

115MM01

# 國立臺北科技大學 115 學年度碩士班招生考試

系所組別：3300 材料科學與工程研究所

## 第一節 普通熱力學 試題

第 1 頁 共 1 頁

### 注意事項：

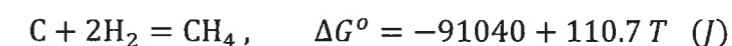
1. 本試題共 10 題，每題 10 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

Determine the statements **true** or **false** and **explain the reasons** for the following 1~6 questions:

1. At 1 atm, entropy decrease with increasing volume. (10%)
2. Gibbs free energy change ( $\Delta G^\circ$ ) of any reactions always decrease with increasing temperature. (10%)
3. Gibbs free energy can be measured **directly** using Differential Scanning Calorimetry (DSC) thermal analyses. (10%)
4. Solid and liquid phase boundary disappears at a certain pressure and temperature for a substance. (10%)
5. If the standard Gibbs Free Energy change ( $\Delta G^\circ$ ) for a reaction is negative, the reaction is spontaneous in any conditions. (10%)
6. By increasing pressure, liquid can always transform into solid at temperature near melting point. (10%)

7. The vegetable oil and water forms a regular solution and has a enthalpy of mixture at 2.5 kJ/mole for oil:water=1:1 in atomic ratio. What is the temperature required to mix 1 mole water with 1 mole of oil as one phase? (10%)

8. Pure CH<sub>4</sub> methane gas is kept at 500°C, what products and pressures would you expect after thermal equilibrium if the total pressure is 1 atm? (10%)



9. Mercury (Hg) has saturated vapor pressure of

$$\ln p_{Hg(l)}^\circ (atm) = -7611/T - 0.795 \ln T + 17.168$$

What would be the vapor pressure of Hg(l) when left in 298 K and 1 atm air atmosphere?

And please estimate the heat of evaporation for Hg(l). (10%)

10. Please calculate the partial pressure of B at  $X_A=0.3$  and 1000 K for an A-B binary alloy. (10%) Given that

$$G^{XS} = 20000 X_A^2 X_B \left(1 - \frac{T}{2000}\right)$$

$$\ln p_B^\circ (atm) = -30000/T - 3 \ln T + 38$$