Past-paper walk-through

Hydrogen–oxygen fuel cells ▪ 4.2

eXercise

Questions in this set

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Question 12

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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

Solution 12

Answer: **D**

Why

- A fuel cell is the *opposite* of electrolysis: it produces electricity from a reaction rather than driving one.
- Water is the product, not the reactant, so it is not being broken down.
- Hydrogen is oxidised and oxygen reduced, and water is the only product.

Question 15

0620/23 N25 ▪ Q15 ▪ 1 mark

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

Question 15

D	hydrogen	water

Solution 15

Answer: **B**

Why

- In a fuel cell the fuel is the substance oxidised, so it must be the hydrogen.
- The oxidising agent is what gains the electrons – the oxygen.
- Nitrogen is unreactive and water is the product, not a reagent.

Question 12

0620/21 J25 ▪ Q12 ▪ 1 mark

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 $H_2O_2 \rightarrow H_2 + O_2$

Solution 12

Answer: **A**

Why

- A hydrogen–oxygen fuel cell combines hydrogen and oxygen electrochemically.
- The only product is water: $2H_2 + O_2 \rightarrow 2H_2O$.
- The reverse equation is electrolysis, and hydrogen peroxide is never formed.

Question 12

0620/22 J25 ▪ Q12 ▪ 1 mark

12 Hydrogen–oxygen fuel cells can be used to power vehicles.

Which statement about hydrogen–oxygen fuel cells is correct?

A The equation for the overall reaction is $H_2 + O_2 \rightarrow H_2O_2$.

B The only chemical products are water and carbon dioxide.

C Chemical energy in the fuel is converted into electrical energy.

D The hydrogen used in hydrogen–oxygen fuel cells is a fossil fuel.

Solution 12

Answer: **C**

Why

- The overall reaction is $2H_2 + O_2 \rightarrow 2H_2O$, so hydrogen peroxide is never formed.
- Water is the only chemical product – there is no carbon anywhere, so no carbon dioxide.
- The cell converts chemical energy directly into electrical energy, without combustion.

Question 15

0620/22 M25 ▪ Q15 ▪ 1 mark

15 Which statements about hydrogen–oxygen fuel cells are correct?

1 They convert chemical energy into electrical energy.

2 Hydrogen is reduced in the fuel cells.

3 They do **not** produce any atmospheric pollutants.

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

Solution 15

Answer: **C**

Why

- A fuel cell converts chemical energy straight into electrical energy – statement 1 is right.
- Hydrogen *loses* electrons, so it is oxidised, not reduced – statement 2 is wrong.
- The only product is water, so there are no atmospheric pollutants – statement 3 is right.