

C 1. Which ionic equation represents a spontaneous reaction that can occur in a voltaic cell? *use Table J*

- A)  $Cu(s) + Zn(s) \rightarrow Cu^{2+}(aq) + Zn^{2+}(aq)$  *Zn is higher which means*
- B)  $Cu(s) + Zn^{2+}(aq) \rightarrow Cu^{2+}(aq) + Zn(s)$  *it is the anode*
- C)  $Cu^{2+}(aq) + Zn(s) \rightarrow Cu(s) + Zn^{2+}(aq)$  *so it is spontaneous*
- D)  $Cu^{2+}(aq) + Zn^{2+}(aq) \rightarrow Cu(s) + Zn(s)$  *the # increases Cu is lower which means cathode - reduced - # decreases*

A 2. Which energy conversion occurs in an operating voltaic cell? → Spontaneous

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

B 3. In an operating voltaic cell, reduction occurs

- A) at the anode
- B) at the cathode *RED*
- C) in the salt bridge
- D) in the wire *CAT ALWAYS!*

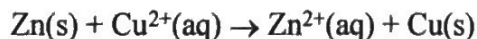
A 4. Which statement is true for any electrochemical cell?

- A) Oxidation occurs at the anode, only. *AN OX*
- B) Reduction occurs at the anode, only.
- C) Oxidation occurs at both the anode and the cathode. *NOT POSSIBLE*
- D) Reduction occurs at both the anode and the cathode.

C 5. When a voltaic cell operates, ions move through the

- A) anode
- B) cathode *definition*
- C) salt bridge *of salt bridge*
- D) external circuit

C 6. Given the balanced ionic equation representing the reaction in an operating voltaic cell:



*(same explanation as #1)*

The flow of electrons through the external circuit in this cell is from the

- A) Cu anode to the Zn cathode *Zn is higher on Table J which*
- B) Cu cathode to the Zn anode
- C) Zn anode to the Cu cathode *means it is the anode (oxidation occurs) & # increases*
- D) Zn cathode to the Cu anode

*Cu is lower so it is the cathode*

*where reduction takes place (# ↓)*

*electrons always flow anode → cathode*

LEO GER AN OX RED CAT

*more questions on back.*

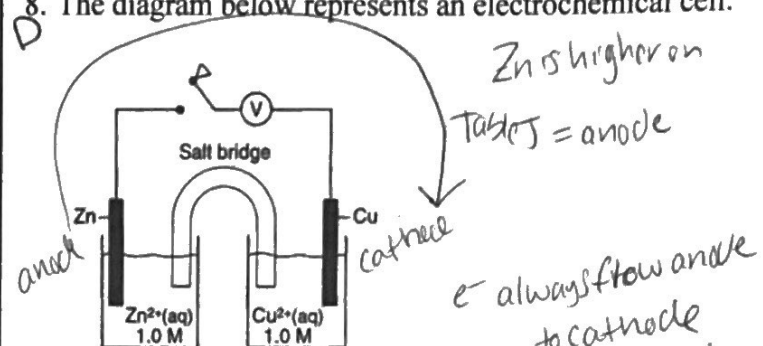
7. Given the balanced equation representing the reaction occurring in a voltaic cell:



In the completed external circuit, the electrons flow from *Zn is higher on Table J so it is the anode*

- A) Pb(s) to Zn(s) *electrons flow anode → cathode*
- B)  $Pb^{2+}(aq)$  to  $Zn^{2+}(aq)$  *they go from ore solid*
- C) Zn(s) to Pb(s) *to the other - think about the diagram.*
- D)  $Zn^{2+}(aq)$  to  $Pb^{2+}(aq)$

D 8. 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.

A 9. Which device requires electrical energy to produce a chemical change? → non-spontaneous - definition of electrolytic cell

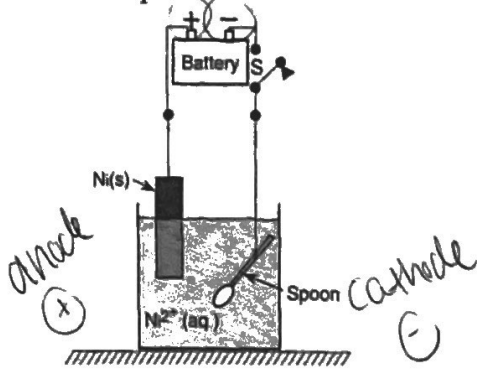
- A) electrolytic cell
- B) salt bridge
- C) voltaic cell
- D) voltmeter

C 10. 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. *function of electrolytic cell*
- D) It is non-spontaneous and produces an electric current.

*it is non-spontaneous because it requires the electrical current.*

D 11. 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.

*the thing getting plated (random object) acts as the cathode which has the mass increase*

A 12. 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

*definition of electrolytic cells  
it's non-spontaneous because it needs that outside electrical energy before it can do chemistry stuff.*