

C6.1.7 Extracting Iron

Previous learning:

C4.1.6 Reactivity of elements

More reactive elements can displace a less reactive element from its compound

C6.1.6 Extracting metals

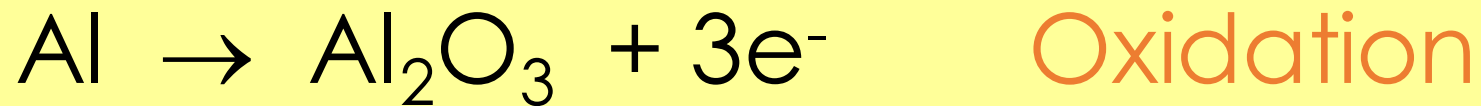
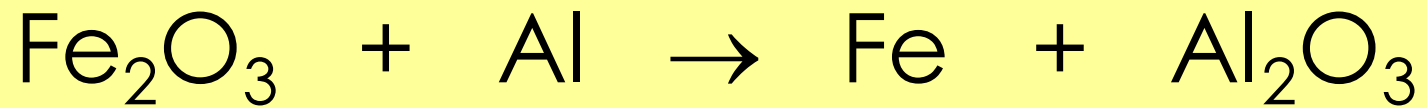
An ore is a rock or mineral that contains enough metal to make it economically worth extracting

Carbon can be used to extract a metal from its ore if the metal is less reactive than carbon

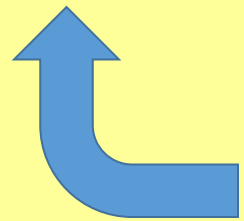
Learning Objectives

- Describe how iron is extracted from its ore
- Write balanced symbol equations to represent each stage of the blast furnace
- Identify the types of reactions involved in the blast furnace

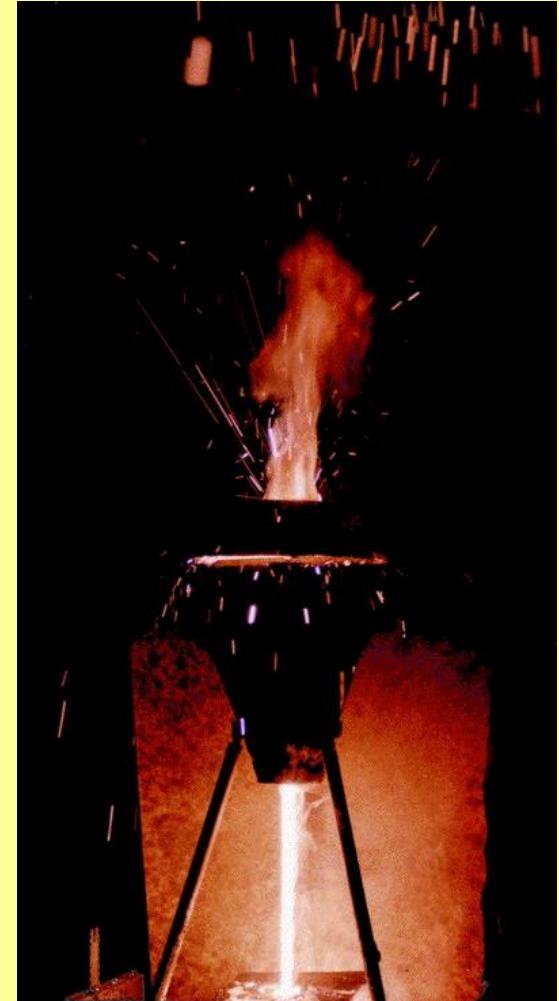
Iron can be extracted from its ore on a small scale using the thermite reaction



Al is more reactive
It displaces the iron



Ionic half-equations



Most reactive



Least reactive

K
Na
Ca
Mg
Al
C
Zn
Fe
Sn
Pb
H
Cu
Ag
Au
Pt

- A metal that is **more** reactive than carbon is extracted from its ore using electrolysis
- A metal that is **less** reactive than carbon is extracted from its ore using carbon
- Iron is **less** reactive than carbon



