

國立臺北科技大學 101 學年度碩士班招生考試

系所組別：3711 有機高分子研究所甲組

第二節 分析化學 試題 (選考)

第一頁 共一頁

注意事項：

1. 本試題共 9 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Estimate the absolute deviation and the coefficient of variation for the results of the following calculations. Round each result so that it contains only significant digits. The numbers in parentheses are absolute standard deviations. (10 points total, 5 points each)

(a) $y = 6.75(+0.03) + 0.843(+0.001) - 7.021(+0.001) = 0.572$

(b) $y = 6.71(\pm 0.3) \times 1.03(\pm 0.02) \times 10^{-17} = 6.9113 \times 10^{-16}$

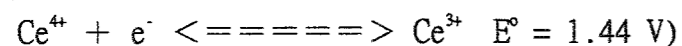
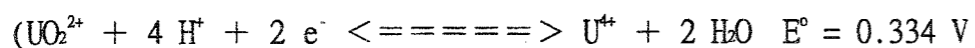
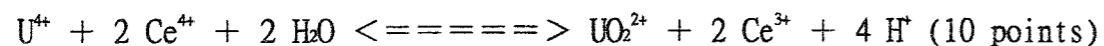
2. The addition of 5.00mL of 0.1000M NaOH into 25mL of a 0.1000M maleic acid (H_2M), $HOOC-CH=CH-COOH$, results in the formation of a buffer. Please calculate the pH of this buffer. (10 points)

(H_2M $K_{a1} = 1.3 \times 10^{-2}$, $K_{a2} = 5.9 \times 10^{-7}$)

3. Determine pCa at the equivalence-point for the titration of 50.0mL of 0.00500M Ca^{2+} with 0.0100M EDTA in a solution buffered to a constant pH of 10.0.

($K_{CaY} = 1.75 \times 10^{10}$ at pH = 10.0) (10 points)

4. Calculate the equivalence-point potential in the titration of 0.0500M U^{4+} with 0.1000M Ce^{4+} , assume both solution are 2.0M in H_2SO_4



5. Define the following terms (20 points, 5 points each)

- (a) first-order NMR spectra
- (b) ion cyclotron resonance
- (c) molar absorptivity
- (d) selection rule

6. Using a tungsten x-ray tube and a LiF analyzing crystal ($d = 2.01 \text{ \AA}$), a very strong x-ray fluorescence peak for pure but unknown metal was observed at $2\theta = 69.36^\circ$. Calculate the wavelength of the fluorescence radiation.

(10 points)

7. Describe what quantity is measured and how the measurement is performed for each of the following techniques: (a) differential thermal analysis (DTA) (b) differential scanning calorimetry (DSC) (10 points total, 5 points each)

8. (a) Calculate the energy (in J/mol) that electrons acquire as a result of being accelerated through a potential of 70 V. (b) How does this energy compare to that of a typical chemical bond? (10 points total, 5 points each)

($1 e = 1.60 \times 10^{-19} \text{ Coulomb}$)

9. The proton spectrum in the following figure is for compound with empirical formula $C_7H_{10}O$. Identify the compound and determine the chemical shift for each proton set. (10 points)

