

Unit 7 - Week 5

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Assignment 5

The due date for submitting this assignment has passed. Due on 2019-10-02, 23:59 IST.
 As per our records you have not submitted this assignment.

1) Consider that a piece of nickel is corroding in a deaerated acidic electrolyte of pH 2 at a rate of 30 mdd. The cathodic Tafel slope is 1 point and exchange current density of hydrogen evolution on the surface of Ni are 0.2 V/decade of current density and 10^{-9} A/cm², respectively. The value of corrosion current density (i_{corr}) (A/cm²) will be; (Given: Atomic weight of Ni = 58.69, n = 2, F = 96500 C)

- (8.22 to 9.00) x 10⁻⁵
- (3.64 to 3.72) x 10⁻⁵
- (1.11 to 1.21) x 10⁻⁵
- (13.25 to 13.29) x 10⁻⁵

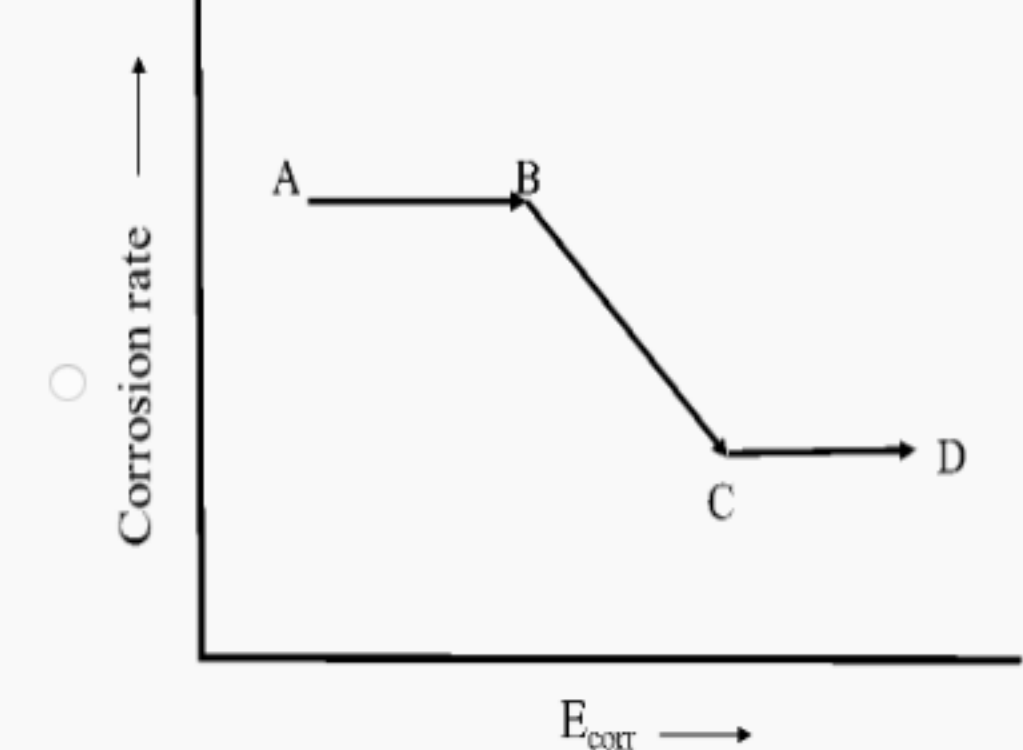
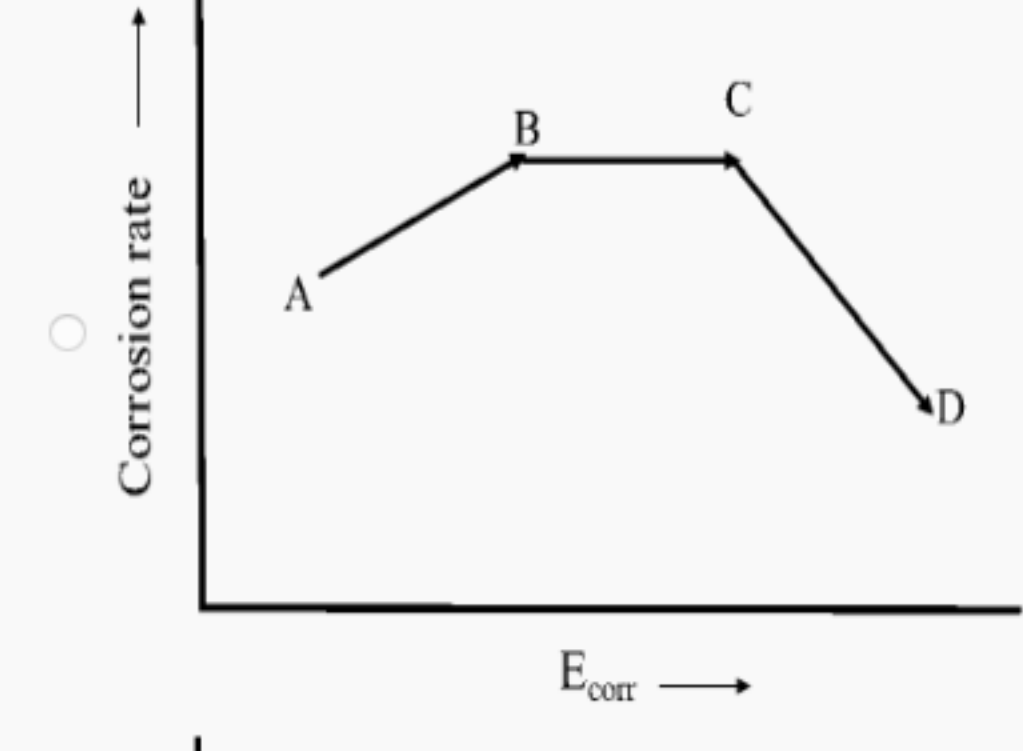
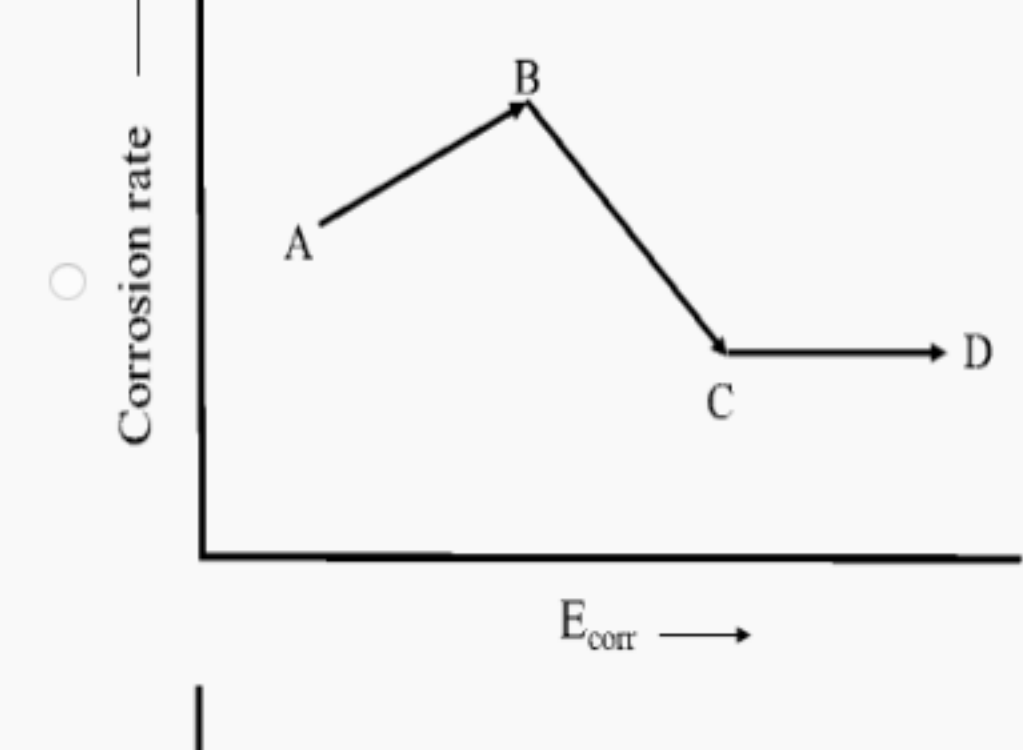
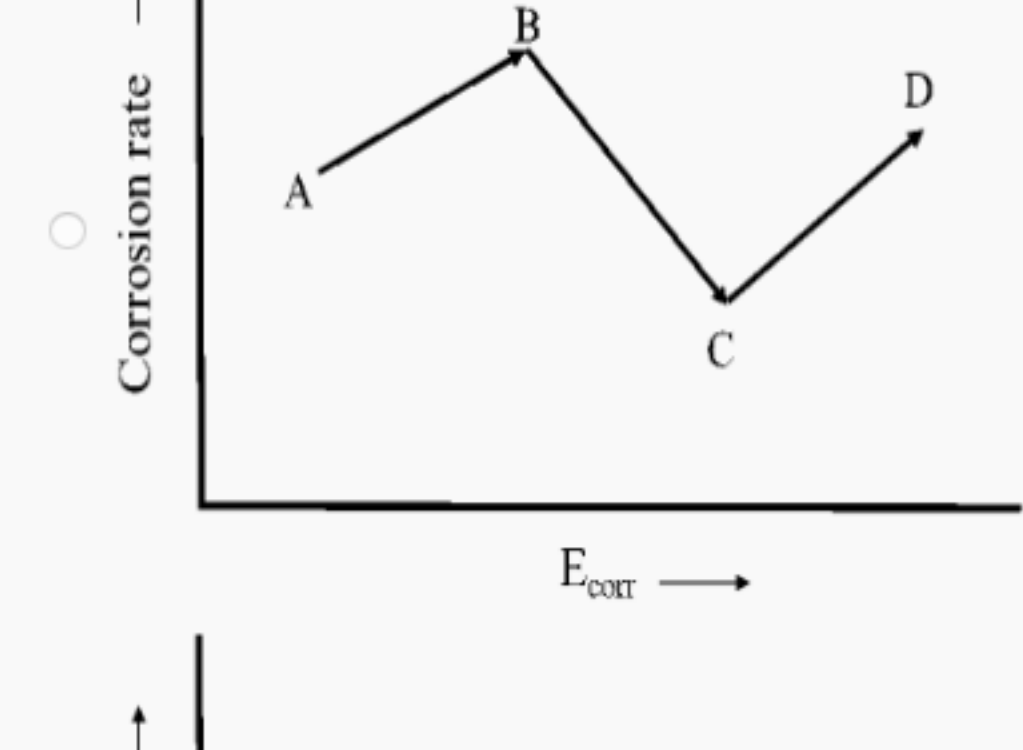
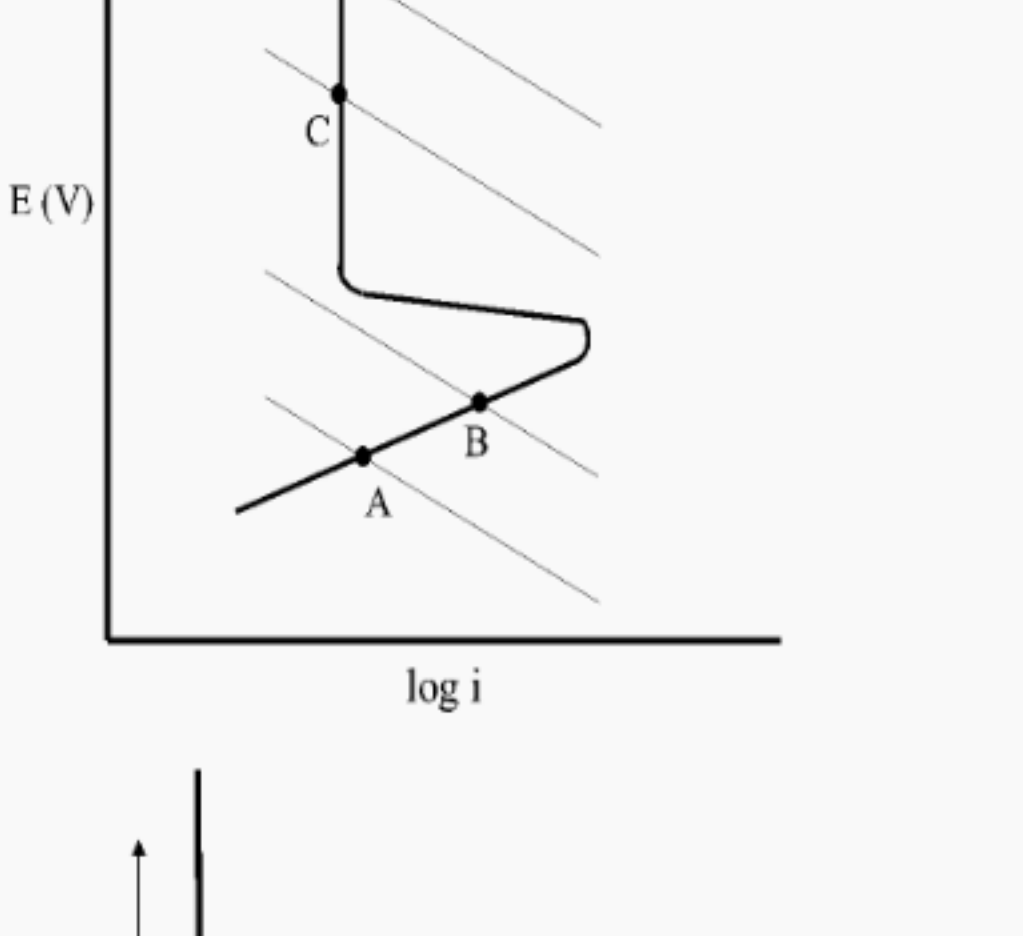
No, the answer is incorrect.
 Score: 0
 Accepted Answers: (1.11 to 1.21) x 10⁻⁵

