

Electrolysis of dilute aqueous ionic compounds

Note: When electrolysing dilute aqueous ionic compounds,

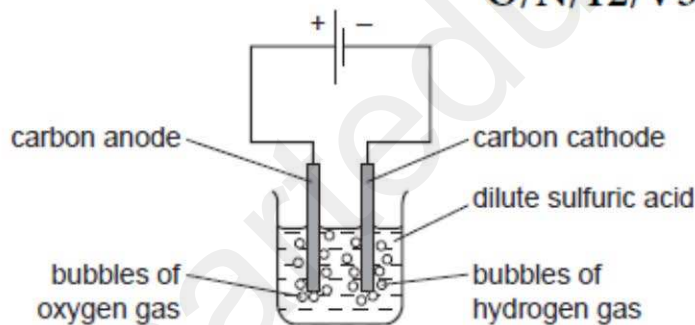
- The cations (+ve ions) always follow the reactivity series.
- The anions DO NOT FOLLOW the reactivity series. Only those anions that are in excess are oxidised.
- The basic electrolysis concepts stay the same, i.e. the cations go to the cathode and the anions go to the anode / reduction at cathode and oxidation at anode/ half equations etc...

Example 1:

Electrolysis of dilute sulfuric acid

- (c) The diagram below shows the electrolysis of dilute sulfuric acid. Hydrogen is formed at the negative electrode (cathode) and oxygen at the positive electrode (anode) and the concentration of sulfuric acid increases.

O/N/12/V32-Q6



The ions present in the dilute acid are $\text{H}^+(\text{aq})$, $\text{OH}^-(\text{aq})$ and $\text{SO}_4^{2-}(\text{aq})$.

Anode:

In a dilute solute since the OH^- are in excess so the OH^- are reduced to O_2 gas.



Cathode:

Only H^+ ions are present, so they get reduced to hydrogen gas.



Change to the electrolyte:

The sulfuric acid becomes more concentrated as the water is used up

Table showing the electrolysis products of some more dilute aqueous products

Dilute Aqueous Ionic Compound	Ions present	Cathode (-ve electrode)	Anode (+ve electrode)	Change to the electrolyte
KI	K^+, H^+, OH^-, I^-	$2H^+ + 2e^- \rightarrow H_2$	$4OH^- - 4e^- \rightarrow 2H_2O + O_2$	KI becomes more concentrated
NaCl	Na^+, H^+, OH^-, Cl^-	$2H^+ + 2e^- \rightarrow H_2$	$4OH^- - 4e^- \rightarrow 2H_2O + O_2$	NaCl becomes more concentrated
$Cu(NO_3)_2$	$Cu^{2+}, H^+, OH^-, NO_3^-$	$Cu^{2+} + 2e^- \rightarrow Cu$	$4OH^- - 4e^- \rightarrow 2H_2O + O_2$	$Cu(NO_3)_2$ changes to HNO_3 , i.e. nitric acid. So the electrolyte becomes acidic