Show all work to receive credit.   Molar masses: Na 23.00,   K   39.01, H 1.01,   O 16.00,
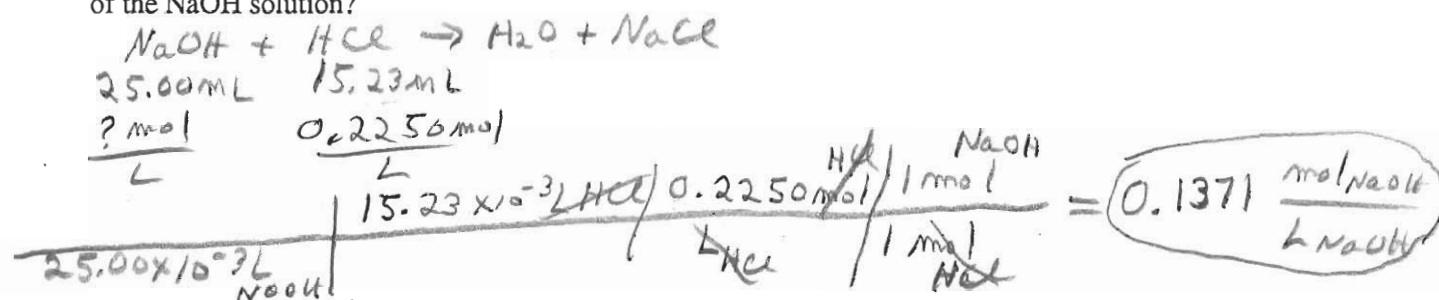
1. (5 Pts)   If 1.928 g KNO_3 is dissolved in enough water to make 250.0 mL of solution, what is the molarity of potassium nitrate?

$$\text{molar mass } KNO_3 = \frac{101.02 g}{mol} \qquad \frac{1.928 g}{} \left| \frac{mol}{101.02 g} \right| \frac{}{0.250 L} = \boxed{0.07634 \frac{mol}{L}}$$

2. (5 Pts)   How many mL of 0.1107 M NaOH contain 10.00 g of NaOH?

$$\frac{10.00 g\, NaOH}{} \left| \frac{mol}{40.01 g} \right| \frac{L}{0.1107\, mol\, L} \left| \frac{m}{10^{-3}} \right. = \boxed{2258\, mL_{NaOH\,soln}}$$

3. (5 Pts) A 25.00 mL sample of NaOH is titrated with 15.23 mL of 0.2250 M HCl. What is the concentration (Molarity) of the NaOH solution?
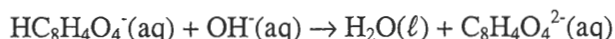
$$NaOH + HCl \rightarrow H_2O + NaCl$$

25.00 mL   15.23 mL
$\frac{? mol}{L}$ $\frac{0.2250 mol}{L}$

$$\frac{15.23 \times 10^{-3} L\, HCl}{25.00 \times 10^{-3} L\, NaOH} \left| \frac{0.2250\, mol}{L\, HCl} \right| \frac{1\, mol\, NaOH}{1\, mol\, HCl} = \boxed{0.1371 \frac{mol\, NaOH}{L\, NaOH}}$$

4. (5 Pts) If 5.00 mL of 1.66×10^{-1} M HCl is diluted to exactly 250.0 L with water, what is the concentration of the resulting solution?

$$M_1 V_1 = M_2 V_2 \quad (Dilution)$$
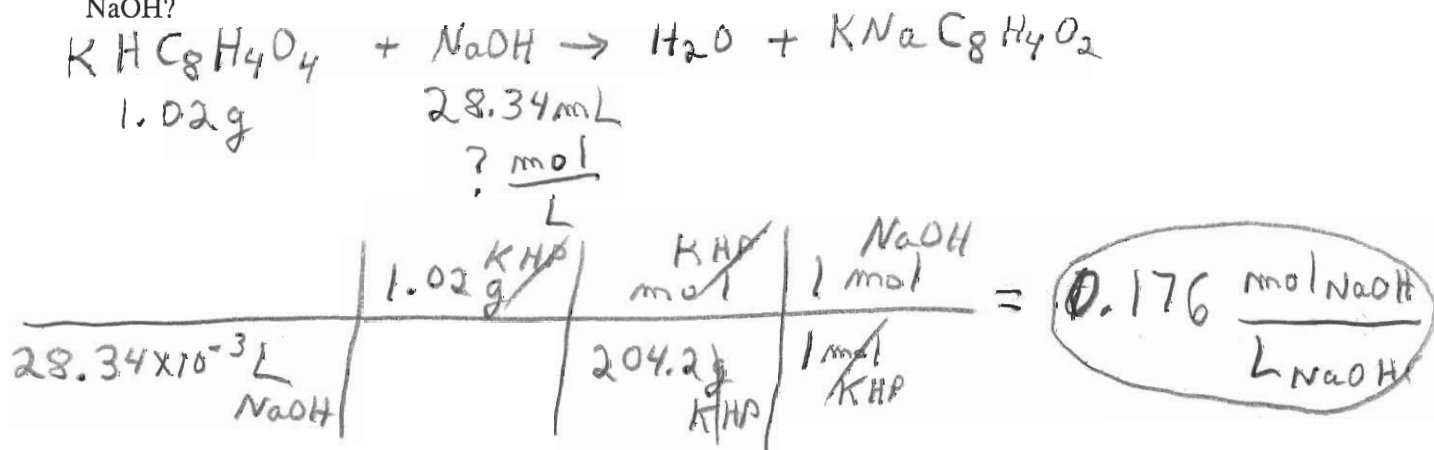$$(1.66 \times 10^{-1} M)(5.00 \times 10^{-3} L) = M_2 (250.0 L)$$
$$\boxed{M_2 = 3.32 \times 10^{-6} M}$$

