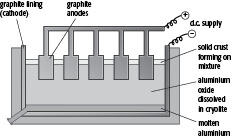
The extraction of aluminium

The diagram shows the electrolysis of alumina (aluminium oxide) purified from bauxite.



**1** a What is the formula for aluminium oxide? …………………………….. [1]

**b** What ions are present in aluminium oxide? …………………………….. [1]

**c** What is the purpose of the cryolite in the process? ……………………………..

……………………………………………………………………………………………………………………..

……………………………………………………………………………………………………………………..[2]

**2** Write down half-equations for the processes occurring during electrolysis at:

**a** the anode: ………………………………………………..…….. [1]

**b** the cathode: ………………………………………………..…….. [1]

**3** Complete the two statements.

**a** Oxidation (………………………….. of electrons) occurs at the ………………………….. .

**b** Reduction (………………………….. of electrons) occurs at the ………………………….. [2].

**4** The graphite anodes have to be replaced regularly. Why is this? (Give the equation.)

……………………………………………………………………………………………………………………..

…………………………………………………………………………………………………………………………....[1]

**5** Why is it so much more cost-effective to recycle aluminium than to extract new aluminium?

……………………………………………………………………………………………………………………..

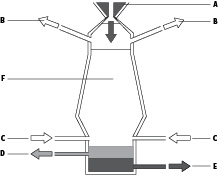
…………………………………………………………………………………………………………………………...[1]

The blast furnace

1. Complete the following labels for the diagram of the blast furnace for extracting iron. The labels fit in places   
**A–F** on the diagram.

**molten iron out   1500 °C   hot gases out   blast of hot air in**

**mixture of iron ore, coke and limestone in  molten slag out**



**A** = …………………………………………….. **B**  = ……………………………………………..

**C** = …………………………………………….. **D** = ……………………………………………..

**E**  = …………………………………………….. **F**   = ……………………………………………..

**2.** Write balanced chemical equations for these reactions which occur in the blast furnace.

**a** Carbon and oxygen react to form carbon dioxide.

……………………………………………………………………………………………………………………………………………………….……………………..[1]

**b** Carbon dioxide reacts with carbon to form carbon monoxide.

……………………………………………………………………………………………………………………………………………….……………………………..[1]

**c** Hematite (iron(iii) oxide) reacts with carbon monoxide to form iron and carbon dioxide.

……………………………………………………………………………………………………………………………………………….……………………………..[1]

**d** Limestone (calcium carbonate) decomposes to form calcium oxide and carbon dioxide.

………………………………………………………………………………………………………………………………………….…………………………………..[1]

**e** Calcium oxide reacts with impurities such as silica to form slag (calcium silicate).

……………………………………………………………………………………………………………………………………….……………………………………..[1]