

参 其1式

(iii) Gibbs の自由エネルギー (ΔG_{353})

等温過程より

$$\begin{aligned}\Delta G_{353} &= \Delta H_{353} - T \Delta S_{353} \\ &= 921.562 \dots\end{aligned}$$

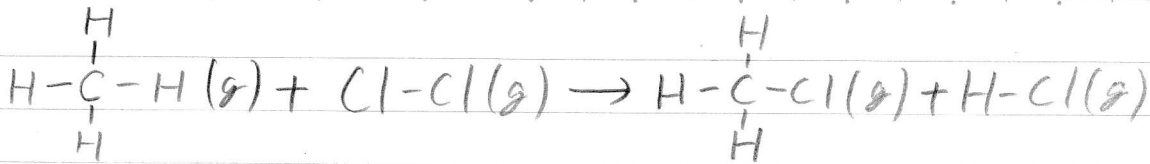
$$9.21 \times 10^2 [\text{cal} \cdot \text{mol}^{-1}] \dots (\text{答}) //$$

(iv) 変化の可否

$\Delta G_{353} > 0$ となるので

この変化は 不可能

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(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

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

よって

$$\begin{aligned} -\Delta H &= 3E(\text{C}-\text{H}) + E(\text{C}-\text{Cl}) + E(\text{H}-\text{Cl}) - 4E(\text{C}-\text{H}) - E(\text{Cl}-\text{Cl}) \\ &= E(\text{C}-\text{Cl}) + E(\text{H}-\text{Cl}) - E(\text{C}-\text{H}) - E(\text{Cl}-\text{Cl}) \\ &= 330.82 + 431.6 - 415.86 - 242.60 \\ &= 103.96 \text{ (kJ)} \\ &= 103.96 \times 10^3 \text{ (J)} \end{aligned}$$

$$\begin{aligned} T\Delta S &= (273+25)(234.3 + 186.8 - 186.1 - 223) \\ &= 3576 \text{ (J)} \end{aligned}$$

以上の値を(*)に代入して

$$\begin{aligned} \Delta G &= -103.96 \times 10^3 - 3576 \\ &= -107.536 \times 10^3 \end{aligned}$$

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

(ii) $\ln K$ の値

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

$$\begin{aligned} \ln K &= - \frac{-107.536 \times 10^3}{8.314 \times (273+25)} \\ &= 43.4037 \dots \end{aligned}$$

$$\underline{43.4 \dots (\text{答})}$$