

10M-一般化学Ⅱ解答

Date

No.

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$$\begin{cases} \Delta S = S_{298}(\text{H}_2\text{O}(\text{l})) - S_{298}(\text{H}_2(\text{g})) - \frac{1}{2} S_{298}(\text{O}_2(\text{g})) \\ \quad = -163.2 (\text{J} \cdot \text{K}^{-1}) \\ \Delta H = -285.8 (\text{kJ}) \end{cases}$$

等温過程下で

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

であるから上記の値を代入して

$$\Delta G = -285.8 \times 10^3 + 298 \times 163.2$$

$$= -2.371664 \times 10^5$$

$$= -2.372 \times 10^5 (\text{J}) \dots (\text{答}) //$$

$$12) A = G - pV = G - nRT (\because \text{ideal gas, 状態方程式 } pV = nRT)$$

であるので

等温過程下で

$$\Delta A = \Delta G - RT \Delta n$$

$$= -2.371664 \times 10^5 + 8.314 \times 298 \times \frac{1}{2}$$

$$= -2.35927614 \times 10^5$$

$$= -2.359 \times 10^5 (\text{J}) \dots (\text{答}) //$$

式 其 / 卷

$$H = U + PV = U + nRT \quad (\because \text{ideal gas, 状態方程式 } PV = nRT)$$

等温過程下で

$$dH = dU + nRdT = 0$$

$$\therefore \Delta H = \int dH = 0$$

(i) 系内

$$\Delta \dot{S}_{\text{内}} = \int \frac{d'Q}{T} = \int \frac{dH - TdP}{T}$$

$$= -nR \int \frac{dP}{P} \quad (dH = 0, PV = nRT)$$

$$= -1 \times 8.314 \times \ln \frac{1}{100}$$

$$= 38.28 \dots$$

$$\underline{38.3 \text{ (J} \cdot \text{K}^{-1}) \dots (\text{答})}$$

等温過程下で

$$\Delta G_{\text{内}} = \Delta H - T\Delta \dot{S}$$

$$= 0 - 300 \times 38.28 \dots$$

$$= -11486.21 \dots$$

$$\underline{-1.15 \times 10^4 \text{ (J)} \dots (\text{答})}$$

$$\Delta A_{\text{内}} = \Delta G_{\text{内}} = -11486.21 \dots$$

$$\underline{-1.15 \times 10^4 \text{ (J)} \dots (\text{答})}$$

(ii) 系外, 系内 + 系外

(a) 等温過程下で

$$\Delta \dot{S}_{\text{外}} = \frac{d'Q}{T} = \frac{-11.5 \times 10^3}{300}$$

$$= -38.33 \dots$$

$$\underline{-38.3 \text{ (J} \cdot \text{K}^{-1}) \dots (\text{答})}$$

$$\Delta G_{\text{外}} = -T\Delta \dot{S}_{\text{外}} = 1.15 \times 10^4 \text{ (J)} \dots (\text{答})$$

$$\Delta A_{\text{外}} = \Delta G_{\text{外}} = 1.15 \times 10^4 \text{ (J)} \dots (\text{答})$$

$$\Delta \dot{S}_{\text{全}} = \Delta \dot{S}_{\text{内}} + \Delta \dot{S}_{\text{外}} = -0.04594 \dots \approx 0 \text{ より } \underline{\text{可逆}} \dots (\text{答})$$

$$\Delta G_{\text{全}} = -T\Delta \dot{S}_{\text{全}} \approx 0 \text{ (J)} \dots (\text{答})$$

$$\Delta A_{\text{全}} = \Delta G_{\text{全}} \approx 0 \text{ (J)} \dots (\text{答})$$

式 其ノ式

(b) (a)と同様に考えると

$$\Delta \dot{S}_{\text{外}} = \frac{d'Q}{T} = \frac{-7.32 \times 10^3}{300}$$

$$= -24.4 \text{ (J} \cdot \text{K}^{-1}) \dots (\text{答}) //$$

$$\Delta G_{\text{外}} = -T \Delta \dot{S}_{\text{外}} = 7.32 \times 10^3 \text{ (J)} \dots (\text{答}) //$$

$$\Delta A_{\text{外}} = \Delta G_{\text{外}} = 7.32 \times 10^3 \text{ (J)} \dots (\text{答}) //$$

$$\Delta \dot{S}_{\text{全}} = \Delta \dot{S}_{\text{内}} + \Delta \dot{S}_{\text{外}} = 13.88 \dots > 0 \text{ より } \underline{\text{不可逆}} \dots (\text{答}) //$$

$$\Delta G_{\text{全}} = -T \Delta \dot{S}_{\text{全}} = -4166.21 \dots$$

$$\underline{-4.17 \times 10^3 \text{ (J)} \dots (\text{答}) //$$

$$\Delta A_{\text{全}} = \Delta G_{\text{全}} = -4166.21 \dots$$

$$\underline{-4.17 \times 10^3 \text{ (J)} \dots (\text{答}) //$$

$$(c) \Delta \dot{S}_{\text{外}} = 0 \dots (\text{答}) //$$

$$\Delta G_{\text{外}} = 0, \Delta A_{\text{外}} = 0 \dots (\text{答}) //$$

$$\Delta \dot{S}_{\text{全}} = \Delta \dot{S}_{\text{内}} + \Delta \dot{S}_{\text{外}} = 38.28 \dots > 0 \text{ より } \underline{\text{不可逆}} \dots (\text{答}) //$$

$$\Delta G_{\text{全}} = -T \Delta \dot{S}_{\text{全}} = -11486.21 \dots \underline{-1.15 \times 10^4 \text{ (J)} \dots (\text{答}) //$$

$$\Delta A_{\text{全}} = \Delta G_{\text{全}} = -11486.21 \dots \underline{-1.15 \times 10^4 \text{ (J)} \dots (\text{答}) //$$