

本試題是否可以使用計算機：可使用，不可使用（請命題老師勾選）

### 環境化學

1. Disinfection By Products (DBP) will be produced through the chlorination process of contaminated water supply in the drinking water treatment plant. Write out at least 4 components of Tri Halogen Methane (THM with one Carbon) and 4 components of Halogen Acetic Acid (HAA with two carbon). What is their harmful effect to the human health?(18%)
2. Polycyclic Aromatic Hydrocarbon (PHAs) and Poly Chlorinated Biphenyls (PCB) compounds are present in different polluted sources. Write out these two groups of different chemical structure and their polluted sources.(10%)
3. To calculate out the COD(mg/L as O<sub>2</sub>) and TOC(mg/L as C) and the ratio of COD/TOC from the mass concentration of 1,000mg/L of :  
(1) Isopropyl Alcohol (2) Acetone (3) Acetic Acid (12%)
4. Protein compound would be the nature organic nitrogen pollutant discharged into the aerobic activated sludge process. With extended aeration and anoxic denitrification processes, the organic nitrogen will be biodegraded to different oxidized nitrogen and reduced nitrogen. Please write down at least 3 biochemical reactions and at least 5 different intermediate and end products of nitrogen components. (10%)

(背面仍有題目,請繼續作答)

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### Problem Sets for Environmental Microbiology

5. **Diversity of Microbial Ecology** Please clearly describe, compare, and contrast physiological characteristics and their environmental significance of the following paired microorganisms:
- (1) *Nitrosomonas* and *Nitrobacter* (5 pt)
  - (2) Methanogenes and Methanotrophs (5 pt)
  - (3) *Thiobacillus* and *Desulfovibrio* (5 pt)
6. **Microbial Tools to study microbial ecology** The start of 21<sup>st</sup> century marks a period of revolutionary advancement in our ability to study microbial ecology. Please list 3 traditional and 3 molecular tools that can be used to study microbial ecology and comment on their advantages and disadvantages in studying microbial ecology. (7 pts)
7. **Microbial growth kinetics** Assume that you have run a batch growth study using five concentrations of substrate  $S_0$  and have generated the growth data shown in the table below. Each system was started using an initial inoculation  $X_0 = 30$  mg/L of cells previously acclimated to the substrate.
- (a) Determine the specific growth rate ( $\mu$ ) of each batch system (10 pt)
  - (b) Determine values of  $\mu_{\max}$  and  $K_s$  (5 pt)
  - (c) The substrate concentration in flask 5 was 150 mg/L at 20 hour; calculate the cell yield and maximum substrate utilization rate ( $q^{\max}$ ) (5 pt)

Biomass concentration  $X$  in mg/L at time and  $S_0$  indicated

Time (h)	$S_0 = 500$	$S_0 = 1000$	$S_0 = 4000$	$S_0 = 8000$	$S_0 = 12000$
0	30	30	30	30	30
2	47	52	58	58	60
4	64	90	103	118	120
8	140	234	354	419	420
12	300	637	1154	1500	1500
16	300	640	2828	5405	5400
20	300	640	2850	5500	7500

8. **Bioenergy Production from Renewable Biomass** Assuming that you are assigned by the Taiwan Bureau of Energy to propose a feasible plan for a full-scale production of ethanol from biomass. Please outline the scheme of your proposal including (1) the raw biomass materials will be used for ethanol production (2) what kind of pretreatment of raw materials (3) bioprocess for ethanol production (4) wastes treatment processes. When you propose you plan, please consider that it must be feasible for Taiwan and the whole process should be environmentally friendly (8 pt).