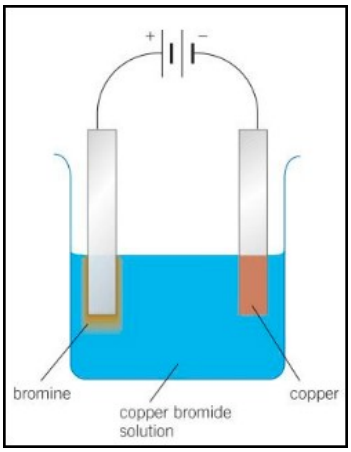
Name _____ Class _____ Date _____ /20_____

Introduction to Electrolysis

The word electrolysis means 'breaking down using electricity'. In electrolysis you use an electric current to break down an ionic compound. The compound that is broken down by electrolysis is called the **electrolyte**.



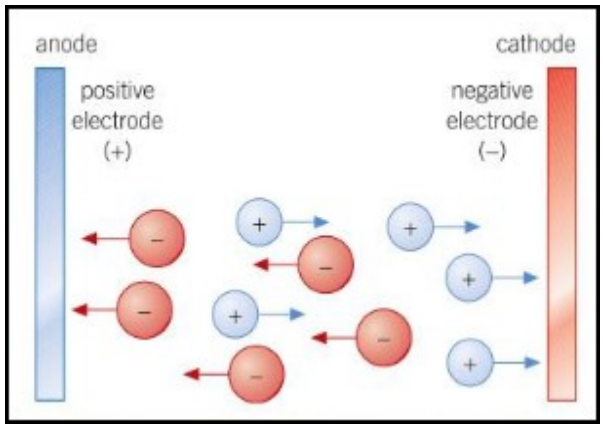
Key points

- Electrolysis breaks down a substance using electricity.
- Ionic compounds can only be electrolysed when they are molten or dissolved in water. This is because their ions are then free to move and carry their charge to the electrodes.
- In electrolysis, positive ions move to the cathode (negative electrode), while negative ions move to the anode (positive electrode).

Remember—STATE SYMBOLS are crucial when dealing with electrolysis:

(s) - solid
(l) - liquid
(g) - gas
(aq) - aqueous solution

copper(II) bromide	→	copper	+	bromine
$CuBr_2(aq)$	→	$Cu(s)$	+	$Br_2(aq)$



REMEMEMBER—PANIC AND OILRIG

P OSITIVE
A NODE
N EGATIVE
I S
C ATHODE

O XIDATION
I S
L OSS
R EDUCTION
I S
G AIN

POSITIVE CATIONS ARE REDUCED AT THE CATHODE TO BECOME NEUTRAL ATOMS OF THE ELEMENT

NEGATIVE ANIONS ARE OXIDISED AT THE ANODE TO BECOME NEUTRAL ATOMS OF THE ELEMENT

Half equations

You represent what is happening at each electrode using **half equations**.

At the cathode (negative electrode) you get reduction of a positive ion:

$$Pb^{2+} + 2e^- \rightarrow Pb$$

At the anode (positive electrode) you get oxidation of a negative ion:

$$2Br^- \rightarrow Br_2 + 2e^-$$

Sometimes half equations at the anode are written to show the electrons being removed from negative ions, like this:

$$2Br^- - 2e^- \rightarrow Br_2$$

You can write the half equation for negative ions either way. They both show the same oxidation of the negatively charged ions.

Key points

- In electrolysis, the ions move towards the oppositely charged electrodes.
- At the negative electrode (cathode), positive ions gain electrons, so are reduced.
- At the positive electrode (anode), negative ions lose their extra electrons, so are oxidised.
- When electrolysis happens in aqueous solution, the less reactive element, either hydrogen or the metal, is usually produced at the cathode. At the anode, you get either:
  - oxygen gas given off, from discharged hydroxide ions produced from water, or
  - a halogen produced if the electrolyte is a solution of a halide.