



Year: 11

Topic: 5.3 METALS AND THEIR EXTRACTION

Knowledge and Understanding to be developed:

This topic considers the processes involved in extracting metals, based upon initial work with reactivity series and related reactions. It includes an introduction to electrolysis and its use in the extraction of aluminium. Learners should be able to write word and balanced symbol equations for all reactions described in this topic.

Working Scientifically

In this topic, learners will use scientific vocabulary, terminology and definitions to describe extraction processes. They can explain every day and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.

Mathematical Skills

Mathematical skills will be used in this topic to balance ionic formulae and chemical equations. Higher tier learners will be able to link these ideas to calculation work and ratios in reacting masses.

Key Terms to be learned this topic:

Acid

Alkali

Neutral

Universal Indicator

pH scale

Neutralisation

Titration

Concentration

Soluble

Insoluble

Salt

Learning Objectives and Outcomes:

Students should be able to demonstrate and apply their knowledge and understanding of :

- (a) ores found in the Earth's crust as the source of most metals and that these metals can be extracted using chemical reactions
- (b) some unreactive metals (e.g. gold) being found in their native form and that the difficulty involved in extracting metals increases as their reactivity increases
- (c) the relative reactivities of metals as demonstrated by displacement (e.g. iron nail in copper(II) chloride solution) and competition reactions (e.g. thermite reaction)
- (d) reduction and oxidation in terms of removal or gain of oxygen
- (e) the industrial extraction of iron in the blast furnace, including the combustion, reduction, decomposition and neutralisation reactions
- (f) electrolysis of molten ionic compounds e.g. lead(II) bromide (including electrode equations)
- (g) reduction and oxidation in terms of gain or loss of electrons
- (h) the industrial extraction of aluminium using electrolysis, including the use of cryolite to dissolve alumina
- (i) the properties and uses of iron (steel), aluminium, copper and titanium
- (j) the general properties of transition metals, including their ability to form ions with different charges
- (k) an alloy being a mixture made by mixing molten metals, whose properties can be modified by changing its composition
- (l) factors affecting economic viability and sustainability of extraction processes e.g. siting of plants, fuel and energy costs, greenhouse emissions and recycling

SPECIFIED PRACTICAL WORK

- Determination of relative reactivities of metals through displacement reactions