

淡江大學九十三年學年度轉學生招生考試試題 (44-1)

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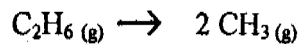
系別：化學工程與材料工程學系三年級 科目：物理化學

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○	簡單型計算機

節次： 7 月 14 日 第 3 節
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25% 1. A molecule has a ground state and two excited electronic energy levels, all of which are nondegenerate: $\epsilon_0 = 0$, $\epsilon_1 = 1 \times 10^{-20}$ J, and $\epsilon_2 = 3 \times 10^{-20}$ J. What fraction of each level is occupied at 298 K and 1000 K?

25% 2. The forward rate constant for the elementary reaction



is 0.00157 s^{-1} at 1000 K. What is the rate constant for the backward reaction at this temperature?

For $\text{CH}_3(\text{g})$ and $\text{C}_2\text{H}_6(\text{g})$ the standard Gibbs free energies of formation are 159.74 kJ/mol and 109.55 kJ/mol, respectively, at 1000 K.

25% 3. An ideal gas expands isothermally at 27°C into an evacuated vessel so that the pressure drops from 10 to 1 bar. Calculate the change in thermodynamic quantities q , w , ΔH , ΔS and ΔG for one mole of the gas. Note the process described is an irreversible one.

25% 4. A gas follows the equation of state $P(V-b) = RT$, where V is the molar volume. P , V , R , T and b are in SI units. Given that $b = 0.039 \text{ dm}^3/\text{mol}$, estimate the fugacity of the gas at 298 K and 50 bar.