

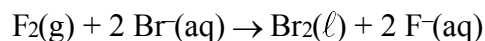
Unit 13 Electrochemistry Review

15. What occurs during the reaction below?



- A) **The manganese is reduced and its oxidation number changes from +4 to +2.**
B) The manganese is oxidized and its oxidation number changes from +4 to +2.
C) The manganese is reduced and its oxidation number changes from +2 to +4.
D) The manganese is oxidized and its oxidation number changes from +2 to +4.

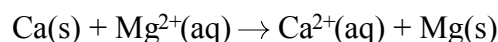
16. Given the reaction:



Which species is reduced?

- A) **F₂(g)** B) Br⁻(aq)
C) Br₂(ℓ) D) F⁻(aq)

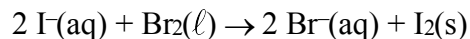
17. Given the cell reaction:



Which substance was oxidized?

- A) **Ca(s)** B) Mg²⁺(aq)
C) Ca²⁺(aq) D) Mg(s)

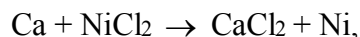
18. Given the redox reaction:



What occurs during this reaction?

- A) **The I⁻ ion is oxidized, and its oxidation number increases.**
B) The I⁻ ion is oxidized, and its oxidation number decreases.
C) The I⁻ ion is reduced, and its oxidation number increases.
D) The I⁻ ion is reduced, and its oxidation number decreases.

19. In the reaction



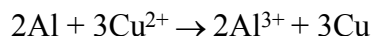
the oxidation number of the chlorine

- A) decreases B) increases
C) **remains the same**

20. Which half-reaction correctly represents oxidation?

- A) $\text{F}_2 \rightarrow 2 \text{F}^- + 2\text{e}^-$ B) $\text{F}_2 + 2\text{e}^- \rightarrow 2 \text{F}^-$
C) **$\text{H}_2 \rightarrow 2 \text{H}^+ + 2\text{e}^-$** D) $\text{H}_2 + 2\text{e}^- \rightarrow 2 \text{H}^+$

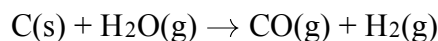
21. Given the balanced equation representing a redox reaction:



Which statement is true about this reaction?

- A) Each Al loses 2e⁻ and each Cu²⁺ gains 3e⁻.
B) **Each Al loses 3e⁻ and each Cu²⁺ gains 2e⁻.**
C) Each Al³⁺ gains 2e⁻ and each Cu loses 3e⁻.
D) Each Al³⁺ gains 3e⁻ and each Cu loses 2e⁻.

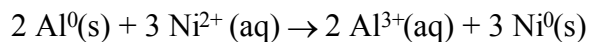
22. Given the equation:



Which species undergoes reduction?

- A) C(s) **B) H⁺**
C) C²⁺ D) H₂(g)

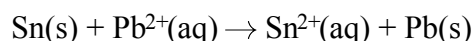
23. Given the reaction:



What is the total number of moles of electrons lost by 2 moles of Al⁰(s)?

- A) **6** B) 2 C) 3 D) 8

24. Given the cell reaction:



The reduction half-reaction for this cell is

- A) **$\text{Pb}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Pb}(\text{s})$**
B) $\text{Pb}(\text{s}) \rightarrow \text{Pb}^{2+}(\text{aq}) + 2\text{e}^-$
C) $\text{Sn}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Sn}(\text{s})$
D) $\text{Sn}(\text{s}) \rightarrow \text{Sn}^{2+}(\text{aq}) + 2\text{e}^-$

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25. In the reaction $\text{Mg} + \text{Cl}_2 \rightarrow \text{MgCl}_2$, the correct half-reaction for the oxidation that occurs is

- A) $\text{Mg} + 2\text{e}^- \rightarrow \text{Mg}^{2+}$
- B) $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
- C) $\text{Mg} \rightarrow \text{Mg}^{2+} + 2\text{e}^-$**
- D) $\text{Cl}_2 \rightarrow 2\text{Cl}^- + 2\text{e}^-$

