

1. Which energy conversion must occur in an operating electrolytic cell?

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

2. Which term identifies the half-reaction that occurs at the anode of an operating electrochemical cell?

- A) oxidation
- B) reduction
- C) neutralization
- D) transmutation

3. Which reaction occurs at the cathode in an electrochemical cell?

- A) combustion
- B) neutralization
- C) oxidation
- D) reduction

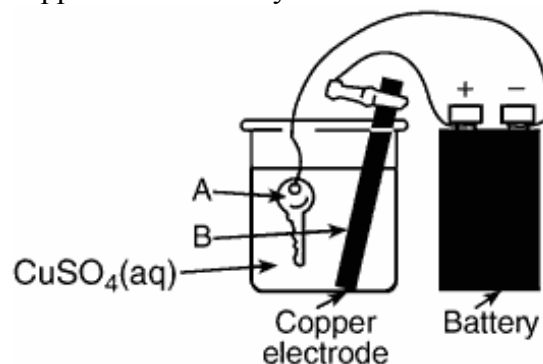
4. Given the balanced equation representing a reaction occurring in an electrolytic cell:



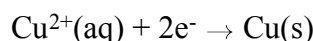
Where is $\text{Na}(\ell)$ produced in the cell?

- A) at the anode, where oxidation occurs
- B) at the anode, where reduction occurs
- C) at the cathode, where oxidation occurs
- D) at the cathode, where reduction occurs

5. The diagram below shows a key being plated with copper in an electrolytic cell



Given the reduction reaction for this cell:



This reduction occurs at

- A) *A*, which is the anode
- B) *A*, which is the cathode
- C) *B*, which is the anode
- D) *B*, which is the cathode

6. Which process occurs at the anode in an electrochemical cell?

- A) the loss of protons
- B) the loss of electrons
- C) the gain of protons
- D) the gain of electrons

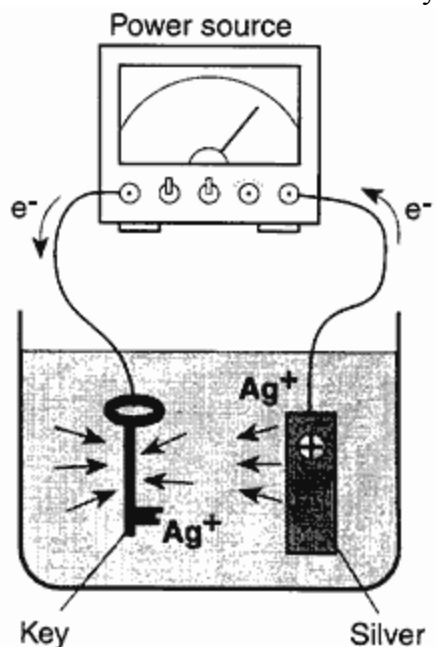
7. Which energy transformation occurs when an electrolytic cell is in operation?

- A) chemical energy \rightarrow electrical energy
- B) electrical energy \rightarrow chemical energy
- C) light energy \rightarrow heat energy
- D) light energy \rightarrow chemical energy

8. Which process requires an external power source?

- A) neutralization
- B) synthesis
- C) fermentation
- D) electrolysis

9. 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.

10. In an electrolytic cell, the anode is always the

- A) negative electrode, where reduction occurs
- B) negative electrode, where oxidation occurs
- C) positive electrode, where reduction occurs
- D) positive electrode, where oxidation occurs

11. Which statement describes the redox reaction that occurs when an object is electroplated?

- A) It is spontaneous and requires an electric current.
- B) It is spontaneous and produces an electric current.
- C) It is non-spontaneous and requires an electric current.
- D) It is non-spontaneous and produces an electric current.

12. In an electrolytic cell, the positive electrode is the

- A) anode, where oxidation occurs
- B) anode, where reduction occurs
- C) cathode, where oxidation occurs
- D) cathode, where reduction occurs

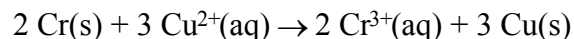
13. Given the cell reaction:



This cell is best described as

- A) an electrolytic cell in which an exothermic reaction occurs
- B) an electrolytic cell in which an endothermic reaction occurs
- C) a chemical cell in which an exothermic reaction occurs
- D) a chemical cell in which an endothermic reaction occurs

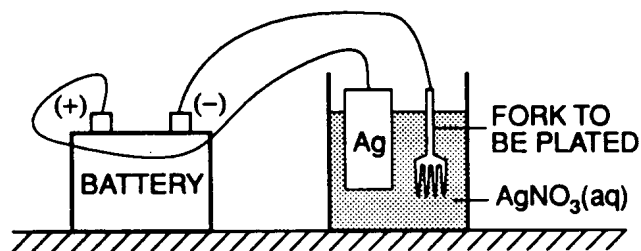
14. Given the redox reaction:



Which reaction occurs at the cathode in an electrochemical cell?

