

本試題是否可以使用計算機：可使用，不可使用（請命題老師勾選）

考試日期：0301，節次：1

1. Calculate the order of reaction for decomposition of CH_3CHO from the following experimental data. (20%)

Rate (torr/min)	2.30	4.31	6.74	8.53
Conversion	0.5	0.3	0.1	0

2. Define the efficiency (ϵ) of the reversible Carnot cycle and calculate ϵ for the hot reservoir at $T_{\text{hot}} = 800 \text{ K}$ undergoing to an adiabatic expansion until the temperature falls to $T_{\text{cold}} = 400 \text{ K}$ and the amount of heat that is extracted from the hot reservoir to do 1000 J of work in the surroundings. (30%)
3. Calculate the dissociation degree of $\text{CO}_2(\text{g})$ into $\text{CO}(\text{g})$ and $\text{O}_2(\text{g})$ at 1000 K. (20%)
4. A syngas (CO (35%), H_2 (45%), O_2 (5%), H_2O (5%), N_2 (5%) and CO_2 (5%)) is burned with 5% excess air (20% O_2 and 80% N_2) at 320 K. Calculate (a) the exit temperature (20%) and (b) the off gas composition (10%).

	ΔH° (kJ/mol)	ΔG° (kJ/mol)	d (J/Kmol)	e (J/K ² mol)	f (JK/mol)
O_2	0	0	30	4.2×10^{-3}	-1.7×10^5
CO	-110.5	-137.2	28	4.1×10^{-3}	-4.6×10^4
N_2	0	0	28	3.8×10^{-3}	-5.0×10^4
$\text{H}_2\text{O}(\text{g})$	-241.8	-228.6	31	10.3×10^{-3}	0
CO_2	-393.5	-394.4	44	8.8×10^{-3}	-8.6×10^5
H_2	0	0	27	3.3×10^{-3}	5.0×10^4

$$C_p = d + eT + fT^{-2}$$