

系所組別 醫學工程研究所丁組

考試科目 普通化學

考試日期: 0307, 節次: 1

※ 考生請注意: 本試題 可 不可 使用計算機

1. Write a structural formula for each of the following compounds. (10%)  
 (1) 2-Chloro-3-methylpentane, (2) Ethylene glycol, (3) *tert*-Butyl alcohol,  
 (4) Ethyl methyl ketone, (5) N-Methylacetamide.
2. Name the following compounds with **English and Chinese**. (10%)  
 (1)  $Al_2O_3$ , (2)  $SnO_2$ , (3)  $H_2PtCl_6$ , (4)  $K_2Cr_2O_7$ , (5)  $Na_2HPO_4$
3. Consider the unbalanced reaction:  $C_6H_6 + H_2 \rightarrow C_6H_{12}$  (10%)  
 (a) Balance the reaction by inspection.  
 (b) Write this reaction in English, using the word mole(s) wherever appropriate.  
 (c) To produce 1 mole of  $C_6H_{12}$  from this reaction, how many grams of  $C_6H_6$  and  $H_2$  must you combine?  
 (d) What is the theoretical yield of  $C_6H_{12}$  for this reaction?  
 (e) Suppose only 24.0 g of  $C_6H_{12}$  was recovered. What would be the percent yield of this reaction?
4. (1) What are the structural characteristics of a chelating agent?  
 (2) Illustrate measurement of the standard electrode potential for the  $Ag/AgCl$ . (10%)
5. Describe the alternative definitions of acids and bases on the basis of Arrhenius, Bronsted-Lowry and Lewis concepts, respectively. (10%)
6. What current is needed to deposit 0.250 g of chromium from a solution containing  $Cr^{3+}$  over a one hour period (MW for Cr=52)? (10%)  
 (Farady's Law:  $Q$  (charge) =  $nF$ )  
 Here,  $n$  = number of moles of electrons,  $F$  = constant of 96500 Coulomb/mole)
7. The nitrobenzene in 210 mg of an organic mixture was reduced to phenylhydroxylamine at a constant potential of -0.96 V (vs. SCE) applied to a mercury cathode: (10%)  
 $C_6H_5NO_2 + 4H^+ + 4e^- \rightarrow C_6H_5NHOH + H_2O$   
 The sample was dissolved in 100 mL of methanol; after electrolysis for 30 min, the reaction was judged complete. An electronic coulometer in series with the cell indicated that the reduction required 26.74 C. Calculate the percentage of  $C_6H_5NO_2$  in the sample.
8. Please describe van der Waal Forces (10%)
9. Please give an example to explain what a buffer solution is and its capacity. (10%)
10. Explain what fluorescence is and why the molecular fluorescence often a longer wavelength than the exciting radiation occurs. (10%)