26. Which reaction is an example of oxidation-reduction?

- A) $\text{KOH} + \text{HCl} \rightarrow \text{KCl} + \text{H}_2\text{O}$
- B) $2\text{KCl} \rightarrow 2\text{K} + \text{Cl}_2$**
- C) $\text{BaCl}_2 + \text{K}_2\text{SO}_4 \rightarrow 2\text{KCl} + \text{BaSO}_4$
- D) $\text{KCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{KNO}_3$

27. Which is a redox reaction?

- A) $2\text{KBr} + \text{F}_2 \rightarrow 2\text{KF} + \text{Br}_2$**
- B) $2\text{HCl} + \text{Mg}(\text{OH})_2 \rightarrow 2\text{HOH} + \text{MgCl}_2$
- C) $2\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{HCl}$
- D) $\text{Ca}(\text{OH})_2 + \text{Pb}(\text{NO}_3)_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + \text{Pb}(\text{OH})_2$

28. Based on Reference Table J, which metal will react spontaneously with Al^{3+} ?

- A) $\text{Co}(\text{s})$
- B) $\text{Cr}(\text{s})$
- C) $\text{Cu}(\text{s})$
- D) $\text{Ca}(\text{s})$**

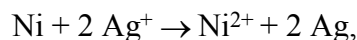
29. According to Reference Table J, which redox reaction occurs spontaneously?

- A) $\text{Cu}(\text{s}) + 2\text{H}^+ \rightarrow \text{Cu}^{2+} + \text{H}_2(\text{g})$
- B) $\text{Mg}(\text{s}) + 2\text{H}^+ \rightarrow \text{Mg}^{2+} + \text{H}_2(\text{g})$**
- C) $2\text{Ag}(\text{s}) + 2\text{H}^+ \rightarrow 2\text{Ag} + \text{H}_2(\text{g})$
- D) $2\text{Ag}(\text{s}) + 2\text{H}^+ \rightarrow 2\text{Ag}^{2+} + \text{H}_2(\text{g})$

30. Based on Reference Table J, which oxidation is most likely to occur?

- A) $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$
- B) $\text{Mg} \rightarrow \text{Mg}^{2+} + 2\text{e}^-$**
- C) $\text{Ag} \rightarrow \text{Ag}^{1+} + 1\text{e}^-$
- D) $\text{Au} \rightarrow \text{Au}^{3+} + 3\text{e}^-$

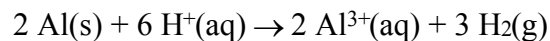
31. In the reaction



what is the total number of moles of electrons lost by 1 mole of Ni?

- A) 1
- B) 2**
- C) 0.5
- D) 4

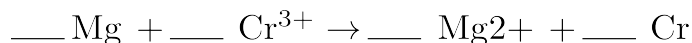
32. Given the balanced equation:



When 2 moles of $\text{Al}(\text{s})$ completely reacts, what is the total number of moles of electrons transferred from $\text{Al}(\text{s})$ to $\text{H}^+(\text{aq})$?

- A) 5
- B) 6**
- C) 3
- D) 4

33. Given the reaction:



When the equation is correctly balanced using smallest whole numbers, the sum of the coefficients will be

