

臺北市立大學

105 學年度第一學期學士班二、三年級轉學生招生考試試題

系 別：應用物理暨化學系（二年級）

科 目：普通化學

考試時間：90 分鐘【8:30-10:00】

總 分：100 分

不得使用計算機
或任何儀器。

※ 注意：不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上；限用藍色或黑色筆作答，使用其他顏色或鉛筆作答者，所考科目以零分計算。（於本試題紙上作答者，不予計分。）

問答題（共 100 分）

一、Draw Lewis structures that obey the octet rule for the following species. Assign the formal charge to each central atom. (20 分)

(1) POCl_3 (2) ClO_4^- (3) SO_2Cl_2 (4) XeO_4

二、Calculate the pH of a 1.0 M solution of methylamine (CH_3NH_2).

($K_b = 4.38 \times 10^{-4}$) (10 分)

三、Using the VSEPR model to predict the shapes of the following molecules or ions. (20 分)

(1) BF_4^- (2) ICl_4^- (3) XeF_2 (4) AlCl_3 (5) SiCl_4

四、The following reaction at 25°C is spontaneous? If not, calculate the temperature at which the reaction becomes spontaneous. (10 分)

$\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$ $\Delta H^\circ = 179.2 \text{ kJ}$ $\Delta S^\circ = 160.0 \text{ J/K}$

五、Hydrogen iodide(HI) gas decompose at 410°C :

$2\text{HI}(\text{g}) \rightarrow \text{H}_2(\text{g}) + \text{I}_2(\text{g})$

The following data describe this decomposition:

Time(min)	0	20	40	60	80
[HI]	0.500	0.382	0.310	0.260	0.224

(1) What is the order of the reaction? (10 分)

(2) What is the value of the rate constant for consumption of HI?
(10 分)

六、Identify the difference of following terms. (20 分)

(1) Covalent bond / Ionic bonding

(2) Valence band / Conduction band

(3) Galvanic cell / Electrolytic cell

(4) n-type semiconductor / p-type semiconductor