



I	excess	.25 moles	.33 moles	0	0	0
Δ		-.33/2	-.33	+.33	+.33	+7/2 * .33
F		.085	0	+.33	.33	1.15

$$[\text{Al}^{3+}] = \frac{.33 \text{ mol Al}^{3+}}{500 \text{ mL} + \left(1.15 \text{ mol} \cdot \frac{18.02 \text{ g}}{\text{mol}} \cdot \frac{1 \text{ mL}}{\text{g}}\right)} = \frac{.33 \text{ mol Al}^{3+}}{520.7 \text{ mL}}$$

$$\text{Al}^{3+} = .6337 \rightarrow 0.63 \text{ M}$$

$$q = n \Delta H_{\text{rxn}}$$

$$q = \frac{.33 \text{ moles Cr}_2\text{O}_7^{2-}}{2} \cdot -1500 \text{ kJ/mol Cr}_2\text{O}_7^{2-}$$

$$q = -247.5 \text{ kJ heat released}$$

$$q_{\text{rxn}} = -q_{\text{cal}} \leftarrow \text{water of solution}$$

$$q_{\text{cal}} = m C_p \Delta T$$

$$247.5 \text{ kJ} = 520.7 \text{ mL} \cdot \cancel{\text{mL}} \cdot 1.00 \frac{\text{g}}{\text{mL}} \cdot 4.1 \text{ J/g} \cdot \Delta T$$
$$247500 \text{ J} =$$

$$115.9 \text{ }^\circ\text{C} = \Delta T$$

$$\Delta T = T_f - T_i = T_f - 4^\circ\text{C}$$

$$T_f = 119.9^\circ\text{C} \quad \text{more than boiling for pure water!}$$

$$\Delta T = i K_b m = (i m) K_b \quad \text{molality of ions} = \frac{\text{moles ions}}{\text{kg solvent}}$$
$$= \frac{(.085 \text{ mol Cr}_2\text{O}_7^{2-} + .33 \text{ mol Cr}^{3+} + .33 \text{ mol Al}^{3+}) \cdot 1.86 \text{ }^\circ\text{C/m}}{.5207 \text{ kg}}$$

$$\Delta T = 2.66 \text{ }^\circ\text{C} \quad T_B = 102.66^\circ\text{C} \quad \text{Yes! it Boils!}$$