編號： 87

國立成功大學 109 學年度碩士班招生考試試題

系　　所：資源工程學系

考試科目：物理化學

考試日期：0210，節次：3

※ 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. Calculate the change in the molar entropy of a perfect gas when it is compressed isothermally to 20% of its initial volume. (10%)
2. The density of liquid carbon disulfide, CS_2, is 1293 kg m^{-3}. Calculate the change in the molar Gibbs energy of carbon disulfide when it is compressed by a change in pressure from 2.00 bar to 3.00 bar. (10%)
3. The normal boiling temperature of liquid bromine, Br_2, is 332 K and the standard enthalpy of vaporization is 29.45 kJ mol^{-1}. Use the Clausius–Clapeyron equation to determine the vapor pressure of liquid bromine at a temperature of 298 K. (15%)
4. Hydrazine, N_2H_4, may be produced by the reaction: $2\ NH_3(g) + H_2O_2(l) \rightarrow N_2H_4(l) + H_2O(l)$
   Use the following data for the standard enthalpies of formation at 298 K for the various species to calculate the standard enthalpy of reaction at this temperature. (15%)

	$\Delta_f H^\circ$ / kJ mol^{-1}
$NH_3(g)$	–46
$H_2O_2(l)$	–188
$N_2H_4(l)$	+51

5. Calculate the entropy of vaporization of ethanol, C_2H_5OH, at 298 K from the following data. The constant-pressure molar heat capacities of ethanol as liquid and vapor are 111.46 and 65.44 J K^{-1} mol^{-1} respectively. The enthalpy of vaporization of ethanol at its boiling temperature, 352 K, is 38.56 kJ mol^{-1} (20%)
6. The value of the equilibrium constant for the reaction $C_2H_4(g) + H_2O(g) \rightleftharpoons C_2H_5OH(g)$ is 9.920 at 423 K and 6.397 at 523 K. Determine the average value of the standard enthalpy of reaction over this temperature range. (15%)
7. Calculate the expansion work done on the system when exactly 1 mol of solid ammonium chloride, NH_4Cl, decomposes completely to yield gaseous ammonia, NH_3 and hydrogen chloride, HCl at a temperature of 1273 K. Treat the expansion as irreversible and the gases formed as perfect. (15%)