(36) Primary standards are used to calibrate instrumentation and reagent solutions such as titrants. If the composition of the standard is not known, then experimental results will not be accurate.

(37) The <u>equivalence point</u> has been reached when all of the analyte has been titrated. The <u>end point</u> occurs usually when a slight excess of titrant causes a physical change in the solution that can be detected.

(39) In a direct titration the analyte is titrated directly by the titrant.
In a back titration a known excess of titrant is added to the analyte. The the excess titrant is titrated using a second titrant.

(42)

$$40.0\,mL \left| \frac{0.0400\,mol\,Hg_2^{2+}}{1000\,mL} \right| \frac{2\,mol\,I^-}{1\,mol\,Hg_2^{2+}} \left| \frac{1000\,mL}{0.100\,mol\,I^-} \right| =$$

32.0 mL

(44) $1.69\,mg\,NH_3 \left| \frac{mmol\,NH_3}{17.031\,mg} \right| \frac{3\,mmol\,OBr^-}{2\,mmol\,NH_3} \right| = \frac{0.149\,mmol\,OBr^-}{1.00\,mL}$

$= 0.149\,M\,OBr^-$

(46) $10.00\,mL\,HCl \left| \frac{1.396\,Mol}{1000\,mL} \right| = 0.01396\,mol\,H^+$ added

$39.96\,mL\,NaOH \left| \frac{0.1004\,mol}{1000\,mL} \right| = 0.004012\,mol\,OH^-$ needed for back titration

$$\begin{array}{r} 0.01396 \\ -\,0.004012 \\ \hline 0.00995 \end{array}$$

0.00995 mol of H^+ to titrate CO_3^{2-}

$0.00995\,mol\,H^+ \left| \frac{1\,mol\,CaCO_3}{2\,mol\,H^+} \right| \frac{100.086\,g\,CaCO_3}{1\,mol\,CaCO_3} \right| = \frac{0.498\,g\,CaCO_3}{0.5413\,g\,limestone} \times 100$

$= 92\%$

Ch 10: (58)

$5.00\,mL\,HCl \left| \frac{0.0336\,mmol}{1\,mL} \right| = 0.168\,mmol\,H^+$

$-$

$6.34\,mL\,NaOH \left| \frac{0.010\,mmol}{1\,mL} \right| = 0.0634\,mmol\,OH^-$

0.1046 mmol excess H^+ = 0.1046 mmol nitrogen $\left| \frac{14.007\,mg}{1\,mmol} \right| = 1.465\,mg\,N$

$256\,\mu L \left| \frac{1\,mL}{10^3\,\mu L} \right| \frac{37.9\,mg}{1\,mL} \right| = 9.707\,mg$ protein

$\frac{1.465\,mg}{9.707\,mg} \times 100 = $ 15.1% N by mass