Chapter 15
Study Guide

Name: _____

Date: _____ Per: _____

Directions: Fill in the blanks.

1. The autoionization of pure water can be described by the equation: _____. When pure water is ionized the concentrations of $[H_3O^+]$ and $[OH^-]$ are _____. The exact concentration of each at 25°C is _____ *M*. Because water is a weak acid/base system its equilibrium position can be described using the equilibrium expression _____. The constant calculated in this case is referred to as the water ionization constant, _____, instead of K_{eq}. The value of the water ionization constant at 25°C is _____. In any aqueous solution the product of _____ x _____ will be equal to this value. This fact explains the following formulas for determining concentration of unknowns in aqueous solution:

$$[H_3O^+] = \frac{\_\_\_\_\_}{[OH^-]} \quad \text{and} \quad [OH^-] = \frac{\_\_\_\_\_}{[H_3O^+]}$$

2. The formulas for calculating pH and pOH are:

pH =	pOH =

3. The pH and the pOH of a solution always add up to _____.
4. Calculate the pH of the following solutions:
   a. $[H^+] = 1.0 \times 10^{-5}\ M$ _____
   b. $[H^+] = 3.0 \times 10^{-5}\ M$ _____
   c. $[OH^-] = 3.1 \times 10^{-8}\ M$ _____
   d. $[OH^-] = 1.0 \times 10^{-10}\ M$ _____
5. Calculate the pOH of the following solutions:
   a. $[H^+] = 1.0 \times 10^{-3}\ M$ _____
   b. $[H^+] = 5.7 \times 10^{-1}\ M$ _____
   c. $[OH^-] = 3.2 \times 10^{-3}\ M$ _____
   d. $[OH^-] = 1.0 \times 10^{-8}\ M$ _____
6. When the pH or pOH of the solution is known, the $[H^+]$ or $[OH^-]$ concentrations may be calculated using antilogs and the formulas:

$[H^+]$ =	$[OH^-]$ =

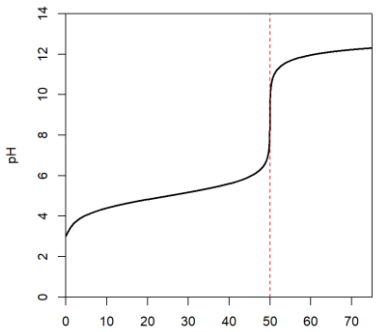
7. Strong acids ionize completely, therefore the concentration of the acid will be equal to the concentration of _____ in solution and the -log of the acid's concentration will be its _____. Strong bases dissociate completely, but some contain more than one _____ ion per formula unit. The concentration of hydroxide, $[OH^-]$, will be equal to the concentration of the base x _____.
8. Weak acids do not ionize completely and the _____ must be calculated using the K_a.
9. A(n) _____ is a substance that changes color based on pH. They are typically _____ or _____ that exist at equilibrium. The addition of acid or base _____. The color changes over a range of pHs called the _____.
10. The technique used to determine the concentration of an unknown acid or base is called _____. It uses a(n) _____ to indicate when a _____ reaction has occurred. The known solution in the process is called the _____ and the solution being tested is called the _____. The process is carried out until the solution changes color at a point known as the _____ point. This is different than the point at

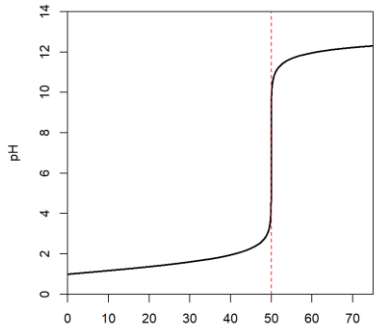
Name: _____

Date:_____ Per:_____

which the [H+] and [OH−] are equal, which is known as the _____ point. The pH of the solution at that point will depend on the combination of the acid and based being used. When a strong acid is titrated with a strong base or vice versa, the pH at this point will be approximately _____. When a strong base is titrated with a weak acid, the pH will be _____. When a strong acid is titrated with a weak base the pH will be _____.

11. The titration curve located on the left below represents the titration of a _____ with a _____. The curve on the right represents the titration of a _____ with a _____. Label the equivalence point for each graph.





12. Calculate the molarity of a KOH solution if 25.0mL of the solution is neutralized by 14.2mL of 0.5M HI.

13. A buffer is made from a _____ and _____. Buffers work by _____. The amount of acid or base that a buffer can neutralize is called the _____.