2) Based on the data provided in Q1, the value of E_{corr} (V) with respect to saturated calomel electrode (SCE) will be; 1 point

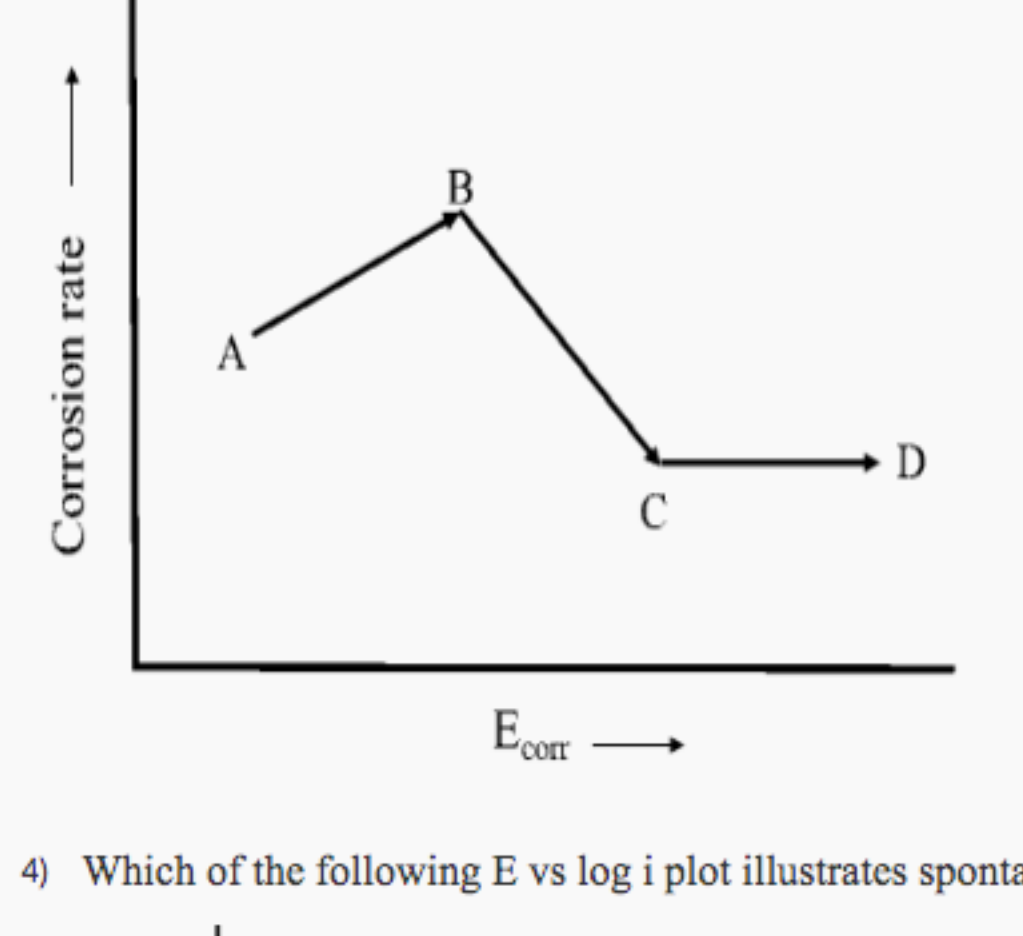
- (0.9 to 1.5)
- (2.3 to 3.0)
- (4.3 to 5.2)
- (6.5 to 7.2)

No, the answer is incorrect.
 Score: 0
 Accepted Answers: - (0.9 to 1.5)

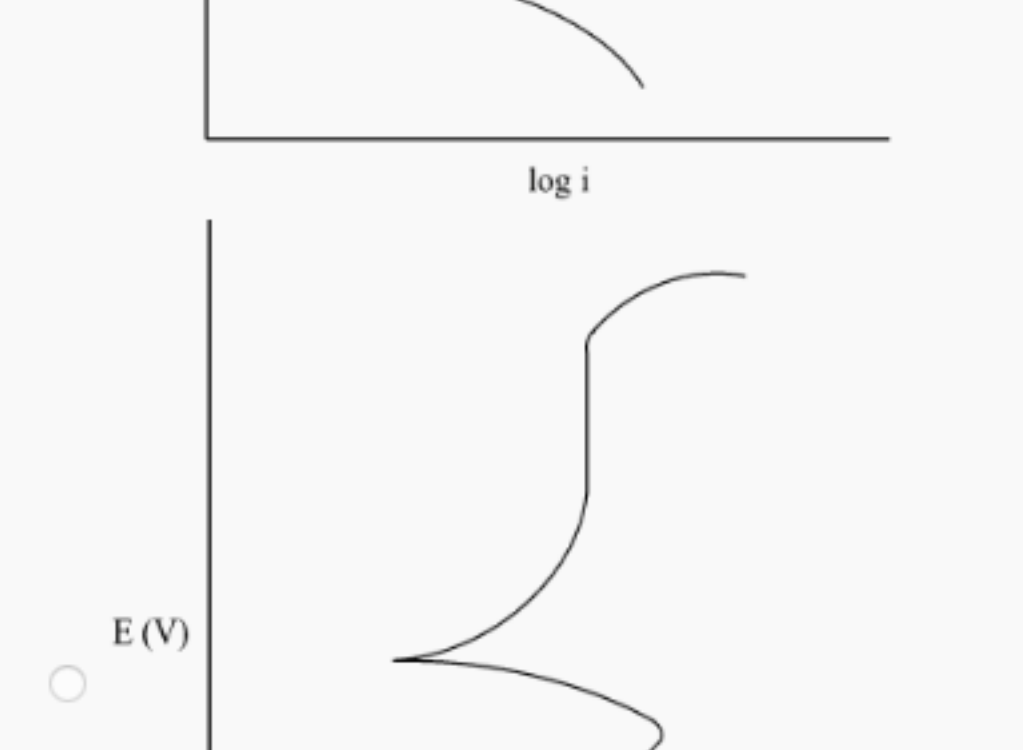
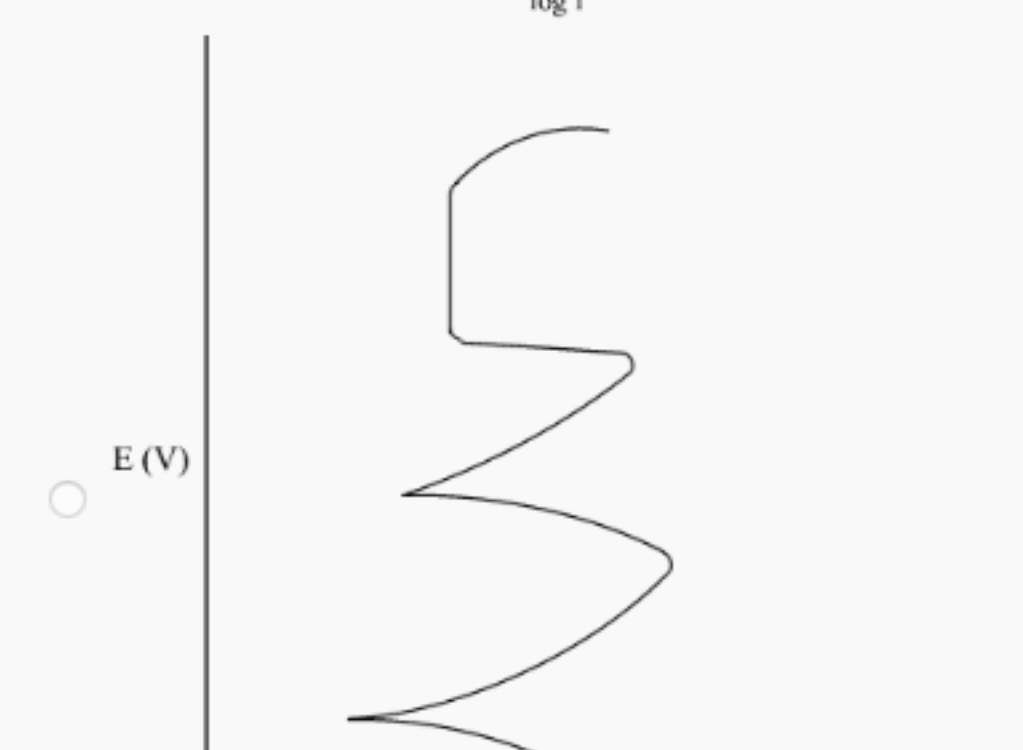
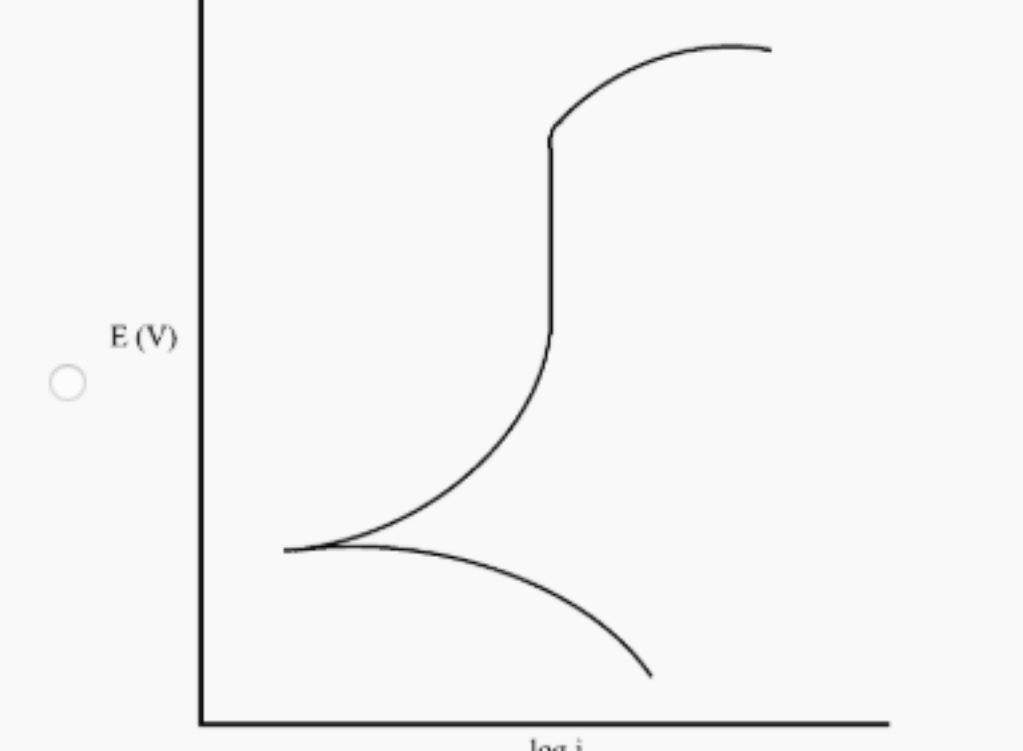
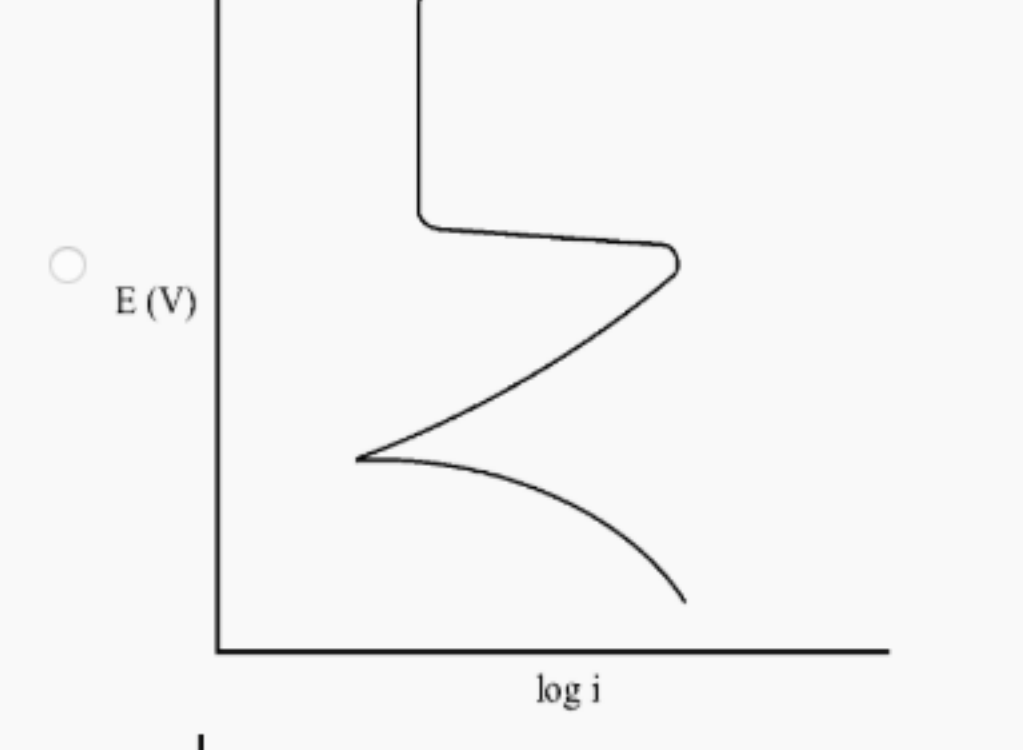
3) The E vs log i plot for a metal M exhibiting active-passive behavior is shown in the figure below. Which of the following plots correctly illustrates the variation of corrosion rate (CR) with E (V)? 1 point



