編號： 145

國立成功大學 106 學年度碩士班招生考試試題

系　　所：環境工程學系

考試科目：衛生工程

考試日期：0213，節次：1

※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. A water treatment plant with maximum daily flow of 8,000 m^3/d used baffle basin as flocculator. The effective volume of the basin was 200 m^3. Assume the water elevation difference between inlet and outlet was 150 cm. Calculate the mean velocity gradient (G), hydraulic detention time (T), and GT values. Compare these values with those from conventional design practice and give your comment. (Assume the water temperature was 20℃, $\rho_w = 998$ kg/m^3, dynamic viscosity $\mu = 1.002 \times 10^{-3}$ kg/m.s)　(20%)

2. The result of the chlorine demand test conducted on the effluent from a dual-media filter is shown in the table below at 20℃. (1) Draw the residual chlorine vs. chlorine dosage curve, and specify the major residual chlorine species in various regions of the curve. (2) Calculate the chlorine dosage and chlorine demand at the breakpoint. (3) Assume the free residual chlorine required is 0.4 mg/L as Cl_2 after chlorination, specify the chlorine dosage needed.

Sample number	Chlorine dosage (mg/L as Cl_2)	Residual chlorine after 30 min. of contact time (mg/L as Cl_2)
1	0.20	0.19
2	0.40	0.37
3	0.60	0.51
4	0.80	0.50
5	1.00	0.20
6	1.20	0.40
7	1.40	0.60
8	1.60	0.80

(20%)

3. What are disinfection by-products? How to control their formation in drinking water treatment processes? (10%)

4. Assume the BOD of the influent to the aeration basin and the effluent of final clarifier of a wastewater treatment plant with completely mixed activated sludge process were 250 and 20 mg/L, respectively, while the suspended solids of both could be neglected. The flow rate of the plant was 10,000 m^3/d. The mixed liquor suspended solids (MLSS) of the aeration basin and the return sludge were 3,000 and 10,000 mg/L, respectively. Assume the recycle ratio (Qr/Q) was 0.43, and the hydraulic retention time of the aeration basin was 6 hrs. Calculate (1) food-to-mass (F/M) ratio, (2) volumetric loading rate, (3) mean cell residence time.　(20%)

5. Give the essential components for enhanced biological phosphorus removal.　(10%)

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6. A 100-m reach of circular sewer is to be designed to carry a flow of 9,504 m^3/d. The street elevation at the upper manhole is 95.00 m and at the lower manhole it is 92.60 m. Assume the slope of the sewer pipe is the same as that of the ground surface. The required minimum earth cover over the top of the sewer is 2.0 m. Assume the commercially available sewer pipe diameter are 250, 300, 375, and 450 mm, and wall thickness of all pipes is 0.05 m. Determine the appropriate pipe diameter, the actual flow depth and velocity in the selected pipe. Also establish the pipe invert elevations at the upper and lower manholes. (Manning equation $V = (1/n) R^{2/3} S^{1/2}$, n = 0.013 at all depth)　(20%)