中國文化大學104學年度碩士班考試入學招生考試試題

M-3-1

系所組：化學系應用化學碩士班　　節次：第2節

科目：物理化學

1. Please give simple description for four principal laws of thermodynamics. (20 pts)

2. For a real gas $P(V - b) = RT$, $C_p - C_V = ?$ Please derive it thoroughly. (10 pts)

3. About the heat capacity

(a) What is the ratio of C_p/C_v for an ideal NO_2 gas? (10 pts)

(b) Calculate the composition of a Pb-Ag alloy given that $C_v = 0.0383$ cal/g·deg (Mw: 207 for Pb and 107 for Ag) (10 pts)

4. The temperature dependence of molar internal energy of an ideal gas can be expressed by $U_m(T) = U_m(0) + f(T)$, where $U_m(0)$ is the molar internal energy at $T = 0$. For nonlinear polyatomic ideal gas, considering translation and rotation only, the $f(T)$ can be approximately expressed in classical limit by? (10 pts)

5. Calculate ΔU, ΔH, w and q for each of the following reversible processes in a cycle. The cycle contains three processes:

(1) An ideal monoatomic gas is compressed adiabatically from 70 °C and 1 bar (initial state) to 150 °C;

(2) then the gas is cooled isobarically from 150 °C to 70 °C;

(3) then the gas expands isothermally to the initial state.

(30 pts)

6. Assume ideal behavior, what is the entropy of mixing two moles of $N_{2(g)}$ with one mole $O_{2(g)}$? (10 pts)