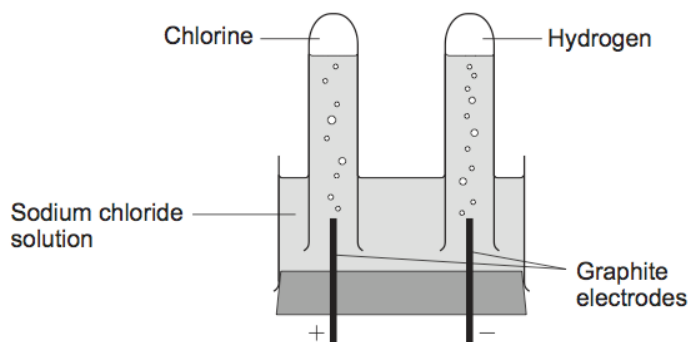


## Electrolysis of Brine and Aluminium Production

Do not write  
outside the  
box

- 1 Sodium chloride solution can be used to produce hydrogen gas and chlorine gas.  
A student did an experiment to produce hydrogen and chlorine gas.  
The diagram shows the apparatus involved.

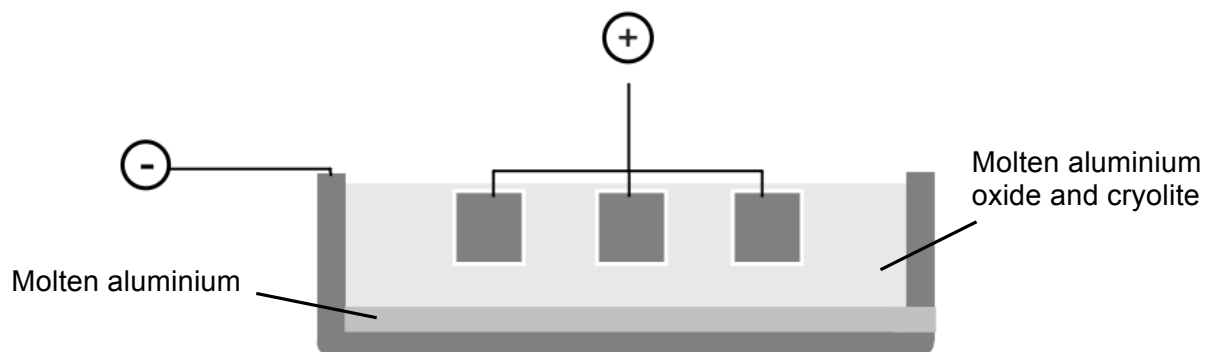


You have to be very careful with the key words for this type of question. Remember reduction is gain of electrons. At the negative electrode, positively charged ions gain electrons (reduction) and at the positive electrode, negatively charged ions lose electrons (oxidation).

- 1 (a) (i) Describe what happens at the negative electrode when a current is flowing.  
Hydrogen ions/H<sup>+</sup> attracted (to the negative electrode) [1 mark]  
Hydrogen ions gain electrons or each hydrogen ion gains an electron [1 mark]  
Reduction or hydrogen ions reduced [1 mark]  
Hydrogen atoms/molecules formed. [1 mark]  
(3 marks)
- 1 (a) (ii) Balance the equations for the reactions at the electrodes.  
 $2 \text{Cl}^- - 2 \text{e}^- \rightarrow \text{Cl}_2$  [1 mark]  
 $2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{H}_2$  [1 mark]  
(2 marks)
- 1 (a) (iii) Name the other substance that is produced by this method.  
Sodium hydroxide [1 mark]  
(1 mark)

**(Total 6 marks)**

2 The diagram shows a cell that is used to produce aluminium.



2 (a) (i) Cryolite is required in the process. Explain why.

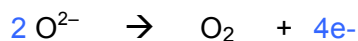
Reduce melting point of aluminium oxide [1 mark]

Reduce energy requirements [1 mark]

Make the process economical or make it cheaper to produce aluminium [1 mark]

(2 marks)

2 (a) (i) Oxygen is produced at the positive electrode. Complete and balance the equation for this reaction.



(2 marks)

2 (a) (ii) The positive electrodes in the cell are made of graphite. They have to be replaced often.

Explain why.

The graphite reacts with the oxygen [1 mark]

The graphite/positive electrodes burn away or are oxidised [1 mark]

(2 marks)

**(Total 6 marks)**