

Unit 7 - Week 5

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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 2020-03-04, 23:59 IST.

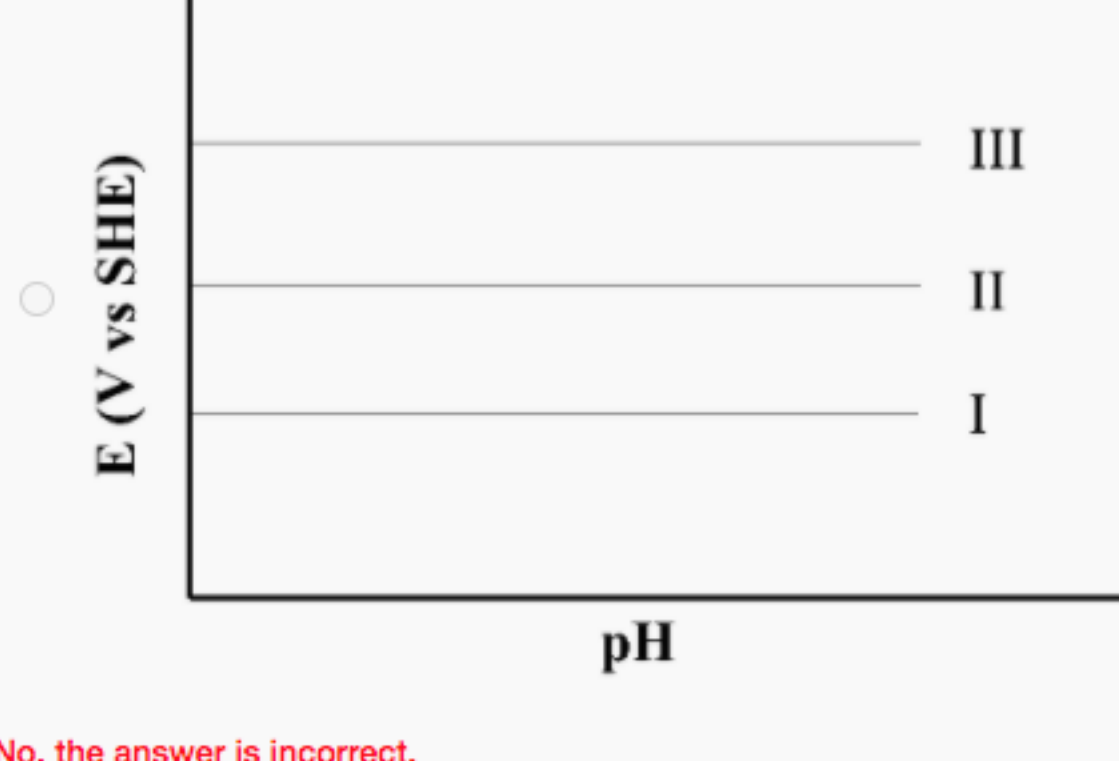
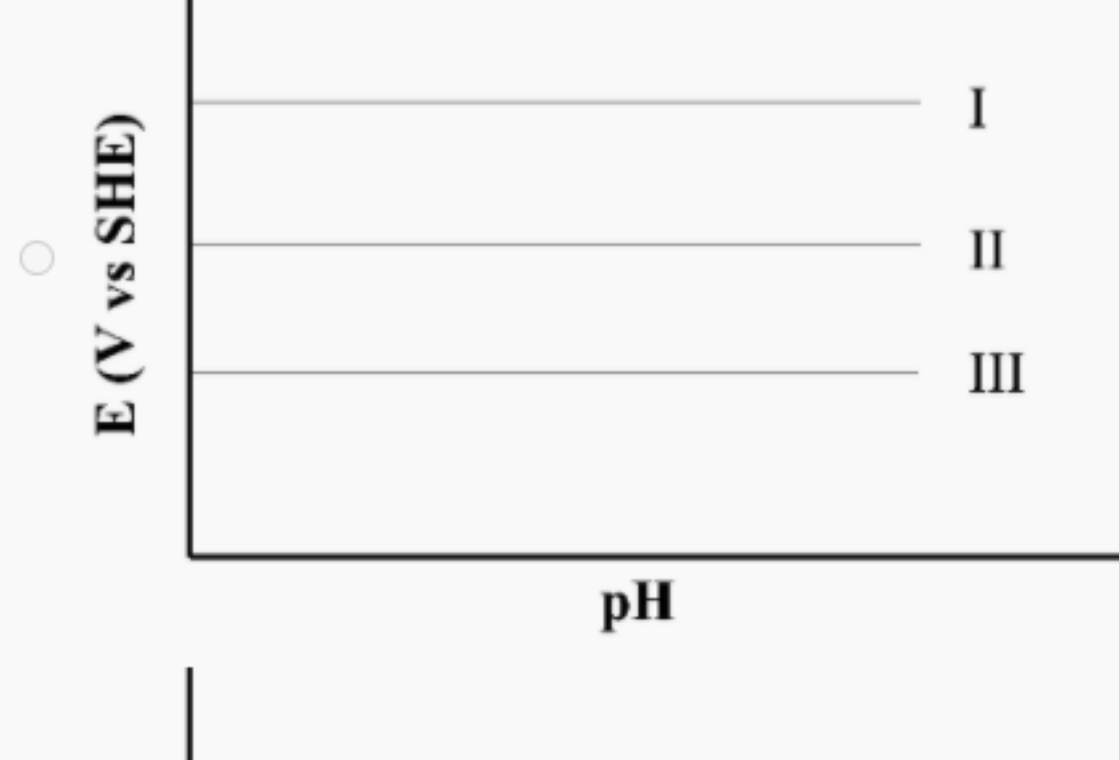
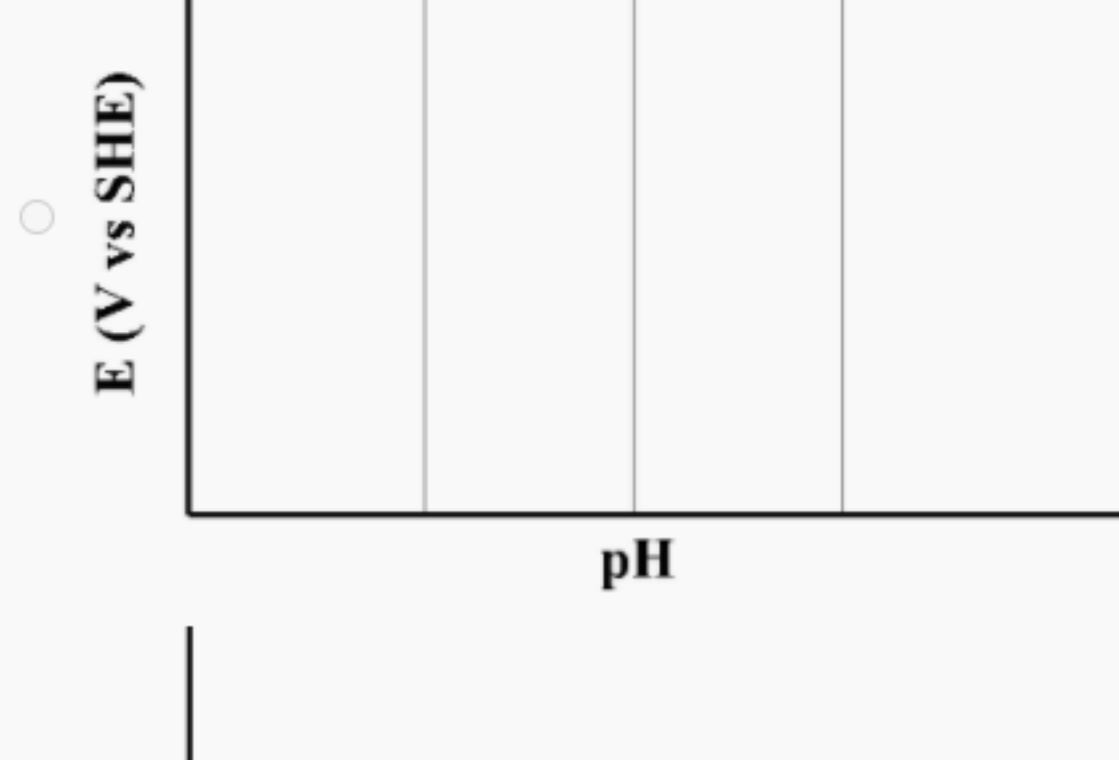
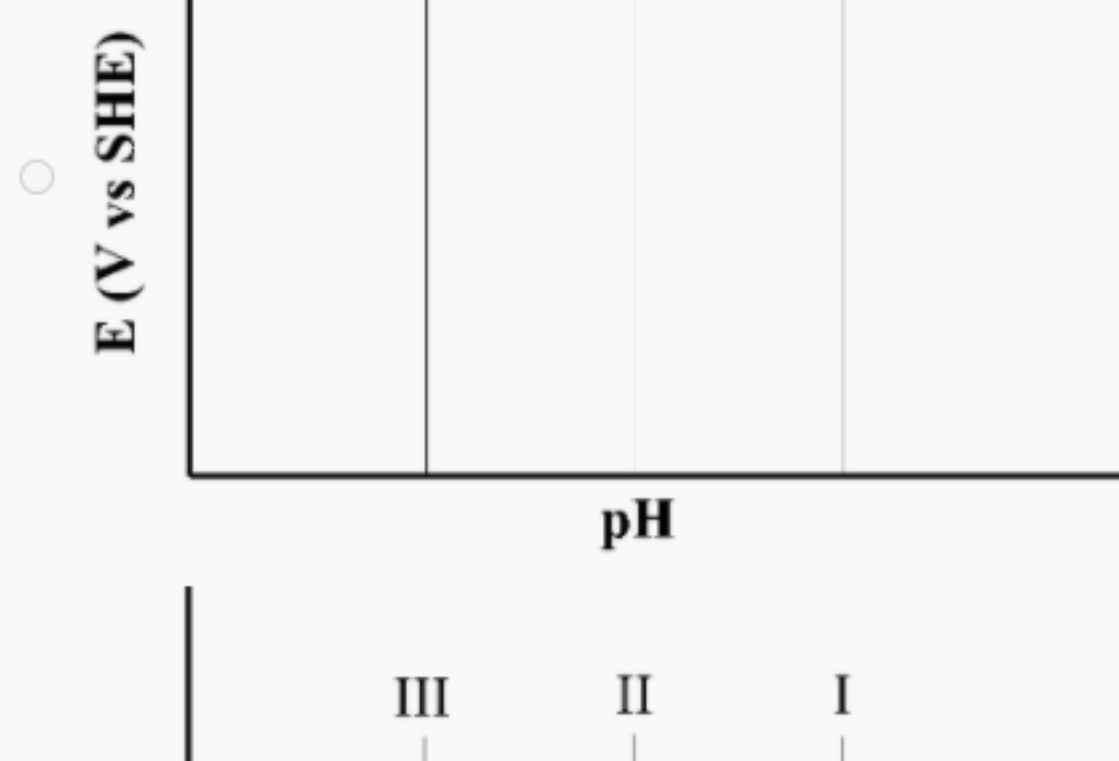
1) Which of the following statements is true for Pourbaix diagram? 1 point

