

6.11 Hydrogen Fuel Cell

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS hydrogen fuel cell 氢燃料电池 • fossil fuels 化石燃料 • methane 甲烷
• solar 太阳能 • wind 风能

Objective

Build the skills to answer exam questions on the **hydrogen fuel cell**.

You must be able to:

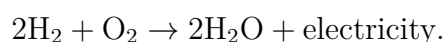
- describe a **hydrogen fuel cell** 氢燃料电池 (hydrogen + oxygen → water + electricity)
- state that the only emission is **water**
- explain why hydrogen is only as clean as its source

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ How it works

A **hydrogen fuel cell** combines **hydrogen and oxygen** to produce **electricity**, with **water** as the only by-product:



■ Advantages

- The only emission at use is **water** — no CO₂ or pollution.
- High efficiency; quiet; useful for vehicles.

■ The catch: making the hydrogen

Hydrogen must be **produced**. If it comes from **fossil fuels**, the overall process still emits CO₂. If made using **renewable** electricity (splitting water), it is truly clean.

■ A worked judgement

A fuel-cell car emits only water, but it is only “green” if the hydrogen was made with clean energy — otherwise the emissions are just moved to the production step.

2 Practice

Now apply the methods above.

2.1 What are the inputs to a hydrogen fuel cell? [1]

2.2 What is the only by-product at the point of use? [1]

2.3 Why might hydrogen not be fully clean? [1]

3 Exam-style questions

3.1 The only emission from a hydrogen fuel cell during use is [1]

A	B
C	D

A carbon dioxide

B water

C methane

D nitrogen oxides

3.2 A car company markets hydrogen fuel-cell cars as “zero emission”.

(a) Explain why this is true at the point of use. [1]

(b) Explain why the full process may still cause emissions. [2]

3.3 Explain how hydrogen could be produced with no net carbon emissions. [2]