

Note: This resource can be downloaded as part of a set of activities exploring how hydrogen fuel cells work (<https://rsc.li/3mQd4a>) or for use with a lesson plan for 16–18 year olds investigating alternative fuels and low-carbon technology (<https://rsc.li/3cdRHLJ>).

Name: Date:

How much energy comes from making water?

Petrol supplies will run out within the next 30 years or so. This means that within your lifetime vehicles will need to change to alternative fuel sources. One source of energy is the reaction between hydrogen and oxygen. Already, cars are being designed that use hydrogen as a fuel instead of petrol.

This activity will help you to understand why and to think about hydrogen as a fuel.

Watch the demonstration then answer the questions.

Questions

1. How do you know that the reaction releases energy?
2. Where does this energy come from?
3. Why can't the water be seen?
4. Write down the equation for the reaction between gaseous hydrogen and gaseous oxygen to make water vapour.
5. Use the equation to work out how many O-H bonds are formed in the reaction.
6. Use your answer from question 5 to work out the enthalpy change of formation for water.
7. Use the equation to work out what bonds are broken in the reaction.
8. How much energy must be put in to break the bonds in question 7?
9. Use your answers to question 6 and question 8 to work out the enthalpy change for the reaction between hydrogen and oxygen to make water.
10. What would the energy be used for in a car?
11. Where would the water go?
12. Summarise the advantages and disadvantages of using hydrogen as a fuel in vehicle engines.

Bond enthalpy values (kJ mol⁻¹)

O-H = 463
O=O = 498
H-H = 432

