

國立中山大學 101 學年度碩士暨碩士專班招生考試試題

題號：4156

科目：化學【海地化所碩士班甲組】

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注意：化學反應式須先行平衡，計算題請寫出計算過程(否則扣分)

一、解釋下列名詞：(30%)

- (1) Heat capacity
- (2) Enthalpy of sublimation
- (3) Acid ionization constant
- (4) Carboxylic acid
- (5) Radioactive decay series
- (6) Avogadro's law
- (7) Fractional distillation
- (8) Buffer solution
- (9) Ligand
- (10) Chemical kinetics

二、(10%) 已知某化合物甲之分子量為 60 g/mol，其成分含質量百分比如下：碳 40.00%；氫 6.71%及氧 53.29%，10.000 g 化合物甲與成分(質量百分比)為含磷 22.56% 及氯 77.44%之化合物乙 7.621 g 反應，生成產物兩種，其中一產物化合物丙有 4.552 g 其成分之質量百分比為氫 3.69%，磷 37.77%，及氧 58.53%，寫出上述反應之平衡反應式(詳列計算過程，否則扣分)。(原子量 C: 12; O: 16; H: 1; Cl: 35.5; P: 31)

三、(10%) 以滴定方法測定水溶液中碘化鉛的 K_{sp} (7.1×10^{-9}) 是分析實驗室中普遍的練習，實驗中需配製 0.020 M 之碘化鉀(KI)及硝酸鉛($Pb(NO_3)_2$)溶液。

(1) 準確定量 10.0 mL 之硝酸鉛溶液，將碘化鉀溶液以一特殊的滴管逐滴加進硝酸鉛溶液中並均勻攪拌，一直到穩定的黃色混濁物出現為止，此特殊滴管經測量每 100 滴溶液之容積為 1.12 mL。計算此實驗之滴定終點(endpoint)為幾滴碘化鉀溶液。

(2) 某學生被指定進行(1)之滴定步驟，但將滴定液與被滴定液顛倒，發現滴定達終點所需溶液滴數與(1)部分實驗結果不同，說明發生此差異的原因。(原子量 I: 127; K: 39; N: 14; O: 16; Pb: 207)

四、(20%) 欲測定某未知成分岩石樣品中銅的含量，有許多不同方法，說明下列不同分析儀器測量銅的原理，並說明測定前必要的樣品前處理方式。

- (1) 原子吸收光譜儀(atomic absorption spectrometer)。
- (2) 感應耦合電漿—質譜儀(inductively coupled plasma—mass spectrometer)。
- (3) X-ray fluorescence spectroscopy。
- (4) 中子活化法(instrumental neutron activation analysis)。

五、(20%) 在自然樣品或環境樣品分析時，如何定義分析方法的準確度(accuracy)與精確度(precision)。說明儀器探測下限(instrumental detection limit)與方法探測下限(method detection limit)的差異。

六、(10%) 分析之動力學方法，係測定動力對化學反應速率之影響，以決定分析物之含量，說明為何有些化學分析不適用平衡分析法，而必須發展動力分析法？

國立中山大學 101 學年度碩士暨碩士專班招生考試試題

科目：普通地質學【海地化所碩士班乙組】

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一、名詞解釋 (30%)

1. lithosphere (3%)
2. isostasy (3%)
3. granite (3%)
4. epicenter (3%)
5. cross-bedding (3%)
6. metamorphic rocks (3%)
7. unconformity (3%)
8. tsunami (3%)
9. diagenesis (3%)
10. reverse fault (3%)

二、請解釋風化作用的機制(mechanism)，及風化作用在地質中的重要性。(10%)

三、何謂沈積作用(deposition)？形成沈積作用的機制與營力(forcing)有哪些？(10%)

四、請描述大陸漂移、海底擴張及板塊構造學說的內容及其發展歷史。(20%)

五、請簡述台灣造山運動的歷程，並解釋台灣島形成的可能機制為何。(10%)

六、決定地層單位的依據為何？決定地層年代的定年方法有哪些？(10%)

七、影響全球海平面高度變化的原因有哪些？如何重建過去海平面高度變化的資料？(10%)

國立中山大學 101 學年度碩士暨碩士專班招生考試試題

科目：科學英文【海地化所碩士班甲組、乙組】

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A. 閱讀能力測驗：每一題僅有一個正確或最佳答案；請於答案卷作答 (每題 4 分，共 40 分)。

(1). Answer questions 1-5 according to the abstract of the following article:

Huber, M. and Knutti, R., 2011. Nature Geoscience, vol. 5, 31-36.