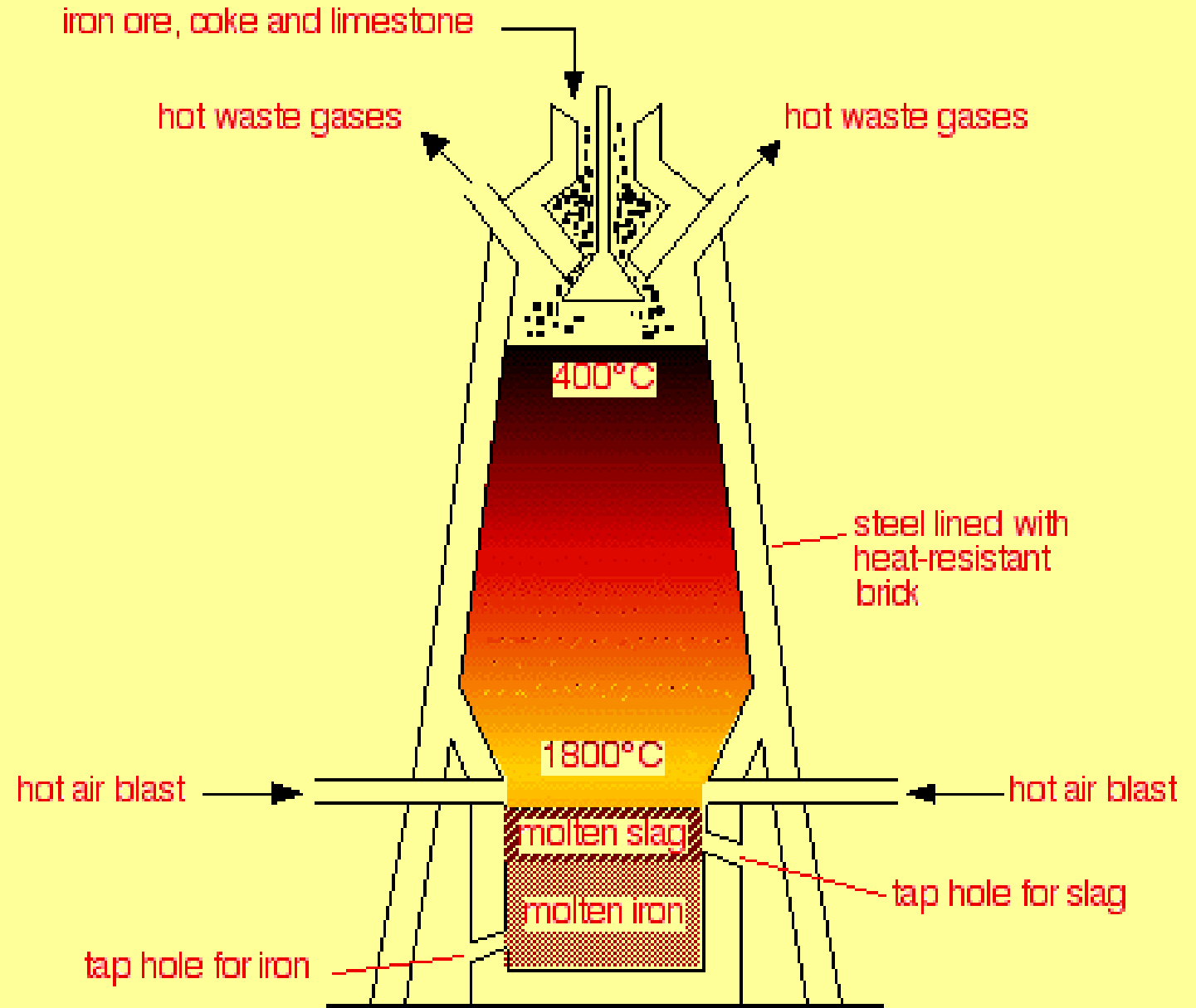
This huge container is called a blast furnace. It is used to extract iron from its ore.

Some facts about Iron...

