

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：在職生

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、 請考生自填准考證號碼。
- 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. Please explain the following meaning or definition. (10%)**

- a. Ideal solution?
- b. Fuel cell?

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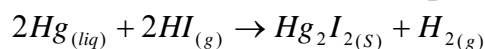
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3. Assume that the following heat capacities are constant between 25 and 125 .

	Hg(liq)	H <sub>2</sub> (g)	Hg <sub>2</sub> I <sub>2</sub> (s)	HI(g)
C <sub>p</sub> <sup>o</sup> (cal-K <sup>-1</sup> -mole <sup>-1</sup> )	6.6	6.9	25	7.0

	HI(g)	Hg <sub>2</sub> I <sub>2</sub> (s)
G <sup>o</sup> (25 /kcal-mole <sup>-1</sup> )	0.31	-26.6
H <sup>o</sup> (25 /kcal-mole <sup>-1</sup> )	6.2	-28.91

Find H, S, G, and K<sub>p</sub> at 125 for the reaction: (20%)



4. For the reaction  $3H_2 + N_2 \rightarrow 2NH_3$  what is the reaction order ? (10 %)

	$P_{H_2}$	$P_{N_2}$	$-dP_t/dt$
1	1.00	1.00	0.01
2	2.00	1.00	0.04
3	4.00	0.5	0.08

5.(1) Liquid A decomposes by first-order kinetics and 5 % of A is converted in 5 minutes. How much longer would it take to reach 75 % conversion ? (15 %)

(2) Repeat the previous problem for second-order kinetics. (15 %)

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