

國立成功大學

113學年度碩士班招生考試試題

編 號：138

系 所：環境工程學系

科 目：衛生工程

日 期：0201

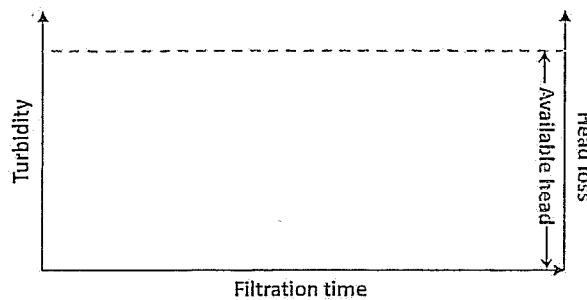
節 次：第 1 節

備 註：可使用計算機

※ 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. Answer the following questions or explain the terms.

- (1) What is a master plan? Briefly describe the content. (10%)
- (2) Write the reaction equations if soda-lime chemical precipitation methods are used to remove hardness (Ca^{2+} and Mg^{2+}) from water. (5%)
- (3) Compare the advantages and disadvantages of disinfection using free chlorine vs. combined chlorine. (5%)
- (4) Compare the advantages and disadvantages of tunneling work (as 潛盾施工法) and open cut work (明挖施工法). (5%)
- (5) Describe four types of sedimentation and their characteristics. (5%)
- (6) Sketch the profiles (操作曲線) of head loss and turbidity in optimal filtration operation. Please label the profiles (請標示出曲線) (5%)



2. The following data have been obtained in a BOD test that is made to determine how well a wastewater treatment plant is operating. What percentage of the BOD is being removed by this treatment plant, assuming that this particular BOD test could measure 100% of the pollutants in the wastewater? If this is a secondary treatment plant that is supposed to remove 85% of the BOD, would you say it is operating properly? (15%).

	Initial D.O. (mg/L)	Final D.O. (mg/L)	Volume of wastewater (mL)	Volume of dilution water (mL)
Untreated sewage	6.0	2.0	5	295
Treated sewage	9.0	4.0	15	285

3. A well is producing from a confined aquifer at steady state. An observation well 100 m away from the pumping well shows a drawdown, s_2 of 5 m, while an observation well 20 m away from the pumping well shows a drawdown, s_1 of 16 m. (1) If the well produces at a rate $Q = 20 \text{ m}^3/\text{min}$, what is the transmissivity (m^2/min) of the aquifer? (2) In the case where the pumping rate is unknown, what would be the drawdown, s_w at the pumping well of radius 0.2 m? (20%)
4. Treatment of a water supply requires 60 mg/L of FeCl_3 (molecular weight of 162 g/mole) as a coagulant. The natural alkalinity of the water is 40 mg/L as CaCO_3 . Based on the theoretical chemical reactions, what dosage of lime as CaO (molecular weight of 56 g/mole) is required to react with FeCl_3 after the natural alkalinity is consumed? (10%)
5. What is the corresponding overflow rate (express unit of m/day and rounding to integer 四捨五入到整數) that can just completely remove coagulated particles with a size of 0.00075 m and density of 1001 kg/m^3 ? ($\rho_w = 1000 \text{ kg/m}^3$, $\mu = 0.89 \times 10^{-3} \text{ kg/m}\cdot\text{s}$ at 25°C , $g = 9.8 \text{ m/s}^2$) If the flow rate is 6,000 CMD, retention time is 3 hours, design the sedimentation tank. (10%)

6. The results of a chlorine demand test on a raw water at 20°C are given in the following table.

Sample	Chlorine dosage (mg/L)	Residual chlorine (mg/L)
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

- (a) Sketch the breakpoint chlorination curve. (5%)
- (b) What is the breakpoint chlorine dosage? Indicate the dosage on the plot. (2%)
- (c) What is the chlorine demand at a chlorine dosage of 1.20 mg/L? Indicate the value on the plot. (3%)