



### Energy and the environment: Hydrogen-powered cars

Not all combustion reactions produce carbon dioxide. For example, when hydrogen gas is burned in oxygen, water is the only product:



Perhaps in the future, some of our cars will run by this reaction. In fact, automobile manufacturers are developing hydrogen-powered cars right now using a technology called “fuel cells.”

- How would hydrogen-powered cars impact global warming?
- Do some Internet research to find out about fuel cells and hydrogen-powered cars.

### Try this...

You get energy from a combustion reaction known as respiration. In this reaction, you “burn” glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) in oxygen to produce carbon dioxide and water. Can you write the balanced equation for this reaction?

### Use your head...

Have you ever noticed water dripping from the tailpipe of a car? Could combustion be responsible for some of that water?

## Summary of the types of reactions

**Table 21.1: Summary of the types of reactions**

Type	General equation	Example
addition	$A + B \rightarrow AB$	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
decomposition	$AB \rightarrow A + B$	$2\text{NaHCO}_3 \rightarrow \text{CO}_2 + \text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$
single-displacement	$AX + B \rightarrow BX + A$	$\text{Fe} + \text{CuCl}_2 \rightarrow \text{FeCl}_2 + \text{Cu}$
double-displacement	$AB + CD \rightarrow AD + CB$	$\text{Pb}(\text{NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + 2\text{KNO}_3$
combustion	$\text{carbon cpd} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$	$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$