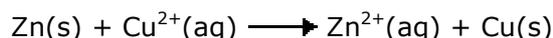


Exercise 8.42 – Electrochemical cells

Q842-01 A voltaic cell is made from magnesium and iron half cells. Magnesium is a more reactive metal than iron. Which statement is correct when the cell produces electricity?

- A. Electrons are lost from magnesium atoms
- B. The concentration of the Fe^{2+} ions increases
- C. Electrons flow from the iron half-cell to the magnesium half-cell
- D. Negative ions flow through the salt bridge from the magnesium half-cell to the iron half-cell

Q842-02 A voltaic cell made from copper and zinc half cells has the equation shown below:



Which statement is correct when the cell produces electricity?

- A. Electrons are lost from zinc atoms
- B. The mass of the copper electrode decreases
- C. Electrons flow from the copper half-cell to the zinc half-cell
- D. Negative ions flow through the salt bridge from the zinc half-cell to the copper half-cell

Q842-03 What occurs during the operation of a voltaic cell based on the following reaction?



External circuit

- A. Electrons move from Ni to Pb
- B. Electrons move from Ni to Pb
- C. Electrons move from Pb to Ni
- D. Electrons move from Pb to Ni

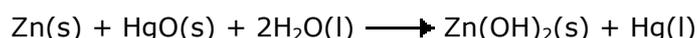
Ion movement in solution

- $\text{Pb}^{2+}(\text{aq})$ moves away from Pb(s)
- $\text{Pb}^{2+}(\text{aq})$ moves towards Pb(s)
- $\text{Ni}^{2+}(\text{aq})$ moves away from Ni(s)
- $\text{Ni}^{2+}(\text{aq})$ moves towards Ni(s)

Q842-04 In a voltaic cell, oxidation occurs at which of the following?

- A. anode
- B. cathode
- C. salt bridge
- D. electrode at which electrons enter from the outside

Q842-05 Mercury batteries, like those used in electric watches, provide a voltage of 1.35 V. If the overall oxidation-reduction equation taking place is:



the anode reaction must be which of the following?

- A. $\text{HgO(s)} + 2\text{H}_2\text{O(l)} + 2\text{e} \longrightarrow \text{Hg(l)} + 2\text{OH}^-(\text{aq})$
- B. $\text{Zn(s)} + 2\text{OH}^-(\text{aq}) \longrightarrow \text{Zn(OH)}_2(\text{s}) + 2\text{e}$
- C. $\text{Hg(l)} + 2\text{OH}^-(\text{aq}) \longrightarrow \text{HgO(s)} + 2\text{H}_2\text{O(l)} + 2\text{e}$
- D. $\text{Zn(OH)}_2(\text{s}) + 2\text{e} \longrightarrow \text{Zn(s)} + 2\text{OH}^-(\text{aq})$

Exercise 8.42 – Electrochemical cells

Q842-06 A battery consists of which type of cells?

- A. electrolytic
 - B. electrochemical
 - C. electroplating
 - D. electromagnetic
-

Q842-07 Given the lead-acid battery reaction:



Which species is oxidized during battery discharge?

- A. Pb
 - B. PbO₂
 - C. SO₄²⁻
 - D. H₂O
-

Q842-08 Given the reaction for the nickel-cadmium battery:



Which of the following species is oxidised during the discharge of the battery?

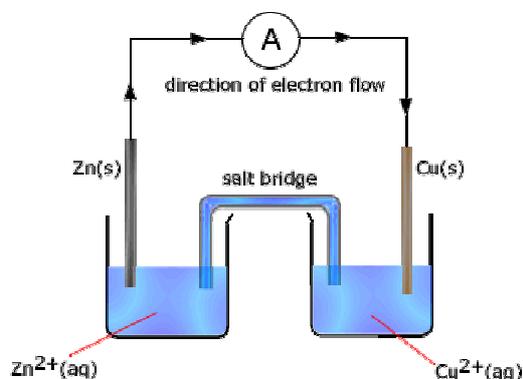
- A. Ni³⁺
 - B. Ni²⁺
 - C. Cd
 - D. Cd²⁺
-

Q842-09 Which statement best describes how a salt bridge maintains electrical neutrality in the half cells of an electrochemical cell?

- A. It prevents the migration of electrons.
 - B. It permits the migration of ions.
 - C. It permits the two solutions to mix completely.
 - D. It prevents the reaction from occurring spontaneously.
-

Exercise 8.42 – Electrochemical cells

Q842-10 The apparatus shown below may be used to carry out a redox reaction.



- State the function of the salt bridge. [1]
- Write the half equation for the oxidation reaction. [1]

The above reactions are carried out under standard conditions.

- State what the standard conditions are for the cell. [2]
- Using the following data, calculate the cell potential. [2]

$$E^{\circ} \text{ of } \text{Zn}^{2+}(\text{aq})|\text{Zn}(\text{s}) = -0.76 \text{ V}$$
$$E^{\circ} \text{ of } \text{Cu}^{2+}(\text{aq})|\text{Cu}(\text{s}) = +0.34 \text{ V}$$

- State and explain what happens to the concentration of copper (II) ions when the cell is producing an electrical current. [2]
 - State two observations that could be made if the zinc rod were to be placed in the solution of copper (II) ions. [2]
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