

國立臺灣科技大學
八十九學年度博士班招生考試試題

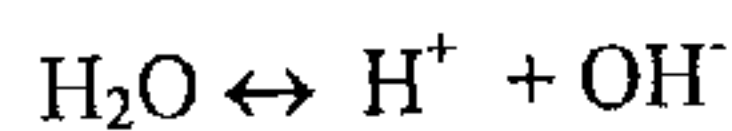
系所組別：化學工程系乙組
科目：物理化學

解釋名詞 (50%)

1. Chemical potential (10%)
2. Physical meanings of the a and b in the van der Waals equation of state (10%)
3. Nernst equation (10%)
4. Raoult's law (10%)
5. Arrhenius equation (10%)

計算與證明

1. (25%) Harned and Owen (1958) have studied the temperature dependence of the ion product of water (K_w). Given their results below, please determine ΔH° for the reaction:



Temperature (°C)	$K_w \times 10^{14}$
0	0.12
5	0.18
10	0.29
15	0.45
20	0.68
25	1.01
30	1.47
50	5.48

Given the following values for ΔG°_f (at 25 °C) of H_2O (-56.69 kcal/mol), of H^+ (0) and of OH^- (-37.59 kcal/mol), please compute ΔG° and ΔS° for the reaction.

2. (25%) Pollution prevention is acknowledged as the first priority consideration for chemical process engineers. In the waste minimization work, how to increase or maximize the selectivity (S), that is the reaction rate ratio of desired product to the undesired by-product, is critical. Advantages include savings in costs of raw materials, of separation and purification, and of waste treatment and disposal, plus less risk of social and judicial liability. As a trained chemical engineer, what reaction scheme, reactor type, and reaction conditions would you use to maximize the selectivity (S) for the following reactions, let M be the desired product and N the undesired by-product:

