C5.1.2
EXTRACTION OF METALS FROM ORE

C5.1.2.1
Extraction of iron by the blast furnace process

Extraction of iron by the blast furnace process (C5.1.2.1)

Cat. No.	Description	C5.1.2.1
661 541	Blast furnace model	1
664 752	Mini-compressor, electric	1
521 551	AC/DC power supply 0...24 V/0...10 A	1
300 02	Stand base, V-shaped, small	1
301 26	Stand rod 25 cm, 10 mm Ø	1
301 09	Bosshead S	1
301 72	Universal clamp, 0...120 mm	1
667 104	Cover plate, 50 cm x 50 cm	1
665 223ET10	Connector, T-shaped, 8 mm Ø, 10 pieces	1
667 180	Rubber tubing 7 mm Ø, 1 m	1
656 016	Bunsen burner, universal	1
667 035	Crucible tongs 200 mm	1
667 176	Hofmann tubing clamp, 30 mm	1
510 15	Magnet with bore	1
667 7931	Pocket Balance JE120	1
661 083	Wooden turnings, 10 pieces	1
671 8810	Peroxide of iron (haematite), 250 g	1
670 2020	Activated charcoal, granulated, 500 g	1
672 2490	Charcoal, small pieces, 500 g	1
665 213	Glass stirring rod, 300 mm x 8 mm diam.	1*

* additionally recommended

Metal is certainly the most commonly used material in the manufacture of tools, weapons and jewellery. Hardly any other material has so profoundly marked human development.

Iron does not exist on the Earth as an element, but rather in the form of its oxides and sulphides in iron ore. They are the starting materials for the technical extraction of pig iron in the blast furnace.

The blast furnace operates at 1900 °C in order to smelt iron from iron ore. To attain that temperature, coke (and not coal) is used as fuel, and the fire inside the furnace is fanned with hot air at 1200 °C to 1300 °C degrees. Lime is added as an additional component; it binds contaminants. The blast furnace is fed from the top, so that alternating layers of coke and iron ore are formed.

The highest temperature occurs in the lower part of the furnace. The liquid iron, on which the slag floats, collects at the base. About once every two or three hours, the furnace is „tapped". First the slag is allowed to flow out, and then the glowing yellow pig iron at about 1450 °C. The toxic waste gases (blast furnace gases) rise, are fed into a gas purification system, and heat the supply air for the furnace.

Experiment C5.1.2.1 uses the blast furnace model to demonstrate the reduction of iron ore in a way that is similar to the industrial scale process. Depending on the ore used and the reaction conditions (temperature, air supply, additives), the resulting reaction product is a mixture of different proportions of slag, partially reduced iron ore (Fe_3O_4) and metallic iron.