

銘傳大學九十學年度管理科學研究所碩士班招生考試

(甲組) 第一節

普通化學 試題

I. Multiple Choice (30%) 單選題(每題 3 分，答錯倒扣 1 分)

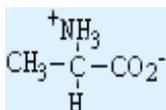
1. A glass column is filled with mercury and inverted in a pool of mercury. The mercury column stabilizes at a height of 735 mm above the pool of mercury. What is the pressure of the atmosphere?
 - (a) 0.697 atm
 - (b) 0.735 atm
 - (c) 0.967 atm
 - (d) 1.03 atm
 - (e) 194 atm
2. Which statement about equilibrium is **NOT** true?
 - (a) When a system is disturbed, it responds to restore equilibrium.
 - (b) Equilibrium in molecular systems is dynamic, with two opposing processes balancing one another.
 - (c) The value of the equilibrium constant for a reaction does not depend on the direction from which equilibrium is attained.
 - (d) A system moves spontaneously toward a state of equilibrium.
 - (e) The equilibrium constant is independent of temperature.
3. Identify the Bronsted acids and bases in the following equation
(A = Bronsted acid, B = Bronsted base): $\text{HSO}_4^- + \text{CN}^- = \text{HCN} + \text{SO}_4^{2-}$
 - (a) B A B A
 - (b) A B A B
 - (c) B B A A
 - (d) A B B A.
 - (e) B A A B
4. Which of the following processes increases the atomic number by 1 ?
 - (a) gamma-ray production
 - (b) electron capture
 - (c) positron production
 - (d) beta-particle production
 - (e) alpha-particle production

5. The process of transforming N_2 to a form usable by animals and plants is called
- Nitrogen fixation.
 - Fertilization.
 - Denitrification
 - The Ostwald process.
 - Nitrogenation.
6. Hydrogen and lithium react very differently, although they are both members of Group 1. What is the primary reason for this difference?
- The metallic character increases going down a group.
 - The ionization energy increases going down a group.
 - Electron affinity increases going down a group.
 - Electronegativity increases going down a group.
 - There is a very large difference in the atomic radii of H and Li.
7. What is the feature of CFCs that causes the destruction of the ozone layer?
- they react with NO, which then cannot protect ozone.
 - the fluorine reacts with ozone
 - the molecule photodissociates to produce Cl atoms that react with ozone
 - the carbon reacts with ozone to produce CO
 - the C-Cl bond reacts with ozone
8. The equilibrium constant for the reaction $A^- + H^+ = HA$ is called:
- $1/K_a$
 - K_b
 - K_a
 - K_w/K_b
 - K_wK_a
9. For a spontaneous endothermic Process, which of the following must be true?
- $W_{\max} = \Delta G$
 - $\Delta S_{\text{surr}} > 0$
 - ΔS cannot be negative
 - ΔG is positive
- I, II and IV
 - I and III
 - III and IV

- (d) all are true
 (e) none are true

10. Which of the following molecules **cannot** display optical activity ?

- (a) Co(en)_3^{3+}
 (b) $\text{cis Cr(en)}_2\text{Cl}_2^+$
 (c) tetrahedral $[\text{Ni}(\text{CN})(\text{CO})(\text{Cl})(\text{Br})]^-$
 (d) $[\text{trans Cr(ox)}_2(\text{NH}_3)_2]^+$ (ox = oxalate, $\text{C}_2\text{O}_4^{2-}$)
 (e)



II. Briefly explain the following terms by using sentences and/ or equations : (40% each with 4%) 簡要以詞句或式子回答下列各名詞(每題 4 分)

- SI unit of 1 standard atmosphere
- Cold Atoms
- SCUBA Diving
- Effusion
- Le Chatelier's Principle
- Common Ion Effect
- Buffer Capacity
- Bond Order
- van der Waals equation
- Formal charge

III. Essay Questions : (問答與計算題)(30%)

- (a) 磷酸與亞磷酸都含有三個質子，但卻是一者為二質子酸，另一者為三質子酸，其因何在？(試以 Lewis 分子結構式說明)(6%)
 (b) 試寫出 $\text{Cr}(Z=24)$ ，及 $\text{Cu}(Z=29)$ 的實際電子組態？(6%)
- 恐怖份子，常利用肥料「硝酸銨」做為汽車炸彈的主要成分。以之當硝酸銨爆炸，會分解圍氮氣、氧氣及水蒸氣。(a) 寫出此爆炸反應的平衡化學反應式？(5%) (b) 引爆 1.80m^3 固體的硝酸銨，若在 1atm 時產生溫度為 500°C ，且硝酸銨的密度為 1.725g/cm^3 ，此時產生多少升的氣體體積？(8%)
- For the general reaction : $j\text{A} + k\text{B} = l\text{C} + m\text{D}$,

(a) derive; $K_p = K_c(RT)^{\Delta n}$. (4%) and (b) what is the Δn ? (2%)

試題完