

12 Aqueous copper(II) sulfate is electrolysed using copper electrodes.

Which statement is correct?

- A** Oxygen gas is produced at the positive electrode.
- B** The blue colour of the solution gradually fades.
- C** The concentration of copper ions in the solution stays the same.
- D** The mass of the negative electrode decreases.

13 Which row describes the reactions during the electrolysis of dilute aqueous sodium chloride?

	anode reaction	cathode reaction
A	$\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-$	$2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^- \rightarrow 4\text{OH}^-$
B	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$	$4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$
C	$2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^- \rightarrow 4\text{OH}^-$	$\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}^-$
D	$4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$	$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$

12 Hydrogen–oxygen fuel cells are used in electric cars.

Three statements about these fuel cells are listed.

- 1 The process in the cell is called electrolysis.
- 2 Water is broken down in the cell to produce hydrogen, oxygen and electricity.
- 3 Water is the only chemical product formed in the reaction.

Which statements are correct?

- A** 1 and 2 **B** 1 and 3 **C** 2 only **D** 3 only

13 A solution of copper(II) sulfate can be electrolysed using copper electrodes or carbon electrodes.

Which statements are correct?

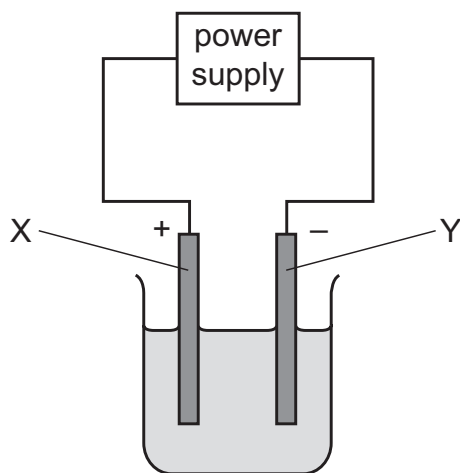
- 1 Using copper electrodes, oxygen gas forms at the anode.
- 2 Using copper electrodes, copper atoms lose electrons at the anode.
- 3 Using carbon electrodes, copper metal forms at the cathode.
- 4 Using carbon electrodes, copper ions gain electrons at the cathode.

- A** 1 and 2 **B** 1 and 3 **C** 2, 3 and 4 **D** 4 only

- 13** Which product is initially obtained at each electrode during the electrolysis of concentrated aqueous sodium chloride?

	cathode	anode
A	hydrogen	chlorine
B	hydrogen	oxygen
C	sodium	chlorine
D	sodium	oxygen

- 14** Molten lead(II) bromide is electrolysed using inert electrodes.



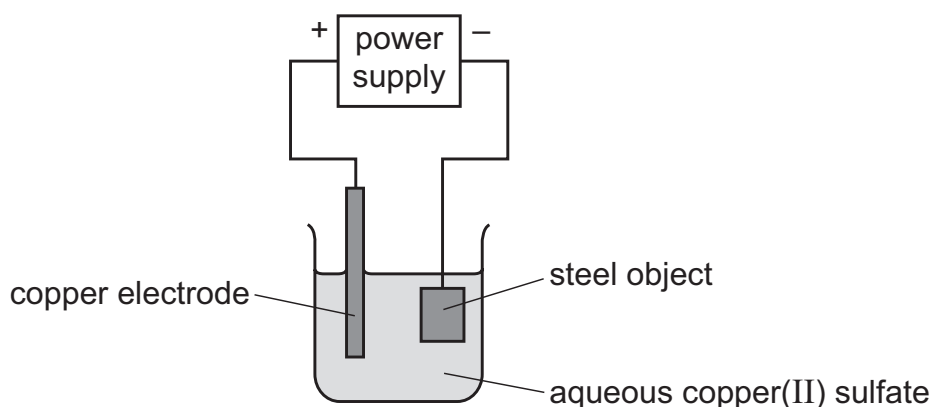
Which statement describes the movement of electrons?

- A** from X to Y through the external wire
 - B** from Y to X through the external wire
 - C** from X to Y through the electrolyte
 - D** from Y to X through the electrolyte
- 15** In a fuel cell, a fuel is oxidised to produce electricity.

Which row describes the fuel and the oxidising agent used?

	fuel	oxidising agent
A	nitrogen	oxygen
B	hydrogen	oxygen
C	nitrogen	water
D	hydrogen	water

10 The diagram shows the electroplating of a steel object.



A student makes three statements.

- 1 The steel object turns a reddish-brown colour.
- 2 The aqueous copper(II) sulfate changes to a paler blue colour.
- 3 The copper electrode becomes thinner.

Which statements are correct?

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

11 Concentrated aqueous sodium chloride is electrolysed using inert electrodes.

Which equation shows the correct ionic half-equation for the reaction at the anode?

- A** $Cl^- + e^- \rightarrow Cl$
- B** $2Cl^- \rightarrow Cl_2 + 2e^-$
- C** $H^+ \rightarrow H + e^-$
- D** $2H^+ + 2e^- \rightarrow H_2$

12 Which equation represents the overall reaction in a hydrogen–oxygen fuel cell?

- A** $2H_2 + O_2 \rightarrow 2H_2O$
- B** $2H_2O \rightarrow 2H_2 + O_2$
- C** $H_2 + O_2 \rightarrow H_2O_2$
- D** $H_2O_2 \rightarrow H_2 + O_2$