The Earth's energy balance is key to understanding climate and climate variations that are caused by natural and anthropogenic changes in the atmospheric composition. Despite abundant observational evidence for changes in the energy balance over the past decades, the formal detection of climate warming and its attribution to human influence has so far relied mostly on the difference between spatio-temporal warming patterns of natural and anthropogenic origin. Here we present an alternative attribution method that relies on the principle of conservation of energy, without assumptions about spatial warming patterns. Based on a massive ensemble of simulations with an intermediate-complexity climate model we demonstrate that known changes in the global energy balance and in radiative forcing tightly constrain the magnitude of anthropogenic warming. We find that since the mid-twentieth century, greenhouse gases contributed 0.85 °C of warming (5–95% uncertainty: 0.6–1.1 °C), about half of which was offset by the cooling effects of aerosols, with a total observed change in global temperature of about 0.56 °C. The observed trends are extremely unlikely (<5%) to be caused by internal variability, even if current models were found to strongly underestimate it. Our method is complementary to optimal fingerprinting attribution and produces fully consistent results, thus suggesting an even higher confidence that human-induced causes dominate the observed warming.

1. According to the passage, the best way to understand climate is to study what? (A) Natural and anthropogenic changes. (B) Spatial warming patterns. (C) The Earth's energy balance. (D) Climate variations.
2. What method is unlikely to be used in the research? (A) Climate simulation. (B) Statistical analysis. (C) Model computation. (D) Field trip.
3. What is the best title for this article? (A) Anthropogenic and natural warming inferred from changes in Earth's energy balance. (B) The signal of ocean global warming. (C) Greenhouse-gas emission targets for global warming. (D) The detection and attribution of climate change.
4. About half of the earth can be neutralized by what? (A) Carbon dioxide. (B) Aerosols. (C) Organic carbon. (D) Radiative forcings.
5. Which forcing contributes the most to global temperature change? (A) Natural forcing. (B) Greenhouse gases. (C) anthropogenic forcing. (D) Aerosols.

(2). Answer questions 6-10 according to the abstract of the following article:

Emanuel, K., 2005. Nature 436, 686-688.

Theory and modelling predict that hurricane intensity should increase with increasing global mean temperatures, but work on the detection of trends in hurricane activity has focused mostly on their frequency and shows no trend. Here I define an index of the potential destructiveness of hurricanes based on the total dissipation of power, integrated over the lifetime of the cyclone, and show that this index has increased markedly since the mid-1970s. This trend is due to both longer storm lifetimes and greater storm intensities. I find that the record of net hurricane power dissipation is highly correlated with tropical sea

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surface temperature, reflecting well-documented climate signals, including multidecadal oscillations in the North Atlantic and North Pacific, and global warming. My results suggest that future warming may lead to an upward trend in tropical cyclone destructive potential, and—taking into account an increasing coastal population—a substantial increase in hurricane-related losses in the twentyfirst century.

6. Which terminology belongs to a different category? (A) Typhoon. (B) Cyclone. (C) Hurricane. (D) Anticyclone.
7. What factor will probably not strengthen the storm intensity? (A) Rising sea surface temperature. (B) Dissipation of hurricane power. (C) Seawater pollution. (D) Global warming.
8. According to the article, which factor may also contribute to the destructive force of tropical cyclones? (A) Human activities. (B) Hurricanes. (C) Earthquakes. (D) Increasing coastal population.
9. What is the best title for this article? (A) The side effect of global warming. (B) The strongest Atlantic tropical cyclones in history. (C) Increasing destructiveness of tropical cyclones over the past 30 years. (D) Ways to observe tropical cyclones.
10. What time scale is the most appropriate to the author's study? (A) Centurial. (B) Seasonal. (C) Annual. (D) Millennial.

B. 基本字彙測驗：寫出下列各英文名詞的中文(每題 3 分，共 15 分)。

1. Greenhouse effect
2. Thermocline
3. El Nino
4. Tsunami
5. Carbon cycle

C. 基本字彙測驗：寫出下列各中文名詞的英文(每題 3 分，共 15 分)。

1. 中洋脊
2. 貧營養鹽
3. 混合作用
4. 陸源物質
5. 間冰期

D. 英文表達測驗：將下列段落文字以大意(非逐字)方式翻寫成英文，評分以文法和拼字的正確及文句通順程度為標準(每題 15 分，共 30 分)。

1. 在去年世界的人口已經超過了 70 億；同時由於科技的發達；許多開發中國家的生活標準逐漸達到富裕的程度；這種種的因素對於地球的自然資源和生態環境均造成了重大的壓力。
2. 全球暖化到底是人類所導致的，還是自然的變化，不同領域的科學家有不同的看法。古海洋和古環境學家認為是地球系統的自然變化，但是大氣、水文、海洋學家則認為主要是因人類活動而造成的。