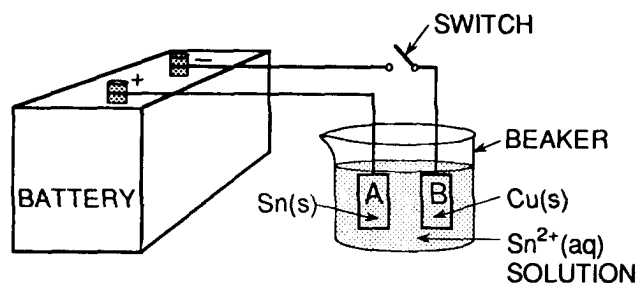
- A) reduction of $\text{Cu}^{2+}(\text{aq})$
- B) reduction of $\text{Cu}(\text{s})$
- C) oxidation of $\text{Cr}^{3+}(\text{aq})$
- D) oxidation of $\text{Cr}(\text{s})$

Base your answers to questions 15 and 16 on the diagram below which represents the electroplating of a metal fork with Ag(s).



15. Which equation represents the half-reaction that takes place at the fork?
- A) $\text{Ag}^+ + \text{NO}_3^- \rightarrow \text{AgNO}_3$
 B) $\text{AgNO}_3 \rightarrow \text{Ag}^+ + \text{NO}_3^-$
 C) $\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag(s)}$
 D) $\text{Ag(s)} \rightarrow \text{Ag}^+ + \text{e}^-$
16. Which part of the electroplating system is provided by the fork?
- A) the anode, which is the negative electrode
 B) the cathode, which is the negative electrode
 C) the anode, which is the positive electrode
 D) the cathode, which is the positive electrode
17. Which half-reaction occurs at the negative electrode in an electrolytic cell in which an object is being plated with silver?
- A) $\text{Ag}^0 + 1\text{e}^- \rightarrow \text{Ag}^+$ B) $\text{Ag}^0 \rightarrow \text{Ag}^+ + 1\text{e}^-$
 C) $\text{Ag}^+ + 1\text{e}^- \rightarrow \text{Ag}^0$ D) $\text{Ag}^+ \rightarrow \text{Ag}^0 + 1\text{e}^-$

18. Base your answer to the following question on the diagram below of an electrolytic cell in which the electrodes are tin and copper.



In this electrolytic cell, electrode A is designated as the

- A) anode and is positive
 B) anode and is negative
 C) cathode and is positive
 D) cathode and is negative
19. What occurs when an electrolytic cell is used for silver-plating a spoon?
- A) A chemical reaction produces an electric current.
 B) An electric current produces a chemical reaction.
 C) An oxidation reaction takes place at the cathode.
 D) A reduction reaction takes place at the anode.
20. If fused silver chloride is electrolyzed, the Ag^+ ions are
- A) reduced at the negative electrode
 B) reduced at the positive electrode
 C) oxidized at the negative electrode
 D) oxidized at the positive electrode
21. Which net reaction occurs by the process of electrolysis?
- A) $2 \text{H}_2\text{O}(\ell) \rightarrow 2 \text{H}_2(\text{g}) + \text{O}_2(\text{g})$
 B) $2 \text{HgO}(\text{s}) \rightarrow 2 \text{Hg}(\ell) + \text{O}_2(\text{g})$
 C) $2 \text{KClO}_3(\ell) \rightarrow 2 \text{KCl}(\text{s}) + 3 \text{O}_2(\text{g})$
 D) $\text{MgCO}_3(\text{s}) \rightarrow \text{MgO}(\text{s}) + \text{CO}_2(\text{s})$
22. Which metal can be produced only by the electrolysis of its fused salt?
- A) Ag B) Zn C) Pb D) K

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23. Metals from which groups are obtained by the reduction of their fused salts?
- A) Group 1 and Group 2
 - B) Group 1 and Group 12
 - C) Group 2 and Group 11
 - D) Group 11 and Group 12
24. Which element is obtained only by the electrolysis of its fused salt?
- A) lithium
 - B) gold
 - C) silver
 - D) zinc
25. Which occurs at the cathode during the electrolysis of fused KCl?
- A) the oxidation of K^+ ion
 - B) the reduction of K^+ ion
 - C) the oxidation of Cl^- ion
 - D) the reduction of Cl^- ion
26. In the electrolysis of molten $CaCl_2$, the particle reduced is
- A) Cl^-
 - B) Cl^0
 - C) Ca^0
 - D) Ca^{2+}
27. Which half-reaction occurs at the cathode in an electrolytic cell in which an object is being plated with copper?
- A) $Cu(s) \rightarrow Cu^{2+} + 2e^-$
 - B) $Cu(s) + 2e^- \rightarrow Cu^{2+}$
 - C) $Cu^{2+} \rightarrow Cu(s) + 2e^-$
 - D) $Cu^{2+} + 2e^- \rightarrow Cu(s)$
28. The metals in Group 1 (IA) are obtained commercially from their fused salts by
- A) electrolysis with electricity
 - B) decomposing with heat
 - C) reduction with carbon
 - D) reduction with aluminum
29. Which equation represents the half-cell reaction that occurs at the negative electrode during the electrolysis of fused calcium chloride?
- A) $Ca^{2+} \rightarrow Ca(s) + 2e^-$
 - B) $Ca^{2+} + 2e^- \rightarrow Ca(s)$
 - C) $2 Cl^- + 2e^- \rightarrow Cl_2(g)$
 - D) $2 Cl^- \rightarrow Cl_2(g) + 2e^-$
30. Which metals are produced commercially only by electrolysis of their fused salts?
- A) Sr and Cr
 - B) Be and Fe
 - C) Li and Ni
 - D) Na and Ca
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