

Paper 1

Questions are applicable for both core and extended candidates

1 Which row about a hydrogen–oxygen fuel cell is correct?

	energy transfer	equation for the reaction
A	chemical to electrical	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
B	chemical to electrical	$2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
C	electrical to chemical	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
D	electrical to chemical	$2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$

2 Which gases are used to generate electricity in a fuel cell?

- A** carbon dioxide and oxygen
- B** hydrogen and methane
- C** hydrogen and oxygen
- D** methane and carbon dioxide

3 Which statement about hydrogen fuel cells is correct?

- A** Hydrogen fuel cells do not produce carbon dioxide.
- B** Hydrogen fuel cells do not need oxygen.
- C** The waste from a hydrogen fuel cell is an acidic gas.
- D** The reaction in a fuel cell is endothermic.

4 Which statement about a hydrogen-oxygen fuel cell in a car is correct?

- A** The fuel cell produces heat, which powers the car.
- B** The fuel cell is supplied with hydrogen directly from the air.
- C** The only emission from the fuel cell is nitrogen gas, which is non-polluting.
- D** The fuel cell produces electricity, which powers an electric motor.

- 5 Which row shows the waste products released from the exhaust of a vehicle powered using a hydrogen–oxygen fuel cell?

	carbon dioxide	oxides of nitrogen	water
A	✓	✓	✓
B	x	✓	✓
C	✓	x	x
D	x	x	✓

Paper 2

**Questions are applicable for both core and extended candidates
unless indicated in the question**

6 Which statement about hydrogen–oxygen fuel cells is correct?

- A** Hydrogen is extracted from clean, dry air.
- B** The only product is carbon dioxide.
- C** The reaction is endothermic.
- D** No toxic gases are produced.

7 Which statements about hydrogen and oxygen are correct?

	hydrogen and oxygen can react to produce electrical energy	hydrogen and oxygen can be made by the electrolysis of dilute aqueous sodium chloride
A	<i>x</i>	<i>x</i>
B	<i>x</i>	✓
C	✓	<i>x</i>
D	✓	✓

8 Which statements about hydrogen fuel cells are correct?

- 1 Water is formed as the only waste product.
- 2 Both water and carbon dioxide are formed as waste products.
- 3 The overall reaction is $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$.
- 4 The overall reaction is endothermic.

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

9 Which row shows the waste products released from the exhaust of a vehicle powered using a hydrogen–oxygen fuel cell?

	carbon dioxide	oxides of nitrogen	water
A	✓	✓	✓
B	x	✓	✓
C	✓	x	x
D	x	x	✓

10 Which statement about fuels is correct?

- A** Heat energy is only produced by burning fuels.
- B** Hydrogen is used as a fuel although it is difficult to store.
- C** Methane is a good fuel because it produces only water when burned.
- D** Uranium is burned in air to produce energy.