1. A balloon filled with 10.50 L of Ar at 18.0°C and 1 atm rises to a height in the atmosphere where the pressure is 248 Torr and the temperature is -30.5°C. What is the final volume of the balloon? 10%

2. 3.00 moles of an ideal gas at 27.0°C expands isothermally from an initial volume of 20.0 L to a final volume of 40.0 L. Calculate w for this process: (1) for expansion against a constant external pressure of 1.00 × 10^5 Pa and (2) for a reversible expansion. 10%

3. Calculate w, ΔU, and ΔH for the transformation of 1 mol of an ideal gas from 27.0°C and 1.00 atm, adiabatic reversible compressing to 327°C and 17.0 atm if C_v,m = 20.9 + 0.042 T in units of J K^-1 mol^-1. 10%

4. One mole water is vaporized formed water vapor at 1 atm and 100°C, the latent heat of vaporization of water as 540 cal/g. Calculate ΔU, ΔH, ΔG, ΔA and ΔS for this process? R=8.314 J/K.mole. 10%

5. 請敘述下列相關名詞定義或定律: 30%
   (1) Ideal Gas
   (2) Gibbs Phase Rule (吉布斯相律)
   (3) 高力學第二定律之文字敘述(Statements)與數學式
   (4) Raoult’s Law (拉朱耳定律)
   (5) Ideal Solutions

6. A and B form an ideal solution at 298 K, with x_A = 0.600, P_A = 105 Torr and P_B = 63.5 Torr. 10%
   Calculate the partial pressures of A and B in the gas phase.

7. Write the half cell and overall reactions and determine K_sp for AgBr at 298.15 K using the electrochemical cell described by Ag(s)|AgBr(s)|Br^- (aq,a_{Br^-})|Ag^+ (aq,a_{Ag^+})|Ag(s) E^0 = +0.07133 V, E^0 = -0.7996 V 10%

8. A convenient source of gamma rays for radiation chemistry research is ^60Co, which undergoes the following decay process (the first order reaction): ^60Co[2γ] → ^60Co[β+] + γ. The half-life of ^60Co is 1.9 × 10^3 days. What is the rate constant for the decay process? 10%