

## 淡江大學九十三年學年度碩士班招生考試試題

系別：化學工程與材料工程學系

科目：物理化學

准帶項目請打「○」否則打「×」
簡單型計算機
✓

本試題共 4 頁

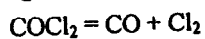
25 分 1. One gram of liquid water at 100 °C is initially at 1 atm pressure and is confined to a volume in which no vapor is present. A valve is then opened and the water evaporates into an evacuated space of such volume that the final pressure is 0.1 atm. The entire apparatus is in a heat reservoir at 100 °C.  $\Delta H$  for the vaporization of  $H_2O(l)$  is 540 cal/g at 100 °C. Assume that the vapor is an ideal gas and that the volume of the liquid is negligible as compared to the volume of the vapor. Find  $q$  and  $\Delta S$  for

- (a) the water, (10 分)  
 (b) the reservoir, and (5 分)  
 (c) the universe. (5 分)  
 (d) Is this a reversible process? (5 分)

25 分 2. At a temperature of 300 K it takes 12.6 min for a certain reaction to be 20% complete, and at 340 K the same reaction takes 3.2 min to be 20% complete. Calculate the activation energy  $E_a$  for the reaction. State clearly all the assumptions you made.

25 分 3. The partial molar volume of  $K_2SO_4$  in water solution at 298 K is given by  $\bar{V}_{K_2SO_4} (\text{cm}^3) = 32.280 + 18.216 m^{0.5} + 0.0222 m$  Where  $m$  is the molality. Obtain an equation for the partial molar volume of  $H_2O$ . The molar volume for water is 17.963  $\text{cm}^3/\text{mole}$ .

25 分 4. The following data are available for the reaction



which involves gases (assumed ideal)

T (K)	635.7	670.4	686.0
$K_p$ (atm)	0.01950	0.05467	0.0840

Calculate  $\Delta H^\circ$ ,  $\Delta S^\circ$ ,  $K_p$  and  $\Delta G^\circ$  for the reaction at 298 K.