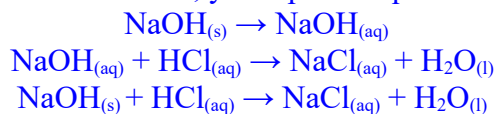
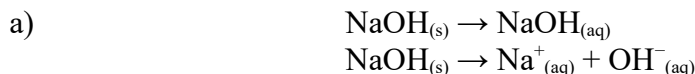


Problema 421: Calcula ΔH° de las reacciones, y comprueba que se cumple la Ley de Hess.



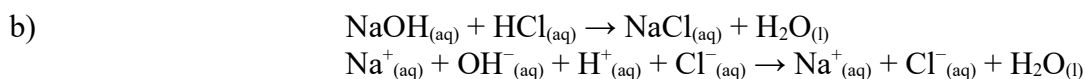
Sumando las dos primeras reacciones obtenemos la tercera, sumando los calores de las dos primeras debemos obtener el calor de la tercera según la ley de Hess.



$$\Delta H^\circ_R = \sum n_p \cdot \Delta H^\circ_{f \text{ prod}} - \sum n_r \cdot \Delta H^\circ_{f \text{ react}}$$

$$\Delta H^\circ_R = 1 \text{ mol} \cdot \Delta H^\circ_f [\text{Na}^+_{(aq)}] + 1 \text{ mol} \cdot \Delta H^\circ_f [\text{OH}^-_{(aq)}] - 1 \text{ mol} \cdot \Delta H^\circ_f [\text{NaOH}_{(s)}]$$

$$\Delta H^\circ_R = 1 \text{ mol} \cdot \left(-240,0 \frac{\text{kJ}}{\text{mol}}\right) + 1 \text{ mol} \cdot \left(-229,9 \frac{\text{kJ}}{\text{mol}}\right) - 1 \text{ mol} \cdot \left(-426,7 \frac{\text{kJ}}{\text{mol}}\right) = \underline{\underline{-43,2 \text{ kJ}}}$$

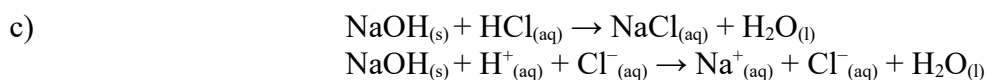


$$\Delta H^\circ_R = \sum n_p \cdot \Delta H^\circ_{f \text{ prod}} - \sum n_r \cdot \Delta H^\circ_{f \text{ react}}$$

$$\begin{aligned} \Delta H^\circ_R &= 1 \text{ mol} \cdot \Delta H^\circ_f [\text{Na}^+_{(aq)}] + 1 \text{ mol} \cdot \Delta H^\circ_f [\text{Cl}^-_{(aq)}] + 1 \text{ mol} \cdot \Delta H^\circ_f [\text{H}_2\text{O}_{(l)}] - \\ &- 1 \text{ mol} \cdot \Delta H^\circ_f [\text{Na}^+_{(aq)}] - 1 \text{ mol} \cdot \Delta H^\circ_f [\text{OH}^-_{(aq)}] - 1 \text{ mol} \cdot \Delta H^\circ_f [\text{H}^+_{(aq)}] - 1 \text{ mol} \cdot \Delta H^\circ_f [\text{Cl}^-_{(aq)}] \end{aligned}$$

$$\Delta H^\circ_R = 1 \text{ mol} \cdot \Delta H^\circ_f [\text{H}_2\text{O}_{(l)}] - 1 \text{ mol} \cdot \Delta H^\circ_f [\text{OH}^-_{(aq)}] - 1 \text{ mol} \cdot \Delta H^\circ_f [\text{H}^+_{(aq)}]$$

$$\Delta H^\circ_R = 1 \text{ mol} \cdot \left(-285,0 \frac{\text{kJ}}{\text{mol}}\right) - 1 \text{ mol} \cdot \left(-229,9 \frac{\text{kJ}}{\text{mol}}\right) - 1 \text{ mol} \cdot 0 \frac{\text{kJ}}{\text{mol}} = \underline{\underline{-55,1 \text{ kJ}}}$$



$$\Delta H^\circ_R = \sum n_p \cdot \Delta H^\circ_{f \text{ prod}} - \sum n_r \cdot \Delta H^\circ_{f \text{ react}}$$

$$\begin{aligned} \Delta H^\circ_R &= 1 \text{ mol} \cdot \Delta H^\circ_f [\text{Na}^+_{(aq)}] + 1 \text{ mol} \cdot \Delta H^\circ_f [\text{Cl}^-_{(aq)}] + 1 \text{ mol} \cdot \Delta H^\circ_f [\text{H}_2\text{O}_{(l)}] - \\ &- 1 \text{ mol} \cdot \Delta H^\circ_f [\text{NaOH}_{(s)}] - 1 \text{ mol} \cdot \Delta H^\circ_f [\text{H}^+_{(aq)}] - 1 \text{ mol} \cdot \Delta H^\circ_f [\text{Cl}^-_{(aq)}] \end{aligned}$$

$$\Delta H^\circ_R = 1 \text{ mol} \cdot \Delta H^\circ_f [\text{Na}^+_{(aq)}] + 1 \text{ mol} \cdot \Delta H^\circ_f [\text{H}_2\text{O}_{(l)}] - 1 \text{ mol} \cdot \Delta H^\circ_f [\text{NaOH}_{(s)}] - 1 \text{ mol} \cdot \Delta H^\circ_f [\text{H}^+_{(aq)}]$$

$$\Delta H^\circ_R = 1 \text{ mol} \cdot \left(-240,0 \frac{\text{kJ}}{\text{mol}}\right) + 1 \text{ mol} \cdot \left(-285,0 \frac{\text{kJ}}{\text{mol}}\right) - 1 \text{ mol} \cdot \left(-426,7 \frac{\text{kJ}}{\text{mol}}\right) - 1 \text{ mol} \cdot 0 \frac{\text{kJ}}{\text{mol}} = \underline{\underline{-98,3 \text{ kJ}}}$$

$$\Delta H^\circ_A + \Delta H^\circ_B = -43,2 \text{ kJ} - 55,1 \text{ kJ} = -98,3 \text{ kJ} = \Delta H^\circ_C$$