

國立臺北科技大學九十八學年度碩士班招生考試

系所組別：3721 有機高分子研究所乙組

第二節 熱力學 (選考) 試題

第一頁 共一頁

注意事項：

1. 本試題共 4 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (30%) The thermodynamic treatment of the rubber deformation is based on the following equation;

$$dU = TdS - dW$$

$$dW = PdV - f dL \text{ (where } L \text{ is the length of the rubber)}$$

$$\text{Prove } (df/dT)_{p,L} = [f - (dH/dL)_{T,P}] / T$$

T=temperature

P=pressure

S=entropy

f= the tension force within the rubber

2. (40%) Air is to be compressed reversibly from an initial condition

of 1 atm and 60 (^oF) to a final state of 5 atm and 60 (^oF) by three different processes:

- (a) heating at constant volume followed by cooling at constant pressure.
- (b) isothermal compression.
- (c) Adiabatic compression followed by cooling at constant Volume

Air may be considered as ideal gas with $C_v=5$ and $C_p=7$ (Btu)/(lb mol)(^oF)

, The initial volume=379 ft³. The final volume=75.8 ft³ (每小題 10 分)

Calculate (1) the work required

- (2) The heat transferred,
 - (3) The change in the internal energy of the gas
 - (4) The change in the enthalpy of the gas
- For the three processes.

3. (15%) Prove the following equation;

(1) k is the Joule-Thomson coefficient,

$$\text{show } (dH/dP)_T = -(dH/dT)_P (dT/dP)_H = -C_p k \quad (7\%)$$

$$(2) (dV/dT)_P = -(dS/dP)_T \quad (8\%)$$

4. (15%) Explain the following questions; (每小題 5 分)

- (1). Partial molar quantity
- (2). Fugacity and activity
- (3). Gibbs-Duhem equation