- It allows to predict whether a system will passivate or corrode
- It is applicable to both metals and alloys
- It can predict the chloride effect on corrosion
- It considers both thermodynamic and kinetic parameters

No, the answer is incorrect. Score: 0

Accepted Answers: It allows to predict whether a system will passivate or corrode

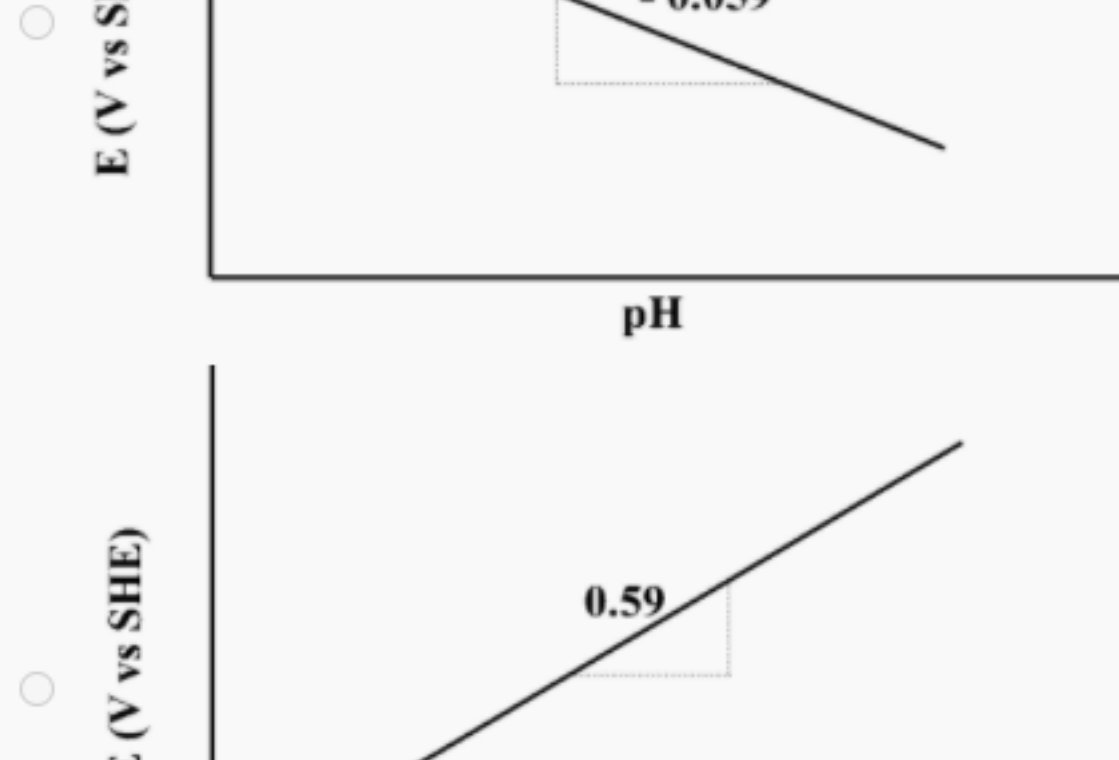
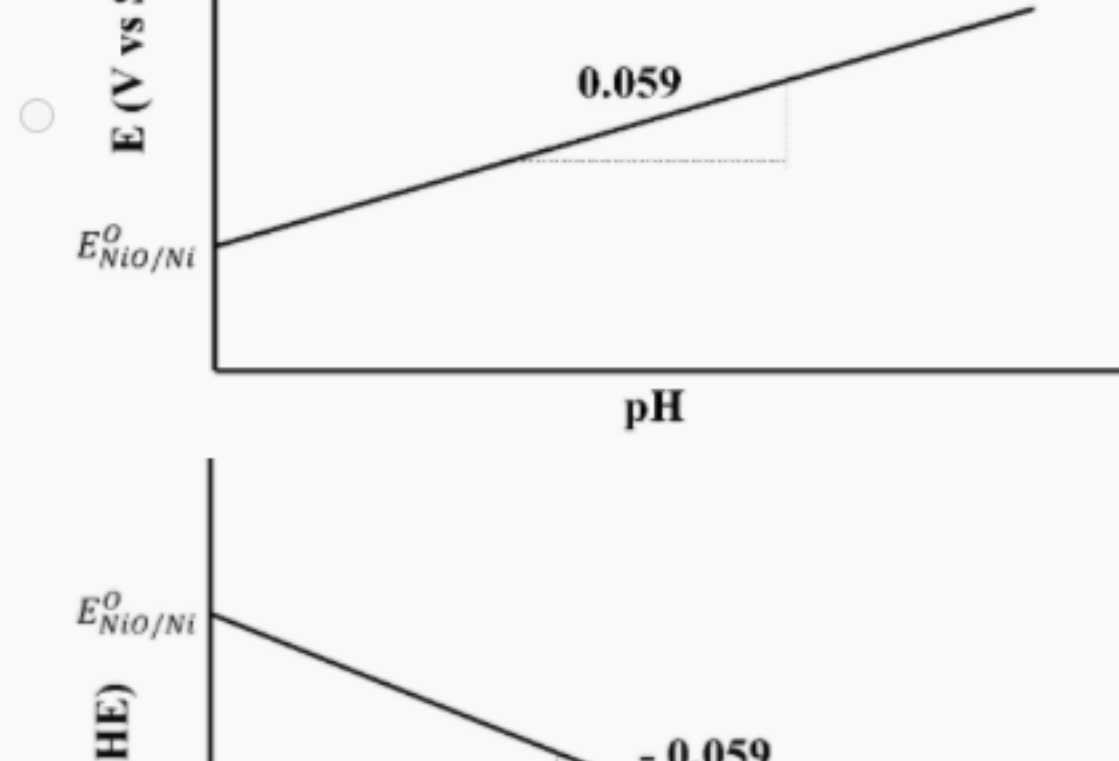
