

國立宜蘭大學

102 學年度研究所碩士班考試入學

環境工程概論試題

(環境工程學系碩士班)

准考證號碼：

《作答注意事項》

1. 請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。
2. 考試時間：100 分鐘。
3. 本試卷共有 7 大題，共計 100 分。
4. 請將答案寫在答案卷上。
5. 考試中禁止使用大哥大或其他通信設備。
6. 考試後，請將試題卷及答案卷一併繳交。
7. 本試卷採雙面影印，請勿漏答。
8. 應試時不得使用電子計算機。

1. Give a brief description or a definition of the following terminologies (30%):
 - (a) Particulate matter 2.5;
 - (b) Persistent organic pollutants;
 - (c) Refuse-derived fuel 5;
 - (d) Carbon footprint;
 - (e) Eutrophication;
 - (f) Mixed liquor volatile suspended solids;
 - (g) Battery-powered electric vehicles;
 - (h) Energy Conservation;
 - (i) Clean Development Mechanism;
 - (j) Activated noise control.

2. The initial oxygen concentration of diluted water sampling without seeding is 8 mg/L, this value decreased to 5.5 mg/L after 5 days' cultivation. (a) How much is the BOD_5 of the waste water with the dilution ratio (P) of 0.005? (5%) (b) If the waste water was seeded and the seeding ratio (f) is 0.6, the initial and 5 days' oxygen concentrations of seeding samplings are 5 and 3 mg/L. What is the real BOD_5 value? (5%)

3. Dust air at a fertilizer plant flows through a 70% efficient cyclone and then through an electrostatic precipitation (ESP). The inlet air to the cyclone has a dust loading of 50 grains/cubic foot. (a) In order to meet a control standard of 98.5% collection efficiency for the fertilizer plant as a whole, what is the allowable concentration of dust (in grains/cubic foot) in the air that exits from the ESP? (5%) (b) The outlet air from the ESP actually contains dust at 0.5 grain/cubic foot. Calculate the efficiency of the ESP. (5%) (c) Furthermore; a baghouse is taken as the third controller with the collection efficiency of 98%, what are the overall collection efficiency and exit concentration of this set of air control system? (5%)

4. The concentration of glucose ($C_6H_{12}O_6$) in some waste water is 1000 mg/L, please try to find the values of COD (oxidation completely) and TOC of this waste water. (10%)

5. The following table shows the amount of CO₂ that is emitted by the combustion of four types of fuel. Suppose each fuel is used as the primary energy source for a 1000 MW power plant. (a) If the power plant operates for 20 years, how much energy will be provided during the period of operation? Express your answer in GJ. (2%) (b) How many kg of CO₂ will be emitted by each fuel? (8%)

| Fuel | CO ₂ emission [kg per GJ heat output] |
|---------|--|
| Coal | 120 |
| Oil | 75 |
| Methane | 50 |
| Wood | 77 |

6. Please describe all kinds of the derivative waste (衍生廢棄物) from municipal solid waste (MSW) combustion in the incinerator in great detail, including the characteristics, analysis, treatment methods and processes. (15%)
7. 依據土壤及地下水污染整治法第五條，縣市主管機關應定期檢測轄區地下水品質狀況，如污染物達地下水污染管制標準者，應採取必要措施，追查污染者責任。為預防地下水污染，法規已賦予主關機關職責，應積極進行地下水之污染控制。請分項說明地下水污染控制的策略應如何擬定與進行。(10%)