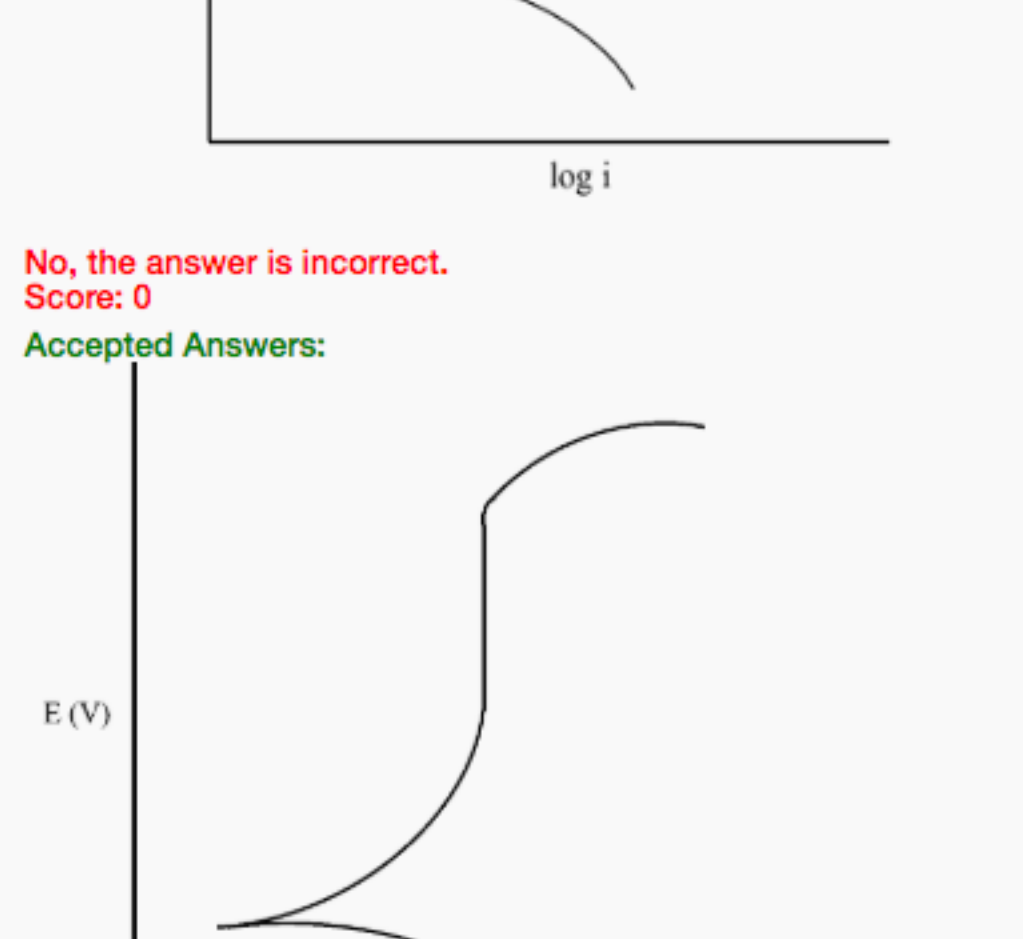
No, the answer is incorrect.
 Score: 0
 Accepted Answers: Corrosion rate vs E_{corr} plot showing a peak at B and a dip at C.



