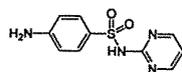


1. 為何民生汙水處理系統中，通常厭氧系統較好氧活性污泥系統產生的汙泥量少？ (15 分)
2. 檢測自來水中總菌數時，甲生以薄膜過濾法過濾自來水後，以 nutrient agar 培養，可得平均 68 CFU/100 ml，但若以 R2A 培養基培養，可得平均 102 CFU/100 ml。請詳述為何兩種培養基會有不同結果？ (15 分)
3. 檢測自來水中是否遭受糞便汙染時及水處理時檢測消毒效能的常用指標菌分別為何？是否可利用相同指標菌？原因為何？ (20 分)
4. Please design a series of experiments to test the hypothesis that addition of nitrate to a typical municipal wastewater is able to enhance the photodegradation of Sulfadiazine (4-amino-*N*-pyrimidin-2-yl-benzenesulfonamide). You have to clearly describe the following experimental approaches:
 - (1) the composition of the tested solution
 - (2) the treatment variables
 - (3) the blanks (may be more than one type of blank)
 - (4) sampling method and sample preservation method
 - (5) major analytical method and the necessary pretreatment of sample
 (12.5 分)



5. Solid 2,4,6-trichlorophenol (TCP) was found in a dumping site. The pH of the leachate from the dumping site is 7 and it has been equilibrated with pure TCP with the total dissolved concentration at 6272 mg/L. What will be the total dissolved concentration of TCP (including the ionized and non-ionized TCP) in a leaching solution, which has been added to the dumping site to try to remove TCP and has a buffered pH at 7.5? (the pKa of TCP is 6.19) (12.5 分)
6. One hundred cubic meters of soil have been contaminated with 1000 ppm (dry weight basis) of oxygenated fuel with its average chemical formula as $C_{10}H_{20}O$. The bulk density of the soil is 1.8 g/cm^3 . An engineer is going to provide air into the soil layer as electron acceptor for microorganisms to transform the contaminants into carbon dioxide. How many cubic meters of air are needed to complete this remediation work assuming that the oxygen utilization efficiency is only 10%? Please also quantitatively describe the strategy of regulating the magnitude of flow rate with time as you blow or suck air into or through the soil layer. (12.5 分)
7. There is a soil contaminated with 2000 ppm cadmium (Cd). Cadmium is all in solid form as $CdS_{(s)}$. How much Na_2EDTA (ethylenediaminetetraacetic acid disodium salt dehydrate) is needed to make 10 m^3 EDTA solution to remove 80% of cadmium in 100 Kg of dry soil? (note: $CdS_{(s)}$ residue is existing, and carbonates in the solution is negligible) (12.5 分)

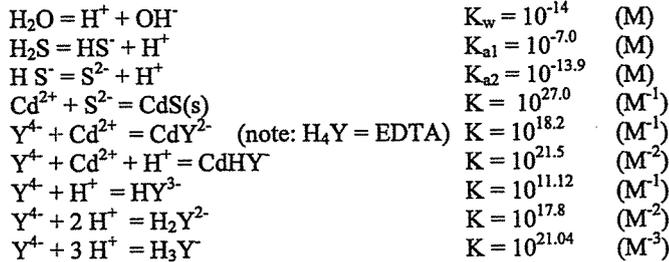
見背面

Supplementary material

(1) Atomic weight and molecular weight

H = 1, C = 12, O = 16, Cl = 35.45, Na = 23, Cd = 112.41, S = 32,
TCP = 197.2, Na₂EDTA (=Na₂Y) = 336.24, H₄EDTA = 292.24

(2) Equilibrium constants



Logarithm Table

Table of base 10, base 2 and base e (ln) logarithms:

x	log ₁₀ x	log ₂ x	log _e x
0	undefined	undefined	undefined
0 ⁺	-∞	-∞	-∞
0.0001	-4.000000	-13.287712	-9.210340
0.001	-3.000000	-9.965784	-6.907755
0.01	-2.000000	-6.643856	-4.605170
0.1	-1.000000	-3.321928	-2.302585
1	0.000000	0.000000	0.000000
2	0.301030	1.000000	0.693147
3	0.477121	1.584963	1.098612
4	0.602060	2.000000	1.386294
5	0.698970	2.321928	1.609438
6	0.778151	2.584963	1.791759
7	0.845098	2.807355	1.945910
8	0.903090	3.000000	2.079442
9	0.954243	3.169925	2.197225
10	1.000000	3.321928	2.302585
20	1.301030	4.321928	2.995732
30	1.477121	4.906891	3.401197
40	1.602060	5.321928	3.688879
50	1.698970	5.643856	3.912023
60	1.778151	5.906991	4.094345
70	1.845098	6.129283	4.248495
80	1.903090	6.321928	4.382027
90	1.954243	6.491853	4.499810
100	2.000000	6.643856	4.605170
200	2.301030	7.643856	5.298317
300	2.477121	8.228819	5.703782
400	2.602060	8.643856	5.991465
500	2.698970	8.965784	6.214608
600	2.778151	9.228819	6.396930
700	2.845098	9.451211	6.551080
800	2.903090	9.643856	6.684612
900	2.954243	9.813781	6.802395
1000	3.000000	9.965784	6.907755
10000	4.000000	13.287712	9.210340

x	10 ^x
0.1	1.26
0.2	1.58
0.3	2.00
0.4	2.51
0.5	3.16
0.6	3.98
0.7	5.01
0.8	6.31
0.9	7.94

試題隨卷繳回