Fall 2005
CEE 432/532
Quiz #5

1. Fill in the blanks: **[10]**

(a) Two equations are widely used to model the velocity of water in uniform river or stream channels: (1) the ______________ equation and (2) the ______________ equation.

(b) For a pipe (radius = r) flowing full, the hydraulic radius (r_h) is defined as the ratio of _______________ area to ______________.

(c) In a stream (flow area A), the relationship between discharge (Q) and velocity (V) is:

Q = __________ * ________________

(d) Which of the following represent the correct vertical velocity profile along depth for a river (circle the correct answer).

(e) The average amount of time that water remains in the lake is called the _____________ __________________ time.

(f) The downward surface current in a lake is called wind _______________ .

(g) ___________________ occurs when water at the bottom of a lake is denser than the surface water, and water currents fail to generate eddies strong enough to penetrate the boundary between the water layers.

(h) The upper layer of a lake, which is typically well-mixed, is called ____________________.

(i) The region between the rapid temperature change in lake is called __________________.

(j) The isolation of bottom waters from the atmosphere prevents the renewal of oxygen as it is consumed by the organism, and therefore the water may become ______________ or _______________________.

2. The transverse dispersion coefficient of a river ($Q = 100\ m^3/day$) is 0.1 m2/sec. The river is most likely: **[2]**

(A) Beaver
(B) MacKenzie
(C) Danube
(D) Mississippi

3. A lake has a volume of $60{,}000\ m^3$, and the flow into the lake is $17\ m^3/day$. The hydraulic detention time (in days) is most nearly: **[4]**

(A) 1,500
(B) 2,500
(C) 3,500
(D) 4,500

4. The temperature in the epilimnion of a lake is 20°C. The thermocline is at a depth of 7.5 m (approximate thickness = 3 m). Assuming the molecular diffusion coefficient is $2.5\ x10^{-5}\ cm^2/sec$, the oxygen flux (in mg/cm^2-sec) through the thermocline is most nearly: **[4]**

(A) $7.67\ x10^{-5}$
(B) $7.67\ x10^{-8}$
(C) $2.30\ x10^{-9}$
(D) $7.67\ x10^{-10}$

TABLE 2-4 Solubility of Oxygen (mg/liter) in Water Exposed to Water-Saturated Air at a Total Pressure of 760 mm Hg[a]

Temperature (°C)	Chloride concentration in water (mg/liter) 0	5,000	10,000	15,000	20,000
0	14.6	13.8	13.0	12.1	11.3
1	14.2	13.4	12.6	11.8	11.0
2	13.8	13.1	12.3	11.5	10.8
3	13.5	12.7	12.0	11.2	10.5
4	13.1	12.4	11.7	11.0	10.3
5	12.8	12.1	11.4	10.7	10.0
6	12.5	11.8	11.1	10.5	9.8
7	12.2	11.5	10.9	10.2	9.6
8	11.9	11.2	10.6	10.0	9.4
9	11.6	11.0	10.4	9.8	9.2
10	11.3	10.7	10.1	9.6	9.0
11	11.1	10.5	9.9	9.4	8.8
12	10.8	10.3	9.7	9.2	8.6
13	10.6	10.1	9.5	9.0	8.5
14	10.4	9.9	9.3	8.8	8.3
15	10.2	9.7	9.1	8.6	8.1
16	10.0	9.5	9.0	8.5	8.0
17	9.7	9.3	8.8	8.3	7.8
18	9.5	9.1	8.6	8.2	7.7
19	9.4	8.9	8.5	8.0	7.6
20	9.2	8.7	8.3	7.9	7.4
21	9.0	8.6	8.1	7.7	7.3
22	8.8	8.4	8.0	7.6	7.1
23	8.7	8.3	7.9	7.4	7.0
24	8.5	8.1	7.7	7.3	6.9
25	8.4	8.0	7.6	7.2	6.7

[a]American Public Health Association (1960).

TABLE 2-2 Reported Transverse Dispersion Coefficients[a]

River type/river	Transverse dispersion coefficients (m^2/sec)	Discharge during dispersion measurement (m^3/sec)
Straight channels		
Atrisco	0.010	7.4
South	0.0047	1.5
Athabasca	0.093	776
Bends		
Missouri	1.1	1900[b]
Beaver	0.043	20.5
Mississippi	0.1	92–120
Meandering		
Missouri	0.12	966
Danube	0.038	1030
Rea	0.0014	0.30
Orinoco	3.1	47,000
MacKenzie	0.67	15,000[b]

[a]Rutherford (1994).
[b]Estimated based on height, width, and velocity.