5. (5 Pts) Potassium hydrogen phthalate (KHP) is a weak acid that is used to standardize sodium hydroxide according to the net ionic equation below.

$$HC_8H_4O_4^-(aq) + OH^-(aq) \rightarrow H_2O(\ell) + C_8H_4O_4^{2-}(aq)$$

If 1.02 g KHP (molar mass = 204.2 g/mol) is titrated with 28.34 mL of NaOH, what is the concentration of NaOH?

$$KHC_8H_4O_4 + NaOH \rightarrow H_2O + KNaC_8H_4O_2$$

1.02 g   28.34 mL
                    $\frac{? mol}{L}$

$$\frac{1.02 \frac{g}{} KHP}{28.34 \times 10^{-3} L\, NaOH} \left| \frac{KHP\, mol}{204.2 g} \right| \frac{1\, mol\, NaOH}{1\, mol\, KHP} = \boxed{0.176 \frac{mol\, NaOH}{L\, NaOH}}$$

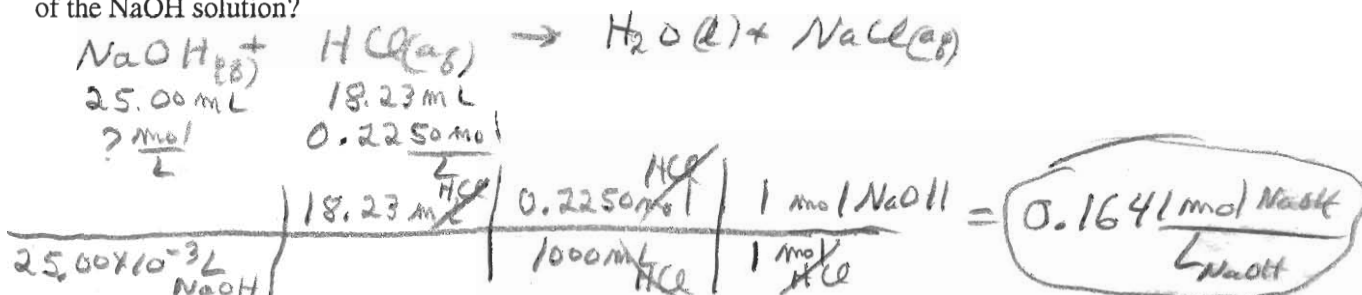**Show all work to receive credit**. Molar masses: Na 23.00, K 39.01, H 1.01, O 16.00,

1. (5 Pts) If 2.928 g KNO_3 is dissolved in enough water to make 350.0 mL of solution, what is the molarity of potassium nitrate?

Molar mass
KNO_3 = $\dfrac{101.02\,g}{mol}$

$\dfrac{2.928\,g\,KNO_3}{} \cdot \dfrac{mol}{101.02\,g} \cdot \dfrac{1}{0.350\,L} = \boxed{0.08281\,\dfrac{mol}{L}}$

2. (5 Pts)   How many mL of 0.1207 M NaOH contain 20.00 g of NaOH?

NaOH
$\dfrac{20.00\,g}{} \cdot \dfrac{mol}{40.01\,g} \cdot \dfrac{1000\,mL}{0.1207\,mol} = \boxed{4141\,mL}$

3. (5 Pts) A 25.00 mL sample of NaOH is titrated with 18.23 mL of 0.2250 M HCl. What is the concentration (Molarity) of the NaOH solution?
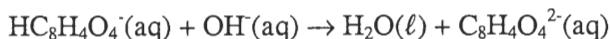
$NaOH_{(s)} + HCl_{(aq)} \rightarrow H_2O_{(\ell)} + NaCl_{(aq)}$
25.00 mL   18.23 mL
? $\dfrac{mol}{L}$ 0.2250 mol

$\dfrac{1}{25.00 \times 10^{-3}\,L\;NaOH} \cdot \dfrac{18.23\,mL\,HCl}{} \cdot \dfrac{0.2250\,HCl}{1000\,mL\,HCl} \cdot \dfrac{1\,mol\,NaOH}{1\,mol\,HCl} = \boxed{0.1641\,\dfrac{mol\,NaOH}{L\,NaOH}}$

4. (5 Pts) If 8.00 mL of 1.66×10^{-1} M HCl is diluted to exactly 250.0 L with water, what is the concentration of the resulting solution?

$M_1 V_1 = M_2 V_2$
$(1.66 \times 10^{-1}\,M)(8.00 \times 10^{-3}\,L) = M_2 (250.0\,L)$

$M_2 = \boxed{5.32 \times 10^{-6}\,M\;HCl}$

5. (5 Pts) Potassium hydrogen phthalate (KHP) is a weak acid that is used to standardize sodium hydroxide according to the <u>net ionic equation</u> below.

$HC_8H_4O_4^-(aq) + OH^-(aq) \rightarrow H_2O(\ell) + C_8H_4O_4^{2-}(aq)$

If 1.25 g KHP (molar mass = 204.2 g/mol) is titrated with 28.34 mL of NaOH, what is the concentration of NaOH?

$KHC_8H_4O_4 + NaOH \rightarrow H_2O + KNaC_8H_4O_4$
1.25 g   28.34 mL
                   ? $\dfrac{mol}{L}$

$\dfrac{1}{28.34 \times 10^{-3}\,L\;NaOH} \cdot \dfrac{1.25\,g\,KHP}{} \cdot \dfrac{mol\,KHP}{204.2\,g\,KHP} \cdot \dfrac{1\,mol\,NaOH}{1\,mol\,KHP} = \boxed{0.216\,\dfrac{mol\,NaOH}{L\,NaOH}}$