國立高雄應用科技大學
101 學年度碩士班招生考試
化學工程與材料工程系

准考證號碼□□□□□□□□□□□ （考生必須填寫）

材料熱力學

注意：a. 本試題共 5 題，每題 20 分，共 100 分。
b. 作答時不必抄題。
c. 考生作答前請詳閱答案卷之考生注意事項。

1. Three moles of a monatomic ideal gas are at contained at a pressure of 1atm and a temperature of 350 K. 25000 J of heat are transferred to the gas, as a result of which the gas expands and does 1100 J of work against its surroundings. The process is reversible, and the molar heat capacity of the gas at constant volume is 1.5R. Calculate the final temperature of the gas. (20%)
2. A Carnot heat engine operates between reservoirs at 1100℃ and 200℃. The isothermal process at the hotter reservoirs consists of a reversible expansion from an initial pressure of 10^5 N/m^2 to 10^4 N/m^2. Assuming that the working substance is 500 moles ideal gas, calculate the heat rejected to the colder reservoir. (20%)
3. If a copper-gold alloy is a random mixture of gold and copper atoms, calculate the entropy increase when 15 grams of gold are mixed with 30 grams of copper to form an ideal homogeneous alloy. The atomic weights of Au and Cu are 197 and 64 respectively. (20%)
4. The activity coefficient of A in A-B alloys in the temperature range of 1000 to 1400 K can be expresses as $RT\ln\gamma_A = -30000X_B^2$, R = 8.314 J/mole.K. γ_A is the activity coefficient of A and X_B is the molar fraction of B in A-B alloys. Calculate the activity of B in A-B binary solution of $X_B = 0.6$ at 1250 K (20%)
5. Please calculate the equilibrium constant for 2 $NH_3 \rightarrow N_2 + 3\ H_2$ at 350℃ (ΔG^0 (J) = 87000 - 25 T lnT - 30 T) (20%)