Topic: Useful Products from Metal Ores, Rocks and Air

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Issues tackled:

1. **Key ideas, use of language and terminology – Redox reactions**
2. **Misconceptions – How the reactivity of a metal affects how it is extracted from its naturally occurring ores.**
3. **Practical work – Extraction of lead from lead oxide using carbon: smelting**
4. **Applications, relevance and cross-curricular issues - Recycling of metals compared to new extraction.**

Issue 1: Key ideas, use of language and terminology - Redox reactions in a blast furnace

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:

1. Find a simulation, video or activity that you think clearly explores the main areas of redox reactions within the context of a blast furnace.
2. Prepare a short presentation on the reactions taking place within a blast furnace.

Possible activities during tutorial:

1. Demonstrate the resource and be prepared to justify why you think it is particularly good at getting over the idea of redox reactions.
2. Give the presentation as if to a class.

AST Input:

- Feedback on the resource or presentation in relation to pedagogy and accessibility to all learning styles.
- Go through the key reactions and conditions inside the blast furnace. Check trainee's ability to express the reactions in words and symbols.

Reading:

Subject knowledge and understanding

Lewis, M. & Waller, G., (1992), **Thinking Chemistry,** Oxford. (pp 187- 197).

Ryan, L., (2001), **Chemistry for You**, Nelson Thornes, Cheltenham. (Page 91 for the blast furnace and page 115 for redox reactions.)

Subject pedagogy

Amos, S. & Boohan, R., (Eds.) (2002) **Teaching Science in Secondary Schools,** OU Press. (Chapter 11 on learning science concepts.)

Useful websites and applications

Factual information on steel making and the blast furnace can be found at http://www.schoolscience.co.uk Follow links **to chemistry 14-16** and **steelmaking**.

The BBC website, history section, contains a simulation of the blast furnace. It can be found at http://www.bbc.co.uk/history/games/blast/blast.shtml or just search for blast furnace on the website www.bbc.co.uk

Resources:

Task 2
Digital Projector and computer may be required.

Issue 2: Misconceptions - How the reactivity of a metal affects how it is extracted from its naturally occurring ores.

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:
1. Prepare an activity to start a lesson that explores the prior knowledge and understanding of reactivity.
2. Design a VAK activity that explores the link between reactivity and extraction method.

Possible activities during tutorial:
1. and 2. Present the activity as if to a class. Discuss the rationale for the activity and how it attempts to overcome potential misconceptions.

AST Input:
- Feedback and critique from a learner's point of view.
- Feedback on how closely this meets the criteria of addressing the main misconceptions and the VAK principle.

Reading:

Subject knowledge and understanding

Barker, V., (2002), **Building Success in GCSE Science: Chemistry**, Folens.

Subject pedagogy

Ryan, L. (2005) **Chemistry for You**, Nelson Thornes, Cheltenham. Support pack pages 109 – 130 for useful worksheets.

DfES (1999) Science: The National Curriculum for England, HMSO, London.

Useful websites and applications:

http://www.chemsoc.org/pdf/LearnNet/rsc/miscon.pdf A document on misconceptions.

http://www.chemsoc.org/networks/learnnet/miscon2.htm Chemical misconceptions : prevention, diagnosis and cure.

Resources:

Issue 3: Practical work - Extraction of lead from lead oxide using carbon; smelting.

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:

1. Find out which metals can be extracted using carbon / charcoal. Find out why not all metals can be extracted using this method.
2. Find out different methods of setting up equipment for extraction with carbon. Find out safety issues involved. Ask teachers and technicians what can go wrong with this experiment.

Possible activities during tutorial:

1. Present findings about metal extraction using carbon/charcoal.
2. Present methods for doing an experiment to show extraction with carbon.

AST Input:

- Get trainees to demonstrate the selected experiment.
- Explore a dialogue to use while the practical is proceeding.
- Comment on the safety of the demonstration/experiment and organisational issues.
- Explore and extend the chemistry involved and look towards electrolytic extraction.

Reading:

Subject knowledge and understanding

Any GCSE chemistry textbook.
E.g. Nelson or Chemistry in Action.

Subject pedagogy

Nuffield Chemistry (1966) The sample scheme stages I and II: The Basic Course (or similar) for brief outline of schemes.
Crowther, B. & Freemantle, M. (1989), **Experiments and Investigations in Chemistry**, Oxford University Press, Oxford.

Useful websites and applications

www.Chemsoc.org/networks/learnnet
Go into this excellent website and follow links to **books** and get one called **Classic Chemistry Experiments**. Look at experiment 33.

Resources: Task 2 and **Tutorial**
Bunsen burner and gas turned on.
Ignition tube.
Charcoal.
Copper oxide or lead oxide.
Tongs.
Heatproof mats, etc.

Issue 4: Applications, relevance and cross-curricular issues - Recycling of metals compared to new extraction.

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:
1. Look through the education section of the "British Metals Recycling Association" website. (Link below.)

Possible activities during tutorial:
1. Develop a lesson plan that gets pupils to explore the social and economic arguments between new extraction of metals and recycling of metals in the current climate, preferably using ICT.

AST Input:

- Act as a coach in lesson planning and a "critical friend" to the outcome.

Reading:

Subject knowledge and understanding

Ryan, L. (2001) **Chemistry for You**, Nelson Thornes, Cheltenham. Page 109 for information on recycling Aluminium.

Subject pedagogy

ASE (1998). **Science and Technology in Society (SATIS). 310 Recycling Aluminium.** Association for Science Education, Hatfield.

Useful websites and applications

http://www.recyclemetals.org This is the web site of the British Metals Recycling Association, follow link to **education.**

http://www.canmakers.co.uk/education/recycling_cans.asp Has information about recycling steel and aluminium cans.

Visit the friends of the Earth website at www.foe.co.uk and search for metals, minerals. This will produce some useful information.

Resources:

Task 1
Computer with internet access.

Tutorial
Computer and Digital Projector if available.