

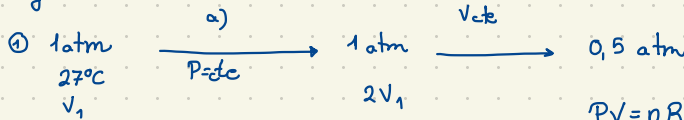
$$Q_1 = m L_{VAP} = 18 \cdot 10^{-3} \cdot 2,2 \cdot 10^6 = 39600 \text{ J}$$

$$Q_2 = m c_e \Delta T = 18 \cdot 10^{-3} \cdot 1850 (200 - 100) = 3330 \text{ J}$$

$$Q = 42930 \text{ J}$$

P. 169 E. 3

Gas: 7g N₂



	①	②	③
P	1 atm	1 atm	0,5 atm
V	6,15 L	12,3 L	12,3 L
T	300,15 K	600,3 K	300 K

$$PV = nRT$$

$$1 \cdot V = \frac{7}{28} \cdot 0,082 \cdot 300,15 = 6,15 \text{ L}$$

$$1 \cdot 12,3 = \frac{7}{28} \cdot 0,082 \cdot T_2$$

$$0,5 \cdot 12,3 = \frac{7}{28} \cdot 0,082 \cdot T_3$$

$$W_{1 \rightarrow 2} = -P(V_2 - V_1) = -1 \cdot (12,3 - 6,15) = -6,15 \text{ atm} \cdot \text{L} = -622,99 \text{ J}$$

$$W_{2 \rightarrow 3} = 0$$

$$W_T = -623 \text{ J} \quad (\text{LO REALIZA EL STA})$$

②

	①	②	③
P	1 atm	0,5 atm	0,5 atm
V	6,15 L	6,15 L	12,3 L
T	300,15 K		

$$W_{1 \rightarrow 2} = 0$$

$$W_{2 \rightarrow 3} = -0,5 (12,3 - 6,15) = -3,075 \text{ atm} \cdot \text{L} = -311,5 \text{ J}$$

LEY BOYLE-MARIOTTE

$$P_1 V_1 = P_2 V_2$$

INVERSA PROPORTIONAL

③

$$W = -nRT \ln \frac{V_2}{V_1}$$

$$= -\frac{7}{28} \cdot 8,31 \cdot 300,15 \ln \frac{12,3}{6,15} = -432,2 \text{ J}$$

P 171 Ej 5



1 mol C_4H_{10} $\Delta H = -2878 \text{ kJ/mol}$

→ INTERVIENEN GASES $Q_p = Q_v + (\Delta n)RT$

$$\Delta n = 4 - 15/2 = -7/2$$

$$-2878 = Q - 7/2 \cdot 8,31 \cdot (298)$$

$$Q = -2869332 \frac{\text{J}}{\text{mol}} = -2869 \text{ kJ/mol}$$

P 171 Ej 6



$$\Delta H = Q_p \quad Q_p = Q_v + \Delta n RT$$

$$Q_p = -2559000 + (12 - 6) 8,31 \cdot 298 = -2544 \frac{\text{J}}{\text{mol}} = -2544 \frac{\text{kJ}}{\text{mol}}$$

SE DESPRENDEN
⊖

P 173 Act 7

$$Q_{\text{abs}}^{\text{calorimetro}} = m \cdot c_e \Delta T = 25 \cdot 10^3 \cdot 4180 \cdot 4 = 418 \text{ J}$$

$$Q_{\text{abs}}^{\text{disol}} = m_d \cdot c_e \Delta T = 102 \cdot 10^3 \cdot 4180 \cdot 4 = 1705,44 \text{ J}$$

$$\downarrow$$

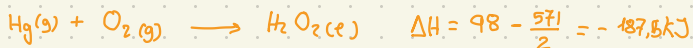
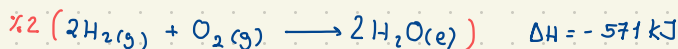
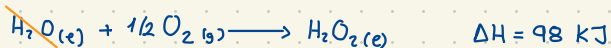
2 + 100

$$Q_{\text{desprendido}} = 2123,44 \text{ J}$$

$$\Delta H = \frac{-2123,44}{\frac{2}{40}} = -4246,8 \text{ J} = -42,5 \frac{\text{kJ}}{\text{mol}}$$