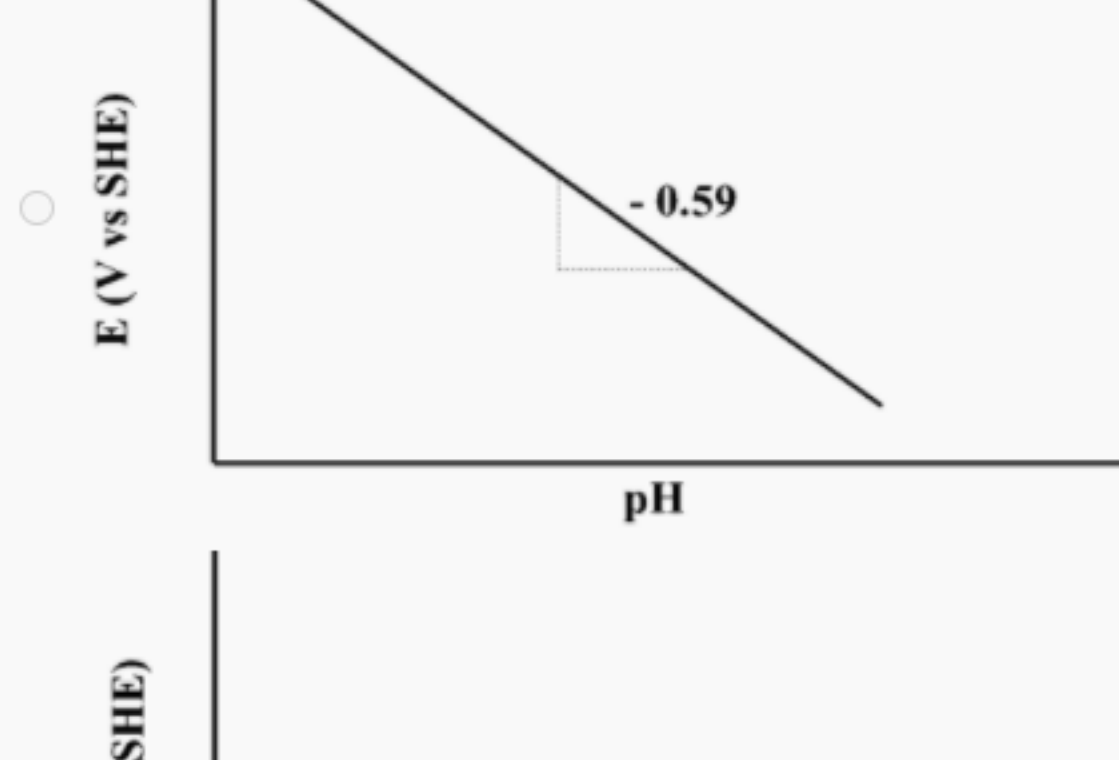
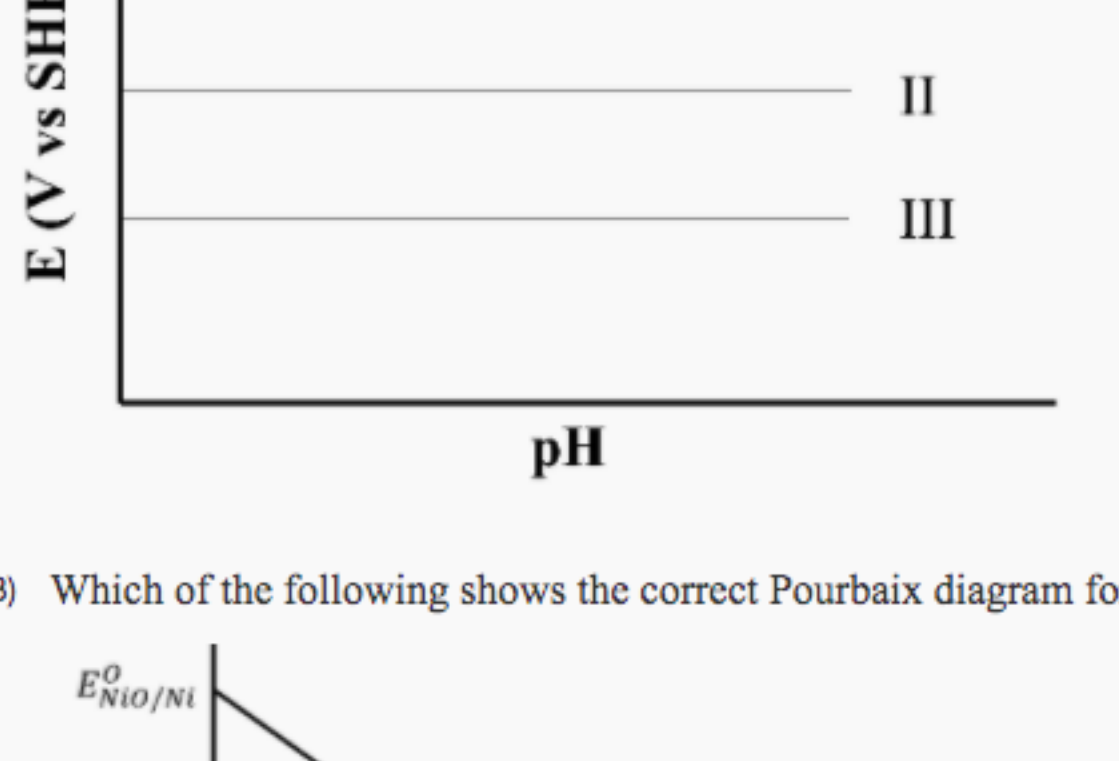
2) Consider the reaction $Cu^{2+} + 2e^- = Cu$ at three different activities where $a_{Cu^{2+}}(I) > a_{Cu^{2+}}(II) > a_{Cu^{2+}}(III)$. Which of the following shows the correct sequence for activity of Cu^{2+} ($a_{Cu^{2+}}$) ions in the Pourbaix diagram of Cu-H₂O system corresponding to I, II and III lines; 1 point



No, the answer is incorrect. Score: 0

Accepted Answers: I, II, III

3) Which of the following shows the correct Pourbaix diagram for the reaction $NiO + 2H^+ + 2e^- = Ni + H_2O$ in the Ni-H₂O system; 1 point



No, the answer is incorrect. Score: 0

Accepted Answers: -0.059

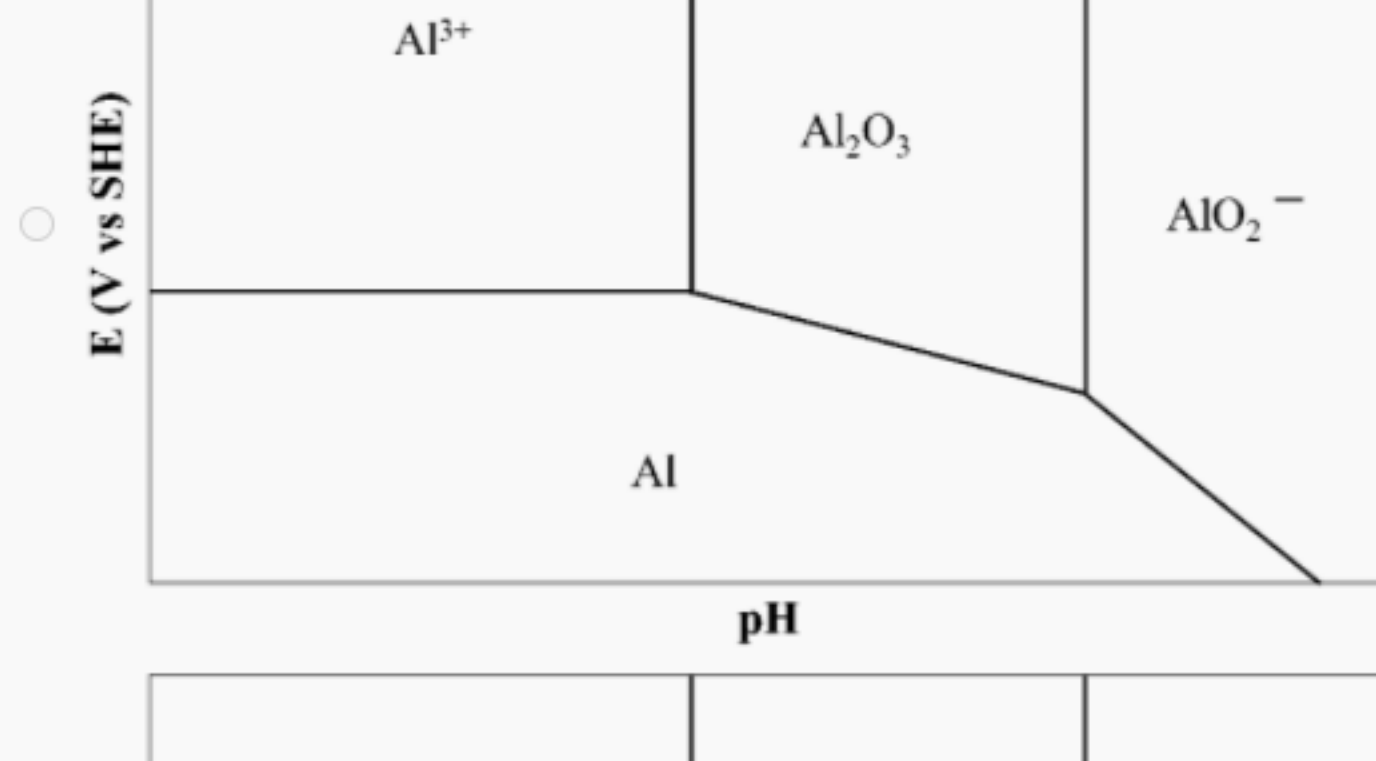
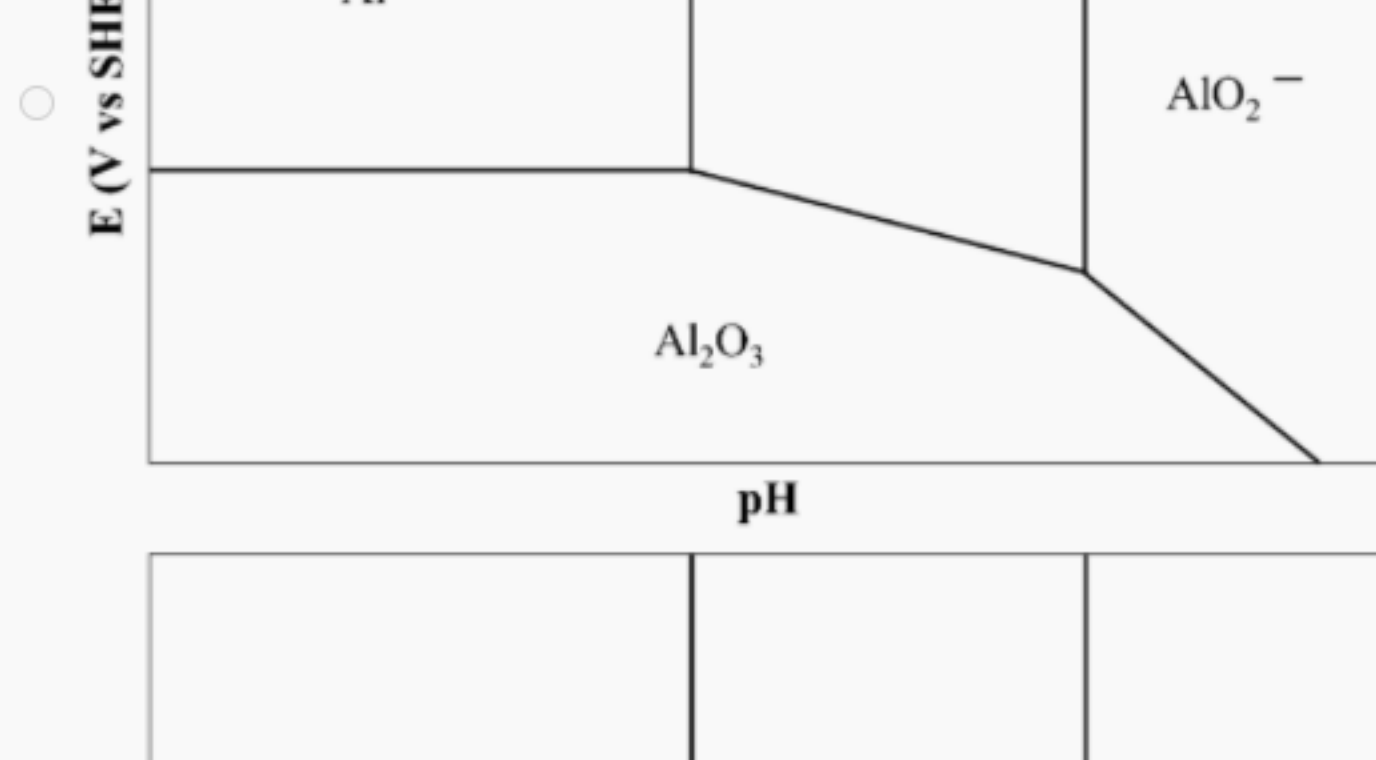
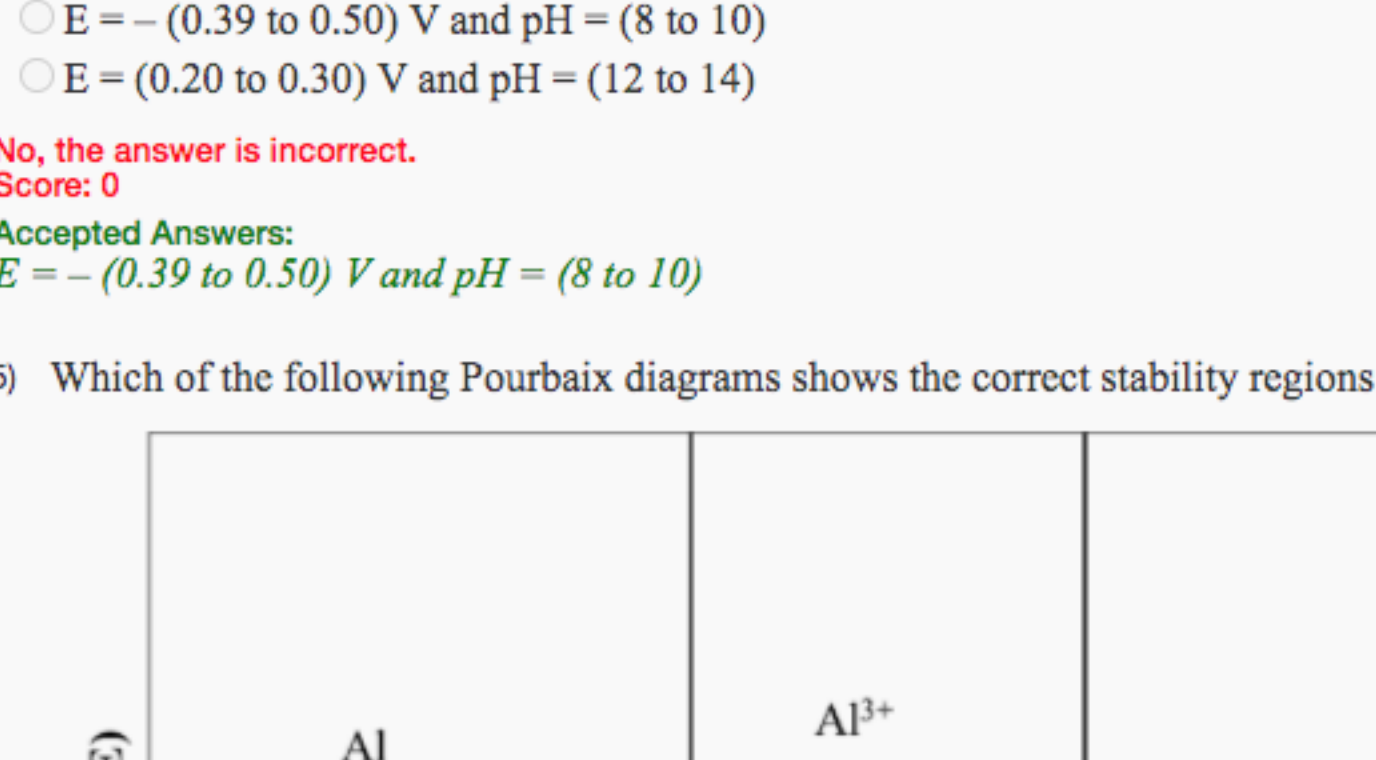
