國立臺北大學自然資源與環境管理研究所
102 學年度第一學期『環境工程科學概論』
期中考試試題

（Take-Home，請另頁書寫列印答案，並於 2013 年 12 月 03 日繳回）
請親自做答，嚴禁抄襲，違者本科成績以不及格論處！！

一、（20%）請下載並詳閱近期送交環保署審查有關「風力發電離岸系統」
（離岸風力發電）開發行為之環境影響說明書，並蒐尋相關資訊以回
答以下問題：

　　1. 離岸風力發電之開發可能涉及政府部門那些業務，其主管機關又
　　　有那些？

　　2. 離岸風力發電開發行為之環境影響評估應該考量那些「環境議
　　　題」？

二、（20%）請查詢「臺北捷運系統防洪設計標準」之「臺北捷運系統車站
出入口防洪措施」，並就近拍攝一捷運站之出入口防洪措施標示，以
說明出入口地板高程與擋水板高度之設計準則，並應用繪圖軟體繪製
上述設計準則之示意圖。

三、（20%）請查詢近 50 年來大氣層 CO_2 濃度之年平均值，並應用電腦軟
體繪製其變化趨勢圖。由於地球表面 CO_2 濃度近期已突破 400 ppm，
請再依據化學平衡理論，計算在標準狀態下（0°C, 1 atm）、大氣中 CO_2
濃度達到 400 ppm，屆時若遇有降雨，其雨水 pH 的理論值。

四、（15%）請列表說明我國空氣品質標準，其中，粒狀污染物何以不能使
用 ppm 或 ppb 為其單位？請簡要說明其理由。並請針對其中之氣狀污
染物，以 $\mu g/m^3$ 為單位，換算其在一般狀態下（25°C, 1 atm）之標準
值。

五、（25%）苯二甲酸（Benzenedicarboxylic acid）為石油化學工業常用的
一種有機化合物，並有三種同分異構物，請先就二甲酸官能基以相對
位置之連接方式，繪製對苯二甲酸（(Purified) Terephthalic acid, PTA）
之化學構造式。現若以對苯二甲酸與乙二醇（(Mono)-Ethylene Glycol,
MEG)為原料聚合生產聚對苯二甲酸乙二酯（Polyethylene terephthalate,
PET)，請圖示其聚合化學反應式。而 PET 與日前喧囂一時的塑化劑
（Plasticizer，最常見者為鄰苯二甲酸酯類 Phthalates）又有何關聯？
請概要論述之。

Institute of Natural Resource Management

National Taipei University

Introduction to Environmental Science and Engineering

Fall Semester, 2013

Midterm Examination

(Take-home, Hand-in the answer sheets by December 03, 2013)

1. (20%) Please identify related environmental issues that should be considered in the Environmental Impact Assessment of offshore wind power development. In addition, try to read and comment on the two examples of Environmental Impact Statement (of offshore wind power development) reviewed by Taiwan EPA.

2. (20%) Please describe and illustrate (by sketch) the design criteria of exit elevation in the Taipei Mass Rapid Transit (MRT) system for the consideration of flood prevention. In general, there are two types of elevation to be specified: ground level and the height of flood gate.

3. (20%) Please collect the data of annual average concentrations of global atmospheric CO_2 from year 1963 to year 2013 and illustrate the trend by graph. The concentration of global CO_2 has reached the level of 400 ppm (parts per million) recently. Please calculate the pH value of natural rain water with CO_2 concentration of 400 ppm under the standard condition (temperature: 0°C, atmospheric pressure: 1 atm).

4. (15%) Please describe Taiwan standard of ambient air quality in their original metric units. Why cannot the units of particulate matters (PM) standards be in ppm or ppb (parts per billion)? Moreover, could you try to calculate the standards of gaseous pollutants in the metric unit of $\mu g/m^3$ under the normal condition (temperature: 25°C, atmospheric pressure: 1 atm)?

5. (25%) Please sketch the chemical structure of (Purified) Terephthalic acid (PTA in short or Benzene-1,4-dicarboxylic acid), one of the isomers of Benzenedicarboxylic acid. A commonly-used plastic, Polyethylene terephthalate (PET), is made of the polymerization of PTA and (Mono)-Ethylene Glycol (MEG in short). Please illustrate the reaction by chemical structures. Lastly, please discuss and comment the connections of PET to plasticizer (the most commonly-applied family is Phthalates).