

## Chemguide – answers

### EXTRACTION OF METALS: COPPER

- The ore is crushed and treated with something which bonds to the particles of the metal compound you want, and makes those particles water-repellant. The mixture is placed in a large container with water and a foaming agent. The water-repelling mineral particles are picked up by the bubbles, float to the top and flow out over the sides.
  - It forms a slag which floats to the top of the mixture
  - It is used to make sulphuric acid via the Contact Process
  - $$\text{Cu}_2\text{S} + \text{O}_2 \longrightarrow 2\text{Cu} + \text{SO}_2$$
  - The reducing agent is the sulphide ion. The copper is reduced from oxidation state +1 in the  $\text{Cu}_2\text{S}$  to zero in the metal, and the sulphur is oxidised from the -2 oxidation state to the +4 oxidation state in  $\text{SO}_2$ .
  - Traditionally, lead-based alloys. Nowadays, titanium or stainless steel.
    - Either pure copper or stainless steel.
    - $$\text{Cu}^{2+} + 2\text{e}^- \longrightarrow \text{Cu}$$
- Pure copper. 
$$\text{Cu}^{2+} + 2\text{e}^- \longrightarrow \text{Cu}$$
  - $$\text{Cu} \longrightarrow \text{Cu}^{2+} + 2\text{e}^-$$
  - These go into solution as zinc ions at the anode, but aren't released as zinc at the cathode provided their concentration in the solution is low.
  - These don't form ions at the anode, and simply fall to the bottom as part of the anode sludge.
  - To prevent the concentration of zinc and similar ions from getting high enough to deposit at the cathode.
- Take any two examples from the Chemguide page. Choose easy examples where the reason for the use is obvious.