



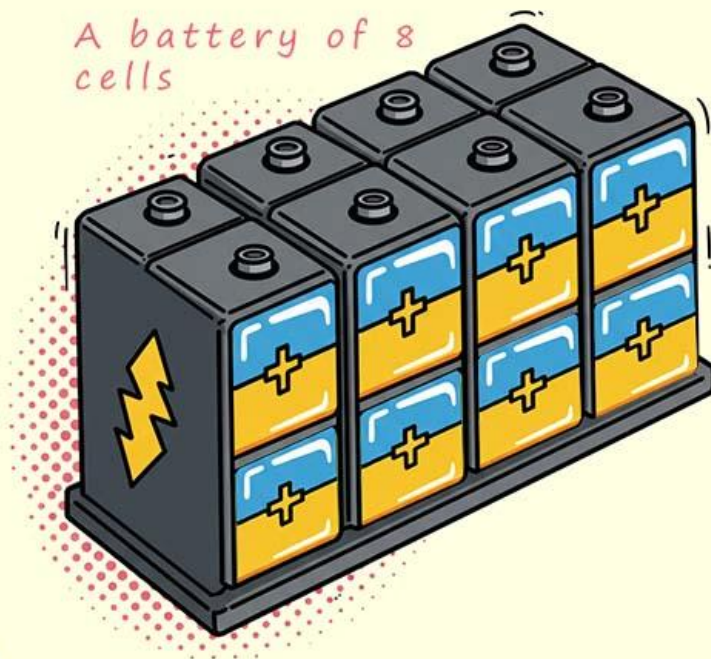
## CELLS AND BATTERIES

Answer all the questions below then check your answers

1. What is the correct definition of a battery?

- a) A single electrochemical cell.
- b) A group of electrochemical cells connected together.
- c) Any device that produces electricity.
- d) A solution that conducts electricity.

A battery of 8 cells



2. In an electrochemical cell, which metal undergoes oxidation?

- a) The least reactive metal.
- b) The most reactive metal.
- c) The metal in the salt bridge.
- D) The metal in the electrolyte.

3. What is the function of a salt bridge in an electrochemical cell?

- a) To provide electrons to the circuit.
- b) To prevent the metals from reacting with the electrolyte.
- c) To complete the circuit and maintain charge balance.
- d) To increase the voltage of the cell.

4. Which of the following solutions is a good choice for an electrolyte in an electrochemical cell?

- a) Copper sulfate solution.
- b) Sodium nitrate solution.
- c) Hydrochloric acid.
- d) Any solution that reacts with metal.

5. Explain why biting a metal sweet wrapper against a metal filling can cause a sharp pain.

6. Describe the difference between an electrochemical cell and a battery.

7. Write the half-equation for the oxidation of zinc (Zn) to zinc ions



8. What factors affect the voltage produced by a electrochemical cell?

9. A student sets up an electrochemical cell using magnesium (Mg) and silver (Ag) electrodes in a sodium nitrate ( $\text{NaNO}_3$ ) electrolyte.

a) Identify the anode and the cathode in this cell.

b) Explain the direction of electron flow in the external circuit.

c) Explain why sodium nitrate is a suitable electrolyte for this cell.

Which of the questions below are true and which are false?

10. In an electrochemical cell, the anode is positively charged.

Answer: False

a. A 12V car battery contains 6 cells each producing 2V.

