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Aalto University
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Engineering

Equations for exam 5.2.2017

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General idea

- **Fundamental equations (most important ones listed in the next slide) should be recalled by heart.**
- **Others equations will be provided in the exam if needed.**
- **Also Physical Chemistry table book is provided in the exam. It contains some thermodynamic equations and tables of important parameter (ionic molar coefficients, Gibbs energy of formation, standard potentials, etc.)**

Equations to be membered

Faraday law

$$I = nFr$$

$$Q = It = nzF$$

Potential

$$E = - \frac{DG}{nF}$$

Electrical energy

$$En = DEIt$$

Ohm's law

$$i = kE$$

Conductivity

$$k = \sum_k \lambda_k c_k$$

Molar conductivity

$$L = u_+ |I_+| + u_- |I_-|$$

Transport number

$$\sum_k t_k = 1$$

Electrochemical potential

$$\tilde{m}_i = m_i + z_i F \phi = m_i^0 + RT \ln a_i + z_i F \phi$$

Nernst equation

$$E = E^0 - \frac{RT}{nF} \ln \frac{a_D^d a_E^e a_F^f \dots}{a_A^a a_B^b a_C^c \dots}$$

Nernst-Planck eq

$$\bar{J}_k = -D_k \tilde{N} c_k - \frac{z_k F}{RT} D_k c_k \tilde{N} \phi + \bar{v} c_k$$

Double layer capacitance

$$C_{dl} = \frac{\partial Q}{\partial \phi} = \frac{\partial (nF \Gamma)}{\partial \phi}$$