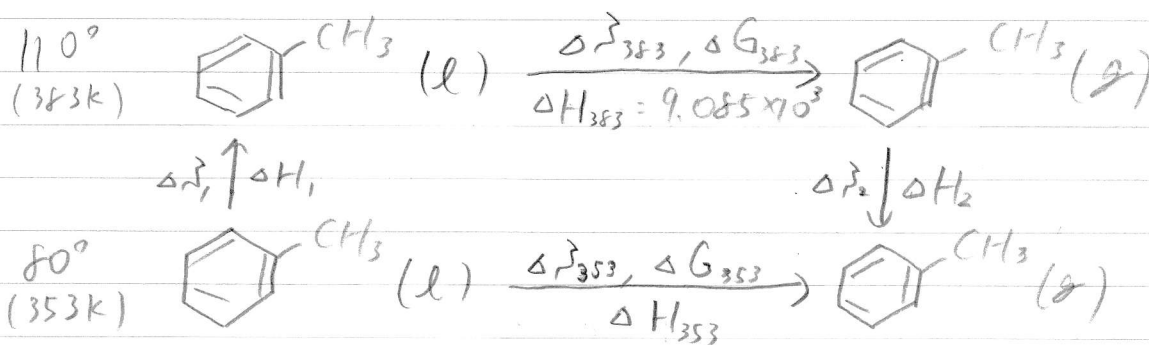


参 類題 11M 参



上図のように文字をかき

(i) 80° における蒸発熱 (ΔH_{353})

定圧過程なので

$$\Delta H_1 = C_{p,m}^l \Delta T = 43.3 \times (383 - 353) = 1299$$

$$\Delta H_2 = C_{p,m}^g \Delta T = 31.3 \times (353 - 383) = -939$$

Kirchhoff の法則より

$$\Delta H_{353} = \Delta H_1 + \Delta H_{383} + \Delta H_2 = 9445 [\text{cal} \cdot \text{mol}^{-1}] \dots (\text{答}) //$$

(ii) エントロピー変化 ($\Delta \tilde{f}_{353}$)

$$\Delta \tilde{f}_1 = \int_{353}^{383} \frac{C_{p,m}^l}{T} dT = C_{p,m}^l \ln \frac{383}{353}$$

$$\Delta \tilde{f}_2 = \int_{383}^{353} \frac{C_{p,m}^g}{T} dT = -C_{p,m}^g \ln \frac{383}{353}$$

ここで $H = U + PV$, 定圧過程より

$$dH = dU + P dV$$

これを $d'Q = dU + P dV$ に代入して

$$d'Q = (dH - P dV) + P dV = dH$$

$$\therefore \Delta Q = \Delta H$$

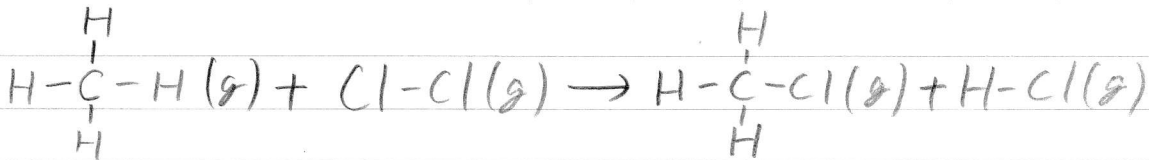
$$\Delta \tilde{f}_{383} = \frac{\Delta Q_{383}}{T} = \frac{\Delta H_{383}}{T} = \frac{9085}{383}$$

Kirchhoff の法則

$$\begin{aligned} \Delta \tilde{f}_{353} &= \Delta \tilde{f}_1 + \Delta \tilde{f}_{383} + \Delta \tilde{f}_2 \\ &= (43.3 - 31.3)(\log 383 - \log 353) + \frac{9085}{383} \\ &= 24.699 \dots \end{aligned}$$

$$24.7 [\text{cal} \cdot \text{K}^{-1} \cdot \text{mol}^{-1}] \dots (\text{答}) //$$

計算 類題; 10M 伍



(i) Gibbs の自由エネルギー変化 (ΔG)

$$G = H - T\Delta S \text{ より}$$

等温過程下で

$$\Delta G = \Delta H - T\Delta S \dots (*)$$

ここで

$$\Delta H = 3E(\text{C-H}) + E(\text{C-Cl}) + E(\text{H-Cl}) - 4E(\text{C-H}) - E(\text{Cl-Cl})$$

$$= E(\text{C-Cl}) + E(\text{H-Cl}) - E(\text{C-H}) - E(\text{Cl-Cl})$$

$$= 330.82 + 431.6 - 415.86 - 242.60$$

$$= -103.96 \text{ (kJ} \cdot \text{mol}^{-1})$$

$$= -103.96 \times 10^3 \text{ (J} \cdot \text{mol}^{-1})$$

$$T\Delta S = (273+25)(234.3 + 186.8 - 186.1 - 223)$$

$$= 3576 \text{ (J} \cdot \text{mol}^{-1})$$

以上の値を(*)に代入して

$$\Delta G = -103.96 \times 10^3 - 3576$$

$$= -107.536 \times 10^3 \text{ (J} \cdot \text{mol}^{-1})$$

$$= -107.5 \times 10^3 \text{ (J} \cdot \text{mol}^{-1}) \dots (\text{答})$$

(ii) $\ln K$ の値

$$\Delta G = -RT \ln K \text{ に値を代入して}$$

$$\ln K = - \frac{-107.536 \times 10^3}{8.314 \times (273+25)}$$

$$= 43.4013 \dots$$

$$= 43.4 \dots (\text{答})$$