Unit C1 - Revision Lesson 4 Metals

Specification learning outcomes	HSW statements	Exemplar teaching activities	Main differentiation	Resource sheets
0.2 Represent chemical reactions by word equations H and simple balanced equations. H **0.3** Write balanced chemical equations including the use of state symbols (s), (l), (g) and (aq) for a wide range of reactions in this unit. **4.1** Recall that: a) most metals are extracted from ores found in the Earth's crust; b) unreactive metals are found in the Earth as the uncombined elements. **4.2** Describe how most metals are extracted from their ores by: a) heating with carbon, illustrated by iron b) electrolysis, illustrated by aluminium (knowledge of the blast furnace or the electrolytic cell for aluminium extraction are not required). **4.3** Explain why the method used to extract a metal is related to its position in the reactivity series and cost of the extraction process. *4.4 Investigate methods for extracting a metal from its ore.* **4.5** Describe oxidation as the gain of oxygen and reduction as the loss of oxygen. **4.6** Recall that the extraction of metals involves reduction of ores. **4.7** Recall that the oxidation of metals results in corrosion. **4.8** Demonstrate an understanding that a metal's resistance to oxidation is related to its position in the reactivity series. **4.9** Discuss the advantages of recycling metals, including economic	**HSW 3, 5, 10, 11, 12, 13**	The theme of this lesson is metals. **Starter:** *Timeline.* Write the phrases Bronze Age, Iron Age and Stone Age on the board and ask pupils to put them in the correct order. You could discuss why they are in this order and the changes in technology needed to move from one to the next. This then links into the ability to extract iron from its ore and how this is harder than copper and tin. **Main:** *Extraction of metals.* Worksheet C1.18c contains questions on extraction of metals and how the method of extraction is linked to the reactivity series. Unreactive metals are not on the worksheet so it may be worth reminding students that these metals can be found uncombined. The worksheet also reminds pupils that metals are often reduced when they are extracted. *Investigating extraction.* Ask students to write a hypothesis for an investigation where they are given different metal oxides and carbon and asked to extract the metal from the oxide. They should use their scientific knowledge to justify their hypothesis or any predictions that they make. *Oxidation and reduction.* Worksheet C1.18b asks pupils to identify which substances have been oxidised and which have been reduced in various different reactions. This is a good time to remind students of the link between oxidation and corrosion. This can be extended by referring back to the reactivity table on worksheet C1.18c and reminding students that position in the reactivity series is also related to resistance to corrosion. *Recycling metals.* Look at the pros and cons of recycling metals. Ask students to draw a table, with one column for the pros, and one column for the cons, of recycling. Then ask students to identify which are the economic and which are the environmental factors. *Matching properties to uses.* Cut Worksheet C1.20c into separate cards showing the physical properties of metals. Remove any cards which refer to mercury, i.e. *liquid at room temperature and used in thermometers*. There are also some cards with uses on them, and students need to match the property cards to 'uses' cards. Some property cards are linked to two uses. Then ask students to explain which of the four metals mentioned on the specification matches the uses and properties in the card-sort exercise. *Alloys.* Draw a model of an alloy on the board and ask students to suggest why the alloy is stronger and more resistant to corrosion. **Plenary:** *Quiz questions.* Students work in pairs to write four quiz questions about this spread, and then use them with at least one other pair. **Homework:** Students complete worksheet C1.21a which looks at steel and alloy steels.	**Stretch:** Students write balanced equations for some or all of the reactions on worksheet C1.18b. Students should be asked to write a paragraph to answer the following question: 'Discuss the features and applications of memory shape alloys. Explain why they were developed. ' This could be used as practice for an extended writing question. Students could also be asked to discuss alloys of gold. **Support:** Give students full word equations for worksheet C1.18b. Leave out the four cards at the bottom of worksheet C1.20c, meaning there is one use for each property card.	Worksheet C1.18c Worksheet C1.18b Worksheet C1.20c Worksheet C1.21a

implications, and how recycling preserves both the environment and the supply of valuable raw materials. **4.10** Describe the uses of metals in relation to their properties, including: a) aluminium b) copper c) gold d) steel. **4.11** Use models to explain why converting pure metals into alloys often increases the strength of the product. **4.12** Demonstrate an understanding that iron is alloyed with other metals to produce alloy steels with a higher strength and a greater resistance to corrosion. **H 4.13** Describe how alloying changes the properties of the metals, including: a) smart or shape memory alloys, including nitinol, an alloy of nickel and titanium b) gold alloys with higher strength, including fineness (parts per thousand) and carats, to indicate the proportion of pure gold. **H 4.14** Demonstrate an understanding that new materials are developed by chemists to fit new applications, such as the creation of new shape memory alloys for use, for example, in spectacle frames and as stents in damaged blood vessels.				