

科目：水處理工程 適用：土木所環工組

編號：461

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

本 試 題

共 / 頁

第 / 頁

計算題請務必詳列計算過程與單位，否則不予計分或酌情扣分。

- 一、The city of Taipei, is considering two proposals for a new water-treatment plant. Taipei's average daily demand is $8,640 \text{ m}^3/\text{d}$. Proposal A is to build a plant that will produce $360 \text{ m}^3/\text{h}$ and a storage reservoir to hold $2,000 \text{ m}^3$ of water. Proposal B is to build a plant that will produce $1,080 \text{ m}^3/\text{h}$, but no water storage reservoir will be provided. Which proposal do you recommend? Explain why. (12%)
- 二、The Rappahannock River near Warrenton, VA, has a flow rate of $3.00 \text{ m}^3/\text{s}$. Tin Pot Run (a pristine stream) discharges into the Rappahannock at a flow rate of $0.05 \text{ m}^3/\text{s}$. To study mixing of the stream and river, a conservative tracer is to be added to the stream. If the instruments that can measure the tracer can detect a concentration of 1.0 mg/L , what minimum concentration must be achieved in the stream so that 1.0 mg/L of tracer can be measured after the river and stream mix? Assume that the 1.0 mg/L of tracer is to be measured after complete mixing of the stream and Rappahannock has been achieved and that no tracer is in Tin Pot Run or the Rappahannock above the point where the two streams mix. What mass rate (kg/d) of tracer must be added to the stream? (12%)
- 三、Why the colloids are suspended in solution and cannot be removed by sedimentation or filtration? And how to destabilize them? What are the differences between *coagulation* and *flocculation* from colloids removal points of view? (12%)
- 四、Explain the differences between biological nitrification and denitrification. (12%)
- 五、What are the differences between *Disinfection* and *sterilization*? Why a disinfectant that has a residual is preferable to one that does not? What are the differences between *free available residual chlorine* and *combined available residual chlorine*? (12%)
- 六、The operating parameters of an activated sludge pilot plant are as follows:
 Inflow rate = 100 mL/min
 Return sludge flow rate = 50 mL/min
 Influent soluble COD concentration = 300 mg/L
 Effluent soluble COD concentration = 30 mg/L
 Effluent suspended solid concentration = 15 mg/L
 Mixed liquid suspended solid concentration in aeration tank = 2000 mg/L
 Settled sludge volume after 30 min = 150 mL/L
 Aeration tank size = 40 cm wide by 50 cm long by 30 cm effective liquid depth
 Sedimentation tank size = 20 cm wide by 30 cm long by 40 cm effective liquid depth
 Wastage volume from aeration tank = 6 L/day
 Please calculate (a) Hydraulic retention time in aeration tank; (b) Sludge retention time; (c) Specific substrate utilization rate; (d) Specific growth rate; (e) Sludge volume index; (f) Observed yield coefficient; (g) Overflow rate in sedimentation tank (h) Does the sludge bulking occur? Note: Units must be clearly expressed. (40%; 5 points per issue)