

Задача №1



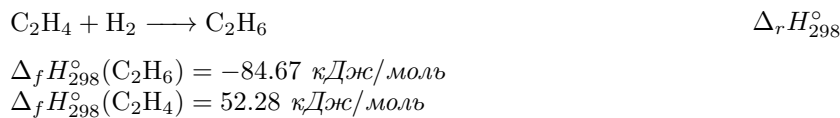
$$\begin{aligned}\Delta_r H_{298}^\circ &= \Delta_r H_1^\circ - \Delta_r H_2^\circ + 2\Delta_r H_4^\circ - \Delta_r H_3^\circ = -102.9 \text{ кДж/моль} \\ \Delta_r H_{298}^\circ &= \Delta_f H_{298}^\circ(\text{CH}_3\text{Cl}) + \Delta_f H_{298}^\circ(\text{HCl}) - \Delta_f H_{298}^\circ(\text{CH}_4) = -99.45 \text{ кДж/моль}\end{aligned}$$

Задача №2



$$\begin{aligned}\Delta_f H_{298}^\circ(\text{C}_2\text{H}_4) &= -\Delta_r H_1^\circ - \Delta_r H_2^\circ + 2\Delta_r H_3^\circ + 3\Delta_r H_4^\circ = -55.37 \text{ кДж/моль} \\ \Delta_c H_{298}^\circ(\text{C}_2\text{H}_4) &= \Delta_r H_1^\circ + \Delta_r H_2^\circ - \Delta_r H_4^\circ = -1411 \text{ кДж/моль}\end{aligned}$$

Задача №3



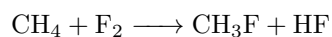
$$\Delta_r H_{298}^\circ = \Delta_f H_{298}^\circ(\text{C}_2\text{H}_6) - \Delta_f H_{298}^\circ(\text{C}_2\text{H}_4) = -136.95 \text{ кДж/моль}$$

$$\begin{aligned}\Delta_c H_{298}^\circ(\text{C}_2\text{H}_6) &= -1559.88 \text{ кДж/моль} \\ \Delta_c H_{298}^\circ(\text{C}_2\text{H}_4) &= -1410.97 \text{ кДж/моль} \\ \Delta_c H_{298}^\circ(\text{H}_2) &= -285.84 \text{ кДж/моль}\end{aligned}$$

$$\Delta_r H^\circ = \Delta_c H_{298}^\circ(\text{C}_2\text{H}_4) - \Delta_c H_{298}^\circ(\text{H}_2) + \Delta_c H_{298}^\circ(\text{C}_2\text{H}_6) = -136.93 \text{ кДж/моль}$$

1 Задача №4

Вещество	$C_p, 298$	$C_p, 400$	$\Delta_f H_{298}^\circ$	$\Delta_f H_{349}^\circ$
CH ₄	35.70	40.63	-74.85	-72.90
CH ₃ F	37.48	44.18	-246.9	-244.82
HF	29.14	29.15	-273.30	-271.81
F ₂	31.30	32.99	0	1.64



$$\Delta_r H_{349}^\circ$$

$$\Delta_f H_{349}^\circ = \Delta_f H_{298}^\circ + \int_{298}^{349} c_p(T) dT \approx \Delta_f H_{298}^\circ + (c_p^{349} + c_p^{298}) \cdot \frac{\Delta T}{2}$$

$$\Delta_r H_{349}^\circ = \Delta_f H_{349}^\circ(\text{CH}_3\text{F}) + \Delta_f H_{349}^\circ(\text{HF}) - \Delta_f H_{349}^\circ(\text{CH}_4) - \Delta_f H_{349}^\circ(\text{F}_2) = -445.37 \text{ кДж/моль}$$

2 Задача №5

$$\Delta_f H_T^\circ(\text{HCl}) = \Delta_f H_{298}^\circ + \int_{298}^T c_p(T') dT' = -92310 + 25.53 \cdot T' \Big|_{298}^T + 2.30 \cdot 10^{-3} \cdot (T')^2 \Big|_{298}^T - 1.09 \cdot 10^5 (T')^{-1} \Big|_{298}^T$$

$$\Delta_f H_T^\circ(\text{O}_2) = \Delta_f H_{298}^\circ + \int_{298}^T c_p(T') dT' = 37.03 \cdot T' \Big|_{298}^T + 0.33 \cdot 10^{-3} (T')^2 \Big|_{298}^T + 2.85 \cdot 10^5 (T')^{-1} \Big|_{298}^T$$

$$\Delta_f H_T^\circ(\text{Cl}_2) = \Delta_f H_{298}^\circ + \int_{298}^T c_p(T') dT' = 31.46 \cdot T' \Big|_{298}^T + 1.69 \cdot 10^{-3} (T')^2 \Big|_{298}^T + 3.77 \cdot 10^5 (T')^{-1} \Big|_{298}^T$$

$$\Delta_f H_T^\circ(\text{H}_2\text{O}) = \Delta_f H_{298}^\circ + \int_{298}^T c_p(T') dT' = -241810 + 30.00 \cdot T' \Big|_{298}^T + 5.35 \cdot 10^{-3} (T')^2 \Big|_{298}^T - 0.33 \cdot 10^5 (T')^{-1} \Big|_{298}^T$$

$$\Delta_r H_T^\circ = -114.38 +$$