CHEM-1110 BACK-TITRATION ANSWERS

1. $\left(1.0000 \times \frac{25.00}{250.0}\right) \text{g } K_2CO_3 \times \frac{1 \text{ mol } K_2CO_3}{138.2055 \text{ g } K_2CO_3} \times \frac{2 \text{ mol HCl}}{1 \text{ mol } K_2CO_3}$

$\times \frac{10^3 \text{ mL HCl}}{0.1000 \text{ mol HCl}} = 14.47 \text{ mL}$

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2. g K_2CO_3 in Erlenmeyer flask $= 0.6000 \times \frac{20.00}{200.0} = 0.06000$

mol HCl added to flask $= 0.02000 \times 0.1700 = 0.003400$ — (1)

mol of HCl that reacted with 0.06000 g K_2CO_3 $= \left(0.06000 \times \frac{1}{138.2055}\right) \times \frac{2 \text{ mol HCl}}{1 \text{ mol } K_2CO_3}$

$= 8.6827225 \times 10^{-4}$ — (2)

mol HCl in excess = (1) − (2) $= 2.5317278 \times 10^{-3}$ — (3)

(3) mol HCl $\times \frac{1 \text{ mol NaOH}}{1 \text{ mol HCl}} \times \frac{10^3 \text{ mL NaOH}}{0.1048 \text{ mol NaOH}} = 24.16 \text{ mL}$

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3. mol of HCl in Solution A $= 0.01500 \times 2.000 = 0.03000$ — (1)

mol HCl reacted with $CaCO_3 = \left(0.4108 \times \frac{1}{100.087}\right) \times \frac{2 \text{ mol HCl}}{1} = 8.2088583 \times 10^{-3}$ — (2)

∴ mol of HCl in excess in Solution A $= 0.0217911$ — (3)

mol of HCl in excess in flask $= (3) \times \frac{20}{250} = 1.7432913 \times 10^{-3}$ — (4)

(4) mol HCl $\times \frac{1 \text{ mol NaOH}}{1 \text{ mol HCl}} \times \frac{10^3 \text{ mL}}{0.1160 \text{ mol NaOH}} = 15.03 \text{ mL}$

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4. Mass M_2CO_3 in 10 mL = $0.6181 \times \frac{10}{100} = 0.06181$

mol HCl in flask = $0.02500 \times 0.1842 = 4.605 \times 10^{-3}$ ——— (1)

mol HCl in excess = (0.01990×0.1473) mol NaOH $\times \frac{1 \text{ mol HCl}}{1 \text{ mol NaOH}} = 2.93127 \times 10^{-3}$ — (2)

" " reacted = 1.6738×10^{-3} (Subtract (2) from (1)) — (3)

∴ mol M_2CO_3 = $\frac{(3)}{2} = 8.369 \times 10^{-4}$ —— (4)

MOLAR MASS = $\frac{0.06184}{(4)} = 73.855897$ g/mol

$(2 \times m) + (60.0) = 73.855897$

∴ $m = 6.93$ m is Li

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5. Total mol HCl = $0.0200 \times 2.00 = 0.04000$ ——— (1)

mol HCl in excess = (0.01764×0.05121) mol NaOH $\times \frac{1 \text{ mol HCl}}{1 \text{ mol NaOH}} \times \frac{100}{100} = 9.033 \times 10^{-3}$ — (2)

mol of HCl used = (1) − (2) = 0.0309665 —— (3), $M(OH)_2 = \frac{(3)}{2}$ — (4)

Mmass of $M(OH)_2$ = $\frac{0.9030}{(4)} = 58.32$

$M + (17 \times 2) = 58.32$ $M = 24.3$ is Mg

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6. Total mol HCl in SOLN A = $0.0200 \times 2.00 = 0.0400$ ——— (1)

mol HCl in excess = (0.0145×0.100) mol KOH $\times \frac{1 \text{ mol HCl}}{1 \text{ mol KOH}} \times \frac{200}{25} = 0.0116$ — (2)

mol HCl reacted = mol OH^- in A = (1) − (2) = 0.0284 — (3)

mol Fe = $[1.0101 - (0.0284 \times 17.0)] \div 55.85 = 0.00944$

	mol	mol RATIO	
Fe	0.00944	1	$n = 3$
OH	0.0284	3	$Fe(OH)_3$