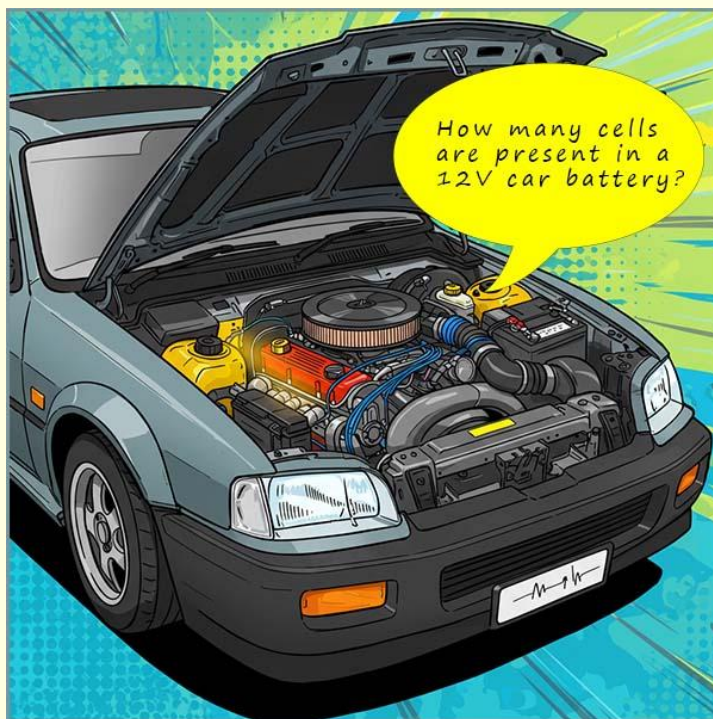
Answer: True

b. Electrolytes do not conduct electricity.

Answer: False

c. A single AA battery is actually a cell.

Answer: True



12. A student sets up an electrochemical cell using zinc and copper in a sodium nitrate solution.

(i) Identify which metal forms the anode and explain why.

(ii) Write the half-equations for the reactions at the anode and cathode.

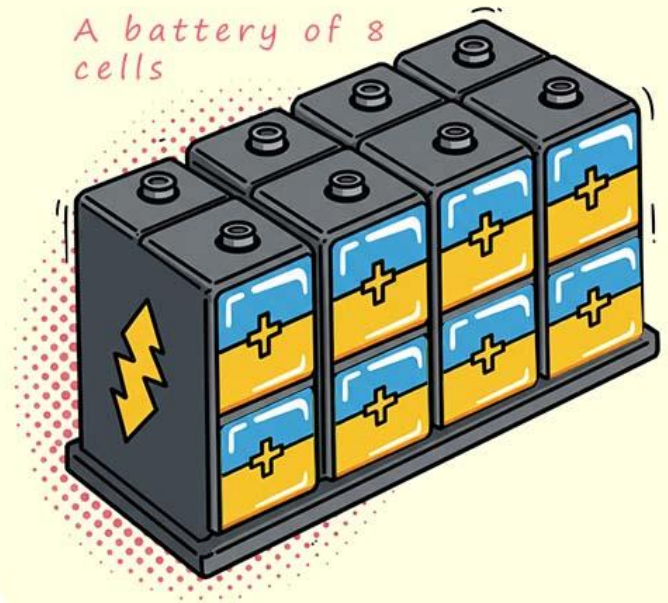
13. A student constructs a simple cell using magnesium and silver electrodes in a sodium nitrate electrolyte. Predict whether a high or low voltage will be produced and justify your answer.

## Answers

1. What is the correct definition of a battery?

- a) A single electrochemical cell.
- b) A group of electrochemical cells connected together.
- c) Any device that produces electricity.
- d) A solution that conducts electricity.

Answer: b) A group of electrochemical cells connected together.



2. In an electrochemical cell, which metal undergoes oxidation?

- a) The least reactive metal.
- b) The most reactive metal.
- c) The metal in the salt bridge.
- D) The metal in the electrolyte.

Answer: b) The most reactive metal.

3. What is the function of a salt bridge in an electrochemical cell?

- a) To provide electrons to the circuit.
- b) To prevent the metals from reacting with the electrolyte.
- c) To complete the circuit and maintain charge balance.
- d) To increase the voltage of the cell.

Answer: c) To complete the circuit and maintain charge balance.

4. Which of the following solutions is a good choice for an electrolyte in an electrochemical cell?

a) Copper sulfate solution.

b) Sodium nitrate solution.

c) Hydrochloric acid.

d) Any solution that reacts with metal.

Answer: b) Sodium nitrate solution. It is unlikely to interfere with any of the cell reactions.

5. Explain why biting a metal sweet wrapper against a metal filling can cause a sharp pain.

Answer: The metal wrapper and the metal filling act as two different metals, and the saliva acts as an electrolyte. This creates an electrochemical cell, producing a small current that stimulates the nerve in the tooth.

