

Unit 6 - Week 4

Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

 Limitations of Standard Reduction Potential Series of Pure Metals

 Concentration Cell Formation and Galvanic Series

 Examples of Concentration cell and Spontaneity of Corrosion Process

 Spontaneity of Corrosion Process and Introduction to Pourbaix Diagram

 Construction of Pourbaix Diagram

 Quiz : Assignment 4

 Corrosion - Part I: Week 4 Feedback

 Assignment 4 - Solution

Week 5

Week 6

Week 7

Week 8

Download Videos

Assignment 4

The due date for submitting this assignment has passed.

Due on 2020-02-26, 23:59 IST.

Assignment submitted on 2020-02-26, 16:24 IST

 1) The value of equilibrium constant (K_c) for the reaction $M(OH)_2 + 2H^+ + 2e^- = M + 2H_2O$ is: 1 point

 (Given: $\mu_{H_2O}^0 = -236950$ J/mol, and $\mu_{M(OH)_2}^0 = -485000$ J/mol)

- (4.7 to 5.5) $\times 10^3$
 (12.2 to 13.0) $\times 10^2$
 (0.5 to 2.9) $\times 10^{-2}$
 (1.5 to 2.4) $\times 10^3$

No, the answer is incorrect.

Score: 0

 Accepted Answers:
 (0.5 to 2.9) $\times 10^{-2}$

 2) A piece of iron has been found to corrode in an aerated solution of pH 8. The value of the solubility product (K_{sp}) of $Fe(OH)_2$ formed on the surface of iron is 2.5×10^{-14} . The value of activity of Fe^{2+} ion in the solution is; 1 point

- (2.0 to 3.5) $\times 10^{-2}$
 (1.0 to 2.5) $\times 10^{-3}$
 (3.5 to 4.2) $\times 10^{-4}$
 (1.2 to 2.0) $\times 10^2$

No, the answer is incorrect.

Score: 0

 Accepted Answers:
 (2.0 to 3.5) $\times 10^{-2}$

 3) Based on Q2, the value of $E_{Fe^{2+}/Fe}$ (in V) with respect to standard hydrogen electrode is; 1 point

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

- (0.77 to 0.85)
 - (0.23 to 0.35)
 - (0.45 to 0.55)
 (0.11 to 0.20)

No, the answer is incorrect.

Score: 0

 Accepted Answers:
 - (0.45 to 0.55)

 4) Based on Q2, the value of overall cell potential (in V) with respect to standard hydrogen electrode is; 1 point

 (Given: $E_{O_2/H_2O}^0 = 0.401$ V, $p_{O_2} = 1$ atm)

- (1.93 to 2.94)
 (0.09 to 0.19)
 (1.15 to 1.35)
 - (0.42 to 0.55)

No, the answer is incorrect.

Score: 0

 Accepted Answers:
 (1.15 to 1.35)

