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]