Acidobasic equilibria – exercises

1. Calculate pH of the sodium hydroxide solution ($c = 2.5 \times 10^{-4}$ mol $\cdot$ dm^{-3}). Assume full dissociation of the hydroxide at these conditions.
   – (pH= 10.40)

2. To 501 mL of a solution of hydrobromic acid ($c = 2.5 \times 10^{-3}$ mol $\cdot$ dm^{-3}) was added 499 mL of the solution of potassium hydroxide with the same concentration. Calculate pH of the final solution. (pH = 5.3)

3. We have the acetic acid solution ($c = 0.01$ mol $\cdot$ dm^{-3}) the dissociation fraction is $\alpha = 0.0134$. Calculate dissociation constant K_a of the acid and pH of the solution. ($K_a = 1.82 \times 10^{-6}$; pH = 3.87)

4. The pH of a solution of a weak acid ($c = 0.01$ mol $\cdot$ dm^{-3}) is 3.7. Calculate dissociation constant K_a of the acid and dissociation fraction α for the solution. (K_a= 4.06×10^{-6}; $\alpha = 0.01995$)

5. Calculate pH of the solution of acetic acid (0.03 mol $\cdot$ dm^{-3}). The dissociation constant of the acid is $K_a = 1.8 \times 10^{-5}$. Calculate dissociation fraction of the acid in the solution in percents.
   – (pH = 3.13; $\alpha = 2.45$ %)

6. Calculate pH of the solution of ammonia (0.02 mol $\cdot$ dm^{-3}). The dissociation constant of ammonia is $K_b = 1.8 \times 10^{-5}$. Calculate dissociation fraction of ammonia in the solution. (pH = 10.95; $\alpha = 0.03$)

7. We have a buffer solution which contains acetic acid and the sodium acetate with concentration of 0.5 mol $\cdot$ dm^{-3} and 0.3 mol $\cdot$ dm^{-3} respectively. To 500 mL of this solution was added 10 mL of sodium hydroxide solution ($c = 1$ mol $\cdot$ dm^{-3}). Dissociation constant of the acetic acid is p$K_a = 4.745$.
   Calculate pH of the original and final solution.

8. To 500 mL of the solution of acetic acid ($c = 0.1$ mol $\cdot$ dm^{-3}) was added 500 mL of the solution of potassium hydroxide ($c = 0.06$ mol $\cdot$ dm^{-3}). Calculate pH of the final solution. (pH = 4.92)