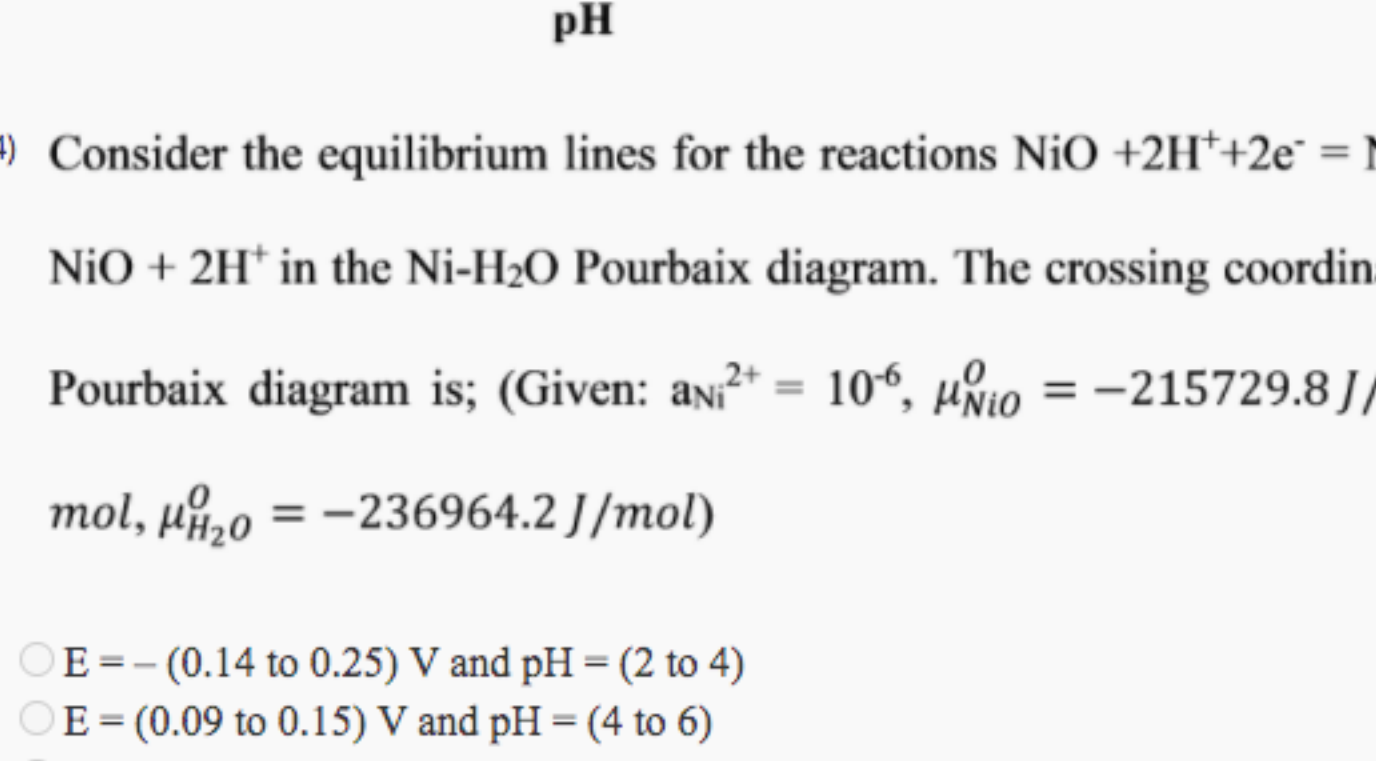
4) Consider the equilibrium lines for the reactions $NiO + 2H^+ + 2e^- = Ni + H_2O$ and $Ni^{2+} + H_2O = NiO + 2H^+$ in the Ni-H₂O Pourbaix diagram. The crossing coordinates of the two lines in the Pourbaix diagram is; (Given: $a_{Ni^{2+}} = 10^{-6}$, $\mu_{NiO}^0 = -215729.8 J/mol$, $\mu_{Ni}^0 = -48250 J/mol$, $\mu_{H_2O}^0 = -236964.2 J/mol$) 1 point

