

Quiz 10.2 – Buffers and Titrations

Name: Key

Question 1

You need to prepare a buffer with $pH = 10.45$. Use table 10.2 from your book to determine the best acid/base conjugate pair for this buffer.

Carbonic acid / bicarbonate ion
 H_2CO_3 / HCO_3^-

$$pK_a = -\log K_a = -\log 5.6 \cdot 10^{-11} = 10.25$$

Question 2

A buffer is made using the formic acid/formate ion conjugate pair. Find the buffer pH when $[HCHO_2] = 0.76M$ and $[CHO_2^-] = 0.32M$

$$pK_a = -\log 1.8 \cdot 10^{-4} = 3.74$$

$$pH = pK_a + \log \frac{[B]}{[A]}$$

$$pH = 3.74 + \log \frac{0.32M}{0.76M} = 3.36$$

Question 3

A buffer is made using the HF/F^- conjugate pair. The buffer has $pH = 4.15$ and $[F^-] = 0.76M$. Find $[HF] = 0.76M$

$$pK_a = -\log 3.5 \cdot 10^{-4} = 3.46$$

$$pH = pK_a + \log \frac{[B]}{[A]} \rightarrow 4.15 = 3.46 + \log \frac{[B]}{[A]} \rightarrow \log \frac{[B]}{[A]} = 0.69 \rightarrow \frac{[B]}{[A]} = 4.90$$

$$\frac{0.76M}{[A]} = 4.90 \rightarrow [A] = 0.155M$$

Question 4

A 25ml sample of HCl with unknown concentration is titrated using 0.125M NaOH. Titrating to the end point required 36ml of the NaOH titrant. What was the original unknown concentration?

$$M_A V_A = M_B V_B$$

$$M_A \cdot 25ml = 0.125M \cdot 36ml$$

$$M_A = 0.18M$$