ERRATA for

PE Environmental Practice Exam

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Errata posted 9-1-2023

Revisions are shown in red.

Question 16, p. 16:

○ D. 1,780

Question 23, p. 22:

The last paragraph and option A should read as follows:

The reaeration rate is estimated to be 0.4 day^{-1} (base e at 20°C), and the temperature correction coefficient is 1.024. The deoxygenation rate constant is estimated to be 0.23 day^{-1} (base e at 20°C), and the temperature correction coefficient is 1.047. Reaeration and deoxygenation are the only major factors affecting the dissolved oxygen concentration in the stream after mixing with wastewater effluent. Assume the time of travel in the stream to reach the maximum dissolved oxygen deficit is 2.5 days. The dissolved oxygen deficit (mg/L) at this location downstream from the point of discharge is most nearly:

○ A. 3.6

Question 67, p. 43:

A 40-ft-thick confined aquifer has a piezometric surface 85 ft above the bottom-confining layer. Groundwater is being extracted from a 4-in.-radius fully penetrating well. The pumping rate is 35 gpm. The aquifer is relatively sandy with a hydraulic conductivity of 175 gpd/ft^2. Steady-state drawdown of 5 ft is observed in a monitoring well 10 ft from the pumping well. The drawdown (ft) in the pumping well is most nearly:

Solution Table p. 54:

16: D

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Solution 16, p. 61:

Lime required = (0.45 + 3.0 + 0.72 + 2.2) meq/L (28 mg/meq) + 35 mg/L

= 213.36 mg/L as CaO

= 1,779 lb per million gallons

THE CORRECT ANSWER IS: D

Solution 18, p. 62:

The column in the last chart should read as follows:

Pipe	***Q*** **(gpm)**	***HL*** **(ft)**	***HL/Q*** **(ft/gpm)**	**Corrected *Q*** **(gpm)**
AB	+3,000	0.7851	0.000262	+3,775
BC	+500	0.0856	0.000171	+1,275
CD	–500	–0.8222	0.001644	+275
AD	–2,000	–10.6856	0.005343	–1,225
		–10.64	0.007420	

Solution 19, p. 63:

Convert the cation and anion concentrations to meq/L.

Cations:

Calcium:	(51 mg/L) / (20 mg/meq)	= 2.55 meq/L
Magnesium:	(12 mg/L) / (12.2 mg/meq)	= 0.98 meq/L
Sodium:	(25 mg/L) / (23 mg/meq)	= 1.09 meq/L
Sum of cations		= 4.62 meq/L

Anions:

Sulfate:	(65 mg/L) / (48 mg/meq)	= 1.35 meq/L
Chloride	(25 mg/L) / (35.5 mg/meq)	= 0.70 meq/L
Nitrate as N:	(14 mg/L) / (14 mg/meq)	= 1.00 meq/L
Bicarbonate as C_aCO_3:	(84 mg/L) / (50 mg/meq)	= 1.68 meq/L
Sum of anions		= 4.73 meq/L

4.73 meq/L – 4.62 meq/L = 0.11 meq/L

Note: Fluoride can be omitted since the concentration is ~ 0.02 meq/L.

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Solution 23, p. 65:
The last equation in the solution should read as follows:

Calculate the dissolved oxygen deficit:

$$D = \frac{k_d}{k_r}\left(L \times \mathrm{e}^{-kt}\right) = \frac{0.306}{0.463}\left(11.76 \times \mathrm{e}^{-0.306(2.5)}\right) = 3.62 \text{ mg/L}$$

Solution 28, p. 67:
Dispersion modeling along the centerline for downwind.
Ground-level concentration can be expressed as:

$C(x,y) = [Q / (3.14\ (\sigma_y \sigma_z)\ u)]\ \exp\{-1/2(H/\sigma_z)^2\}$

where

- Q = emission rate
- σ_y and σ_z = dispersion coefficients
- u = mean wind speed
- H = stack height

As the stack height increases, the concentration decreases at the ground surface.

THE CORRECT ANSWER IS: A

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Solution 29, p. 67:

The standard flow rate can be calculated as follows:

$$Q = A \times V \times (P_s/P_{\text{std}}) \times (T_{\text{std}}\ °\text{R}/T_s\ °\text{R}) \times (1 - (\text{moisture fraction})) \times 60 \text{ sec/min}$$

$$= \left[\frac{(92/12)^2}{4} \times \pi \text{ ft}^2\right] (28.84 \text{ fps}) \left(\frac{23.56}{29.92}\right) \left(\frac{460 + 70}{460 + 355}\right) (1 - 0.1225)\ (60 \text{ sec/min})$$

= 35,895 dry standard cubic feet per minute (DSCFM)

The emission rate of NO_x (lb/hr) can be calculated as:

$$= 117.27 \text{ ppmv} \times 1.194 \times 10^{-7} \text{ lb } NO_x \text{ / scf ppmv} \times Q \text{ scf/min} \times 60 \text{ min/hr}$$

$$= 30 \text{ lb } NO_x \text{ /hr}$$

The heat input rate for the boiler can be calculated as:

$$= 149.9 \times 10^3 \text{ scf/hr} \times 1{,}000 \text{ Btu/scf} = 149.9 \times 10^6 \text{ Btu/hr}$$

The emissions per 10^6 Btu then become:

= 30 lb/hr / 149.9 × 10^6 Btu/hr = 0.2012 lb NO_x / 10^6 Btu, which exceeds the standard

THE CORRECT ANSWER IS: B

Solution 40, p. 71:

$$22.4 \frac{\text{L}}{\text{g mole}} \times \frac{(273 + 15)\text{K}}{273\text{K}} = 23.6 \text{ L/g mole}$$

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Solution 61, p. 77:

$$\text{CW} = \frac{\text{BW} \times \text{LRF}}{\text{CSF} \times (\text{IR}_{\text{water}} + \text{IR}_{\text{fish}})}$$

$$\text{BW} = 170 \text{ lb} = 77.11 \text{ kg}$$

$$\text{LRF} = 10^{-5}$$

$$\text{CSF} = 0.01\left[\text{mg}/\left(\text{kg}\bullet\text{day}\right)\right]^{-1}$$

$$\text{IR}_{\text{water}} = 0.5 \text{ gal/day} = 1.893 \text{ L/day}$$

$$\text{IR}_{\text{fish}} = 0.015 \text{ lb/day} = 0.0068 \text{ kg/day}$$

$$\text{BCF} = 10 \text{ L/kg}$$

$$\text{IR}_{\text{fish}} = \left(0.0068 \text{ kg/day}\right)\left(10 \text{ L/kg}\right) = 0.068 \text{ L/day}$$

$$\text{CW} = \frac{77.11 \times 10^{-5}}{0.01\,(1.893 + 0.068)} = 0.04 \text{ mg/L}$$

Solution 78, p. 82:

$$\begin{aligned}\Delta h_{\text{r}} &= h_{\text{f, CO}_2} + 2h_{\text{f, H}_2\text{O}} - h_{\text{f, CH}_4} - 2h_{\text{f, O}_2} \\ &= (-394{,}088) + 2(-242{,}174) - (-74{,}980) \\ &= -803{,}456 \text{ J/mol}\end{aligned}$$