Example Answers

International Master's Programs of Chemical Engineering in the Graduate School of Engineering, Kyushu University (Academic Year from April, 2026)

科　目／Subject：反応工学／Chemical Reaction Engineering（1 枚/ 1 sheet）

(1.1) $\dfrac{k_1 k_2 [\mathrm{Fe^{2+}}]^2 [\mathrm{Tl^{3+}}]}{k_{-1}[\mathrm{Fe^{3+}}] + k_2 [\mathrm{Fe^{2+}}]}$

(1.2) $\dfrac{k_1 k_2 [\mathrm{Fe^{2+}}]^2 [\mathrm{Tl^{3+}}]}{k_{-1}[\mathrm{Fe^{3+}}]}$

(2.1) 0.6

(2.2) 0.5 よりも小さくなる.

理由： リサイクル比が大きいほど，反応器の特性は PFR から CSTR に近づく．一次反応においては CSTR の性能は PFR の性能よりも低い．したがって，リサイクル比を 2 から 10 にあげると，反応率は低下する.

x_{A} becomes smaller than 0.5.

Reason: As the recycle ratio increases, the overall behavior of the reactor shifts from that of a plug-flow reactor (PFR) toward that of a continuous stirred-tank reactor (CSTR). For a first-order reaction, a CSTR gives a lower conversion than a PFR under the same conditions. Therefore, increasing the recycle ratio from 2 to 10 decreases the conversion of A.