Name: Key
Blk:_____ Date:_____

Chemistry 12
ACID BASE PART II Lesson # 18
PRACTICAL ASPECTS OF TITRATIONS

To carry out a titration you must have a solution of KNOWN concentration. This is also referred to as a STANDARDIZED or a STANDARD SOLUTION.

A PRIMARY STANDARD is a substance that is used to determine the concentration of a standard solution. A primary standard is one that can be obtained in a pure and stable form (does not absorb CO_2 or H_2O from atmosphere) and has a KNOWN MOLAR MASS.

There are TWO WAYS to prepare a **STANDARD SOLUTION**:

1. To prepare a standard solution of a base eg. NaOH

a. Potassium hydrogen phthalate ($KHC_8H_4O_4$ = 204.22 g/mol)
20.422g diluted to 1.0L → [0.1000 M] reacts with NaOH (phenolthalein or T.B.

$$KHC_8H_4O_4 + NaOH \longrightarrow NaKC_8H_4O_4 + H_2O$$

MOST COMMONLY USED ACIDIC PRIMARY STANDARD

b. Oxalic acid dihydrate ($H_2C_2O_4 \cdot 2H_2O$ = 126.07 g/mol)
12.607g diluted to 1.0L → [0.1000 M] reacts with NaOH.

$$H_2C_2O_4 \cdot 2H_2O + \underline{2}\,NaOH \longrightarrow 4H_2O$$

(Indicator used → phenolphthalein) (WA/SB)

2. To prepare a standard solution of an acid eg. HCl

Sodium Carbonate (Na_2CO_3 = 105.99 g/mol)
10.599g diluted to 1.0L → [0.1000 M] reacts with HCl

$$Na_2CO_3 + \underline{2}\,HCl \longrightarrow 2\,NaCl + H_2O + CO_2$$

(Indicator used is Methyl orange) WB/SA.

SEATWORK: Do Exercises 121-123 pg 165 in HEBDEN
PLO's: P1 (PRIMARY STANDARDS AND STANDARDIZED SOLUTIONS)

TYPES OF NEUTRALIZATION REACTIONS

Recall from earlier in this unit that we investigated the Formula, Complete and Net Ionic equations for a STRONG ACID and STRONG BASE neutralization reaction:
Ex. When NaOH reacts with HCl

i. $NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(\ell)$

ii. $Na^+(aq) + OH^-(aq) + H^+(aq) + Cl^-(aq) \longrightarrow Na^+(aq) + Cl^-(aq) + H_2O(\ell)$

iii. $OH^-(aq) + H^+(aq) \rightleftharpoons H_2O(\ell)$

$\longrightarrow 2\,H_2O(\ell) \rightleftharpoons OH^- + H_3O^+$

When the $[H_3O^+] = [OH^-]$ the solution is NEUTRAL, but if one is in excess it is either basic or acidic (depending on which ion is in excess)

When a WEAK ACID is reacted with a STRONG BASE:
eg. HF + NaOH

i. $HF(aq) + NaOH(aq) \longrightarrow NaF(aq) + H_2O(\ell)$

ii. $HF(aq) + Na^+(aq) + OH^-(aq) \longrightarrow Na^+(aq) + F^-(aq) + H_2O(\ell)$

iii. $HF(aq) + OH^-(aq) \longleftrightarrow F^-(aq) + H_2O(\ell)$

When a WEAK BASE is reacted with a a STRONG ACID:
Ex. NH_3 + HCl

i. $NH_3(aq) + HCl(aq) \longrightarrow NH_4^+(aq) + Cl^-(aq)$

ii. $NH_3(aq) + H^+(aq) + Cl^-(aq) \longrightarrow NH_4^+(aq) + Cl^-(aq)$

iii. $NH_3(aq) + H^+(aq) \longleftrightarrow NH_4^+(aq)$

NOTE: STRONG ACIDS / STRONG BASES + SALTS IONIZE 100%
ALL WEAK ACIDS / WEAK BASES ! DO NOT !

SEATWORK/HOMEWORK: Worksheet
PLO's: P4