

Unit 3 - Week 1

Course outline

How to access the portal?

Week 0

Week 1

- Recap of Electrochemical Polarization
- Recap of Electrochemical Polarization - Activation and Concentration Polarization
- Electrochemical Polarization: Activation and Concentration Polarization, Tafel Equation
- Activation and Concentration Polarization: Mixed Potential Theory
- Concentration Polarization and Mixed Potential Theory

Quiz : Assignment 1

- Assignment 1 - Solution
- Feedback for Week-1

Week 2

Week 3

Week 4

Week 5

Week 6

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Live Session

Assignment 1

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2019-09-11, 23:59 IST.

1) Which of the following statements is comprehensively true for exchange current density?

1 point

- $i_a = i_c = i_0$
- the system is a reversible non-corroding type
- the system is at condition of non-steady state
- both (a) and (b) are correct

No, the answer is incorrect. Score: 0

Accepted Answers: both (a) and (b) are correct

2) A piece of zinc is immersed in a dilute solution of $ZnSO_4$ with Zn ion activity of 0.01. The value of electrode reduction potential (V) of zinc at 298K and 1 atm. pressure is:

1 point

(Given: $E_{Zn^{2+}/Zn}^0 = -0.76V$)

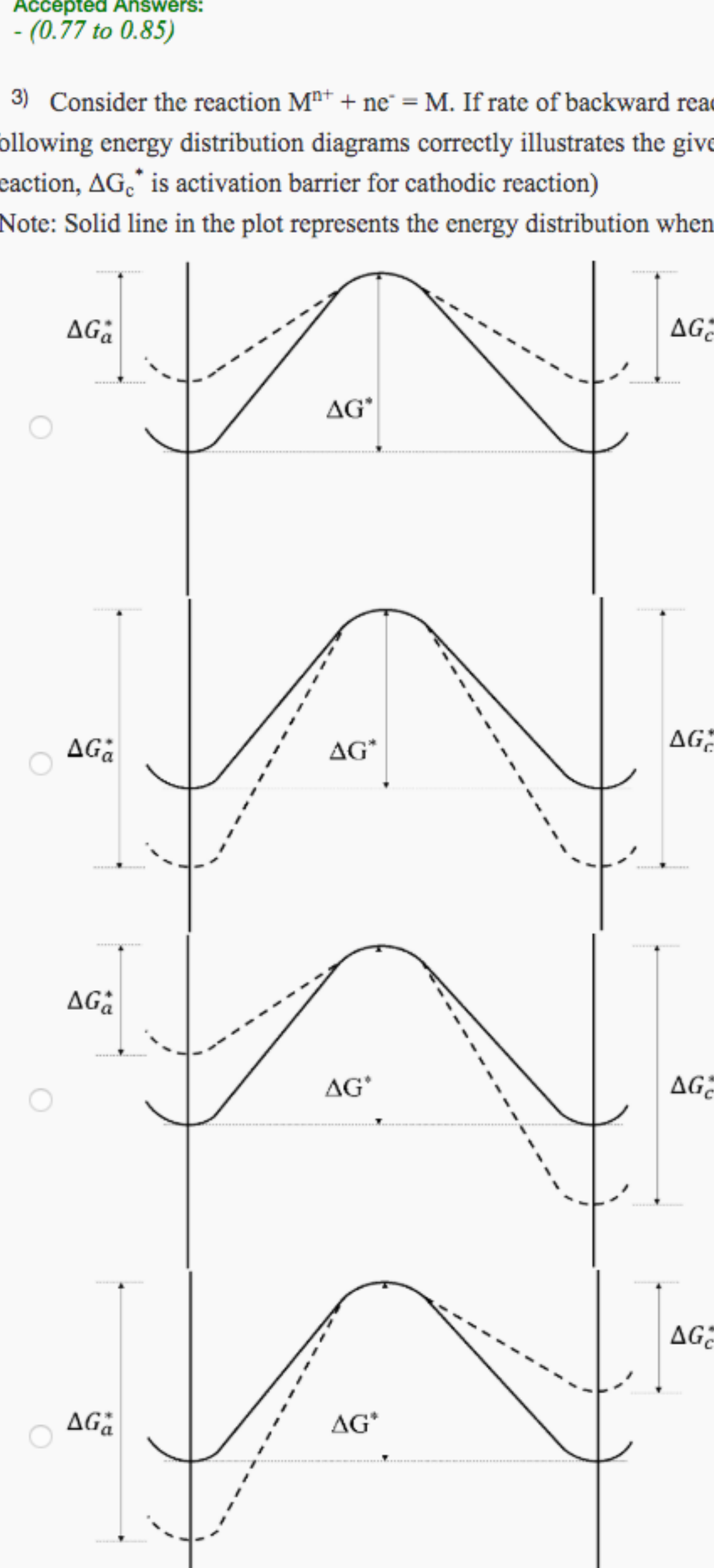
- (0.76 to 0.83)
- (0.41 to 0.50)
- (0.77 to 0.85)
- (0.28 to 0.36)

