



## Reactivity and Using Metals

1. Some metals are more **reactive** than others
2. Some metals **tarnish** because they **react** with **oxygen** in the air
3. The tarnishing of **iron** is called **rusting**
4. Rusting occurs when iron reacts with **oxygen** in the presence of **water**
5. The **reactivity series** is a list of metals in order from most reactive at the top to least reactive at the bottom
6. When a **metal** reacts with an **acid**, a **salt** and **hydrogen** gas are made
7. Bubbles observed in the solution indicate that a gas is being made in the reaction
8. By observing the reactions of metals and acids, it is possible to deduce the order of reactivity of the metals
9. The reactivity series can be used to make predictions about the reactions of metals, such as whether a reaction will take place and how vigorous that reaction will be
10. Most metals are found in **naturally occurring compounds** and have to be extracted from them
11. **Ores** are rocks or minerals which contain enough metal that can be extracted economically
12. Carbon and hydrogen can be used to extract metals from their ores by **displacement reactions**
13. Carbon or hydrogen will displace a less reactive metals from their ores

## Treating Water

14. Urban lifestyles and industrial processes produce large amounts of **wastewater** that require treatment before being released into the environment.
15. **Sewage treatment** includes screening and grit removal, sedimentation to produce sewage sludge and effluent, anaerobic digestion of sewage sludge and aerobic biological treatment of effluent.
16. Water that is safe to drink is called **potable water**.

17. Potable water is not pure water because it contains **dissolved solids**.
18. In the UK, rain provides (fresh) water with low levels of dissolved solids that collects in the ground and in lakes and rivers
19. Most potable water is produced by choosing an appropriate source of fresh water, passing the water through a **metal grid** and **filter beds**, and **sterilising** with chlorine, ozone or ultraviolet light.
20. If supplies of fresh water are limited, **desalination** of salty water or sea water may be required.
21. **Desalination** means to remove salt.
22. Desalination can be done by **distillation** or **reverse osmosis**. These processes require large amounts of energy.
23. Osmosis is the movement of **water** from a **dilute solution** (low solute concentration) to a **concentrated** one (high solute concentration) through a **semi-permeable membrane**.
24. This process can be reversed by forcing water molecules through a semi-permeable membrane **against** their **concentration gradient**:

## The Earth's Resources

25. The Earth's resources can be divided into two groups: finite and renewable.
26. **Finite resources** from the Earth, oceans and atmosphere are processed to provide energy and materials.
27. Finite resources are ones that are being used up more quickly than they are being made e.g., fossil fuels and uranium.
28. **Sustainable development** is development that meets the needs of current generations without compromising the ability of future generations to meet their own needs.
29. Glass is mainly made from **sand**, which has the chemical name silicon dioxide,  $\text{SiO}_2$ .





30. Most of the glass we use is **soda-lime glass**, made by heating a mixture of sand, sodium carbonate and limestone.
31. **Borosilicate glass** is made from sand and boron trioxide. This type of glass **melts at higher temperatures** than soda-lime glass.
32. Clay ceramics, including pottery and bricks, are made by **shaping wet clay** and then **heating in a furnace**.
33. Clay ceramics are strong and hard and have high melting points. They are unreactive but brittle.
34. A **composite** is made of two or more materials with different properties.
35. When these materials are combined, they produce a material that has a combination of these properties.
36. Most composites are made of two materials:
  - a. a **matrix** which surrounds and binds together fibres or fragments of the other material
  - b. a **reinforcement**.
37. **Chipboard** can be used for making furniture.
38. It consists of wood chips and a resin glue.
39. Glass, ceramics and composites are all produced from **limited** raw materials.
40. These materials need to be extracted through mining and quarrying.
45. By reducing, reusing and recycling, people can help the environment by
  - a. Reducing the – often finite – **raw materials** that have to be extracted and processed.
  - b. Reducing the **energy** needed to turn these raw materials into products.
  - c. Reducing **waste**.
46. Almost all plastic is made from crude oil which is a **finite resource**.
47. Plastic can hang around for thousands of years in the environment because it is **non-biodegradable**. If it ends up as litter, it can pollute rivers, lakes and oceans and harm the wildlife that inhabit them.
48. Once a company has completed a **life cycle assessment** for a product, they then need to evaluate what their next steps will be from the information provided.

### Environmental Impact

41. Life Cycle Assessments (LCAs) are used to assess the **environmental impact** of a product.
42. The assessment is broken into the following stages: extracting and processing raw materials, manufacturing and packaging, use and maintenance during its lifetime, disposal at the end of its useful life.
43. Transport and distribution is assessed at each stage.
44. Lots of products can be **reused** or **recycled** to reduce the energy needed to make new products.