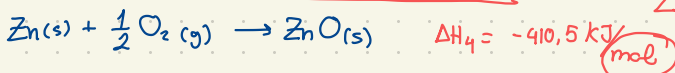
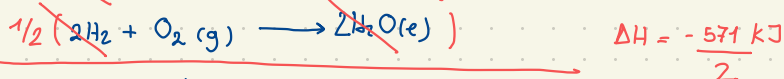
SON DESPRENDIDOS
↙

P175. EJ 9



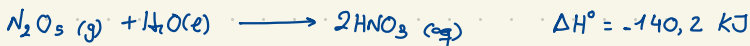
P175

E 10.



Podemos añadir mol
ya que el por mol
de óxido de Zn producido

P177 EJ 11



$$\Delta H_c^\circ = 2\Delta H_{f,\text{HNO}_3}^\circ - (\Delta H_{f,\text{N}_2\text{O}_5}^\circ + \Delta H_{f,\text{H}_2\text{O}}^\circ) = 2(-207,4) - (11,3 - 285,8) = -140,3 \text{ kJ}$$

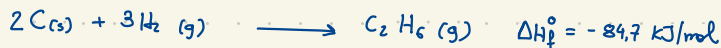
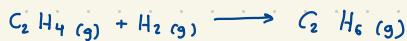
P177 EJ 12



$$100 \text{ kg} \Rightarrow 100\,000 \text{ g} \Rightarrow 2277,72 \text{ mol} \Rightarrow -5043636,4 \text{ kJ}$$

$$\Rightarrow 1724,1 \text{ mol} \Rightarrow -4961579,5 \text{ kJ}$$

P179 Ej 13



$$\Delta H_{\text{H}_2}^\circ = \Delta H_{\text{C}}^\circ = -137 \text{ kJ/mol}$$

P.187

(18) a) aumenta n° mol gas $\Rightarrow$ aumenta desorden $\Delta S > 0$

b) aumenta orden $\Rightarrow$ menos mol gas $\Delta S < 0$

c) Aumenta orden $\Rightarrow \Delta S < 0$

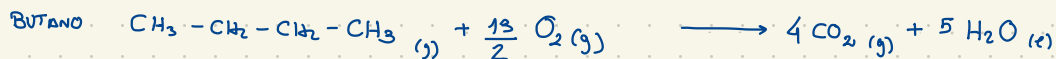
d) Se forma una molécula más grande $\Rightarrow$ AUMENTA ORDEN

(19)

$$\begin{aligned} \text{a) } \Delta S_{\text{reacción}} &= \sum \Delta S_p^\circ - \sum \Delta S_R^\circ = 2S_{\text{HNO}_3(\text{aq})}^\circ - (S_{\text{N}_2\text{O}_5(\text{g})}^\circ - S_{\text{H}_2\text{O}(\text{e})}^\circ) \\ &= 2 \cdot 146,4 - (209,2 + 69,9) = 13,7 \text{ J/K} \end{aligned}$$

$$\text{b) } \Delta S_{\text{reacc}}^\circ = S_{\text{C}_4\text{H}_6(\text{g})}^\circ - (S_{\text{C}_4\text{H}_4(\text{g})}^\circ + S_{\text{H}_2(\text{g})}^\circ) = 289,6 - (219,5 + 130,7) = -120,6 \text{ J/K}$$