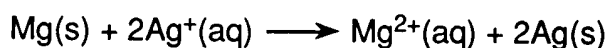
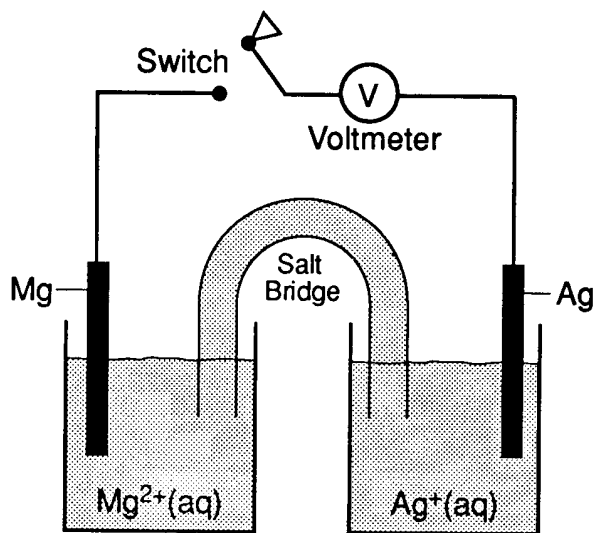
- A) 10**
- B) 7
- C) 5
- D) 4

34. A voltaic cell spontaneously converts

- A) electrical energy to chemical energy
- B) chemical energy to electrical energy**
- C) electrical energy to nuclear energy
- D) nuclear energy to electrical energy

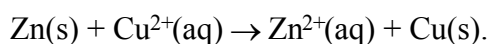
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35. Base your answer to the following question on the equation and diagram below represent an electrochemical cell at 298 K and 1 atmosphere.



Which species is oxidized when the switch is closed?

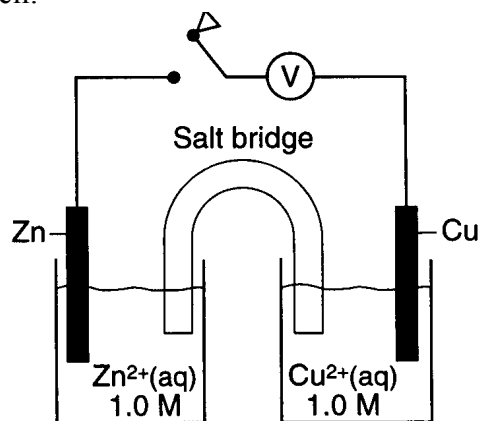
- A) **Mg(s)** B) $\text{Mg}^{2+}(\text{aq})$
 C) Ag(s) D) $\text{Ag}^+(\text{aq})$
36. The overall reaction in a electrochemical cell is



As the reaction in this cell takes place, the

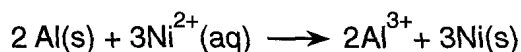
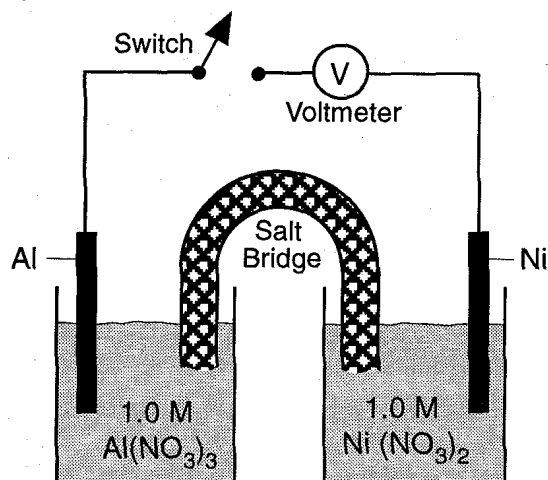
- A) **mass of the Zn(s) electrode decreases**
 B) mass of the Cu(s) electrode decreases
 C) $\text{Cu}^{2+}(\text{aq})$ concentration remains the same
 D) $\text{Zn}^{2+}(\text{aq})$ concentration remains the same
37. A redox reaction is set up so that both half reactions take place in separate beakers that are connected by a salt bridge and an external conductor. A path for the transfer of ions is provided by the
- A) anode B) cathode
 C) **salt bridge** D) external conductor

38. The diagram below represents an electrochemical cell.



What occurs when the switch is closed?