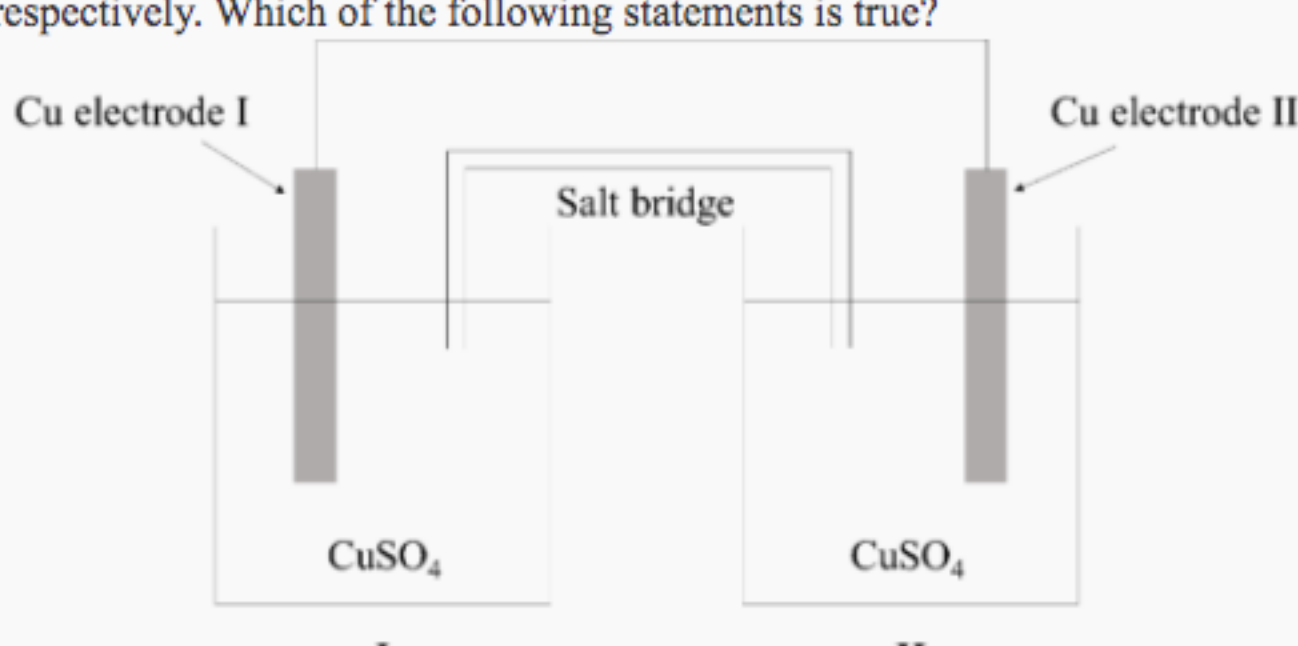
 5) Based on Q2, which of the following statements is correct? 1 point

- $\Delta G_{cell} = - (470 \text{ to } 485 \text{ kJ/mol})$ and the reaction is spontaneous
 $\Delta G_{cell} = - (150 \text{ to } 185 \text{ kJ/mol})$ and the reaction is spontaneous
 $\Delta G_{cell} = (230 \text{ to } 255 \text{ kJ/mol})$ and the reaction is non-spontaneous
 $\Delta G_{cell} = (80 \text{ to } 85 \text{ kJ/mol})$ and the reaction is non-spontaneous

No, the answer is incorrect.

Score: 0

 Accepted Answers:
 $\Delta G_{cell} = - (470 \text{ to } 485 \text{ kJ/mol})$ and the reaction is spontaneous