P195 Ej 25



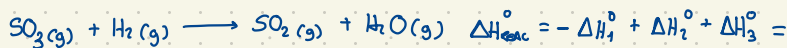
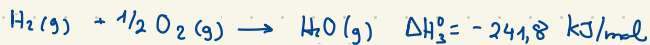
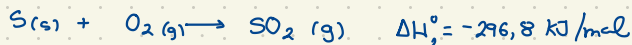
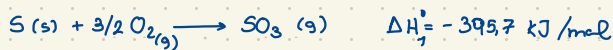
$$\begin{aligned} \Delta H_{\text{reacc}} &= \sum \Delta H_{\text{rotos}} - \sum \Delta H_{\text{formados}} \\ &= 10(412) + 3(348) + \frac{13}{2} \cdot 496 - \left(4 \cdot 2 \cdot 743 + 5 \cdot 2 \cdot 463 \right) = -2186 \frac{\text{kJ}}{\text{mol}} \end{aligned}$$

Se usan valores de energía promedio

TAMBIÉN SE FORMA CARBÓN EN POLVO (y no se tiene en cuenta)



ENTALPIAS FORMACIÓN



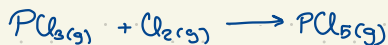
$= -142,9 \text{ kJ/mol}$

$\Rightarrow \text{PARA 1 mol} -142,9 \text{ kJ} \Rightarrow -142900 \text{ J}$

$\Delta S_R^\circ = \sum S_R^\circ - \sum S_P^\circ = 248,8 + 188,8 - (256,8 + 130,7) = 49,5 \text{ J/K}$

$\Delta G^\circ = \Delta H^\circ - T \Delta S^\circ = -142900 - (298)(49,5) = -157651 \text{ J} = -157,651 \text{ kJ}$

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a) $\Delta G = \Delta H - T \Delta S \Rightarrow \Delta S = \frac{\Delta H - \Delta G}{T} = \frac{-87900 - (-37,2)}{298} = -170 \text{ J/K}$

$\Delta G = \Delta H - T \Delta S$

$0 = \Delta H - T \Delta S \quad -87900 - T(-170) = 0$

$T = 517 \text{ K} = 244^\circ\text{C}$

b)

A Temperatura menor 244°C (NO ESPONTANEA AL CONTRARIO)

P197 EJ 44 $\Delta H_R^\circ = \sum \Delta H_{fP}^\circ - \sum \Delta H_{FR}^\circ$

a) $\Delta H_R^\circ = \Delta H_{fC_6H_{12}O_6}^\circ + \Delta H_{fO_2}^\circ - (6 \Delta H_{fCO_2}^\circ - 6 \Delta H_{fH_2O}^\circ)$
 $= -1274,4 - (6(-393,5) - 6 \cdot (-285,9)) = +2802 \text{ kJ}$

$\Delta S_R^\circ = \sum S_P^\circ - \sum S_R^\circ = S_{C_6H_{12}O_6}^\circ + S_{O_2}^\circ - (6 S_{CO_2}^\circ + 6 S_{H_2O}^\circ)$
 $= 212,0 + 205,1 - (6 \cdot 213,7 + 6 \cdot 69,9) = -259,6 \text{ J/K}$

$\Delta G^\circ = \Delta H^\circ - T \Delta S^\circ = 2802000 - 298(-259,6) = 2879360,8 \text{ J}$
 $+ \underbrace{\quad}_{-} \Rightarrow \text{PROCESO NO ESPONTANEO}$
 $\Delta G > 0$

b) $25 \text{ g } C_6H_{12}O_6 \cdot \frac{1 \text{ mol}}{(6 \cdot 12 + 12 + 6 \cdot 16)} = 0,14 \text{ mol GLUCOSA} \cdot \frac{-2802 \text{ kJ}}{1 \text{ mol}} = -389,17 \text{ kJ}$
 LIBERA



$\Delta G^\circ = \underbrace{\Delta H^\circ}_{(-)} - T \underbrace{\Delta S^\circ}_{(+)} = (-) \text{ ESPONTANEO}$
 $\oplus \rightarrow \text{AUMENTA DESORDEN}$