

The Blast Furnace

The activities are related to the work in the KS4 Reactions/Reactivity topic. Module names and content may vary from syllabus to syllabus.

It covers the following National Curriculum statements: SC3.2h pupils should be taught about how the reactivity of a metal affects how it can be extracted from its naturally occurring ores. SC3.2i An example of how a less reactive metal can be extracted by reduction with carbon or carbon monoxide.



Organisation of the Materials

The SMART Notebook™ file is saved as “KS4 blast furnace.notebook”. It consists of 11 pages, the first of which is a title page. There are 8 pages to support the activity.

These can be used as lesson starters, lesson plenaries or to support the main part of the lesson. Page 10 contains links to some useful websites and Page 11 contains teachers notes.

The materials can also be used as part of a revision lesson.

Activity 1

Ask pupils to see if they can remember the reactivity series and to put the metals in order. Ask one pupil to drag the metals into the box in the correct order.

The Reactivity Series

Put these elements into the correct order of reactivity. Most reactive at the top.

Potassium
Sodium

Magnesium Copper

Zinc Aluminium

Iron Tin Lead

Where do you think carbon is in this list? Add it where you think it should go.

Carbon

Page 2

Now ask them to think about where carbon should go in this series. Drag it to where they think it should be.

The correct answer is shown in Page 2.

Potassium Sodium Magnesium Aluminium Carbon Zinc Iron Tin Lead Copper	} Carbon cannot be used to extract the more reactive metals.
} Carbon can be used to extract less reactive metals.	

Page 3

Activity 2

Pages 4 and 5 provide a quick recap of oxidation and reduction.

Page 4 is a simple explanation of the processes in relation to lead oxide. The arrows have been drawn with the pen. If you wish you can erase these and then add them yourself as part of the explanation.

Page 5 shows a simple card matching activity to match up the correct definition with the process.

Carbon can be used to extract metals from their ores.
For example carbon can be used to displace lead from lead oxide.

$$\text{lead oxide} + \text{carbon} \longrightarrow \text{lead} + \text{carbon dioxide}$$

$$2\text{PbO} + \text{C} \longrightarrow 2\text{Pb} + \text{CO}_2$$

Reduction Oxidation

Match the boxes

Reduction	Oxidation
Loss of oxygen	Addition of oxygen

Page 4

Page 5

Activity 3

Page 6 shows a completed diagram of the blast furnace for illustrative purposes. This diagram is also found in the attachments for you to add to your own flipcharts.

Page 7 can be used to take the pupils step-by-step through the various reactions that take place within the blast furnace. Use the 'screen shade' (View/Screen Shade) to hide the screen, then pull the shade down to reveal the first reaction only.

Ask the pupils to suggest the equation for each reaction. And then remove the yellow box to see if they are correct.

iron ore, coke and limestone in

Hot gases out

hot air in

slag tapped off

iron tapped off

Reactions in the Blast Furnace

- Carbon (coke) reacts with oxygen to make carbon dioxide.

$$\text{C} + \text{O}_2 \longrightarrow \text{CO}_2$$

- Carbon dioxide reacts with more coke to make carbon monoxide.

$$\text{CO}_2 + \text{C} \longrightarrow 2\text{CO}$$

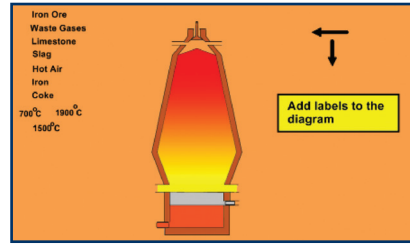
Page 6

Page 7

Notes

www.smartboard.co.uk

Activity 4



Page 8

Then ask pupils to come to the SMART Board™ interactive whiteboard and drag the labels to the correct position on the diagram.

You can refer back to page 6 to see the completed diagram.

Page 8 provides pupils with an unlabelled diagram of the blast furnace. You might wish to print this page off to act as a worksheet so pupils can add their labels themselves.

Activity 5

This is a plenary circle. It is designed to give pupils the opportunity to give one thing that they have learned that lesson.

Invite a pupil to come to the SMART Board and select two or three words that explain one thing they remember from the lesson and say it.

For example in the image below "I know that reduction is the loss of oxygen".

less reactive reduced oxidised

oxidation carbon iron

adding oxygen slag limestone

slag coke

hot air waste

iron oxide carbon monoxide

in out hot air

carbon dioxide more reactive blast furnace

I know that...
reduction
loss of oxygen

Plenary Circle: Drag words into the circle to show what you have learnt.

Page 9

You could also have statements like:

"I know that oxidation is adding oxygen"

"I know that carbon is more reactive than iron"

"I know that iron oxide is reduced to iron", etc.

There are many different combinations of keywords possible, so select five or six pupils to do this as part of a plenary session.

Other Notes

Notes

- Photographs make good source material. You can scan images from text books or you can find images on the Internet or CD.
- Use the camera tool to capture images from websites and incorporate them into your notebook files.
- You can write and draw over any image to add annotations and labels.
- Lock images in place to prevent them moving when adding labels.
- Produce more interesting text labels by drawing a shape first then grouping it with your text (right click-grouping-group)

Page 11

The SMART Notebook Gallery has an Education area, within which is a Science and Technology area. Within the Chemistry area there are some useful images and diagrams that you

can drag into a notebook page, resize and manipulate.

Google is a great source of images to use with your Notebook files. Use the camera tool to capture images and bring them into your notebook.

You can modify the "KS4 Blast Furnace.notebook" notebook file in any way you like – but it would be a good idea to save it with a different name in case you want to access the original again in the future.