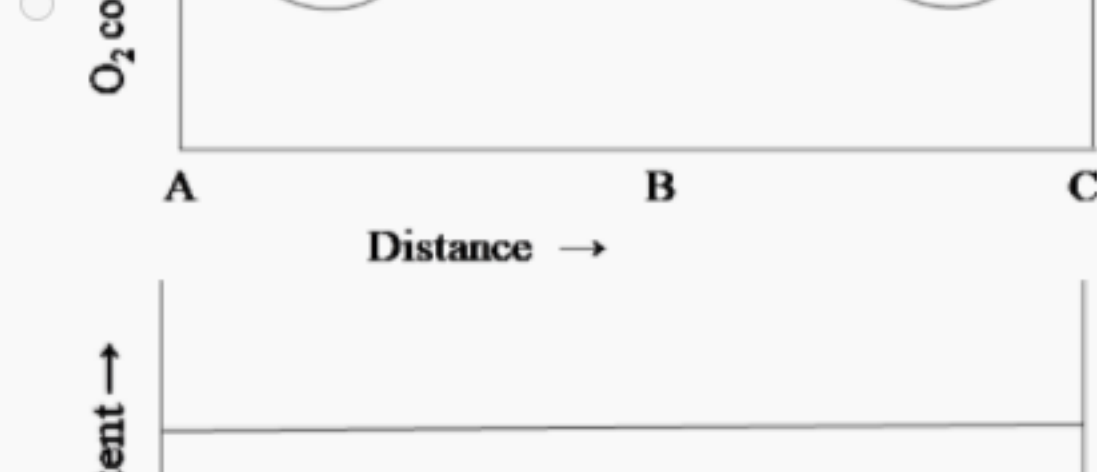
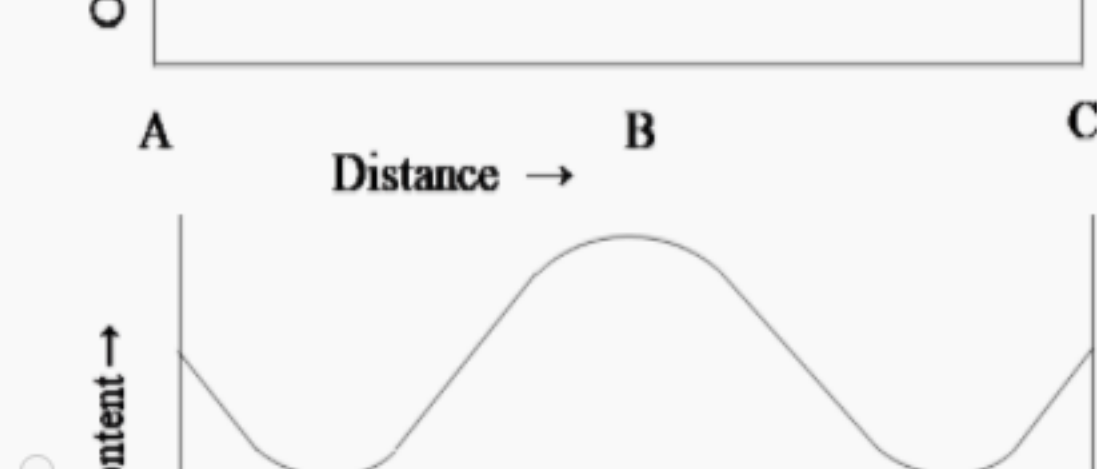
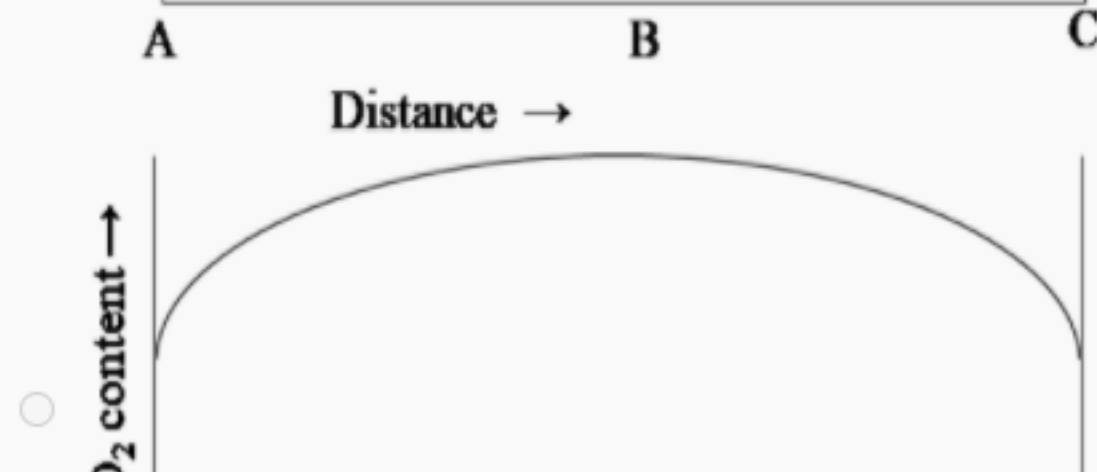
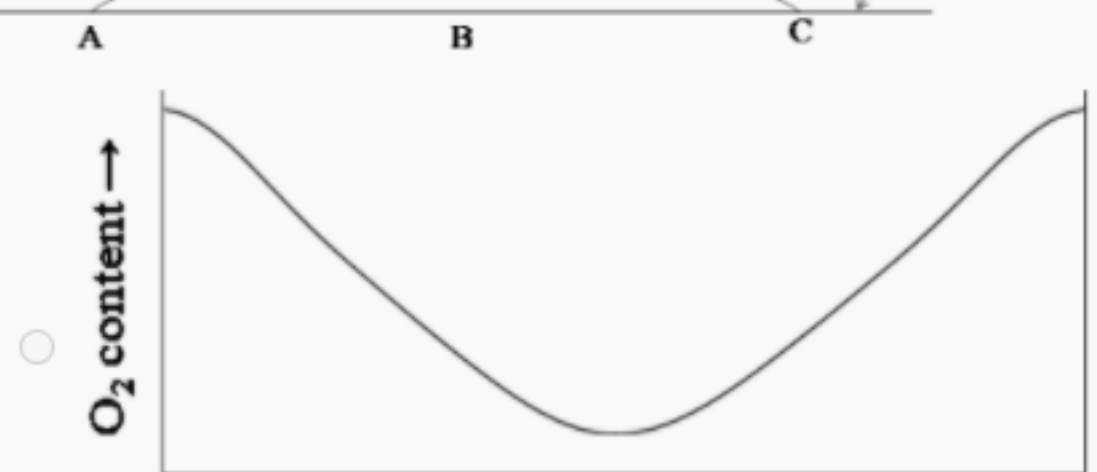
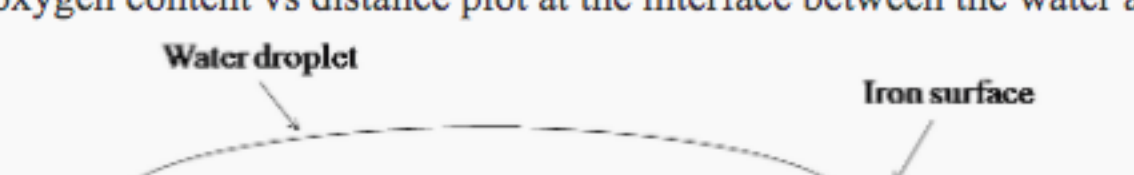
 6) Consider the electrochemical cell as shown in figure below. The activities of Cu^{2+} ions in half cells (I) and (II) are 0.09 and 0.05 respectively. Which of the following statements is true? 1 point