4) Which of the following E vs log i plot illustrates spontaneous passivity? 1 point



No, the answer is incorrect.
 Score: 0
 Accepted Answers: E (V) vs log i plot showing a curve that rises and then levels off, characteristic of spontaneous passivity.



5) Which of the following factors affect the passivity of a metal/alloy? 1 point

- oxidizing/reducing environment
- temperature
- cathodic polarization
- all of these

No, the answer is incorrect.
 Score: 0
 Accepted Answers: all of these

6) A piece of iron, coated with zinc has been found to show superior corrosion resistance at room temperature. However, at an elevated temperature of 80°C, it was observed that iron was heavily corroded without much of the corrosion of Zn. Which of the following is the possible reason for the increase in corrosion rate of iron? 1 point

- zinc coating delaminates from the surface of iron
- iron becomes nobler to zinc
- due to formation of a passive layer of ZnO
- due to formation of Fe-Zn alloy on the surface

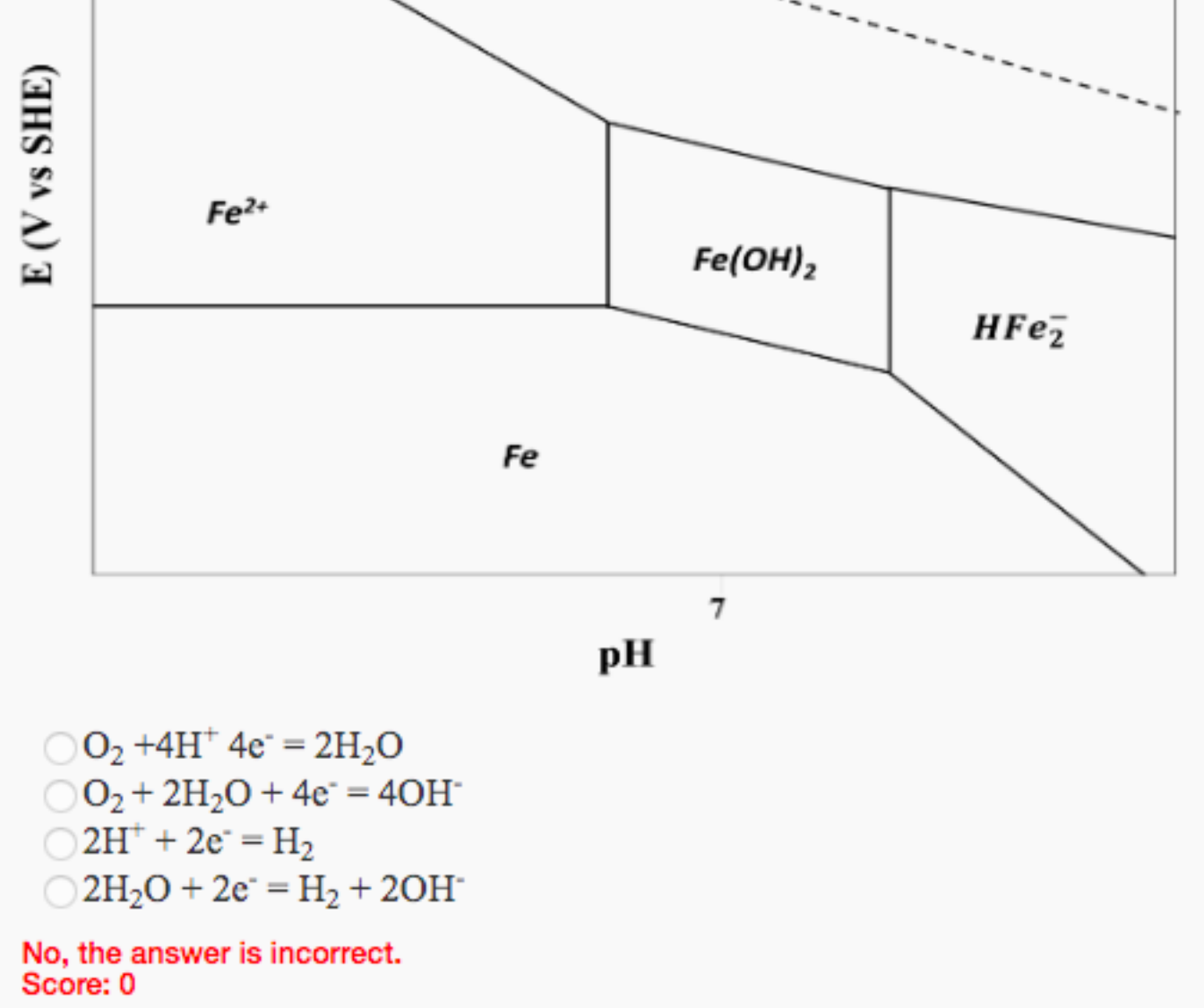
No, the answer is incorrect.
 Score: 0
 Accepted Answers: due to formation of a passive layer of ZnO

7) Consider that a metal M is immersed in an acidic electrolyte of pH 3 exhibiting an active-passive behavior. If the metal is anodically polarized beyond primary passivation potential (E_{pp}), which of the following statements is correct? 1 point

