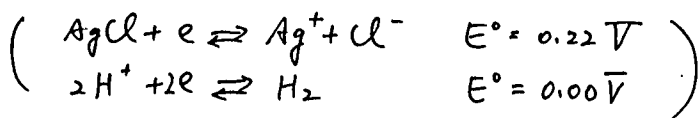
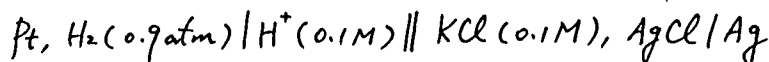


1. Calculate the potential of the following cell, giving the polarities of the electrodes and the direction of spontaneous reaction. Calculate the equilibrium constant of the cell reaction.



2. Calculate the value of the ionic strength of these solutions:

(a) 0.10 M NaCl

(b) 0.1 M Na₂SO₄

(c) 0.10 M MgSO₄

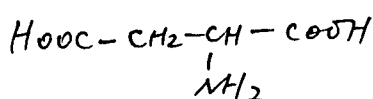
(d) 0.1 M NaCl + 0.10 M MgSO₄

By definition

$$\mu = \frac{1}{2} \sum_i C_i z_i^2$$

where μ is ionic strength, C_i and z_i are the molar concentration and the charge of each ionic species in the solution, respectively.

3. Show the isoelectric point of aspartic acid.



$$pK_1 (\alpha\text{-COOH}) = 2.09$$

$$pK_2 (\beta\text{-COOH}) = 3.86$$

$$pK_3 (-\text{NH}_3^+) = 9.82$$

4. The activity a_i of a substance i in a liquid or solid mixture is defined by

$$\mu_i = \mu_i^\circ + RT \ln a_i$$

where μ_i , μ_i° is the chemical potential of i in mixture and in pure phase, respectively.

What is the activity? What is the activity coefficient?

5. Derive the integrated rate equation for a reversible first-order reaction. (Assume only A is present initially)

