

Sample „Electrochemistry” exam questions

In all answers please **do not write more than five sentences** (if not indicated otherwise):

1. Explain briefly, how does the hydrogen embrittlement works. [5 p.]
2. Explain briefly, why not all ionic compounds fully dissociate [up to 7 sentences]. [6 p.]
3. Explain briefly, what components are required to build galvanic cell and what are they for. Drawing simple scheme is encouraged. [5 p.]
4. What is the maximum theoretical specific capacity of cathode made of cobalt oxide (in mAh/g) in a lithium-ion cell, if stoichiometry of fully lithiated cathode (in fully discharged cell) is LiCoO_2 , and empty one (in fully charged cell, theoretically) is CoO_2 (pure cobalt oxide)? $M_{\text{Li}} = 7 \text{ g/mol}$; $M_{\text{O}} = 16 \text{ g/mol}$; $M_{\text{Co}} = 59 \text{ g/mol}$. Provide appropriate calculations (if you use any symbols, explain them) and briefly describe, what are you calculating and what for. [10 p.]
5. Calculate the maximum concentration of a lead iodide (PbI_2) in water at the temperature of 25°C , if its solubility product is equal to $8.3 \cdot 10^{-8}$. Provide appropriate calculations (if you use any symbols, explain them) and briefly describe, what are you calculating and what for. [4 p.]
6. Calculate the specific conductivity of Y solution if resistance of it is $R = 20 \text{ Ohm}$ and cell constant is $k_1 = 0.1 \text{ cm}^{-1}$. Provide the resistance of this solution if measured in the cell with constant $k_2 = 0.5 \text{ cm}^{-1}$. Provide appropriate calculations (if you use any symbols, explain them) and briefly describe, what are you calculating and what for. [3 p.]
7. How thick copper layer would be deposited on a circle steel plate of 10 cm diameter, if the electrolysis had a duration of 1 hour and current used was equal to 200 A? Assume ideal conditions for deposition, excess of the material and no changes in a system during electrodeposition. Provide appropriate calculations (if you use any symbols, explain them) and briefly describe, what are you calculating and what for. $d_{\text{Cu}} = 8.96 \text{ g cm}^{-3}$; electrode reaction is $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$. [7 p.]