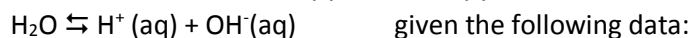Use the Table of Constants handout provided.

1) Determine:
   a. the standard state enthalpy and entropy for the autoionization of water:
      $H_2O \leftrightarrows H^+ (aq) + OH^-(aq)$ given the following data:

T(^oC)	K_w
0	1.14E-15
25	1.00E-14
50.	5.47E-14

   b. A solution is prepared by mixing 25 mL of 0.15 M HCl with 25 mL of 0.25 M NaOH at 25 ^oC. Calculate the free energy change for the solution (based on the mixture) and indicate the spontaneous direction toward the equilibrium (report the free energy change based on the way the reaction is shown is part a.

2) The enthalpy of vaporization of chloroform, $CHCl_3$ is 31.4 kJ/mol at its normal boiling point of 61.7 ^oC. Calculate the ΔS_{sys}, ΔS_{surr} and ΔS_{univ} when 1.00 mol of chloroform is vaporized at its boiling point.

3) Calculate the chloride ion concentration of a saturated sodium chloride (NaCl) solution. Sodium chloride is considered a soluble salt under normal conditions of use, however one can prepare a saturated solution of any ionic salt once the saturation solubility limit of the salt is exceeded. Use the following data:

Species	ΔG_f^o (kJ/mol)
NaCl (s)	-384
Na$^+$(aq)	-262
Cl$^-$ (aq)	-131

Answers
1) a) ΔH^o=58.8 kJ, ΔS^o=-70.8 J/K   b) ΔG=+68.2 (Therefore, reaction is spontaneous in the opposite direction!)
2) ΔS_{sys}= 93.8 J/K, ΔS_{surr}= -93.8 J/K and ΔS_{univ}=0
3) 6M