國立勤益技術學院九十四學年度研究所招生初試試題卷

所別：材化所 組別： 身分別：一般生

科目：物理化學 准考證號碼：□□□□□□□□（考生自填）

考生注意事項：
一、 考試時間 100 分鐘。
二、 請考生自填準考證號碼。
三、 可使用工程用計算機。

試題：(共兩頁)

1.Which of the following statements is correct?(20%)

【 】a.For the reaction , $A+2B\rightarrow 2C$,which relationship is correct?
(A). $\frac{d[A]}{dt}=-2\frac{d[C]}{dt}$ (B). $\frac{d[B]}{dt}=-2\frac{d[C]}{dt}$ (C). $\frac{d[A]}{dt}=-\frac{1}{2}\frac{d[C]}{dt}$ (D). $\frac{d[A]}{dt}=\frac{1}{2}\frac{d[C]}{dt}$

【 】b.If 100 J of heat are added to 1 mole of Ne(g) at 30℃ and constant pressure, how much will its temperature rise?(A)5℃ (B) 8℃ (C) 30℃ (D) 35℃ 。

【 】c.If $\Delta G^0(HI,g)=1.7KJ$, what is the equilibrium constant at 25℃ for $2HI(g)\rightarrow H_{2(g)}+I_{2(S)}$? (A) 4 (B) 2.0 (C) 0.5 (D) 0.1 。

【 】d.Which of the following chemical species shows no ESR(electron spin resonance) spectrum?
(A) Free radicals (B) Transition-metal ions with unpaired electrons (C) Excited triplet states of organic compounds (D) Spin-paired molecules 。

【 】e.A certain molecule A has twice as large a collision diameter as another type of molecule, B. What is the mean free path of A compared to B under the same conditions of temperature and pressure?
(A) 4 times as large (B) 2 times as large (C) 0.5 as large (D) 0.25 as large 。

2.Fox and Flory obtained the following data for the intrinsic viscosity of polyisobutylene in CCl_4 solution at 30℃ as a function of molecular weight. Show that the data fit the relationship $[\eta]=KM^a$ and evaluate the constants K and a. Instrinsic viscosity is defined in the preceding problem. **(10%)**

M(x10^{-3})	1260	463	110	48	10	7
η (deciliter g^{-1})	4.3	2.06	0.78	0.43	0.15	0.115

3.Derive from the first law of thermodynamic and related definition : **(10%)**

$C_V=-(\frac{\partial E}{\partial V})_T(\frac{\partial V}{\partial T})_E$

4.In the vicinity of the triple point the vapor pressure of liquid ammonia in atmosphere is represented by $\ln P = 15.16 - 3063/T$,which is the equation for the liquid-vapor boundary curve in a phase diagram. Similarly the vapor pressure of solid ammonia is $\ln P = 18.7 - 3754/T$,calulate the temperature and pressure at the triple point,the latent heat of sublimation and vaporization and the latent heat of fusion at the triple point.(P=torr ;T=K) **(20%)**

5.A reaction has a rate constant 5 x $10^9 M^{-1}$ sec^{-1} at 300 K and 8×10^{10} M^{-1} sec^{-1} at 320 K. What is the activation energy in Kcal/ mol ? (10 %)

6.A Carnot cycle engine(Fig. 1): T_1 = 1000 K; T_2 = 200 K; Q_1 = 150 KJ. Calculate (1) η % (efficiency of heat engine); (2) Q_2 (KJ) ; (3) $\triangle S_{AB}$ (J/ K) ; (4) $\triangle S_{BC}$ (J/ K) ; (5) $\triangle S_{CD}$(J/ K) ; (6) $\triangle S_{Total}$ (J/ K). (30 %)

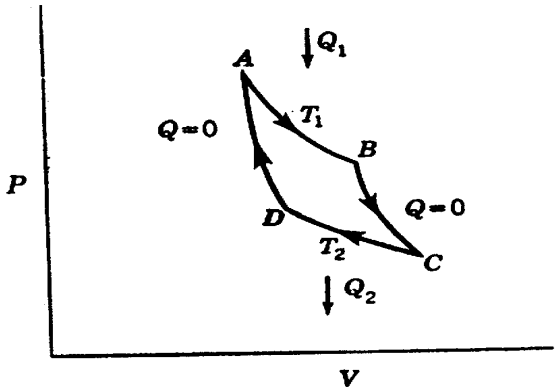

Fig. 1 The path of the state during a Carnot cycle.