Buffer Questions Extra

① Calculate the pH of the following buffer solutions:

a) A solution containing 0.400 mol ethanoic acid, CH_3COOH and 0.500 mol sodium ethanoate, CH_3COONa in $1000cm^3$ of solution. Ka for ethanoic acid $= 1.74 \times 10^{-5} mol dm^{-3}$.

b) A solution made by mixing $50.0cm^3$ of $0.300 mol dm^{-3}$ methanoic acid, $HCOOH$, with $150cm^3$ of $0.300 mol dm^{-3}$ sodium methanoate, $HCOONa$. pKa for methanoic acid $= 3.75$

c) A solution containing 0.100 mol ammonia and 0.200 mol ammonium chloride in $250cm^3$ of solution. pKa for the ammonium ion, $NH_4^+ = 9.25$

d) A solution made by mixing $100cm^3$ of $0.250 mol dm^{-3}$ methylamine solution, CH_3NH_2, with $100cm^3$ of $0.250 mol dm^{-3}$ methylammonium chloride, $CH_3NH_3^+Cl^-$. Ka for the methylammonium ion, $CH_3NH_3^+ = 2.29 \times 10^{-11} mol dm^{-3}$.

② A buffer solution contained a mixture of $60.0g$ of ethanoic acid, CH_3COOH, and $82.0g$ of sodium ethanoate, CH_3COONa in $1000cm^3$ of solution. Ka for ethanoic acid $= 1.74 \times 10^{-5} mol dm^{-3}$.

a) Calculate the pH of the buffer solution.
b) Calculate the pH after adding $1.00cm^3$ of $5.00 mol dm^{-3}$ hydrochloric acid to $50.0cm^3$ of the buffer solution.
c) Calculate the pH after adding $1.00cm^3$ of $5.00 mol dm^{-3}$ sodium hydroxide to $50.0cm^3$ of the buffer solution.