- E = - (0.14 to 0.25) V and pH = (2 to 4)
- E = (0.09 to 0.15) V and pH = (4 to 6)
- E = - (0.39 to 0.50) V and pH = (8 to 10)
- E = (0.20 to 0.30) V and pH = (12 to 14)

No, the answer is incorrect. Score: 0

Accepted Answers: E = - (0.39 to 0.50) V and pH = (8 to 10)

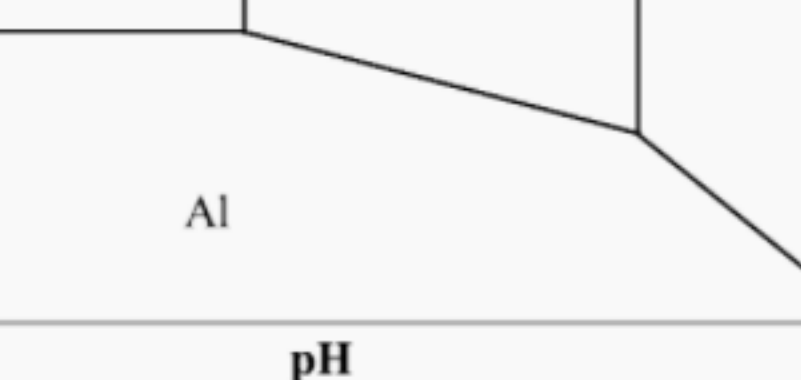
5) Which of the following Pourbaix diagrams shows the correct stability regions in the Al-H₂O system; 1 point



No, the answer is incorrect. Score: 0

Accepted Answers: Al, Al3+, AlO2-, Al2O3

6) The Pourbaix diagram for Ni-H₂O system is shown below. Match set 1 with set 2 and mark the correct option. (The region between the dotted lines is the water stability region) 1 point



Match Set 1 with Set 2 and mark the correct option:

- | | |
|--------------|---|
| Set 1 | Set 2 |
| Line I | (A) $NiO + 2H^+ + 2e^- = Ni + 2H_2O$ |
| Line II | (B) $Ni^{2+} + H_2O = NiO + 2H^+$ |
| Line III | (C) $Ni^{2+} + 2e^- = Ni$ |
| Line IV | (D) $2H^+ + 2e^- = H_2$ (pH < 7), $2H_2O + 2e^- = H_2 + 2OH^-$ (pH ≥ 7) |
| Line V | (E) $O_2 + 4H^+ + 4e^- = 2H_2O$ (pH < 7), $O_2 + 2H_2O + 4e^- = 4(OH^-)$ (pH ≥ 7) |

- I - C, II - B, III - A, IV - D, V - E
- I - D, II - A, III - B, IV - E, V - C
- I - C, II - B, III - E, IV - A, V - D
- I - E, II - D, III - C, IV - A, V - B