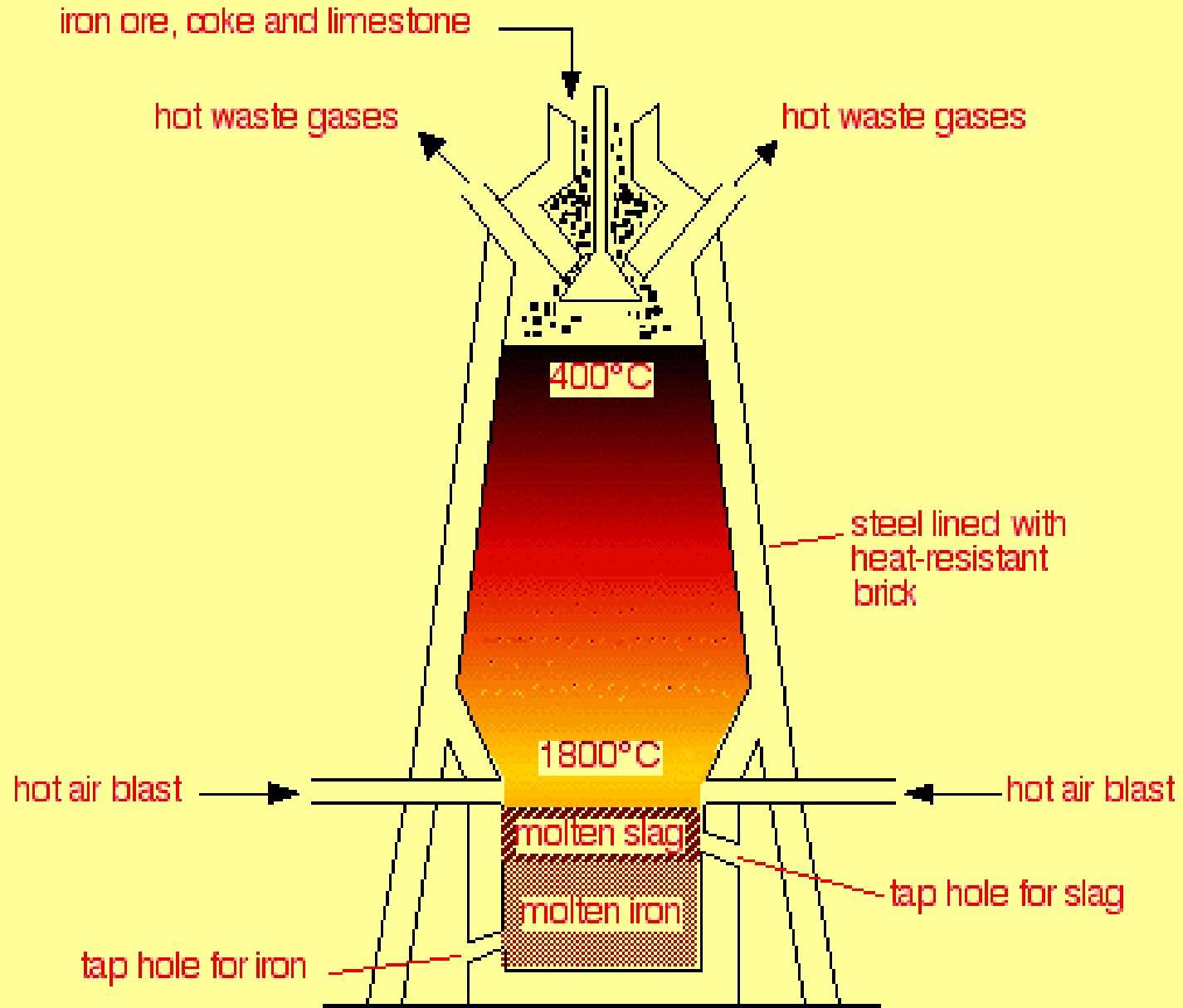
- Iron is a moderately reactive metal.
- Iron ore (**haematite**) is abundant in the Earth's crust and relatively easily **reduced** to iron metal by heating with coal (**carbon**). It is therefore cheap.
- It is strong and malleable (non-brittle)
- Iron is the most commonly used metal

