

平成 30 年度 反応の化学b 期末試験問題

以下の問に答えよ。問題文は英語でも、解答の文章は日本語で良い。
数値は 3 桁まで求めよ。

問 1. Calculating Density

A man receives a platinum ring from his fiancée. Before the wedding, he notices that the ring feels a little light for its size and decides to measure its density. He places the ring on a balance and finds that it has a mass of 4.99 gram. He then finds that the ring displaces 0.233 cm³ of water. Is the ring made of platinum?

白金の密度は 21.4 g/cm³ である。

注) density ; 密度, fiancée ; フィアンセ ♥, platinum ; 白金, balance ; 天秤

問 2.

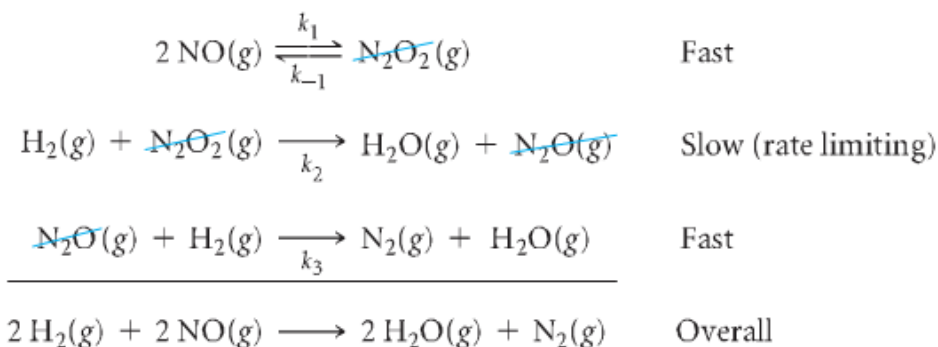
The reaction between hydrogen and nitric oxide is given by the following equation:



The experimentally observed rate law for the reaction is as follows:

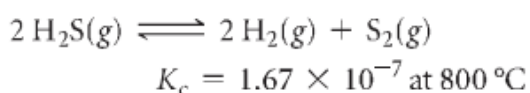
$$\text{Rate} = k[\text{H}_2][\text{NO}]^2$$

Show the following mechanism is consistent with the experimentally observed rate law.



問 3. Finding
Equilibrium Concentrations
from Initial Concentrations in
Cases with a Small
Equilibrium Constant

Consider the following reaction for the decomposition of hydrogen disulfide:

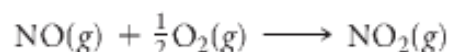


The reaction was carried out at 800 °C with the following initial concentrations: $[\text{H}_2\text{S}] = 0.100 \text{ M}$, $[\text{H}_2] = 0.100 \text{ M}$, and $[\text{S}_2] = 0.00 \text{ M}$. Find the equilibrium concentration of $[\text{S}_2]$.

注) decomposition ; 分解, sulfide ; 硫化物

問 4.

Consider the oxidation of NO to NO_2 :



Compute $\Delta G_{\text{rxn}}^\circ$ at 25 °C and determine whether the reaction is spontaneous.

Reactant or product	ΔH_f° (kJ/mol)	S° (J/mol·K)
NO	91.3	210.8
O ₂	0	205.2
NO ₂	33.2	240.1