No, the answer is incorrect. Score: 0

Accepted Answers: I - C, II - B, III - A, IV - D, V - E

7) For the reaction $O_2 + 2H_2O + 4e^- = 4(OH^-)$, the slope of the equilibrium line in the Pourbaix diagram is; 1 point

- 1.227 V/pH
- 1.227 V/pH
- 0.0591 V/pH
- 0.0591 V/pH

No, the answer is incorrect. Score: 0

Accepted Answers: -0.0591 V/pH

8) Consider the reaction $Al_2O_3 + 6H^+ + 6e^- = 2Al + 3H_2O$. The value of $E_{Al_2O_3/Al}(V)$ at pH 8 is; 1 point

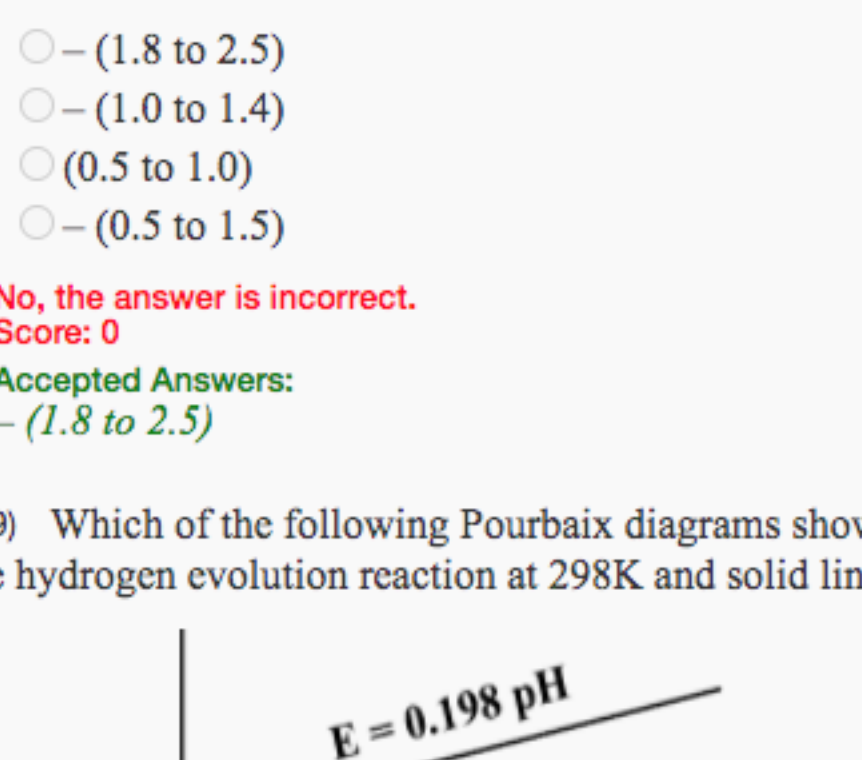
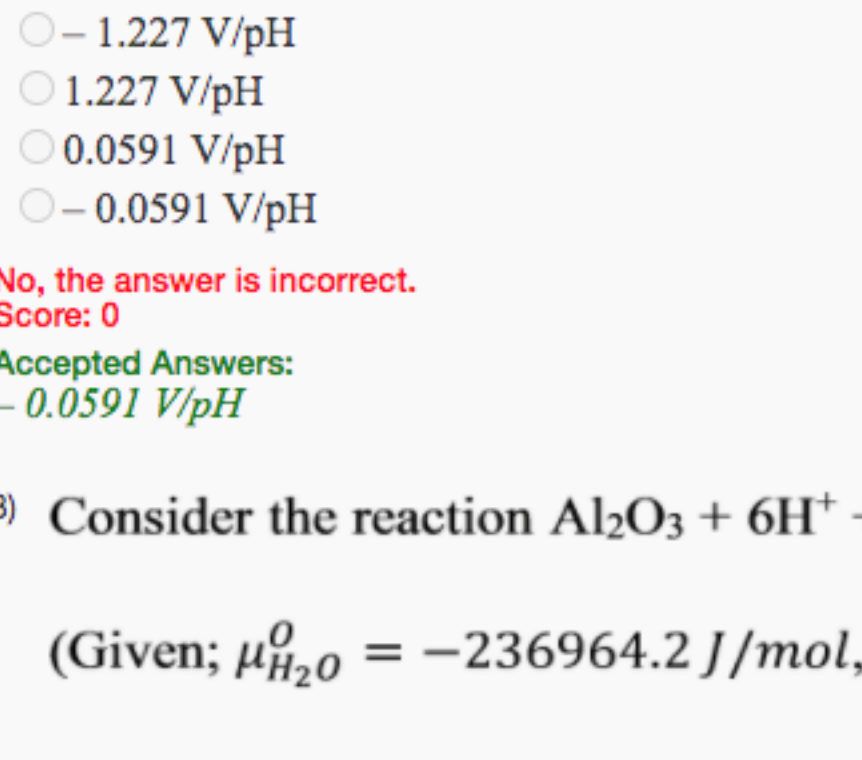
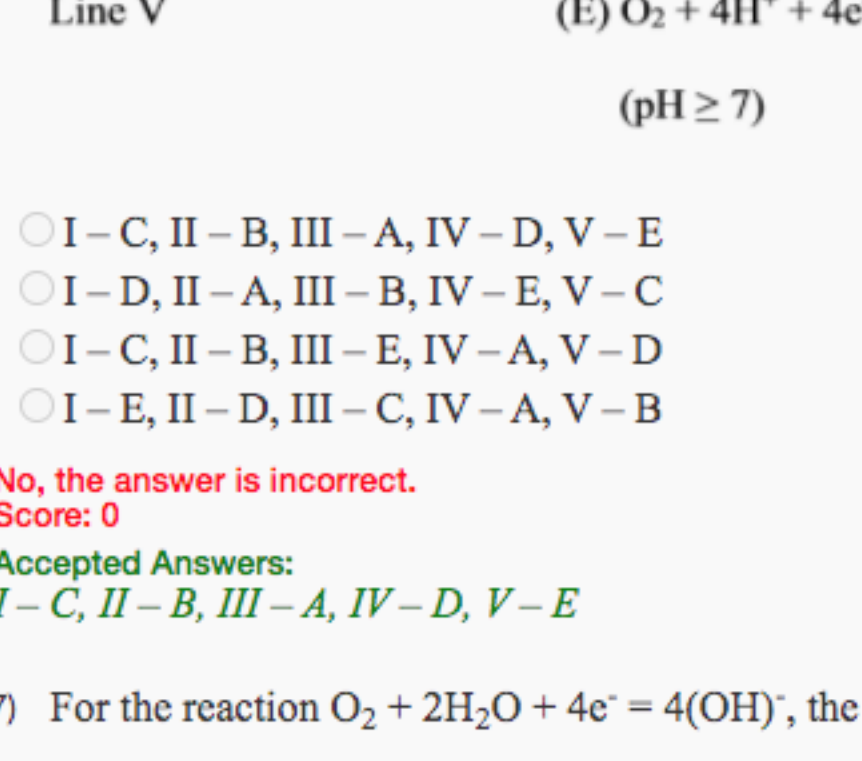
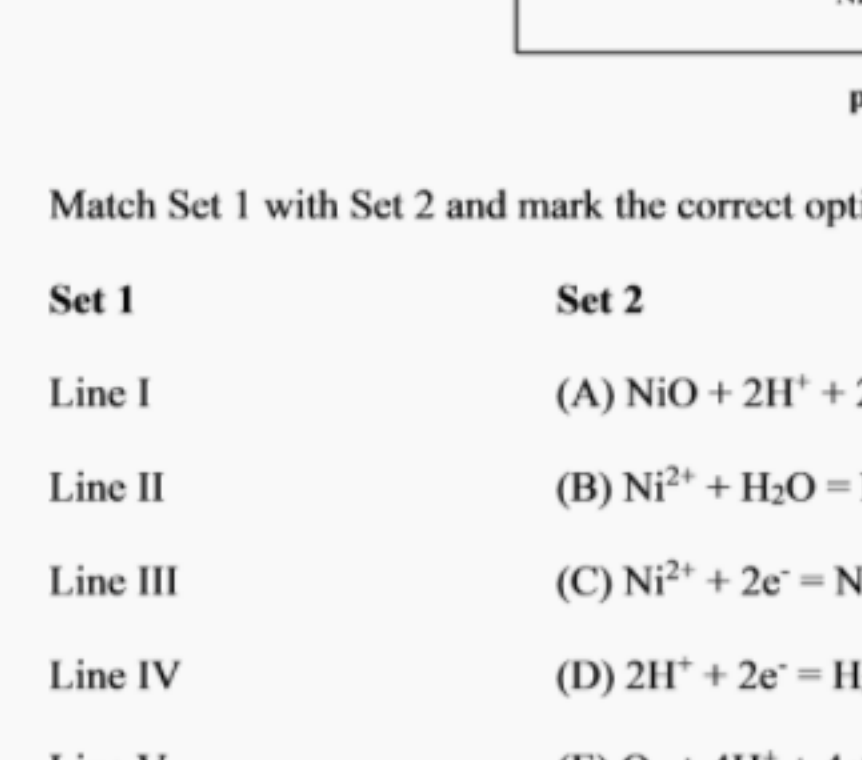
(Given: $\mu_{H_2O}^0 = -236964.2 J/mol$, $\mu_{Al_2O_3}^0 = -1608700 J/mol$)