A mixture of 3 raw materials is added –

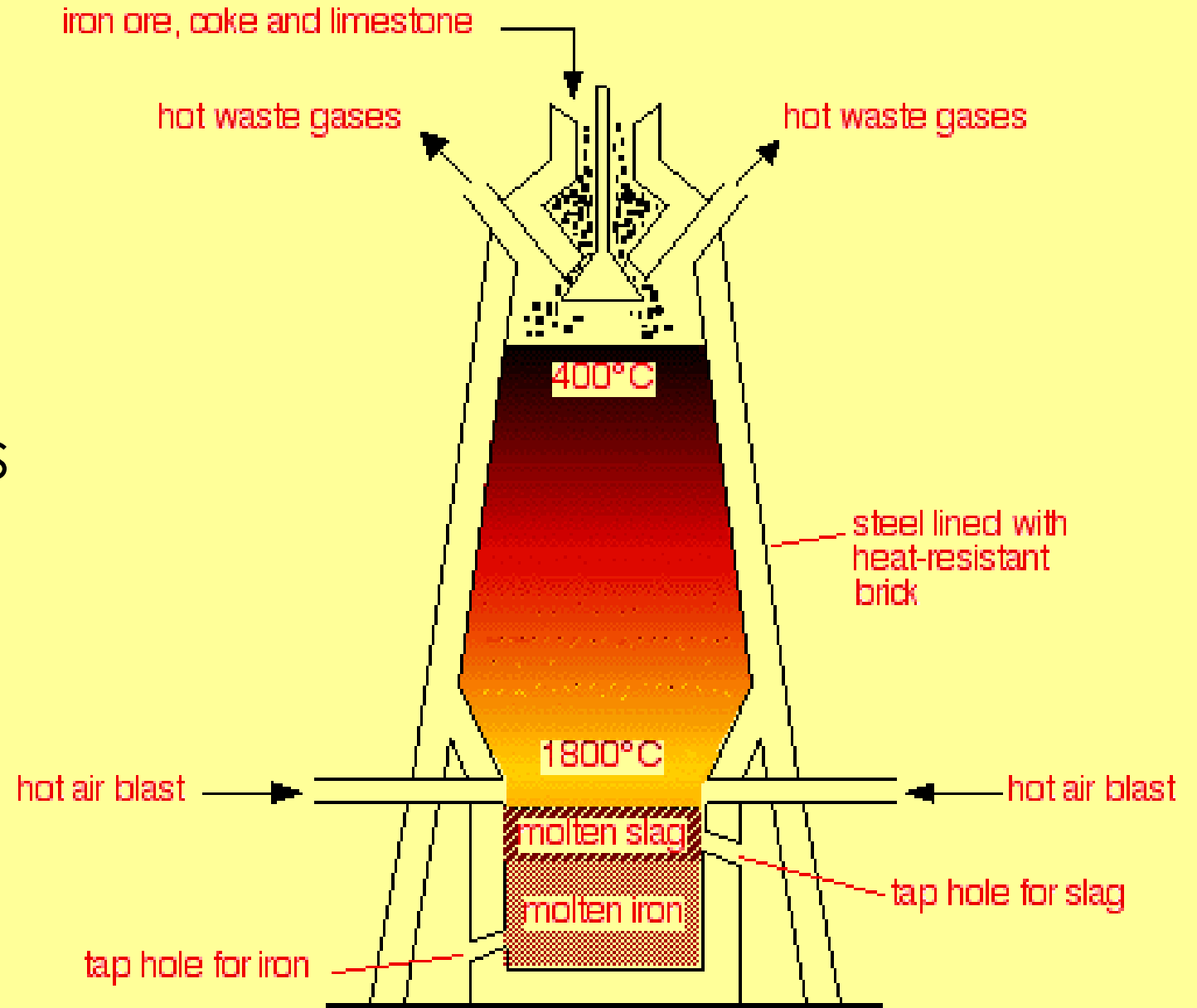
1. Carbon rich coke (because we are reducing the ore with carbon!!)
2. Limestone to remove impurities and of course...
3. Iron ore (iron oxide)



Hot air is blown in, to allow the carbon in the coke to form carbon dioxide, which then reacts further to form carbon monoxide. This is important, because the carbon monoxide will reduce the ore