- Rate of metal oxide (MO) formation is greater than the rate of metal dissolution
- Rate of metal oxide (MO) formation is less than the rate of metal dissolution
- Rate of metal oxide (MO) formation is same as the rate of metal dissolution
- Rate of metal oxide (MO) formation periodically fluctuates

No, the answer is incorrect.
 Score: 0
 Accepted Answers: Rate of metal oxide (MO) formation is greater than the rate of metal dissolution

8) The pourbaix diagram for Fe-H₂O is shown below. The dotted line in the diagram represents the cathodic reaction. Which of the following cathodic reactions will occur at pH 8? 1 point



- $O_2 + 4H^+ + 4e^- = 2H_2O$
- $O_2 + 2H_2O + 4e^- = 4OH^-$
- $2H^+ + 2e^- = H_2$
- $2H_2O + 2e^- = H_2 + 2OH^-$

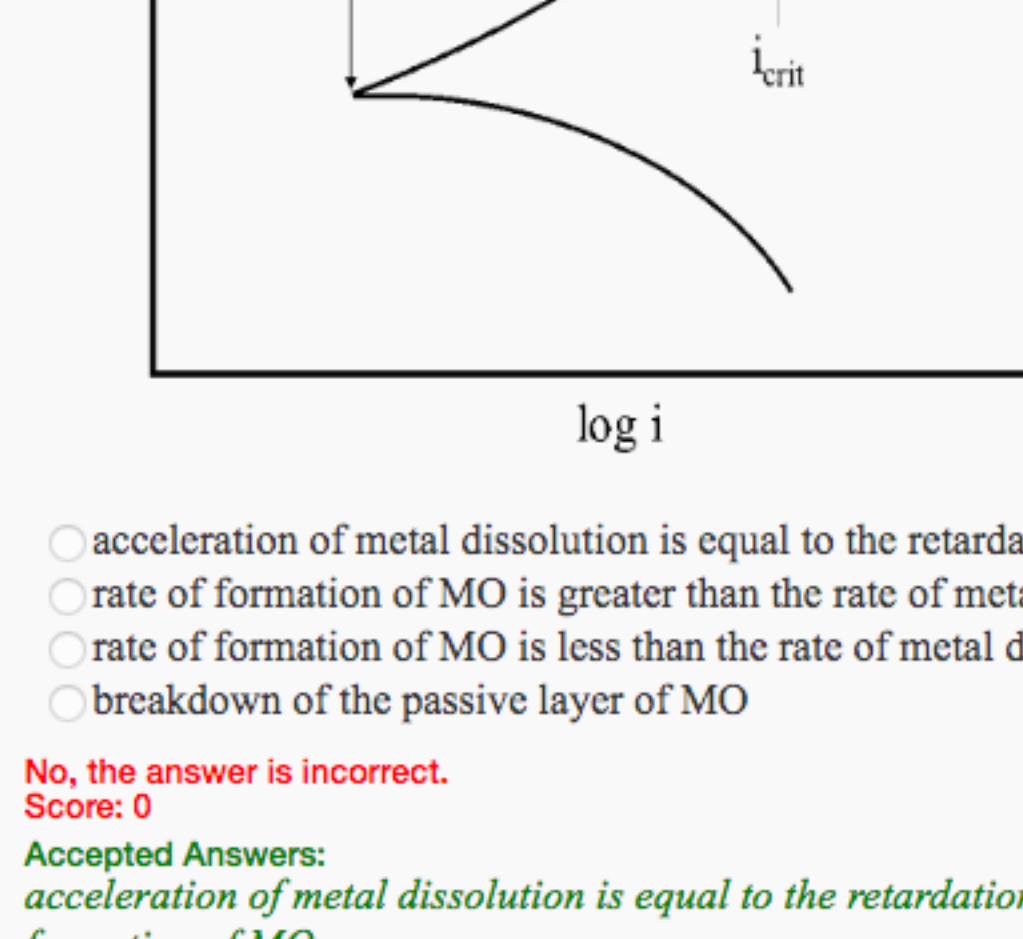
No, the answer is incorrect.
 Score: 0
 Accepted Answers: $O_2 + 2H_2O + 4e^- = 4OH^-$

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

- $Al^{3+} + 3e^- = Al$
- $Zn + 2H_2O = Zn(OH)_2 + 2H^+ + 2e^-$
- $H_2CO_3 = H_2O + CO_2$
- $Zn^{2+} + 2H_2O = Zn(OH)_2 + 2H^+$

No, the answer is incorrect.
 Score: 0
 Accepted Answers: $Zn + 2H_2O = Zn(OH)_2 + 2H^+ + 2e^-$

10) Consider that a metal M exhibits an active-passive behavior as shown in the figure below. Which of the following statement is true at i_{crit} (marked as A)? 1 point



- acceleration of metal dissolution is equal to the retardation of metal dissolution due to formation of MO
- rate of formation of MO is greater than the rate of metal dissolution
- rate of formation of MO is less than the rate of metal dissolution
- breakdown of the passive layer of MO

No, the answer is incorrect.
 Score: 0
 Accepted Answers: acceleration of metal dissolution is equal to the retardation of metal dissolution due to formation of MO