

系所組別：環境工程學系乙組

考試科目：環境工程概論

考試日期：0219，節次：1

※ 考生請注意：本試題 可 不可 使用計算機

1. Explain the glossary. (24%)
 - (1) Water scarcity (3%)
 - (2) Biodiversity (3%)
 - (3) Landfill leachate (3%)
 - (4) Disinfection By-Products (DBPs) (3%)
 - (5) Median lethal dose (LD_{50}) (3%)
 - (6) Sludge Volume Index (SVI) (3%)
 - (7) Carlson Trophic State Index (CTSI) and its water-quality components (3%)
 - (8) River Pollution Index (RPI) and its water-quality components (3%)

2. Natural Organic Matter (NOM) in water is the result of the complexation of soluble organic matter derived from biochemical degradation of vegetation in the surrounding environment. NOM is often measured as Total Organic Carbon (TOC) in waters. Please summarize the primary impact NOM can have on the following drinking-water treatment processes. (12%)
 - (1) Disinfection (3%)
 - (2) Coagulation (3%)
 - (3) Membranes (3%)
 - (4) Distribution system (3%)

3. Wastewater treatment. (12%)
 - (1) Please list the major constituents (5~6 constituents) found in an average-strength municipal wastewater and explain their impacts on the receiving water bodies. (6%)
 - (2) Please list the specific unit process(es) of a conventional wastewater treatment plant that remove significant amount of the correspondent wastewater constituents mentioned in (1). (6%)

4. Please list four major particulate air pollutant emission-control technologies and briefly explain their operating principles, appropriate particle size, advantages and disadvantages. (12%)

5. Please draw a flow diagram for a material recovery facility designed to process source-separated PET and HDPE plastics, metal and aluminum cans, and clear glass. (8%)

6. Please list two examples of persistent organic pollutants (POPs), and write a short paragraph that describes each chemical, its common uses and applications, and known or suspected impacts on the environment and human health. (10%)

(後面尚有試題)

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7. A refuse-derived fuel (RDF) comprises 60% mixed paper, 20% mixed plastic and 20% textiles. Assume the RDF is dried before combustion. Use values from Table 1 to determine the volume of air (in Liter) (20°C , 1 atm, $R = 0.082 \text{ L-atm/mole-K}$, air is approximately 21% O_2) required to combust 1 kg RDF. (10%)

Table 1: Common physical/chemical characteristics of solid-waste components

	Moisture (% by wet mass)	Hydrogen (% by dry mass)	Carbon (% by dry mass)	Sulfur (% by dry mass)	Oxygen (% by dry mass)
Plastic (mixed)	0.2	7.2	60	<0.1	22.8
Paper (mixed)	10	5.8	43.4	0.2	44.3
Textiles	10	6.4	48	0.2	40

The molecular weight for C, H, S and O is 12, 1, 32 and 16 g/mole, respectively.

8. If the measured atmospheric lapse rate is denoted as Γ_a and the standard lapse rate is denoted as Γ_d . Please explain the stability condition of the atmosphere and draw the possible shape of a pollutant plume emanating from smokestacks for each of the following vertical temperature profile of the atmosphere. (12%)