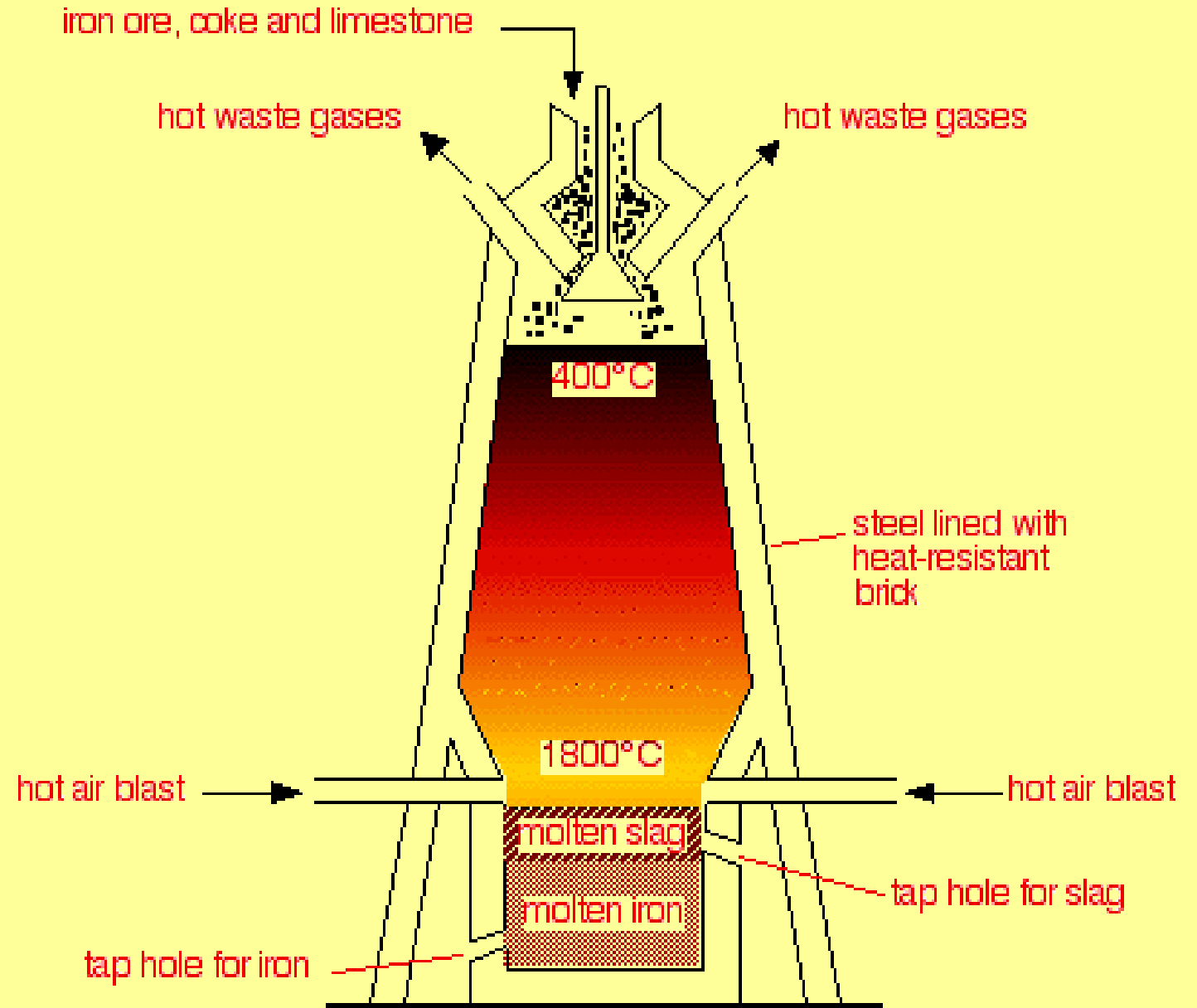


When the coke is burnt, it reacts with the oxygen and forms carbon dioxide. This then forms carbon monoxide, which reacts with the iron ore and reduces it to iron. The molten iron collects at the bottom of the furnace and is about 96% pure – called cast iron