No, the answer is incorrect. Score: 0

Accepted Answers: - (0.77 to 0.85)

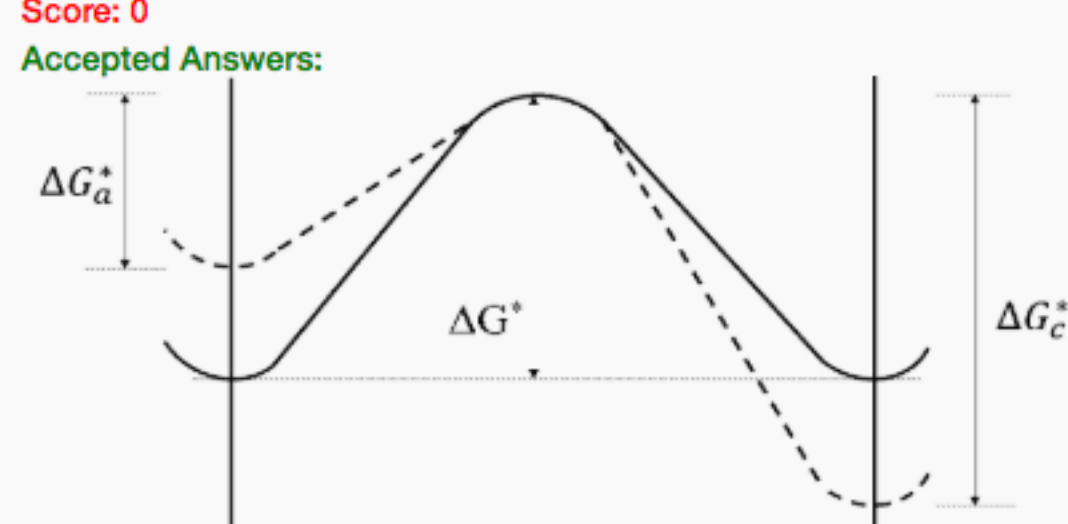
3) Consider the reaction $M^{n+} + ne^- = M$. If rate of backward reaction (r_b) is greater than the rate of forward reaction (r_f), which of the following energy distribution diagrams correctly illustrates the given condition. (ΔG^* is activation barrier, ΔG_a^* is activation barrier for anodic reaction, ΔG_c^* is activation barrier for cathodic reaction)

(Note: Solid line in the plot represents the energy distribution when $r_b = r_f$ and dotted line represents when $r_b \neq r_f$)



No, the answer is incorrect. Score: 0

Accepted Answers:



4) Anodic over-potential of 0.55 V is applied to an iron electrode dipped in an alkaline solution at 298 K. If the exchange current density and symmetry factor (α) for the reaction ($Fe \rightarrow Fe^{2+} + 2e^-$) are $1.8 \times 10^{-11} A/cm^2$ and 0.5, respectively, the value of anodic current density (i_a) in A/cm^2 is:

1 point

- $(0.8 \text{ to } 1.4) \cdot 10^{-2}$
- $(7.3 \text{ to } 8.0) \cdot 10^{-2}$
- $(0.5 \text{ to } 1.2) \cdot 10^{-3}$
- $(3.2 \text{ to } 4.0) \cdot 10^{-2}$

No, the answer is incorrect. Score: 0

Accepted Answers: $(3.2 \text{ to } 4.0) \cdot 10^{-2}$

5) The exchange current density and symmetry factor (α) of hydrogen evolution reaction on the surface of an electrode dipped in an acid at 298 K are $1 \times 10^{-6} A/cm^2$ and 0.5, respectively. If cathodic over-potential of 200 mV is applied to the electrode, the value of cathodic current density (i_c) in A/cm^2 is:

1 point

- $(4.6 \text{ to } 5.3) \cdot 10^{-5}$
- $(1.2 \text{ to } 2.0) \cdot 10^{-4}$
- $(7.8 \text{ to } 8.5) \cdot 10^{-3}$
- $(9.3 \text{ to } 10.1) \cdot 10^{-3}$

No, the answer is incorrect. Score: 0

Accepted Answers: $(4.6 \text{ to } 5.3) \cdot 10^{-5}$

6) Silver is deposited at a current density of 100 A/cm^2 from the electrolyte at 298 K. The limiting current density is 300 A/cm^2 . The value of the concentration over-potential (V) is:

1 point

(Given: $n = 1$)

- $(3.8 \text{ to } 4.5) \cdot 10^{-2}$
- $(0.8 \text{ to } 1.4) \cdot 10^{-2}$
- $(0.8 \text{ to } 4.5) \cdot 10^{-2}$
- $(3.8 \text{ to } 4.5) \cdot 10^{-2}$

No, the answer is incorrect. Score: 0

Accepted Answers: - $(0.8 \text{ to } 1.4) \cdot 10^{-2}$

7) A piece of nickel is corroding in a deaerated acid of pH 2 at 298 K. The corrosion current density (i_{corr}) is $3.5 \times 10^{-4} A/cm^2$. If the exchange current density for hydrogen evolution on nickel surface and Tafel slopes are $1.5 \mu A/cm^2$ and 0.1 V/decade of current density, respectively. The value of E_{corr} (V) with respect to standard hydrogen electrode is:

1 point

- (0.25 to 0.32)
- (0.55 to 0.61)
- (0.82 to 0.90)
- (0.32 to 0.40)

No, the answer is incorrect. Score: 0

Accepted Answers: - $(0.32 \text{ to } 0.40)$

8) The concentration over-potential of 0.015 V is applied to deposit gold from an electrolyte at 298 K with limiting current density of 400 A/cm^2 . The value of current density (A/cm^2) at which gold is deposited is:

1 point

(Given: $n = 2$)

- (105 to 110)
- (272 to 280)
- (156 to 162)
- (82 to 90)

No, the answer is incorrect. Score: 0

Accepted Answers: (272 to 280)

9) A piece of iron is corroding in an acidic electrolyte having Fe ion activity of 0.09. Anodic Tafel slope is 0.1 V/decade of current density. The corrosion current density of Fe is $1 \times 10^{-6} A/cm^2$. The exchange current density of Fe on the surface of Fe is $2 \times 10^{-9} A/cm^2$. The value of E_{corr} (V) with reference to standard hydrogen electrode is:

1 point

(Given: $E_{Fe^{2+}/Fe}^0 = -0.44 V$ and $n = 2$)

