

Section 1.3: Metals & Their Uses

Metal Ores

- That some metals are found as the metal itself but most exist as compounds and need to be extracted from ores.
 - That a rock with enough metal in to make it economic to extract the metal is called an ore.
 - Why the economics of metal extraction can change over time.
 - That most metals need to be extracted from their ores using a chemical reaction such as reduction, electrolysis or displacement.
-

Extracting Metals from Rocks

- That if a metal is below carbon in the reactivity series, it is extracted by reduction with carbon.
 - That if a metal is above carbon in the reactivity series, it is extracted by electrolysis.
 - That in a reduction reaction, oxygen is removed.
 - That aluminium and titanium can't be extracted from their ores by reduction with carbon.
 - That the extraction of aluminium and titanium from their ores is expensive because the processes used have lots of stages and need lots of energy.
-

Extracting Copper

- That copper can be extracted from its ore by smelting (heating it in a furnace).
 - How electrolysis can be used to purify copper.
 - That the supply of copper-rich ores is limited so it's important to recycle as much copper as possible.
 - The two new methods that have been developed for extracting copper from low-grade ores — bioleaching (using bacteria) and phytomining (using plants that absorb copper from soil).
 - The advantages and disadvantages of using bioleaching and phytomining instead of traditional extraction methods to extract copper from low-grade ores.
 - How copper can be extracted from solution using a displacement reaction with scrap iron.
-

Impacts of Extracting Metals

- The social, economic and environmental impacts of mining for metal ores.
 - That recycling metal, rather than extracting more metal, saves limited metal resources, requires less energy, saves fossil fuels and reduces the amount of waste going to landfill.
-

Properties and Uses of Metals

- Where the transition metals are in the periodic table.
 - That metals have similar basic properties — they are strong, can be bent into shape, and conduct heat and electricity.
 - What the specific properties of copper, aluminium and titanium are, and that these mean they are suitable for certain uses.
 - That the downsides to using metals as structural materials are that they may corrode or break due to metal fatigue.
-

Alloys

- That an alloy is a mixture of two metals, or a mixture of a metal and a non-metal.
- That iron from a blast furnace needs to be purified as it contains impurities that make it brittle. It's then made into alloys because its softness means it has limited uses as a pure metal.
- That steel is an alloy of iron and carbon and that most iron is made into steel.
- The properties of low-carbon steel, high-carbon steel and stainless steel.
- That copper, gold and aluminium are made into alloys to make them harder and so more usable.
- That alloys can be designed for specific purposes.