Assignment 7

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment. Due on 2019-03-20, 23:59 IST.

1) Consider the reaction

\[ M \xrightarrow{k_1} M^{\text{ads}} + e^- \]

\[ M^{\text{ads}} + M \xrightarrow{k_2} M^{\text{ads}} + M^{\text{ads}} + e^- \]

The kinetic parameters are given by \( k_{10} = 10^{-9} \text{ mol cm}^{-2} \text{ s}^{-1} \), \( b_1 = 10 \text{ V}^{-1} \), \( k_{20} = 10^{-8} \text{ mol cm}^{-2} \text{ s}^{-1} \), \( b_2 = 10 \text{ V}^{-1} \) and \( \Gamma = 10^{-8} \text{ mol cm}^{-2} \). At \( E_{\text{ ref}} = 0.1 \text{ V} \) vs OCP, the fractional surface coverage of \( M^{\text{ads}} \) is given by.

\[ \theta_{\text{ads}} = \ldots \]

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.4, 0.44

2) Consider the reaction

\[ M \xrightarrow{k_1} M^{\text{ads}} + e^- \]

\[ M^{\text{ads}} + M \xrightarrow{k_2} M^{\text{ads}} + M^{\text{ads}} + e^- \]

The kinetic parameters are given by \( k_{10} = 10^{-9} \text{ mol cm}^{-2} \text{ s}^{-1} \), \( b_1 = 10 \text{ V}^{-1} \), \( k_{20} = 10^{-8} \text{ mol cm}^{-2} \text{ s}^{-1} \), \( b_2 = 10 \text{ V}^{-1} \) and \( \Gamma = 10^{-8} \text{ mol cm}^{-2} \). At \( E_{\text{ ref}} = 0.1 \text{ V} \) vs OCP, the fractional surface coverage of \( M^{\text{ads}} \) is given by.

If the reaction is in kinetic limited regime, the maximum number of loops expected in complex plane plot is ________.
3) Consider the reaction

\[ \text{M} + \text{e}^- \rightleftharpoons \text{M}^{+} \]
\[ \text{M}^{+} + \text{M} \rightleftharpoons \text{M}_{\text{ad}} + \text{M}^{+} + \text{e}^- \]

The kinetic parameters are given by \( k_{10} = 10^{-8} \text{ mol cm}^{-2} \text{ s}^{-1}, k_1 = 10 \text{ V}^{-1}, k_{10} = 10^{-8} \text{ mol cm}^{-2} \text{ s}^{-1}, b_1 = -10 \text{ V}^{-1}, k_{20} = 10^{-8} \text{ mol cm}^{-2} \text{ s}^{-1}, b_2 = 10 \text{ V}^{-1} \) and \( \Gamma = 10^{-8} \text{ mol cm}^{-2} \).

At \( E_{\text{OCV}} = 0.1 \text{ V} \) vs. OCP, the fractional surface coverage of \( \text{M}_{\text{ad}} \) is given by,

\[ \text{The faradaic current is ___ mA cm}^{-2}. \]

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.6,0.7

4) A Frankin isotherm model will reduce to Langmuir isotherm when parameter "g" is

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 0

5) A mechanism is described with 15 kinetic parameters. It contains 3 adsorbed intermediates. The maximum number of loops that can appear in complex plane plots is

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 4

6) In the above question, the total number of electrical elements pairs required to model the reaction (i.e. only the Faradaic part, without considering double layer capacitor) is

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 7
7) To model a system with the above mechanism, the minimum number of dc potentials at which EIS data should be taken is _________.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 3

8) Consider the reaction $M \rightarrow M^{2+} + e^-$. Frumkin isotherm is used to describe the adsorption. The kinetic parameter values are $k_{10} = 10^{-9}$ mol cm$^{-2}$ s$^{-1}$, $\theta_1 = 10$ V$^{-1}$, $\alpha = 15$, $\beta_1 = -0.5$, $k_{30} = 10^{-8}$ mol cm$^{-2}$ s$^{-1}$, $b_2 = 10$ V$^{-1}$, $\beta_2 = +0.5$ and $\Gamma = 10^{-9}$ mol cm$^{-2}$.

The maximum number of 'loops' that can appear in complex plane plots is _________.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 2

9) In the above question, the total number of electrical elements pairs required to model the reaction (i.e. only the Faradaic part, without considering double layer capacitor) is _________.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 3

10) To model a system with the above mechanism, the minimum number of dc potentials at which EIS data should be taken is _________.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Numeric) 3