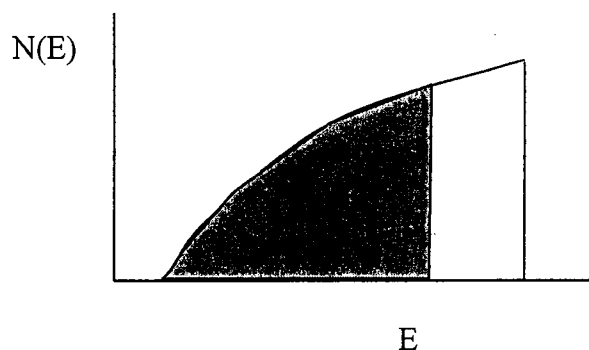


編號: F 157 系所: 化學工程學系乙組

科目: 無機化學及分析化學

無機化學部份, 選擇題共五題, 每一小題 10 分, 此部份總分為 50 分。
請簡述計算過程或理由於答案卷上。若您的答案不在選項上請選 0。

(10pt)1. The distribution of energy states and their electron populations for a material is



This material is (1) a metallic conductor (2) an insulator (3) a semiconductor.

(10pt)2. Would GaAs doped with Se be (1) an n-type or (2) a p-type semiconductor?

(10pt)3. From spectral data the dissociation energy of ClF has determined to be 253 kJ/mole. The ΔH_f° of ClF(g) is -25.7 kJ/mole. The dissociation energy of Cl₂ is 239 kJ/mole. Calculate the dissociation energy of F₂.

(1) 107.8 kJ/mole, (2) 215.6 kJ/mole, (3) 466.3 kJ/mole

(10pt)4. The emission spectrum of atomic Ca shows a transition from a ³D state to a ³P state. If the selection rule permits only $\Delta J = \pm 1$, or 0, (but not $J = 0$ to $J = 0$), how many lines will be observed for this transition?

(1) 2 (2) 4 (3) 6 (4) 8

(10pt)5. The ionization energies of Ti are as follows:

I	II	III	IV	V	
6.82	13.58	27.49	43.27	99.22	ev

What stable oxidation states are expected for Ti in compounds?

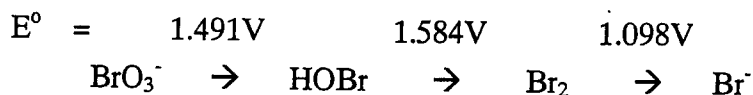
(1) Ti(I) (2) Ti(II) (3) Ti(III) (4) Ti(IV) (5) Ti(V)

(背面仍有題目, 請繼續作答)

分析化學部份，選擇題共五題，每一小題 10 分，此部份總分爲 50 分。
請簡述計算過程或理由於答案卷上。若您的答案不在選項上請選 0。

(10 pt) 1. A 50.0-mL sample containing Ni^{2+} is treated with 25.0 mL of 0.0500 M EDTA to complex all the Ni^{2+} and leave excess EDTA in solution. The excess EDTA was then back-titrated, requiring 5.00 mL of 0.0500 M Zn^{2+} . What was the concentration of Ni^{2+} in the original solution?
(1) 0.0150 M (2) 0.0200 M (3) 0.0735 M (4) 0.0812 M

(10 pt) 2. Calculate E° for the reaction $\text{HOBr} + 2e^- \rightarrow \text{Br}^-$



(1) 0.050 V (2) 0.486 V (3) 1.341 V (4) 2.682 V

(10 pt) 3. A 50.00-mL sample containing La^{3+} was treated with sodium oxalate to precipitate $\text{La}_2(\text{C}_2\text{O}_4)_3$, which was washed, dissolved in acid, and titrated with 18.04 mL of 0.006363 M KMnO_4 . Calculate the molarity of La^{3+} in the unknown.

(1) 2.296 mM (2) 3.826 mM (3) 4.592 mM (4) 5.773 mM

(10 pt) 4. A 0.0450 M solution of benzoic acid has a pH of 2.78. Calculate pKa for this acid.

(1) 3.64 (2) 4.19 (3) 5.78 (4) 6.88

(10 pt) 5. How many grams of Na_2CO_3 (FW 105.99) should be mixed with 5.00 g of NaHCO_3 (FW 84.01) to produce 100 mL of buffer with pH 10.00?

(1) 2.96 g (2) 3.96 g (3) 4.69 g (4) 5.84 g

Note 1: The $\alpha_{\text{Y}4-} = 0.36$ at pH = 10; $\alpha_{\text{Y}4-} = 2.5 \times 10^{-7}$ at pH = 4.5

Note 2: $\text{Hg}^{2+} + 2e^- = \text{Hg}(l)$ $E^\circ = 0.852\text{V}$

Note 3: $\text{La}^{3+} + 3e^- = \text{La}(s)$ $E^\circ = -2.379\text{V}$

Note 4: $\text{MnO}_4^- + 8\text{H}^+ + 5e^- = \text{Mn}^{2+} + 4\text{H}_2\text{O}$ $E^\circ = 1.507\text{V}$

Note 5: $2\text{CO}_2(g) + 2\text{H}^+ + 2e^- = \text{H}_2\text{C}_2\text{O}_4$ $E^\circ = -0.432\text{V}$

Note 6: For H_2CO_3 , the $\text{pK}_{a1} = 6.352$, $\text{pK}_{a2} = 10.329$