一. 無機化學選擇題共 10 小題，每一小題 5 分，答錯一小題扣 10 分．

(   ) 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.

(   ) 2. If Ge is added to GaAs, the Ge is about equally distributed between the Ga
and As sites. Which sites would the Ge prefer if Se is added also?
(1) B,   (2) Ga,   (3) As.

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

(   ) 4. From spectral data the dissociation energy of ClF has determined to be 253
kJ/mole. The ΔH_f^o of ClF(g) is -25.7 kJ/mole. The dissociation energy of
Cl_2 is 239 kJ/mole. Calculate the dissociation energy of F_2.
(1) 107.8 kJ/mole, (2) 215.6 kJ/mole, (3) 466.3 kJ/mole.

(   ) 5. Which of the following species conform to the EAN rule?
(1) $[Fe(CN)_6]^{4-}$ (2) $W(CO)_6$ (3) $Ni(PPh_3)_4(CO)_1$
(4) $Mn(CO)_5(CH_2C_6H_5)$

(   ) 6. Which of the following are not possible close-packing schemes?
(1) ABCABC   (2) ABAC... (3) ABABC... (4) ABCBC   (5) ABBA
(6) ABCCAB

(   ) 7. Indicating which of the following binary systems might expect positive
deviation from Raoult's law:
(1) $HCl - (CH_3)_2O$ (2) $H_2O - C_8H_{18}$ (3) $HCCl_3 - CCl_2$
(4) $HCCl_3 - (C_2H_5)_3N$

(   ) 8. 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

(   ) 9. The ionization energies of Ti are as follows:

I	II	II	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)

(   ) 10. The characteristic valence shell configuration for the Ti family is
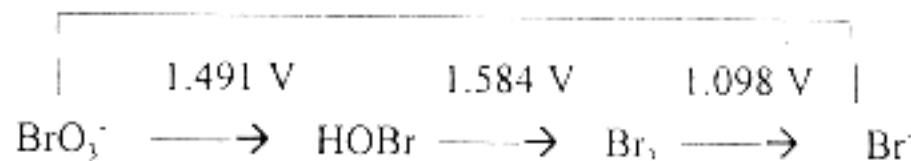(1) ns^2nd^3 (2) ns^2nd^2 (3) $(n-1)d^2ns^2$ (4) ns^2np^6

(背面仍有題目,請繼續作答)

2/500 B

二、分析化學選擇題共 5 小題，每一小題 10 分，答錯一小題扣 15 分。

(　　) 1. A 50.0-mL sample containing Ni^{2+} was 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) 0.0200M　(3) 0.0735 M (4) 0.0812 M

(　　) 2. Calculate E° for the reaction $HOBr + 2e^- \rightarrow Br^-$

$$\begin{array}{c}
1.441\ V \\
\overbrace{\qquad\qquad\qquad\qquad\qquad\qquad\qquad} \\
|\quad 1.491\ V \qquad 1.584\ V \qquad 1.098\ V\quad | \\
BrO_3^- \longrightarrow HOBr \longrightarrow Br_2 \longrightarrow Br^-
\end{array}$$

　　　(1) 0.050 V　(2) 0.486 V　(3) 1.314 V　(4) 2.682 V

(　　) 3. A 50.00-mL sample containing La^{3+} was treated with sodium oxalate to precipitate $La_2(C_2O_4)_3$, 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) 2.296mM　(2) 3.826 mM　(3) 4.592 mM　(4) 5.773 mM

(　　) 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

(　　) 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

(Note1) The $\alpha_{Y^{4-}} = 0.36$ at pH = 10 ; $\alpha_{Y^{4-}} = 2.5 \times 10^{-7}$ at pH = 4.5

(Note2) $Hg^{2+} + 2e^- = Hg(l)$ 　　　　　　$E^\circ = 0.852$ V

(Note3) $La^{3+} + 3e^- = La(s)$ 　　　　　$E^\circ = -2.379$ V

(Note4) $MnO_4^- + 8 H^+ + 5e^- = Mn^{2+} + 4 H_2O$ 　$E^\circ = 1.507$

(Note5) $2 CO_2(g) + 2 H^+ + 2e^- = H_2C_2O_4$ 　　$E^\circ = -0.432$

(Note6) For $H2CO3$, the $pKa1 = 6.352$, $pKa2 = 10.329$.