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科目： 環境工程概論
節次： 8

國立臺灣大學 111 學年度碩士班招生考試試題

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1. Please explain the following terms and their related environmental implications. (15 pts)
   (a) zero carbon emissions
   (b) ammonia stripping
   (c) anaerobic digestion

2. The BOD_5 of the wastewater is 180 mg/L, and the ultimate BOD is 300 mg/L. Please find the reaction rate constant k (based e). (10 pts)

3. A wastewater treatment plant has a chemical tank of 1000 m³ capacity. In the beginning, the tank is half full with 20000 kg of organic waste suspended in water. Water is being pumped into the tank at the rate of 100 m³/hr and leaves the tank at the rate of 75 m³/hr. How much organic waste remains in the tank at the end of 8 hr? (15 pts)

4. 根據下圖及文字說明，論述廢水處理與冠狀病毒(COVID-19)之關係，面臨的風險與相關環境的影響。(10 pts)
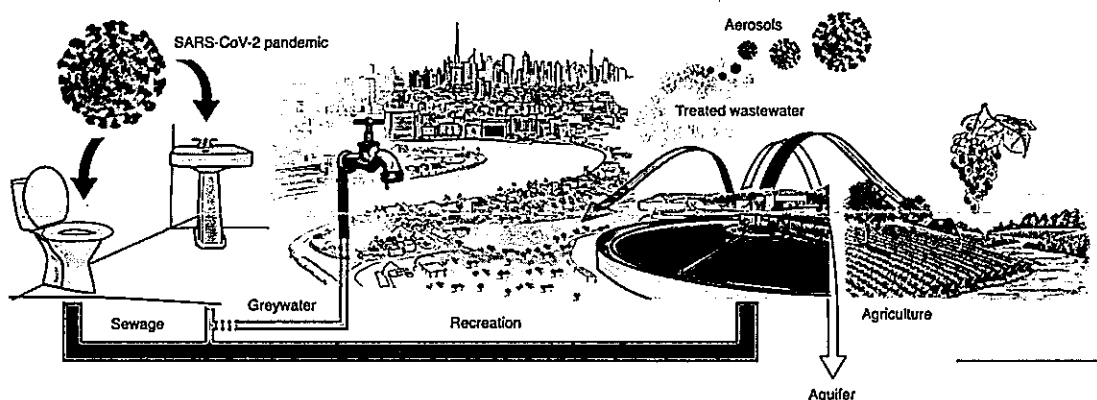
Entry of the virus into the sewer system results in a variety of potential transport pathways that must be considered in the context of faecal–oral transmission. In industrialized countries, most of the collected domestic wastewater and viral load is treated in centralized wastewater treatment plants (WWTPs). However, conventional WWTPs generally do not remove virions completely and high influent viral loads during pandemics can lead to insufficient reduction of viruses before discharge. Furthermore, freshwater scarcity results in the reuse of an increasing volume of treated wastewater for a variety of purposes, such as groundwater recharge, recreation and irrigation of food crops, thus creating other potential routes for SARS-CoV-2 transmission. An additional and potentially serious health risk is faecal–oral transmission in low-income countries where communities with inadequate sanitation infrastructure (for example, open sewers and direct discharge into the environment) could be infected by untreated wastewater or faecal waste.

見背面

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5. The results of noise spectrum analysis are shown in the table below. Please calculate dBA, dBD and dBF. In addition, please describe the meanings of dBA、dBD. (10 pts)

Frequency (Hz)	31.5	63	125	250	500	1000	2000	4000	8000
SPL (dB)	70	85	80	75	75	78	80	73	64
A-frequency weighting	-39	-26	-16	-9	-3	0	+1	+1	-1
D-frequency weighting	-16	-11	-6	-2	0	0	+8	+11	+6

6. Please define what VOCs are and introduce three methods for the control of VOCs emissions and its working mechanism. (10 pts)

7. Dioxin and dioxin-like substances can be transported from the emission source through the atmosphere to a long distance in the environment, leading to accumulate in organisms in the way of the food chain. Many kinds of dioxin and dioxin-like substances are classified as a human carcinogen by The International Cancer Research Center. Please explain how the dioxins and dioxin-like substances are generated naturally and unnaturally, and introduce three different ways to control dioxin in the incinerator. (15 pts)

8. The chemical compositions of organic waste are as follows:

Water content (%)	Ash (%)	Flammable fraction (%)						
		C	H	O	N	S	Cl	Unknow
74.9	0.01	12	1.5	10.25	0.75	0.05	0.25	0.2

(1) Is the treatment of incineration suitable for this organic waste? Why?

(2) This organic waste is proposed to be treated by composting, and the organic waste is mixed with agricultural waste (water content: 20%; C/N = 60 with 0.3% of N). If the water content of the mixture has to be controlled at 49 %, what the mixing ratio of these waste should be? What is the C/N ratio? (15 pts)

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