- (1.8 to 2.5)
- (1.0 to 1.4)
- (0.5 to 1.0)
- (0.5 to 1.5)

No, the answer is incorrect. Score: 0

Accepted Answers: - (1.8 to 2.5)

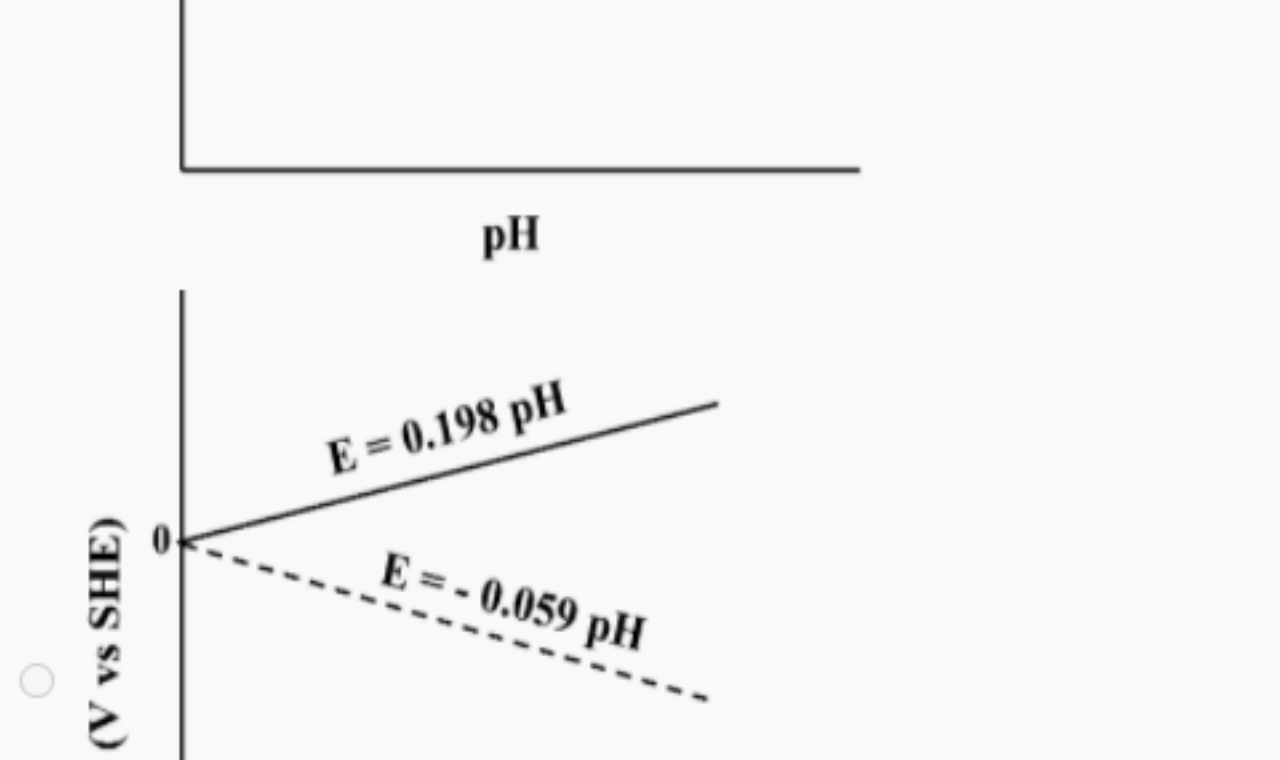
9) Which of the following Pourbaix diagrams shows the correct hydrogen evolution reaction line at 1000 K. The dotted line shows the hydrogen evolution reaction at 298K and solid line shows the hydrogen evolution reaction at 1000K. 1 point



No, the answer is incorrect. Score: 0

Accepted Answers: E = -0.059 pH, E = -0.198 pH

10) Figure below shows the Fe-H₂O Pourbaix diagram. Which of the following shows the correct immune, corrosive and passive region? 1 point



- I-corrosive, II-immune, III-passive, IV-passive
- I-passive, II-corrosive, III-passive, IV-immune
- I-immune, II-corrosive, III-passive, IV-passive
- I-immune, II-passive, III-passive, IV-corrosive

No, the answer is incorrect. Score: 0

Accepted Answers: I-immune, II-corrosive, III-passive, IV-passive