

0	1
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Hydrogen fuel cells have been developed for cars.



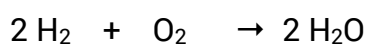
0	1	.	1
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What type of energy is released by hydrogen fuel cells?

[1 mark]

.....

The equation for the reaction of hydrogen with oxygen is:



During the reaction, energy is used to break the bonds of the reactants.

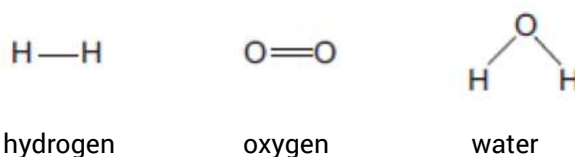
Energy is released when new bonds are made to form the product.

Bond energies for the reaction are given in the table below.

Bond	Bond energy in kJ
H—H	436
O=O	498
O—H	464

The structures of the reactants and product are shown in **Figure 3**.

Figure 3



0	1	.	2
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Calculate the energy change for the reaction:

[3 marks]



.....

Energy change = kJ

0	1
---	---

 .

3

Write the **two** half equations for the reactions that occur at the electrodes in a hydrogen fuel cell.

[2 marks]

Positive electrode:

Negative electrode:

0	1
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 .

4

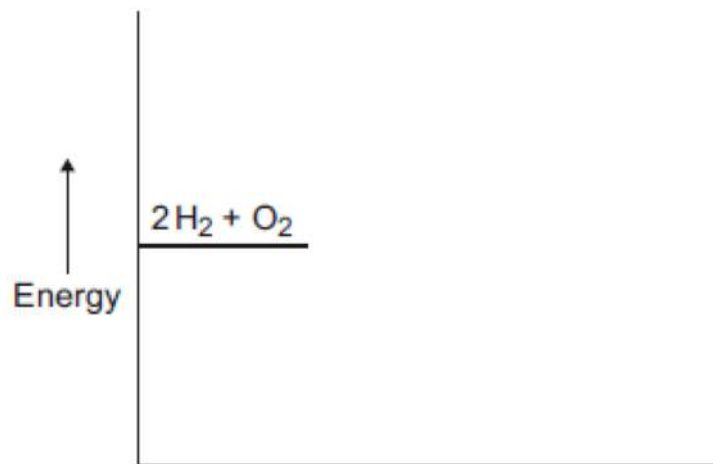
The reaction of hydrogen with oxygen is exothermic.

Complete the energy level diagram for this reaction on **Figure 4**.

Clearly label the activation energy.

[3 marks]

Figure 4



(Total 9 marks)

End