- A) Zn is reduced.
 B) Cu is oxidized.
 C) Electrons flow from Cu to Zn.
 D) **Electrons flow from Zn to Cu.**
39. The diagram below represents a chemical cell at 298 K.

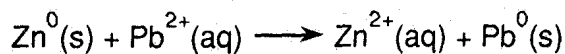
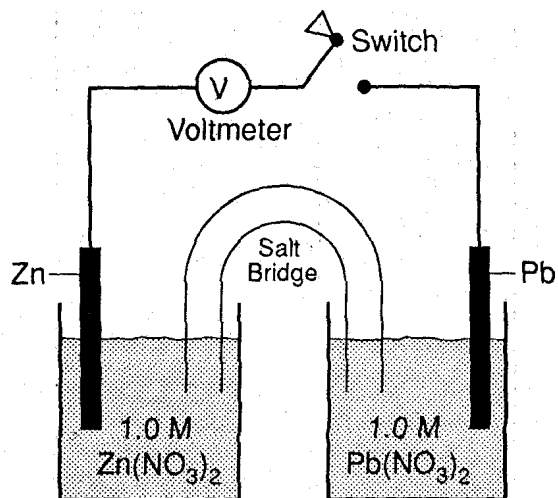


When the switch is closed, electrons flow from

- A) **Al(s) to Ni(s)**
 B) Ni(s) to Al(s)
 C) $\text{Al}^{3+}(\text{aq})$ to $\text{Ni}^{2+}(\text{aq})$
 D) $\text{Ni}^{2+}(\text{aq})$ to $\text{Al}^{3+}(\text{aq})$

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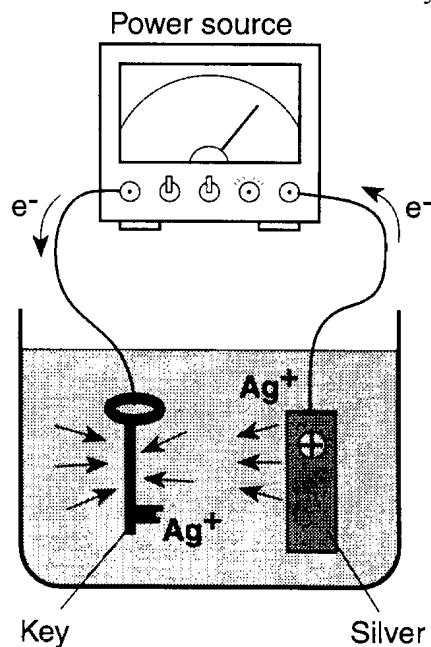
40. Base your answer to the following question on the diagram of the chemical cell shown below. The reaction occurs at 1 atmosphere and 298 K.



When the switch is closed, what occurs?

- A) Pb is oxidized and electrons flow to the Zn electrode.
- B) Pb is reduced and electrons flow to the Zn electrode.
- C) **Zn is oxidized and electrons flow to the Pb electrode.**
- D) Zn is reduced and electrons flow to the Pb electrode.

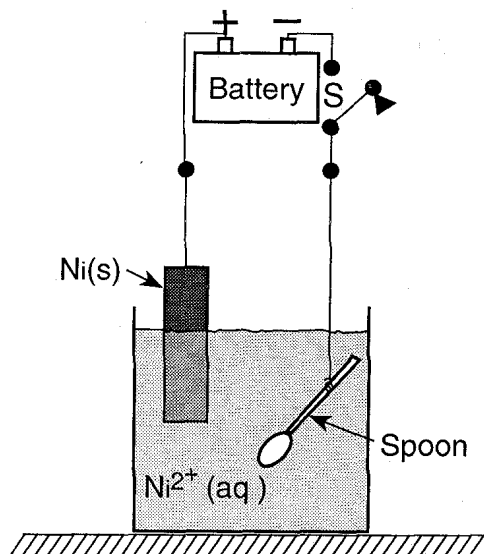
41. Which statement best describes the key?



