國 立 清 華 大 學 命 題 紙

99 學年度 生醫工程與環境科學系乙組(環境分子科學組) 碩士班入學考試

科目 環境科學與工程 科目代碼 2402 共 1 頁第 1 頁 *請在【答案卷卡】內作答

1. Define, explain and if necessary, compare the following terms: (30%: 6 pts of each)
   (A) Pollutants and contaminants
   (B) Risk and hazard
   (C) Limnology and oceanography
   (D) Thirdhand smoke hazards
   (E) Coding system for plastic bottles and describe at least five numbers (examples)

2. We pass a gas stream through a fiber filter that collects 80 percent of the particles present. If we were to use three such filters in series and if we assume that each of them has 80 percent efficiency, what would the expected overall collection efficiency be? (10 %)

3. A conventional complete-mix activated-sludge treatment process is to be used to treat 4000 CMD (m^3/day) of a wastewater with a BOD_5 of 250 mg/L after primary settling. The process loading (food-microorganism ratio) is to be 0.3 kg BOD_5/kg MLVSS•day. If the detention time is 6 hr and the recirculation ratio is 0.33, determine the value of the MLVSS. (10%)

4. Schematic of a typical municipal wastewater treatment plant for surface water showing pretreatment, primary treatment, secondary treatment, and tertiary treatment. Please label all of the parts and explain their functions. (10%)

5. The analysis of a fuel is 86.3% C, 12.2% H, 1.5 % S. It is burned with 20% excess air with humidity 0.0116 mol/mol dry air, and combustion is complete. Determine the concentration of SO_2 produced theoretically at 260 °C. (20%)

6. Bituminous coal has a heat of combustion of 31.4 MJ/kg. A coal-fired power plant produces an average of 2.2 kWh of electrical energy per kilogram of bituminous coal burned. What is the average overall efficiency of this production of electricity? The electrical power output of the plant is 1000 MW. The other energy content of the fuel is rejected to the environment as waste heat. About 15% of the waste heat goes up the smokestack and the other 85% is taken away by cooling water that is drawn from a nearby river. The river has an upstream flow of 100.0 m^3/s and a temperature of 20.0 °C. What would be the river temperature just after it receives the heated cooling water? (20%)