

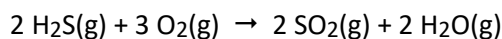
Bereken $\Delta_r H^\circ$ voor de volgende reacties uitgaande van de $\Delta_f H^\circ$ -waarden.

- $2 \text{H}_2\text{S}(\text{g}) + 3 \text{O}_2(\text{g}) \rightarrow 2 \text{SO}_2(\text{g}) + 2 \text{H}_2\text{O}(\text{g})$
- $\text{CH}_4(\text{g}) + 4 \text{Cl}_2(\text{g}) \rightarrow \text{CCl}_4(\text{vl}) + 4 \text{HCl}(\text{g})$
- $\text{SiO}_2(\text{v}) + 4 \text{HF}(\text{g}) \rightarrow \text{SiF}_4(\text{g}) + 2 \text{H}_2\text{O}(\text{g})$
- $\text{C}_2\text{H}_6(\text{g}) + 7/2 \text{O}_2(\text{g}) \rightarrow 2 \text{CO}_2(\text{g}) + 3 \text{H}_2\text{O}(\text{g})$

	$\Delta_f H^\circ$ (kJ/mol)		$\Delta_f H^\circ$ (kJ/mol)
$\text{H}_2\text{S}(\text{g})$	-20,2	$\text{CCl}_4(\text{vl})$	-139
$\text{SO}_2(\text{g})$	-296,8	$\text{HCl}(\text{g})$	-92,3
$\text{H}_2\text{O}(\text{g})$	-241,8	$\text{SiO}_2(\text{v})$	-910,9
$\text{CH}_4(\text{g})$	-74,9	$\text{HF}(\text{g})$	-273
$\text{SiF}_4(\text{g})$	-1614,9	$\text{C}_2\text{H}_6(\text{g})$	-84,7
$\text{CO}_2(\text{g})$	-393,5		

Oplossing

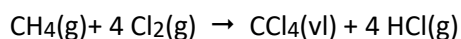
a



Pas de wet van Hess toe.

$$\begin{aligned} \Delta_r H^\circ &= 2 \cdot \Delta_f H^\circ_{\text{SO}_2(\text{g})} + 2 \cdot \Delta_f H^\circ_{\text{H}_2\text{O}(\text{g})} - 2 \cdot \Delta_f H^\circ_{\text{H}_2\text{S}(\text{g})} \\ &= 2 \cdot \left(-296,8 \frac{\text{kJ}}{\text{mol}} \right) + 2 \cdot \left(-241,8 \frac{\text{kJ}}{\text{mol}} \right) - 2 \cdot \left(-20,2 \frac{\text{kJ}}{\text{mol}} \right) \\ &= -1037 \frac{\text{kJ}}{\text{mol}} \end{aligned}$$

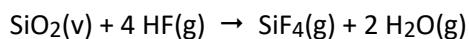
b



Pas de wet van Hess toe.

$$\begin{aligned} \Delta_r H^\circ &= \Delta_f H^\circ_{\text{CCl}_4(\text{vl})} + 4 \cdot \Delta_f H^\circ_{\text{HCl}(\text{g})} - \Delta_f H^\circ_{\text{CH}_4(\text{g})} \\ &= \left(-139 \frac{\text{kJ}}{\text{mol}} \right) + 4 \cdot \left(-92,3 \frac{\text{kJ}}{\text{mol}} \right) - \left(-74,9 \frac{\text{kJ}}{\text{mol}} \right) \\ &= -433 \frac{\text{kJ}}{\text{mol}} \end{aligned}$$

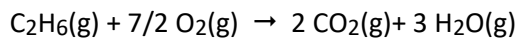
c



Pas de wet van Hess toe.

$$\begin{aligned} \Delta_r H^\circ &= \left(\Delta_f H^\circ_{\text{SiF}_4(\text{g})} + 2 \cdot \Delta_f H^\circ_{\text{H}_2\text{O}(\text{g})} \right) - \left(\Delta_f H^\circ_{\text{SiO}_2(\text{v})} + 4 \cdot \Delta_f H^\circ_{\text{HF}(\text{g})} \right) \\ &= \left[\left(-1614,9 \frac{\text{kJ}}{\text{mol}} \right) + 2 \cdot \left(-241,8 \frac{\text{kJ}}{\text{mol}} \right) \right] - \left[\left(-910,9 \frac{\text{kJ}}{\text{mol}} \right) + 4 \cdot \left(-273 \frac{\text{kJ}}{\text{mol}} \right) \right] \\ &= -95,6 \frac{\text{kJ}}{\text{mol}} \end{aligned}$$

d



Pas de wet van Hess toe.

$$\begin{aligned}\Delta_r H^\circ &= \left(2 \cdot \Delta_f H^\circ_{\text{CO}_2(\text{g})} + 3 \cdot \Delta_f H^\circ_{\text{H}_2\text{O}(\text{g})} \right) - \Delta_f H^\circ_{\text{C}_2\text{H}_6(\text{g})} \\ &= 2 \cdot \left(-393,5 \frac{\text{kJ}}{\text{mol}} \right) + 3 \cdot \left(-241,8 \frac{\text{kJ}}{\text{mol}} \right) - \left(-84,7 \frac{\text{kJ}}{\text{mol}} \right) \\ &= -1427,7 \frac{\text{kJ}}{\text{mol}}\end{aligned}$$