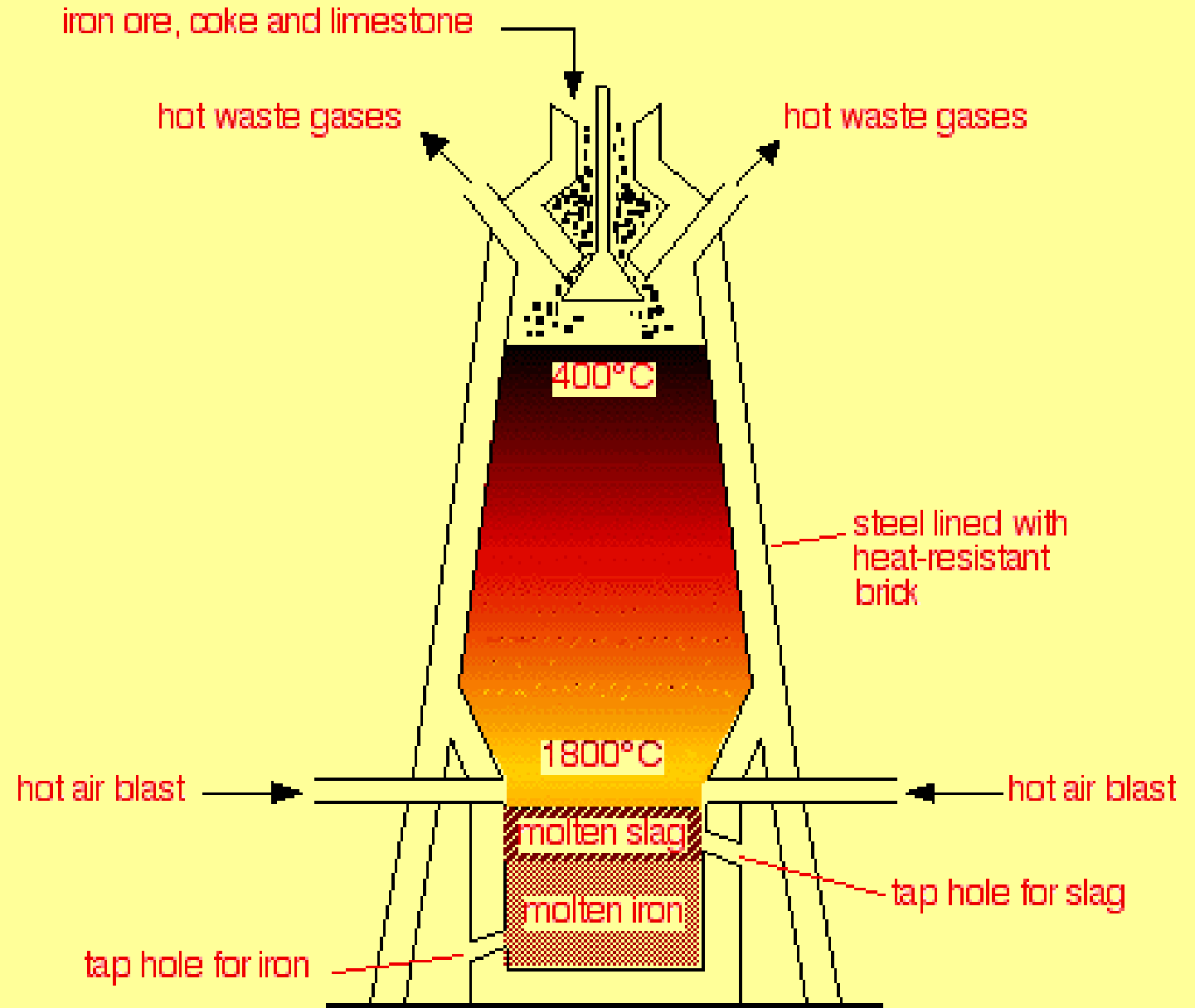


The limestone reacts with the impurities (lots of sand!) to form slag. This floats on top of the iron and is drained off.

