國立成功大學

111學年度碩士班招生考試試題

編　號：86

系　所：資源工程學系

科　目：物理化學

日　期：0219

節　次：第 3 節

備　註：可使用計算機

※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. What is the change in molar entropy of Argon in the following process? **(10%)**

　　1 Ar (30°C, 1 bar)　→　1 Ar (-150°C, 20 bar)

2. If the atmosphere has a temperature of 15°C independent of altitude, the pressure at sea level is 1.0 bar, what are the composition and pressure at a height of 3 km? (Assuming that air is 21% O_2 and 79% N_2) **(20%)**

3. Two moles of N_2 (assuming that it is an ideal gas) expands from 8 to 1 bar at 300 K. Calculate w (1) for a reversible expansion, and (2) for an expansion against a constant external pressure of 1 bar. **(20%)**

4. Derive the equation for the molar entropy of isothermal expansion of a van der Waals gas. **(10%)**

$$P = \frac{RT}{\overline{V} - b} - \frac{a}{\overline{V}^2}$$

5. $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$

   (1) What is the value of the standard Gibbs energy for the above reaction at 300°C? **(5%)**

   (2) When the above reaction is divided by 2, what is the value of the equilibrium constant and the standard reaction Gibbs energy? **(8%)**

   (3) When the above reaction is reversed, what is the value of the equilibrium constant and the standard reaction Gibbs energy? **(7%)**

6. The enthalpy of fusion at 0°C is 6.00 kJ·mol^{-1}. What is the value of the freezing point constant of water? **(10%)**

7. Derive an expression for the expansion coefficient of a perfect gas. **(10%)**