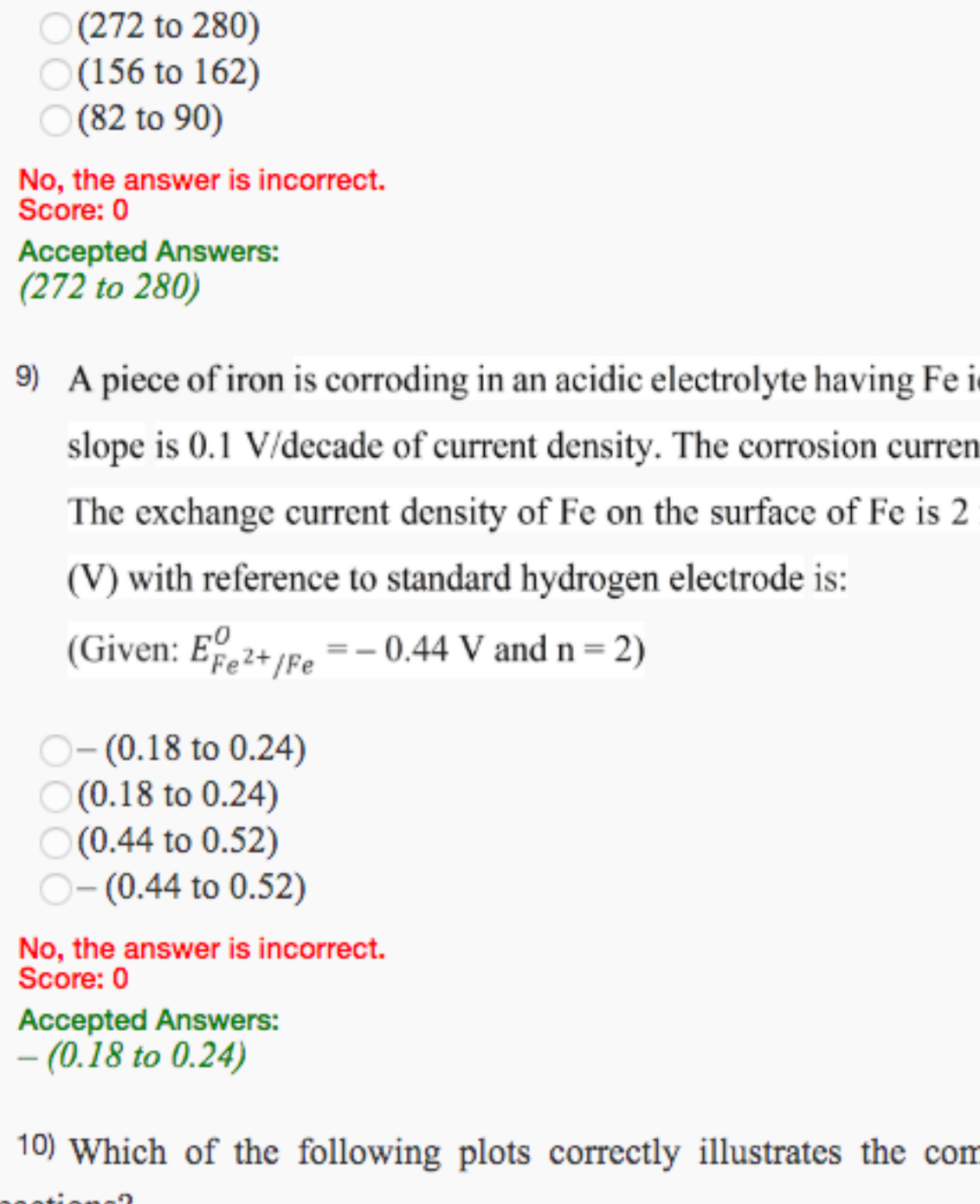
- (0.18 to 0.24)
- (0.18 to 0.24)
- (0.44 to 0.52)
- (0.44 to 0.52)

No, the answer is incorrect. Score: 0

Accepted Answers: - $(0.18 \text{ to } 0.24)$

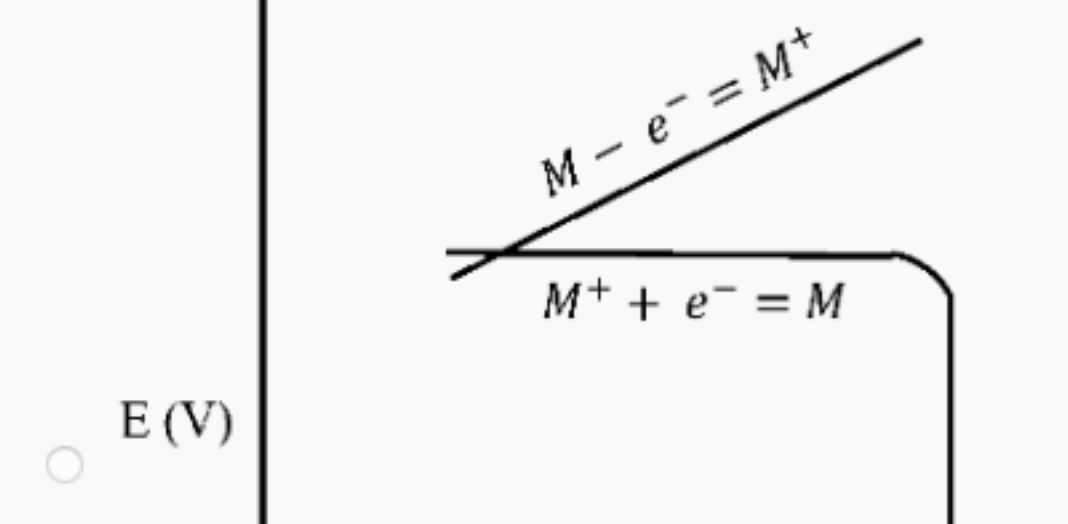
10) Which of the following plots correctly illustrates the combination of both activation and concentration controlled cathodic reactions?

1 point



No, the answer is incorrect. Score: 0

Accepted Answers:



No, the answer is incorrect. Score: 0

Accepted Answers:

