Electrolysis

Content 📹

Electrolysis of a molten binary ionic compound

At the anode	At the cathode
 Anions are preferentially 	 Cations are preferentially
discharged, they lose	discharged, gain electrons
electrons and form a gas	(oxidized) to form a liquid
Ionic half equation	metal
$M^{x-} \rightarrow xe^- + M$	Ionic half equation
	$M^{x+} + xe^- \rightarrow M$

- The ionic half equation can be obtained by obtaining the ionic half equation of the cathode and the anode before balancing the number of electrons lost at the anode and the number of electrons gain at the cation

Electrolysis of dilute solutions with inert electrodes

At the anode	At the cathode
 Hydroxide ions from water are 	 Cations are selectively discharged due
preferentially discharged due to its low	to the low position in the
position in the electrochemical series	electrochemical series
Ionic half equation	Ionic half equation
$40H^{-}(aq) \rightarrow 4e^{-} + 2H_2O(aq) + O_2(q)$	$M^{x+} + xe^- \rightarrow M$

Electrolysis of concentrated metal halide solutions with inert electrodes

At the anode	At the cathode	
- Concentration effect results in the halide	- Cations are selectively discharged due	
ion being preferentially discharged over	to the low position in the	
Ionic half equation	Ionic half equation	
$M^{x-} \rightarrow xe^- + M$	$M^{x+} + xe^- \rightarrow M$	



Simple Electric Cells

- Electrodes used are to be of *two different metal electrodes;* The more reactive metal will undergo oxidation as it will lose its valence electrons more readily than the less reactive metals
- The less reactive electrode is positive electrode; the more reactive electrode is the negative electrode
- The further apart the 2 metal electrodes are in their reactivity, the greater the potential difference, greater electromotive force produced.

Electrolysis vs Electrochemical Cell

Electrolysis	Electrochemical cell
Electricity brings about chemical reaction	Chemical reaction generates electricity
(chemical energy is converted to chemical	(chemical energy is converted to electrical
energy)	energy)

Test yourself 💦

- 1. Define electrolysis?
- 2. Suggest what a binary ionic compound is, with reference to an example?
- 3. What is the difference between electrolysis of a substance and a simple cell?
- 4. A concentrated and dilute solution of Sodium Chloride is an electrolyte, compare the products formed at the
 - i. Anode
 - ii. Cathode, including the ionic half equation
 - iii. Include the overall equation for both scenarios
- 5. What is the relationship between difference of reactivity and the electromotive force produced?
- 6. A solution of concentrated Sodium Chloride and Potassium Iodide is an electrolyte, suggest which anion is selectively discharged, explain your answer.

Glossary of Terms		
Electrolysis	The conduction of electricity by an electrolyte leading to the decomposition of the electrolyte	
Electrolyte	A molten ionic compound or an aqueous solution that conducts electricity through the positive and negative ions which are free to move in molten state or in aqueous solution	
Electrode	Solid electrical contacts immersed in the electrolyte which conduct electricity through electron flow	
Inert electrode	Electrodes that do not react during electrolysis (e.g. Pt or Graphite electrodes)	