

## Unit 7 - Week 5

## Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

Week 5

● Lecture 12: Forms of corrosion: Preventive measures for uniform corrosion (Part-I)

○ Lecture 13: Forms of corrosion: Preventive measures for uniform corrosion (Part-II)

● Lecture 14: Forms of corrosion: Galvanic or dissimilar metal corrosion (Part-I)

○ Quiz : Assignment 5

○ Assignment-5 Solutions

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Week 6

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Week 12

Live Session

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## Assignment 5

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

**Due on 2020-10-28, 23:59 IST.**

## INSTRUCTIONS:

(A) The marks that each question carries is marked against the question.  
(B) There can be more than one correct answers for descriptive questions.

1) Corrosion potential of steel in 0.5 M sulfuric acid is -500 mV (SCE). In addition to inhibitors steel showed a significant reduction in corrosion rates. The measured corrosion potentials of the inhibitors are given below. Which of them are cathodic inhibitors? **2 points**

- 400 mV (SCE)  
 -600 mV (SCE)  
 -500 mV (SCE)  
 -550 mV (SCE)  
 -350 mV (SCE)

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
-600 mV (SCE)  
-550 mV (SCE)

2) For the above question, which of the following would act as anodic inhibitors? **2 points**

- 400 mV (SCE)  
 -600 mV (SCE)  
 -500 mV (SCE)  
 -550 mV (SCE)  
 -350 mV (SCE)

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
400 mV (SCE)  
-350 mV (SCE)

3) Which of the following statements are incorrect? **2 points**

- Zinc coatings can increase the corrosion of steel structure under some condition  
 Paint coatings can increase the corrosion of steel structure under some condition  
 Nickel coatings can increase the corrosion of steel structure under some condition  
 Chromium coatings can increase the corrosion of steel structure under some condition  
 Tin coatings can increase the corrosion of steel structure under some condition

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Zinc coatings can increase the corrosion of steel structure under some condition  
Paint coatings can increase the corrosion of steel structure under some condition

4) Calculate the applied potential required to be applied on steel to bring down the corrosion rate of steel by ten times given the following data: **3 points**  
The  $E^{\circ}_{\text{Fe}^{2+}/\text{Fe}} = -0.44 \text{ V}$ , pH of the soil 8,  $\beta_c = 100 \text{ mV decade}^{-1}$  and  $\beta_a = 100 \text{ mV decade}^{-1}$   $\text{pH}_2 = 1$  atmosphere,  $i_{o_{\text{Fe}^{2+}/\text{Fe}}} = 10^{-6} \text{ A cm}^{-2}$  and  $i_{o_{\text{H}^+/\text{H}}} = 10^{-6} \text{ A cm}^{-2}$ ,  $[\text{Fe}^{2+}] = 10^{-6} \text{ mol l}^{-1}$ .

- 0.7324 V (SHE)  
 -0.8660 V (SHE)  
 -0.6450 V (SHE)  
 -0.5040 V (SHE)

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
-0.6450 V (SHE)

5) For the above problem, determine the required applied current to bring down the corrosion rate by 10 times by cathodic protection. **3 points**

- $5.2195 \times 10^{-5} \text{ A cm}^{-2}$   
  $3.0619 \times 10^{-5} \text{ A cm}^{-2}$   
  $9.0991 \times 10^{-7} \text{ A cm}^{-2}$   
  $7.3545 \times 10^{-7} \text{ A cm}^{-2}$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $5.2195 \times 10^{-5} \text{ A cm}^{-2}$

6) Which of the following galvanic couple(s) lead(s) to reduction in corrosion rate of the more active metal? **3 points**

- Fe-Zn  
 Ti-Pt  
 Fe-Cu  
 Zr-Pt

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Ti-Pt  
Zr-Pt

7) Which of the following will affect galvanic corrosion of a metal? **2 points**

- Cathodic Tafel slope of the active metal  
 Anodic Tafel slope of the active metal  
 Adding a third metal active to the galvanic couple  
 Addition of inhibitors  
 Exchange current density of the cathodic reaction on the noble metal  
 Anodic Tafel slope of the noble metal

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Anodic Tafel slope of the active metal  
Adding a third metal active to the galvanic couple  
Addition of inhibitors  
Exchange current density of the cathodic reaction on the noble metal

8) The following things can never be done to avoid/reduce galvanic corrosion **3 points**

- High cathode to anode ratio of the structure  
 Coating only the anodic part of the galvanic structure  
 Choosing alloys wide apart in the galvanic series.  
 Electrically short dissimilar metals

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
High cathode to anode ratio of the structure  
Coating only the anodic part of the galvanic structure  
Choosing alloys wide apart in the galvanic series.  
Electrically short dissimilar metals