1. The conductivity of a 0.0312 M solution of acetic acid is 1.53×10^{-4} S/cm. If the limiting ionic conductance (infinite dilution) for CH_3COO^- is 100 S*cm²/mol, and 137 S*cm²/mol for H^+,

   a. What is the degree of dissociation α?

$$\Lambda_0 = \Lambda_0[CH_3COO^-] + \Lambda_0[H^+] = 237\ S\,cm^2/mol$$

$$\Lambda = \kappa/c = \frac{1.53 \times 10^{-4}\ S/cm}{0.0312 \times 10^{-3}\ mol/cm^3} = 4.90\ \frac{S\,cm^2}{mol}$$

$$\alpha = \frac{\Lambda}{\Lambda_0} = \frac{4.90}{237} = 0.02$$

   b. Write down the dissociation contestant K_c is terms of α and the solution concentration and calculate its value.

$$CH_3COOH \rightleftarrows CH_3COO^- + H^+$$

$$c \cdot (1-\alpha) \qquad c\alpha \qquad c\alpha$$

$$K_c = \frac{(c\alpha)^2}{c(1-\alpha)} = \frac{c\alpha^2}{1-\alpha} = \frac{0.0312 \cdot 0.02^2}{1-0.02} = 1.27 \times 10^{-5}\ \frac{mol}{\ell}$$

2. The ratio l/A of a conductance cell with an electrolytic solution is called the cell constant.

   a. Find its value for a conductance cell in which the conductance G of a 0.100 M KCl solution is 0.01178 S at 25°C. The molar conductivity of KCl at this concentration and temperature is Λ=128.96 S*cm²/mol.

$$\Lambda = \kappa/c \Rightarrow \kappa = \Lambda \cdot c = 128.96\ S\cdot cm^2/mol \cdot 0.1 \times 10^{-3}\ mol/cm^3$$

$$= 1.2896 \times 10^{-2}\ S/cm$$

$$G = \kappa \cdot \frac{A}{\ell} \Rightarrow \frac{\ell}{A} = \kappa/G = \frac{1.2896 \times 10^{-2}\ S/cm}{0.01178\ S} = 1.0947\ \frac{1}{cm}$$

   b. Using the same cell, what is the molar conductivity of an electrolyte if a 0.0500 M solution of this electrolyte has a measure conductivity of 0.00824 S?

$$\Lambda = \kappa/c = \frac{G \cdot \left(\frac{\ell}{A}\right)}{c} = \frac{1.0947 \cdot 0.00824\ S/cm}{0.0500 \times 10^{-3}\ mol/cm^3}$$

$$= 180\ \frac{S\,cm^2}{mol}$$

3. Write down the net-reaction for the electrolysis of $Au(NO_3)_3$

$$4Au(NO_3)_3 + 6H_2O \rightarrow 4Au + 3O_2 + 12HNO_3$$