

## Quiz 3 Solutions

1. In 1980, the concentration of sulfate ( $\text{SO}_4^{2-}$ ) in rainfall in the northeastern U.S. was as high as 3 milligrams per liter. If sulfate was the only source of acidity, what would be the lowest values of pH measured that year?:

$$[\text{H}^+] = \left[ \frac{3 \cdot 10^{-3} \text{ g}_{\text{SO}_4^{2-}}}{\text{L}} \right] \left[ \frac{\text{mole}_{\text{SO}_4^{2-}}}{96 \text{ g}_{\text{SO}_4^{2-}}} \right] \left[ \frac{2 \text{ mole}_{\text{H}^+}}{\text{mole}_{\text{SO}_4^{2-}}} \right]$$
$$= 6.25 \cdot 10^{-5} \frac{\text{mole}_{\text{H}^+}}{\text{L}}$$

$$\text{pH} = -\log_{10}[\text{H}^+] = -\log_{10} \left[ 6.25 \cdot 10^{-5} \right] = 4.20 \approx 4.2$$

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2. The rain in part 1 also contained a nitrate ( $\text{NO}_3^-$ ) concentration of 2 mg/L. How does that change your answer to part 1?

$$\left[ \frac{2 \cdot 10^{-3} \text{ g}_{\text{NO}_3^-}}{\text{L}} \right] \left[ \frac{\text{mole}_{\text{NO}_3^-}}{62 \text{ g}_{\text{NO}_3^-}} \right] \left[ \frac{\text{mole}_{\text{H}^+}}{\text{mole}_{\text{NO}_3^-}} \right] = 3.23 \cdot 10^{-5} \bar{\text{M}}$$

$$[\text{H}^+] = 6.25 \cdot 10^{-5} + 3.23 \cdot 10^{-5} = 9.48 \cdot 10^{-5} \bar{\text{M}}$$

$$\text{pH} = -\log_{10}[\text{H}^+] = -\log_{10} \left[ 9.48 \cdot 10^{-5} \right] = 4.02 \approx 4.0$$