

Calculate the pH of the solution obtained by adding 0.02 lit of 1 mol./lit nitrous acid (pKa=3.34) to 0.04 lit of 0.5 mol/lit sodium nitrite solution.

Solution:

1. Determine the concentration of nitrous acid in solution, if quantity of nitrous acid in solution is $v=1 \text{ mol/l} \cdot 0.02\text{L} = 0.02 \text{ mole}$:

$$C(\text{HNO}_2) = \frac{0.02}{0.02 + 0.04} = 0.33 \text{ mol/L}$$

2. Determine the concentration of sodium nitrite in solution, if quantity of sodium nitrite in solution is $v=0.5 \text{ mol/l} \cdot 0.04\text{L} = 0.02 \text{ mole}$:

$$C(\text{NaNO}_2) = \frac{0.02}{0.02 + 0.04} = 0.33 \text{ mol/L}$$

3. Calculate the pH of the solution according to equation:

$$\text{pH} = \text{pK}_a + \lg \frac{C(\text{NaNO}_2)}{C(\text{HNO}_2)},$$

$$\text{pH of the solution is: } \text{pH} = 3.34 + \lg \frac{0.33}{0.33} = 3.34$$

Answer: pH of the solution is 3.34.