NAME:

FOR EACH PROBLEM, MAKE (AND STATE) ANY REASONABLE ASSUMPTIONS NECESSARY FOR GETTING A SOLUTION, IN ADDITION TO THOSE GIVEN. BOX YOUR FINAL ANSWERS.

Final Exam Information

$1\ m^3 = 1000$ L 1 mg = 10^{-3} g 1 µg = 10^{-6} g

T(K) = T(°C) + 273.15 1 atm = 101325 Pa $g = 9.81\ m/s^2$

Atomic weights (g/mol): 1 for H, 12 for C, 14 for N, 16 for O, 31 for P, 32 for S, 35.5 for Cl

Density of pure water at 1atm and 4 °C = 1000 kg/m3

Eq. 4.3 $PV=nRT$ where $R=0.08206$ L atm mol^{-1} K^{-1}

Eq. 4.4 $\rho_{air}=\frac{mass\ air}{volume\ air}=\frac{n_{air}\times MW_{air}}{V_{air}}=\frac{n_{air}}{V_{air}}\times MW_{air}=\frac{P}{RT}\times MW_{air}$

Eq. 6.23 $\mathrm{HA_{aq}}\Leftrightarrow H^{+}_{\mathrm{aq}}+\mathrm{A^{-}_{aq}}$

Eq. 6.24 $A_aB_{b_s}\Leftrightarrow \mathrm{aA^{+}_{aq}}+\mathrm{bB^{-}_{aq}}$

Eq. 6.25 $A_{\mathrm{aq}}\Leftrightarrow A_{\mathrm{ads}}$ **or** $A_g\Leftrightarrow A_{\mathrm{ads}}$

Eq. 6.26 $A_aB_{b_{(aq)}}\Leftrightarrow A_aB_{b_{(g)}}$

Eq. 7.8 $E=A\times EF\times(1-ER/100)$

Eq. 7.9 $EF=k\left(\frac{s}{12}\right)^a\left(\frac{W}{3}\right)^b$

Eq. 7.10 $EF=k\left(\frac{s}{12}\right)^a\left(\frac{V}{30}\right)^d\left(\frac{M}{0.5}\right)^{-c}-F$

Eq. 7.11 $C_xH_yO_zN_aS_b+\left(\frac{4x+y-2z+4b+2c}{4}\right)O_2+3.76\left(\frac{4x+y-2z+4b+2c}{4}\right)N_2$

$$\rightarrow \mathrm{xCO_2}+\frac{y}{2}\mathrm{H_2O}+\left(3.76\left(\frac{4x+y-2z+4b+2c}{4}\right)+\frac{a}{2}-\frac{c}{2}\right)N_2+\mathrm{bSO_2}+\mathrm{cNO}$$

Eq. 8.3 $f(t)=f_c+(f_0-f_c)e^{-kt}$

Eq. 8.4 $Q=XY\left[f_c+\frac{(f_0-f_c)}{k}\frac{(1-e^{-kt})}{t}\right]$

Eq. 8.5 $v'=\frac{K}{\eta}\frac{dh}{dL}$

Eq. 8.9 $V\frac{d(\mathrm{DO})}{dt}=Vk_r(\mathrm{DO_s}-\mathrm{DO})-Vk_dL_0e^{-k_dt}$

Eq. 8.13 $D=DO_{sat}(T_0)-DO$

Table 8.7

Temperature (°C)	Chloride Concentration in Water (mg/L): 0	5000	10,000	15,000
0	14.62	13.73	12.89	12.10
5	12.77	12.02	11.32	10.66
10	11.29	10.66	10.06	9.49
15	10.08	9.54	9.03	8.54
20	9.09	8.62	8.17	7.75
25	8.26	7.85	7.46	7.08
30	7.56	7.19	6.85	6.51

Eq. 8.17 $\mathrm{DO}(t)=\mathrm{DO_{sat}}(T_0)-\frac{k_dL_0}{k_r-k_d}[e^{-k_dt}-e^{-k_rt}]-D_0e^{-k_rt}$

Eq. 8.21 $f_i(t)=\frac{f(t)}{R}$

Eq. 8.22 $v_i'=\frac{v'}{R}$

Eq. 8.18 $L(t)=L_0e^{-k_dt}$

Eq. 8.19 $t_c=\frac{1}{k_r-k_d}\ln\left[\frac{k_r}{k_d}\left(1-\frac{D_0}{L_0}\frac{k_r-k_d}{k_d}\right)\right]$

Eq. 8.20 $R=1+\frac{\rho_s}{\eta}K_{oc}f_{oc}=1+\frac{\rho_s}{\eta}K_d$

Eq. 9.1 $\text{Erosion rate}=R\times K\times LS\times C\times P$

Soil type	fc (cm/h)	fo (cm/h)	k (h^{-1})
Alphalpha loamy sand	3.56	48.26	38.29
Carnegie sandy loam	4.50	35.52	19.64
Dothan loamy sand	6.68	8.81	1.40
Fuquay loamy sand	6.15	15.85	4.70
Leefield loamy sand	4.39	28.80	7.70
Troop sand	4.57	58.45	32.71

Table 8.2