- A) **It acts as the cathode and is negative.**
- B) It acts as the cathode and is positive.
- C) It acts as the anode and is negative.
- D) It acts as the anode and is positive.

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42. The diagram below shows a spoon that will be electroplated with nickel metal.

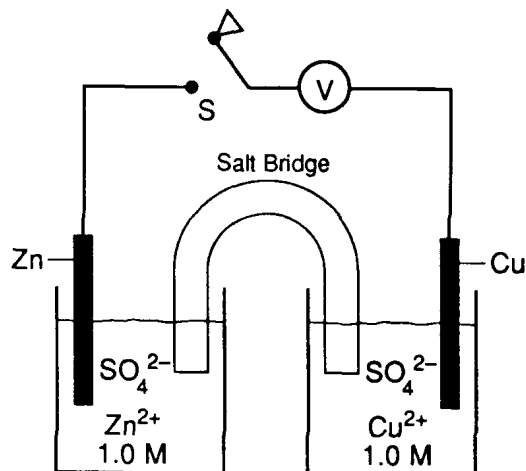


What will occur when switch S is closed?

- A) The spoon will lose mass, and the Ni(s) will be reduced.
B) The spoon will lose mass, and the Ni(s) will be oxidized.
C) The spoon will gain mass, and the Ni(s) will be reduced.
D) The spoon will gain mass, and the Ni(s) will be oxidized.
43. Where does oxidation occur in an electrochemical cell?
- A) at the cathode in both an electrolytic cell and a voltaic cell
B) at the cathode in an electrolytic cell and at the anode in a voltaic cell
C) at the anode in both an electrolytic cell and a voltaic cell
D) at the anode in an electrolytic cell and at the cathode in a voltaic cell

44. An electrochemical cell that generates electricity contains half-cells that produce

- A) oxidation half-reactions, only
B) reduction half-reactions, only
C) spontaneous redox reactions
D) non-spontaneous redox reactions
45. Base your answer to the following question on the diagram below which represents a chemical cell at 298 K and 1 atmosphere.



Which species represents the cathode?

- A) Zn B) Zn²⁺ **C) Cu** D) Cu²⁺

Answer Key
Unit 13 Electrochemistry Review

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|-----|----------|-----|----------|
| 1. | <u>C</u> | 36. | <u>A</u> |
| 2. | <u>A</u> | 37. | <u>C</u> |
| 3. | <u>D</u> | 38. | <u>D</u> |
| 4. | <u>B</u> | 39. | <u>A</u> |
| 5. | <u>C</u> | 40. | <u>C</u> |
| 6. | <u>A</u> | 41. | <u>A</u> |
| 7. | <u>C</u> | 42. | <u>D</u> |
| 8. | <u>B</u> | 43. | <u>C</u> |
| 9. | <u>B</u> | 44. | <u>C</u> |
| 10. | <u>B</u> | 45. | <u>C</u> |
| 11. | <u>B</u> | | |
| 12. | <u>B</u> | | |
| 13. | <u>D</u> | | |
| 14. | <u>A</u> | | |
| 15. | <u>A</u> | | |
| 16. | <u>A</u> | | |
| 17. | <u>A</u> | | |
| 18. | <u>A</u> | | |
| 19. | <u>C</u> | | |
| 20. | <u>C</u> | | |
| 21. | <u>B</u> | | |
| 22. | <u>B</u> | | |
| 23. | <u>A</u> | | |
| 24. | <u>A</u> | | |
| 25. | <u>C</u> | | |
| 26. | <u>B</u> | | |
| 27. | <u>A</u> | | |
| 28. | <u>D</u> | | |
| 29. | <u>B</u> | | |
| 30. | <u>B</u> | | |
| 31. | <u>B</u> | | |
| 32. | <u>B</u> | | |
| 33. | <u>A</u> | | |
| 34. | <u>B</u> | | |
| 35. | <u>A</u> | | |
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