce an acidic solution. Cl- and Br- are the conjugate bases of strong acids and will be pH-neutral. Therefore, the solution will be **acidic**.

* 1. 0.100 M in sodium cyanide and 0.100 M in calcium chloride

Na+ and Ca2+ ions are the counterions of a strong base; therefore, they are pH neutral. Cl- is the conjugate base of a strong acid and is pH-neutral. CN- is the conjugate base of a weak acid and will produce a **basic solution**.

1. Rank the following acids in order of increasing acid strength (3 points):

CH3COOH CCl3COOH CH2ClCOOH CHCl2COOH

CH3COOH < CH2ClCOOH < CHCl2COOH < CCl3COOH