1. Please calculate the p-function of (a) the ion-product constant of water (i.e. pK_w) and (b) the concentrations of the various ions in a solution that is 2.00×10^{-3} M in NaCl and 5.4×10^{-4} M in HCl (i.e. pNa, pCl, and pH). (30%)

2. As shown in Table 1, the data were recorded for the pseudo-first-order decomposition of nitromethane in the presence of excess base. Answer the following questions. (a) Write down the kinetic equation of this reaction. (b) What is the expression of reaction rate? (c) Find the initial concentration (A_0) of nitromethane and the rate constant (k). (30%)

Table 1. Data for the decomposition of nitromethane.

Time, s	$[CH_3NO_3]$, M	$\ln [CH_3NO_3]$
0.25	3.86×10^{-3}	-5.557
0.50	2.59×10^{-3}	-5.956
0.75	1.84×10^{-3}	-6.298
1.00	1.21×10^{-3}	-6.717
1.25	0.74×10^{-3}	-7.206

3. Briefly describe the requirements and procedures in order to determine (a) the chloride in a solution sample using gravimetric method, and (b) the ethanol in beverages using Gas Chromatography. (40%)