- Cu electrode (I) is more active as compared to Cu electrode (II)
 Cu electrode (II) is more active as compared to Cu electrode (I)
 Current would flow from II to I in the external circuit
 Cu deposition happens on both the electrodes

No, the answer is incorrect.

Score: 0

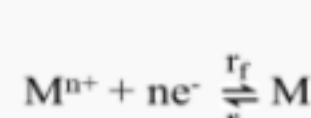
 Accepted Answers:
 Cu electrode (II) is more active as compared to Cu electrode (I)

 7) Figure below shows a droplet of water on the surface of iron exposed to atmosphere. Which of the following shows the correct oxygen content vs distance plot at the interface between the water and iron? 1 point


No, the answer is incorrect.

Score: 0

 Accepted Answers:

 8) Consider the reaction 1 point

 If the rate of backward reaction is greater than the rate of forward reaction, which of the following statements is correct? (where $\Delta G_{M \rightarrow M^{n+}}$ is the change in free energy for anodic reaction and $E_{M \rightarrow M^{n+}}$ is the potential for anodic reaction)

- $\Delta G_{M \rightarrow M^{n+}}$ will increase and $E_{M \rightarrow M^{n+}}$ will decrease
 both $\Delta G_{M \rightarrow M^{n+}}$ and $E_{M \rightarrow M^{n+}}$ will increase
 both $\Delta G_{M \rightarrow M^{n+}}$ and $E_{M \rightarrow M^{n+}}$ will decrease
 $\Delta G_{M \rightarrow M^{n+}}$ will decrease and $E_{M \rightarrow M^{n+}}$ will increase

No, the answer is incorrect.

Score: 0

 Accepted Answers:
 $\Delta G_{M \rightarrow M^{n+}}$ will decrease and $E_{M \rightarrow M^{n+}}$ will increase

 9) The reaction $O_2 + 4H^+ + 4e^- = 2H_2O$ is feasible at pH; 1 point

- 6
 8
 10
 12

No, the answer is incorrect.

Score: 0

 Accepted Answers:
 6

 10) Which of the following reactions is both potential and pH dependent? 1 point

- $M^{n+} + ne^- = M$
 $M + 2H_2O = M(OH)_2 + 2H^+ + 2e^-$
 $M^{2+} + 2H_2O = M(OH)_2 + 2H^+$
 $MCO_3 = MO + CO_2$

No, the answer is incorrect.

Score: 0

 Accepted Answers:
 $M + 2H_2O = M(OH)_2 + 2H^+ + 2e^-$