

Chapter 13

Question 13.12

$\text{pH} = 7.95 = -\log [\text{H}^+]$. Therefore, $[\text{H}^+] = \text{antilog of } -7.95 = 1.1 \times 10^{-8} \text{ mol L}^{-1}$

Question 13.13

$$[\text{HCO}_3^-] = 7.2 - (\beta_{\text{CO}_2} \times P_{\text{CO}_2})$$

Substituting into eq 13.3 we get:

$$7.77 = 6.08 + \log \frac{7.2 - 0.4 P_{\text{CO}_2}}{0.4 P_{\text{CO}_2}}$$

This becomes:

$$1.69 = \log \frac{7.2 - 0.4 P_{\text{CO}_2}}{0.4 P_{\text{CO}_2}}$$

By taking the antilog of both sides, we get:

$$48.98 = \frac{7.2 - 0.4 P_{\text{CO}_2}}{0.4 P_{\text{CO}_2}}$$

Therefore

$$48.98 \times 0.4 P_{\text{CO}_2} = 7.2 - 0.4 P_{\text{CO}_2}$$

$$19.59 P_{\text{CO}_2} + 0.4 P_{\text{CO}_2} = 7.2$$

$$19.99 P_{\text{CO}_2} = 7.2$$

Therefore, $P_{\text{CO}_2} = 0.36 \text{ kPa}$

Amount of CO_2 dissolved is:

$$0.36 \times 0.4 = 0.14 \text{ mmol L}^{-1}$$

Therefore, $[\text{HCO}_3^-] = 7.2 - 0.14 = 7.06 \text{ mmol L}^{-1}$