

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) 2,3-Dichloropentane, (2) 2,3,4-Triethyldecane, (3) 4-Isopropylnonane,
(4) 1,1-Dimethylcyclopropane, (5) *tert*-Butyl iodide.
2. Name the following compounds with **English** and **Chinese**. (10%)
(1) HF, (2) TiO₂, (3) PCl₅, (4) KMnO₄, (5) KH₂PO₄
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 C₆H₁₂ from this reaction, how many grams of C₆H₆ and H₂ must you combine?
(d) What is the theoretical yield of C₆H₁₂ for this reaction?
(e) Suppose only 24.0 g of C₆H₁₂ was recovered. What would be the percent yield of this reaction?
4. A 2.136 g sample of a solid burns in oxygen to produce 5.933 g of CO₂ and 1.227 g of H₂O. (10%)
(a) What are the mass percents of the elements present in this sample?
(b) What is the empirical formula for this compound?
(c) The molar mass of this compound is determined to be about 94 g/mole. What is the molecular formula for this compound?
5. Describe the alternative definitions of acids and bases on the basis of Arrhenius, Bronsted-Lowry and Lewis concepts, respectively. (10%)

(背面仍有題目,請繼續作答)

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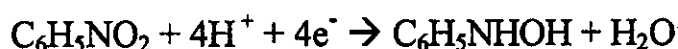
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6. Please define what is (1) buffer solution and buffer capacity, (2) acid-base indicator, respectively. (10%)

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%)



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 $\text{C}_6\text{H}_5\text{NO}_2$ in the sample.

8. Please describe (1) the Pauli exclusion principle, (2) dipole moment, resonance fluorescence. (15%)

9. Alcohols containing two hydroxyl groups are commonly called glycols. In the IUPAC substitute system they are named as diols. Please also give a common and IUPAC name for these alcohols, respectively. (15%).

(1) $\text{CH}_2(\text{OH})\text{CH}_2(\text{OH})$, (2) $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2(\text{OH})$, (3) $\text{CH}_2(\text{OH})\text{CH}_2\text{CH}_2(\text{OH})$.