國　立　宜　蘭　大　學

九十九學年度轉學招生考試

（考生填寫）
准考證號碼：

物　理　化　學　試　題

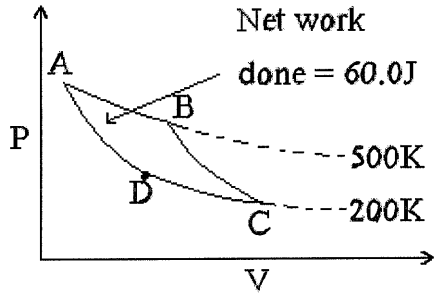
《作答注意事項》

1. 請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。
2. 考試時間：80 分鐘。
3. 本試卷共有 九 題，一題 10 - 15 分，共計 100 分。
4. 請將答案寫在答案卷上。(限用藍或黑色鋼筆、原子筆作答)
5. 考試中禁止使用大哥大或其他通信設備。
6. 考試後，請將試題卷及答案卷一併繳交。
7. 本試卷採雙面影印，請勿漏答。
8. 本考科可自行攜帶使用非程式型(不具備儲存程式功能)之電子計算機。
9. 請利用有效數字運算並注意單位。

一、**Use the Taylor-series approximation $(1-x)^{-1} \approx 1 + x + x^2 + x^3$+----- to determine the second virial constant, B, the third viral constant, C, and the forth viral constant, D, in terms of the van der Waals constant？ (10%)**

二、**10.0 grams of benzene (C_6H_6) is vaporized at its boiling point of 80.2℃** at 760 mmHg. The heat of vaporization is 395.0 J/g . Calculate (a) w (4%) (b) q (2%) (c) △H (2%) (d) △U (2%)？

三、**The accompanying diagram represents a reversible Carnot cycle for an ideal gas: a) What is the thermodynamic efficiency of the engine? (3%) b) How much heat is absorbed at 500 K? (4%) c) How much heat is rejected at 200 K? (4%) d) In order for the engine to perform 1.00 kJ of work, how much heat must be absorbed? (4%)**



四、**Calculate the change in Helmholtz energy, △A, for a process in which 2.00 moles of an ideal gas a). expands from 2.00 L to 10.0 L against a constant pressure of 800 mmHg and a constant temperature of 27.0 ℃？(5%) b). expands from 2.00 L to 10.0 L isothermally and reversibly at 27.0 ℃？(5%)**

五、**For the decomposition of calcium carbonate, $\Delta G° = +130.4$ kJ at 25°C.**

$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$

Calculate the partial pressure of CO_2 if $\Delta G = 0.0$ kJ. (10%)

六、**If it takes 1.334×10^6 bars of pressure to change the melting point of a substance from 222℃ to 122℃ for a change in molar volume of -3.22 cm^3/mol, what is the heat of fusion of the substance? (10%)**

背面尚有試題

七、 **Using the Henry's law constants in the following Table, calculate the percent by volume of oxygen and nitrogen in air dissolved in water at** 25℃ ? The air in equilibrium with the water at 1 atm pressure may be considered to be 22% oxygen and 78% nitrogen by volume. 1 atm = 1.013×10^5 Pa **(10%)**

Henry's law constant T=25℃

Component	K_i (Pa)
Argon	4.03×10^9
Carbondioxide	1.67×10^8
Nitrogen	8.57×10^9
Oxygen	4.34×10^9

八、**A voltaic cell is based upon the half-reactions below.**

$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ $\quad E° = +0.339$ V

$NO_3^-(aq) + 4H^+(aq) + 3e^- \rightarrow NO(g) + 2H_2O$ $\quad E° = +0.964$ V

Calculate (a). $\Delta G°$ (b). the equilibrium constant for the overall chemical reaction at 25°C. (10%)

九、**Plutonium-240 (Pu-240;** $^{94}_{240}\mathrm{Pu}$ **; is a byproduct of the nuclear reaction that takes place in a reactor. It takes one thousand years for 10.0% of 4.60g sample to decay. a). What is the half-life of Pu-240? (5%) b). How long will it takes to reduce a 2.00 g sample to 15% of its original amount? (5%) c). What is the rate of decay of a 5.00 g sample in g/year? (5%)**