

- 一、 精確稱取 0.5 克的海洋沈積物，溶於 10ml 的強酸混合液中 (HNO₃-HCl-HF)，最後以超純水稀釋至 500ml 後，利用原子吸光儀測得溶液中 Al 濃度【Al】為 2.5mM，請問
- (i)沈積物中 Al₂O₃所佔的百分比(%)為何？ 10%
 Al : 27 g/mole O : 16 g/mole
- (ii)你如何由 1000 μg/ml [Al³⁺] 的原液配製成原子吸光儀測定用 10-50 ppm(μg/ml) 的標準液？ 5%
- 二、 大氣中的 CO_{2(g)} 溶於開放系統的純水中並達平衡後【H₂CO₃^{*}】的濃度為 10⁻⁵ M，請問此時該水體 pH 值為何？H₂CO₃^{*}的 K₁=10^{-6.3}，K₂=10^{-10.3} 10%
- 三、(i)請解釋 solubility product (K_p)與 conditional solubility product (K_c) 二者之差異，並以 activity coefficient 表示二者之關係。 5%
 (ii)請解釋水體中任一離子 activity coefficient 的計算方法。 5%
- 四、 取 33.31 ml KMnO₄ 溶液於三角瓶中，若以 Na₂C₂O₄ 滴定時，共需使用 0.1278g 的 Na₂C₂O₄ 才能與 KMnO₄ 完全反應，請問 KMnO₄ 之濃度為何？
 (需寫出平衡反應式 $MnO_4^- + H_2C_2O_4 \rightleftharpoons Mn^{2+} + CO_2$)
 K : 39 g/mole Na : 23 g/mole Mn : 55 g/mole 10%
- 五、(i)計算下列氧化還原反應平衡常數 (K_{eq})為何？-----8%
 $2Fe^{3+} + 3I^- \rightleftharpoons 2Fe^{2+} + I_3^-$
 $2Fe^{3+} + 2e^- \rightleftharpoons 2Fe^{2+} \quad E^0=0.771V$
 $I_3^- + 2e^- \rightleftharpoons 3I^- \quad E^0=0.536V$
- (ii)平衡常數如何由 ΔG(Gibbs free energy)求得 -----4%
 (iii)反應達平衡時 ΔG=? 3%
- 六、解釋或簡答下列各項 40%
- (1)測定溶液 pH 值需利用何種組合電極？ 5%
 (2)測定水體中重金屬，你如何評估準確度或精確度？ 5%
 (3)實驗室中如何配製酸鹼溶液，應注意那些事項？ 5%
 (4)何謂 ICP-OES 或 ICP-AES，做何用途？ 5%
 (5)何謂 HPLC，可應用於那些環境相關研究上？ 5%
 (6)何謂 Standard addition method？有何應用？ 5%
 (7)寫出下列單位(nano-gram, giga-gram)之大小。 5%
 (8)做微量分析時最需注意哪些事項？ 5%

國立中山大學 95 學年度碩士班招生考試試題

科目：普通化學【海地化所碩士班甲組(含乙組選考)】

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1. Give the complete or full name in English for each of the following chemical elements or compounds: (30 %)

- (1) He (2) N (3) S (4) P (5) Si (6) Mg
(7) Fe (8) Zn (9) Hg (10) Th (11) Ar (12) HNO₃
(13) CaCO₃ (14) FeCl₃ (15) NH₄OH

2. Explain the following terms concisely: (30 %)

- (1) polymer (2) carbohydrates (3) Avogadro's number
(4) nuclear fusion (5) pH (6) isotopes (7) enthalpy of reaction
(8) precision and accuracy (9) Henry's law (10) stoichiometry

3. What is the specific heat capacity of a substance? What is its molar heat capacity? (10 %)

4. A piece of pure limestone is subject to reaction with sufficient hydrochloric acid to produce carbon dioxide and other products. Write down the reaction formula with phases indicated, and find out how much carbon dioxide is produced in mole and volume at STP (assuming it is an ideal gas) if the limestone weighs 15g . (atomic weight: calcium 40; carbon 12; oxygen 16) (10 %)

5. What are the characteristics of radioactive decay of an isotope? What are their applications for geosciences? (20 %)

- 一、試述「板塊構造」(plate tectonics) 學說之源起及發展過程，并以現今海底地形說明之。(20%)
- 二、試說明太平洋和大西洋海底沉積物之異同及其原因。(15%)
- 三、試簡繪一完整之「地質年代表」(geologic time table)，并標明其各自之起迄年代。(15%)
- 四、試說明如何利用地球物理探測方法研究地質問題。(20%)
- 五、試舉至少三例說明如何利用地球化學方法來研究地質相關問題。(20%)
- 六、何謂「地球系統科學」(Earth System Sciences) ? (10%)

海洋學概論 (海地化所乙組)

1. Please write short answers and draw diagrams if you can, to explain the following terminologies: (50%)
 - (1). Kuroshio
 - (2). Ekman spiral
 - (3). carbon cycle
 - (4). biological pump
 - (5). photic zone
 - (6). collision margin
 - (7). eutrophication
 - (8). Redfield ratio
 - (9). lithogenic sediment
 - (10). El Nino
2. Please describe the major features on the global ocean floor and their tectonic implications. Please draw a diagram to explain your answers. (15%)
3. What will happen if the wind is blowing a) along the coast, b) toward the coast, and c) away from the coast, for an extended period of time? Please draw diagrams to explain your answers, and specifically, please indicate the sea-surface gradient, the directions of the wind, and the directions of wind-driven currents? (15%)
4. What is the greenhouse effect, and how does it affect the global environment, and particularly, how does it affect oceans and coastal seas? (10%)
5. What are the impacts of typhoons on the coastal and nearshore environments around Taiwan? (10%)

以下每題各佔 20%、請將答案卷轉 90 度後以橫式書寫

1. 在野外進行地質調查時、如何描述地殼的變形及構造？
2. 請以大地應力狀態說明什麼是斷層？有哪些種類？
如何定義活斷層？
3. 請繪圖說明不整合(unconformity)的種類。
4. 請就您的瞭解、說明 921 集集地震相關的大地構造與地質的背景。
5. 請繪圖說明如何分辨向斜褶皺(syncline)與背斜褶皺(anticline)。