Standardized Test Prep

Answer the following items on a separate piece of paper.

MULTIPLE CHOICE

1. The electrode at which reduction occurs is
- **A.** always the anode.
- **B.** always the cathode.
- **C.** either the anode or the cathode.
- **D.** always the half-cell.

2. Refer to the table of standard reduction potentials below. A voltaic cell contains a strip of zinc metal in a solution containing zinc ions in one half-cell. The second is a strip of tin metal in a solution containing tin ions. When this cell operates,
- **A.** Sn is oxidized and Zn^{2+} is reduced.
- **B.** Sn is reduced and Zn^{2+} is oxidized.
- **C.** Sn^{2+} is oxidized and Zn is reduced.
- **D.** Sn^{2+} is reduced and Zn is oxidized.

3. When a rechargeable cell is being recharged, the cell acts as a(n)
- **A.** fuel cell.
- **B.** electrolytic cell.
- **C.** voltaic cell.
- **D.** Leclanche cell.

4. Refer to the table of standard reduction potentials below. The standard potential of the cell $Sn\,|\,Sn^{2+}\,||\,Cr^{3+}\,|\,Cr$ is –0.60 V. What is the standard reduction potential of the Cr^{3+}/Cr electrode?
- **A.** +0.88 V
- **B.** +0.74 V
- **C.** –0.88 V
- **D.** –0.74 V

Half-cell reaction	Standard reduction potential, E^0 (in volts)
$Au^{3+} + 3e^- \rightleftarrows Au$	+1.50
$Cu^{2+} + 2e^- \rightleftarrows Cu$	+0.34
$Fe^{2+} + 2e^- \rightleftarrows Fe$	–0.41
$Sn^{2+} + 2e^- \rightleftarrows Sn$	–0.14
$Zn^{2+} + 2e^- \rightleftarrows Zn$	–0.76
$Mg^{2+} + 2e^- \rightleftarrows Mg$	–2.37

5. Refer to the table of reduction potentials below. Which metal, Zn or Au, can reduce Sn^{2+} ions to Sn metal when placed in an aqueous solution of Sn^{2+} ions?
- **A.** Zn
- **B.** Au
- **C.** Both Zn and Au can reduce Sn^{2+} ions
- **D.** Neither Zn or Au can reduce Sn^{2+} ions

6. When silver is electroplated onto another metal, Ag^+ is
- **A.** oxidized at the anode.
- **B.** reduced at the anode.
- **C.** oxidized at the cathode.
- **D.** reduced at the cathode.

7. Which metal would best provide cathodic protection from corrosion for an iron bridge?
- **A.** Au
- **B.** Sn
- **C.** Cu
- **D.** Mg

SHORT ANSWER

8. In the production of aluminum by the Hall-Héroult process, is the aluminum metal produced at the cathode or the anode?

9. The reduction potential for nitric acid is 0.96 V (reduction half-reaction is $NO_3^- + 4H^+ + 3e^- \longrightarrow NO + 2H_2O$). If gold (Au) is placed in a beaker of 1 M nitric acid, will the gold dissolve?

EXTENDED RESPONSE

10. Given a voltaic cell consisting of a gold electrode in a gold nitrate solution in one half-cell and a zinc electrode in a zinc nitrate solution in the other half-cell, what occurs once the wire is connected to both electrodes?

11. If pure water is placed in a beaker with wires connected to a cathode and anode and electrical voltage is applied, will electrolysis of water occur? Explain your answer.

Test TIP Remember that if you can eliminate two of the four answer choices, your chances of choosing the correct answer choice will double.