6. Describe the difference between an electrochemical cell and a battery.



Answer: An electrochemical cell is a single unit that produces electricity through a chemical reaction between two different metals and an electrolyte. A battery is a collection of two or more cells connected together.

7. Write the half-equation for the oxidation of zinc (Zn) to zinc ions



8. What factors affect the voltage produced by an electrochemical cell?

Answer: The distance between the metals on the reactivity series, and the type and concentration of the electrolyte.

9. A student sets up an electrochemical cell using magnesium (Mg) and silver (Ag) electrodes in a sodium nitrate ( $\text{NaNO}_3$ ) electrolyte.

a) Identify the anode and the cathode in this cell.

b) Explain the direction of electron flow in the external circuit.

c) Explain why sodium nitrate is a suitable electrolyte for this cell.

Answer:

a) Anode: Magnesium (Mg), Cathode: Silver (Ag)

b) Electrons flow from the magnesium (anode) to the silver (cathode) through the external circuit.

c) Sodium nitrate is a suitable electrolyte because it is an inert electrolyte, meaning it will not react with either the magnesium or silver electrodes, preventing unwanted side reactions. It also dissolves to produce ions, that are able to move and carry charge.

Which of the questions below are true and which are false?

10. In an electrochemical cell, the anode is positively charged.

Answer: False

a. A 12V car battery contains 6 cells each producing 2V.

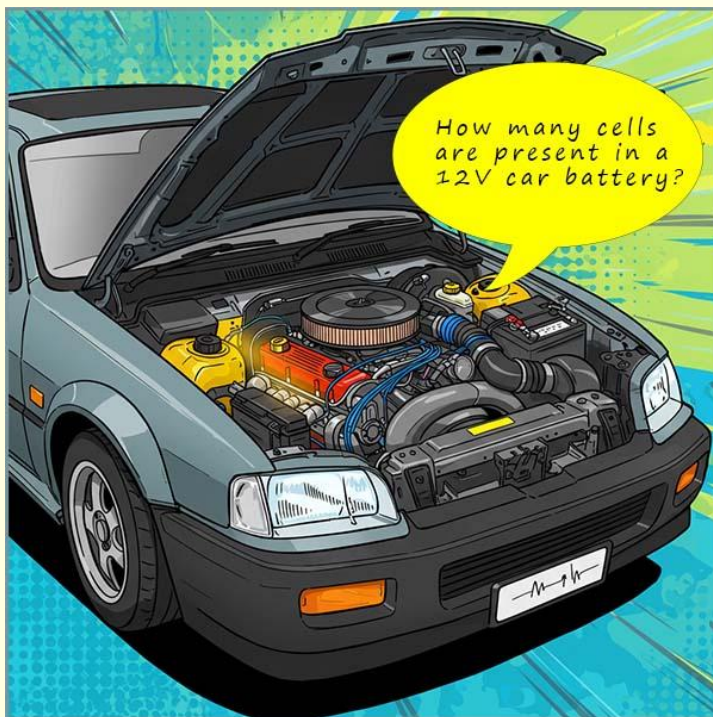
Answer: True

b. Electrolytes do not conduct electricity.

Answer: False

c. A single AA battery is actually a cell.

Answer: True



12. A student sets up an electrochemical cell using zinc and copper in a sodium nitrate solution.

(i) Identify which metal forms the anode and explain why.

Answer: Zinc forms the anode because it is more reactive than copper. This means zinc will lose electrons (oxidation) and become  $Zn^{2+}$  ions.

(ii) Write the half-equations for the reactions at the anode and cathode.

Answer:

At the anode:  $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^{-}$

At the cathode:  $Cu^{2+}(aq) + 2e^{-} \rightarrow Cu(s)$

13. A student constructs a simple cell using magnesium and silver electrodes in a sodium nitrate electrolyte. Predict whether a high or low voltage will be produced and justify your answer.

Answer: A high voltage will be produced because magnesium and silver are far apart in the reactivity series, creating a large potential difference.