Titration practice Name KEY

1. A student titrates 40.00 mL of an HCl solution of unknown concentration with a 0.5500 M NaOH solution. The volume of base solution needed to reach the equivalence point was 24.64 mL. What is the molarity of the HCl solution? $HCl + NaOH \rightarrow H_2O + NaCl$ 1:1

$M_A V_A = M_B V_B$

$M_A (40.00) = (0.5500)(24.64)$ $M_A = \boxed{0.3388\ M}$

2. 20.00 mL of a solution of HNO_3 having an unknown concentration is titrated with 34.37 mL of a 0.8220 M solution of NaOH. What is the concentration of the HNO_3? $HNO_3 + NaOH \rightarrow H_2O + NaNO_3$ 1:1

$M_A V_A = M_B V_B$

$M_A (20.00) = (.8220)(34.37)$ $M_A = \boxed{1.113\ M}$

3. A lab worker makes up 1000.00 mL of KOH solution but has forgotten to record the mass of KOH dissolved. When a 42.82 mL sample of the solution is titrated with a 1.209 M solution of HCl, 28.35 mL of the acid solution is required to reach the equivalence point. What is the concentration of the KOH solution, and what mass of KOH had to be dissolved to make the initial 1000.0 mL of solution? $KOH + HCl \rightarrow KCl + H_2O$ 1:1

$M_A V_A = M_B V_B$

$(1.209)(28.35) = (M_B)(42.82)$

$M_B = \boxed{0.8004\ M}$

$0.8004 = \frac{x}{1.0000}$ $x = 0.8004 \times 56.1\ g/mol =$ $\boxed{44.91\ g}$

4. What volume of a 1.366 M solution of NaOH would be required to titrate 47.22 mL of a 2.075 M solution of H_2SO_4? $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$ 2 : 1

$2M_A V_A = M_B V_B$

$2(2.075)(47.22) = (1.366)(V_B)$ $V_B = \boxed{143.5\ mL}$

5. 25.44 mL of 0.0500 M $Ca(OH)_2$ solution is titrated with 15.34 mL of perchloric acid of unknown concentration. What is the concentration of the perchloric acid? $Ca(OH)_2 + 2HClO_4 \rightarrow Ca(ClO_4)_2 + 2H_2O$ 1 : 2

$M_A V_A = 2M_B V_B$

$M_A(15.34) = 2(0.0500)(25.44)$ $M_A = \boxed{0.1658\ M}$

6. If 4.00 g of solid NaOH is dissolved in water, what volume of 0.35 M HCl will be required to completely neutralize the base? $HCl + NaOH \rightarrow H_2O + NaCl$

$\frac{4.00\ g}{40.0\ g/mol} = 0.100\ mol \times \frac{1}{1} = 0.100\ mol$

$M = \frac{mol}{L}$

$0.35 = \frac{0.100}{x}$

$\boxed{x = 0.286\ L = 286\ mL}$