淡江大學 108 學年度日間部轉學生招生考試試題

系別：化學工程與材料工程學系 二年級　　科目：普通化學

考試日期：7 月 24 日(星期三) 第 1 節　　本試題共 10 大題， 2 頁

問答題 (每題 10 分)　可使用計算機

1. When aqueous solutions of acetic acid (CH_3COOH) and potassium hydroxide (KOH) are combined, a neutralization reaction will occur. Write molecular, total ionic, and net ionic equations for this process.

2. Tetraphosphorus trisulfide, P_4S_3, is used in the manufacture of "strike anywhere" matches. Elemental phosphorus and sulfur react directly to form P_4S_3:

$8\ P_4 + 3\ S_8 \rightarrow 8\ P_4S_3$

If we have 153 g of S8 and an excess of phosphorus, what mass of P4S3 can be produced by this reaction?

3. A balloon is fi lled with helium, and its volume is 2.2 L at 298 K. The balloon is then dunked into a thermos bottle containing liquid nitrogen. When the helium in the balloon has cooled to the temperature of the liquid nitrogen (77 K), what will the volume of the balloon be?

4. Use the periodic table to determine the electron configuration of tungsten (W), which is used in the fi laments of most incandescent lights.

5. Poly(vinyl alcohol) is used in several biomaterials applications, including surgical sutures. Draw the Lewis structure of vinyl alcohol, CH_2CHOH, the monomer from which poly(vinyl alcohol) is made.

6. Show that the packing efficiency of the face-centered cubic structure is actually 74%.

7. Use the signs of ΔH and ΔS to explain why ice spontaneously melts at room temperature but not outside on a freezing winter day.

8. In the following rate laws, determine the orders with respect to each substance and the overall order of the reaction. (a) Rate = $k[A]^2[B]$, (b) Rate = $k[A][B]^{1/2}$

9. When hydrogen gas reacts with iodine gas at elevated temperatures, the following equilibrium is established: $H_2(g) + I_2(g) \leftrightarrows 2HI(g)$

A student measured the equilibrium constant as 59.3 at 400°C. If one trial begins with a mixture that includes 0.050 M hydrogen and 0.050 M iodine, what will be the equilibrium concentrations of reactants and products?

10. Copper and iron (generally in the form of steel) are two of the many metals used in designing machines. (a) Using standard reduction potentials, identify the anode and the cathode and determine the cell potential for a galvanic cell composed of copper and iron. Assume standard conditions. (b) We can also construct a galvanic cell using copper and silver. Confirm that the

potential of the following galvanic cell is 0.462 V: Cu(s) | Cu2+(1 M) || Ag+(1 M) | Ag(s)

(附件於下頁)

背面尚有試題

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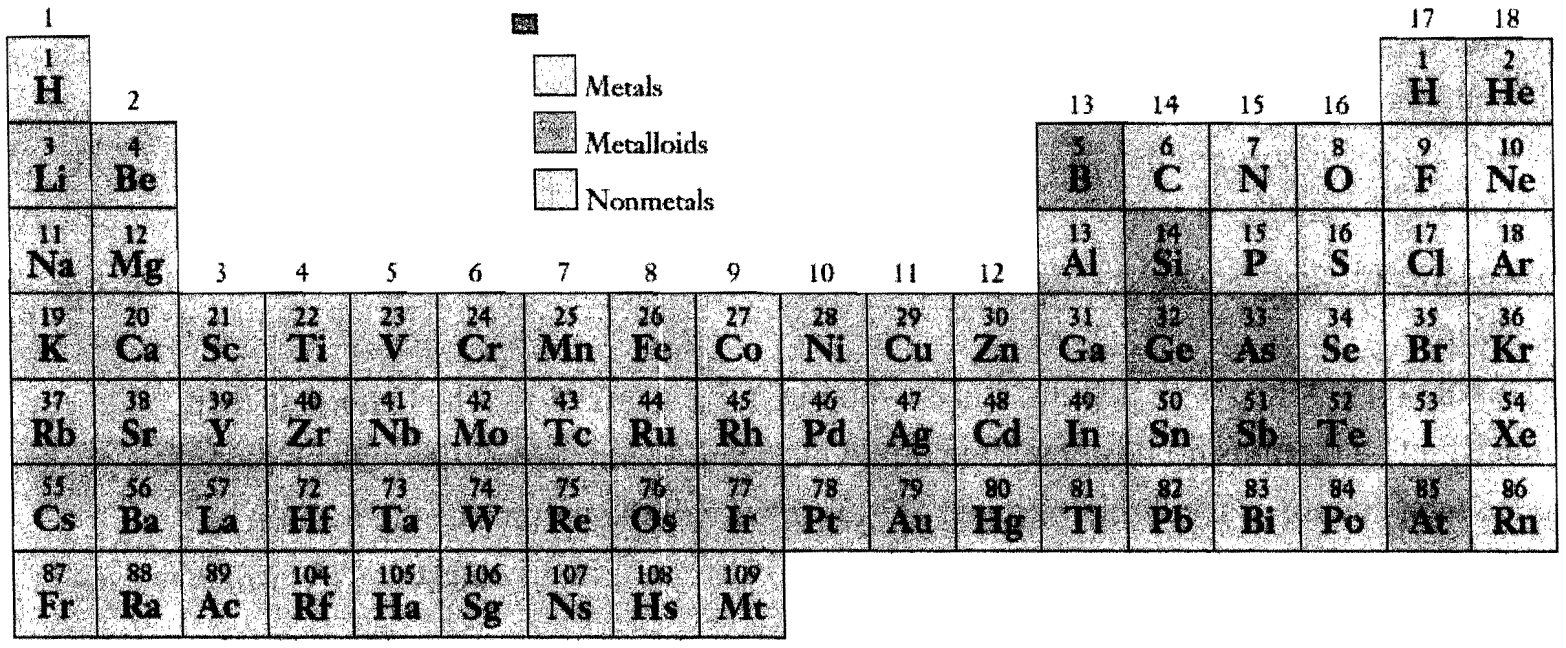
附件一、Periodic Table



附件二、Standard Reduction Potentials

Half-Reaction	Standard Reduction Potential (V)
$Zn^{2+} + 2\ e^- \rightarrow Zn$	−0.763
$Fe^{2+} + 2\ e^- \rightarrow Fe$	−0.44
$2\ H^+ + 2\ e^- \rightarrow H_2$	0.000
$Cu^{2+} + 2\ e^- \rightarrow Cu$	+0.337
$Fe^{3+} + e^- \rightarrow Fe^{2+}$	+0.771
$Ag^+ + e^- \rightarrow Ag$	+0.7794