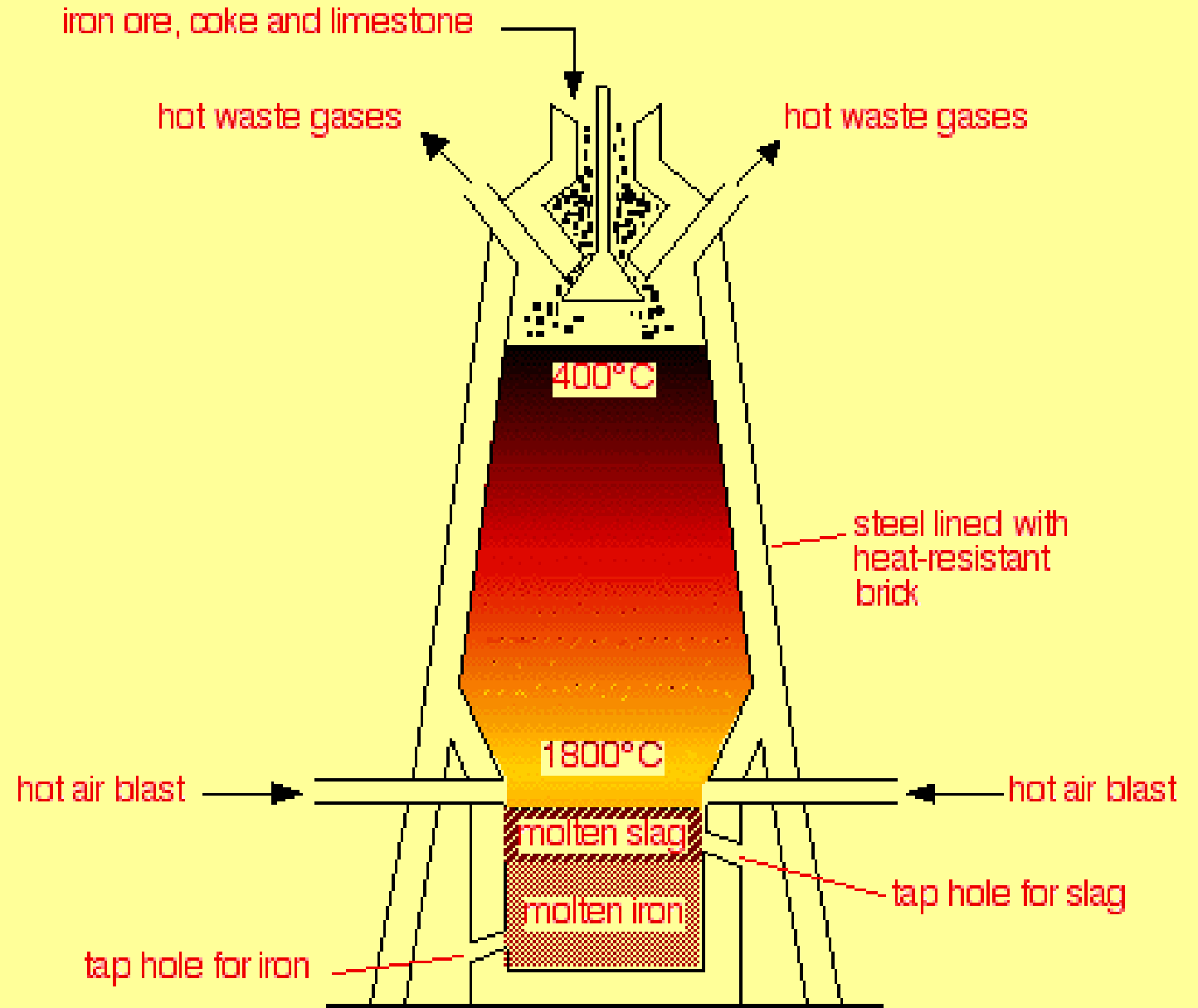
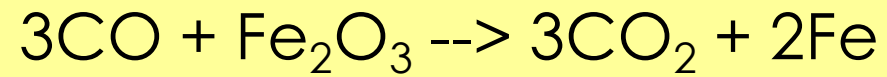
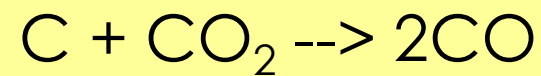
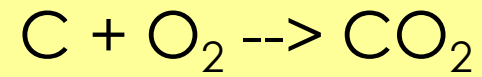
It can be used to build roads.



The reactions inside the furnace produce carbon dioxide and nitrogen. These hot waste gases rise up the furnace and are removed



The reactions for each stage are:



The reactions for removal of impurities are:

