C11 - 3.6 - Neutralize/Precipitate Notes

$$c = \frac{n}{V}$$

$0.040\ L, M = 1.5\ H_2SO_4$ & $0.025\ L, M = ?\ NaOH$

$$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$$

$n = cV$
$n = 1.5 \times 0.04$
$n = 0.06\ mol\ H_2SO_4$

$$0.06\ mol\ H_2SO_4 \times \frac{2\ mol\ NaOH}{1\ mol\ H_2SO_4} = 0.12\ mol\ NaOH$$

$$c = \frac{n}{V}$$
$$c = \frac{0.12}{0.025}$$
$$c = 4.8\ M\ NaOH$$

$$\frac{c_a v_a}{r_a} = \frac{c_b v_b}{r_b}$$
$$c_a = \frac{c_b v_b r_a}{r_b v_a}$$
$$c_a = \frac{(1.5)(0.04)(2)}{(0.025)(1)}$$
$$c_a = 4.8\ M\ NaOH$$

Find the ion concentration of all products.

$75\ mL, 0.2\ M\ Na_3PO_4$ & $25\ mL, 0.8\ M\ K_3PO_4$

$$Na_3PO_4 + K_3PO_4 \rightarrow Na_3PO_4 + K_3PO_4$$

$n = cV$
$n = 0.2 \times 0.075$
$n = 0.015\ mol\ Na_3(PO_4)$

$n = cV$
$n = 0.8 \times 0.025$
$n = 0.020\ mol\ K_3(PO_4)$

$$0.015\ mol + 0.020\ mol = 0.035\ mol\ PO_4$$

$$[PO_4^{3-}] = \frac{0.035\ mol}{0.1L} = 0.35\ M$$

$$75mL + 25mL = 100mL = 0.1L$$

$$0.015\ mol \times \frac{3\ atoms\ Na^+}{molecule\ Na_3} = 0.045\ mol$$

$$[Na^+] = \frac{0.045\ mol}{0.1L} = 0.450\ M$$

$$0.020\ mol \times \frac{3\ atoms\ K^+}{molecule\ K_3} = 0.060\ mol$$

$$[K^+] = \frac{0.060\ mol}{0.1L} = 0.600\ M$$

Find the ion concentration of Cl^- in product.

$0.4\ L, 0.45\ M\ KCl$ & $0.2\ L, 0.75\ M\ Ag(NO_3)$

$$KCl + Ag(NO_3) \rightarrow K(NO_3) + AgCl_{(s)}$$

$n = cV$
$n = 0.45 \times 0.4$
$n = 0.18\ mol\ KCl$
$n = 0.18\ mol\ Cl$

$n = cV$
$n = 0.75 \times 0.2$
$n = 0.15\ mol\ Ag(NO_3)$
$n = 0.15\ mol\ Ag$

$[Ag^+] = 0; ppt$

Less moles → used up

$$mol\ Cl = 0.18 - 0.15 = 0.03$$

$$c = \frac{n}{V}$$
$$c = \frac{0.03}{0.6}$$
$$c = 0.05\ M\ [Cl^-] after\ ppt$$

$$0.4 + 0.2 = 0.6L$$

Equal # of moles react with equal # of moles

OR

$$c = \frac{0.18}{0.6}$$
$$c = 0.3\ M\ [Cl^-]\ before\ ppt$$

$$c = \frac{0.15}{0.6}$$
$$c = 0.25\ M\ [Ag^+]\ b/ppt$$

$$[Cl^-] = 0.3 - 0.25 = 0.05\ M\ after\ ppt$$

Find the ion concentration of Pb^{2+} in product.

$1.3\ L, 0.75\ M\ NaI, 0.75\ L, 2.4\ M Pb(NO_3)_2$

$$2NaI + Pb(NO_3)_2 \rightarrow 2Na(NO_3) + PbI_{2(s)}$$

$n = cV$
$n = 0.75 \times 1.3$
$n = 0.975\ mol\ NaI$
$n = 0.975\ mol\ I$

$[I^-] = 0\ M; a/ppt$

$n = cV$
$n = 2.4 \times 0.75$
$n = 1.8\ mol\ Pb(NO_3)_2$
$n = 1.8\ mol\ Pb$

$$mol\ Pb = 1.8 - 0.975 = 0.825$$

$$c = \frac{n}{V}$$
$$c = \frac{0.825}{2.05}$$
$$c = 0.4\ [Pb^{2+}] a/ppt$$

$$1.3 + 0.75 = 2.05L$$