

EXERCISES CHAPTER 1 & 2

QUESTION 1

An analysis of water from a surface stream yields the following results:

$$\text{Na}^+ = 115 \text{ mg/L}$$

$$\text{SO}_4^{2-} = 240 \text{ mg/L}$$

$$\text{Mg}^{2+} = 36.6 \text{ mg/L}$$

$$\text{Cl}^- = 71.0 \text{ mg/L}$$

$$\text{K}^+ = 20 \text{ mg/L}$$

$$\text{NO}_3^- = 10 \text{ mg/L}$$

- Calculate the percent error in the cation-anion balance.
- Draw a bar diagram for water in meq/L.
- Determine the hardness of water in mg/L as CaCO_3 .

QUESTION 2

An industrial plant discharges wastewater to a surface stream at a maximum flow rate of $20\,000 \text{ m}^3/\text{d}$, a BOD_5 of 50 mg/L , a dissolved oxygen concentration of 2.7 mg/L and a temperature of $28 \text{ }^\circ\text{C}$. The stream just above the point of wastewater discharge flows at $0.84 \text{ m}^3/\text{s}$, a BOD_5 of 3.2 mg/L , a dissolved oxygen concentration of 8.7 mg/L and a temperature of $25 \text{ }^\circ\text{C}$. After a complete mixing of the wastewater, the velocity of the mixture is 38.9 km/d . Given the reaction rate constant at $20 \text{ }^\circ\text{C}$ is 0.23 d^{-1} and the reaeration rate constant is 0.43 d^{-1} .

- Determine the flow rate in m^3/s , temperature in $^\circ\text{C}$, dissolved oxygen in mg/L and BOD_5 in mg/L after the mixing.
- Calculate the deficit (D_t) at 25, 75 and 120 km (in mg/L).
- Sketch the dissolved oxygen profile of a 120 km reach (dissolved oxygen in mg/L versus distance downstream in km) by including the value of the critical deficit (D_c) in the stream in mg/L and the distance downstream when it occurs in km.