

Electrolysis and Electrolytic Cells

Electrolysis: a process by which electrical energy is used to bring about a nonspontaneous redox reaction

⊛ electrical \rightarrow chemical energy

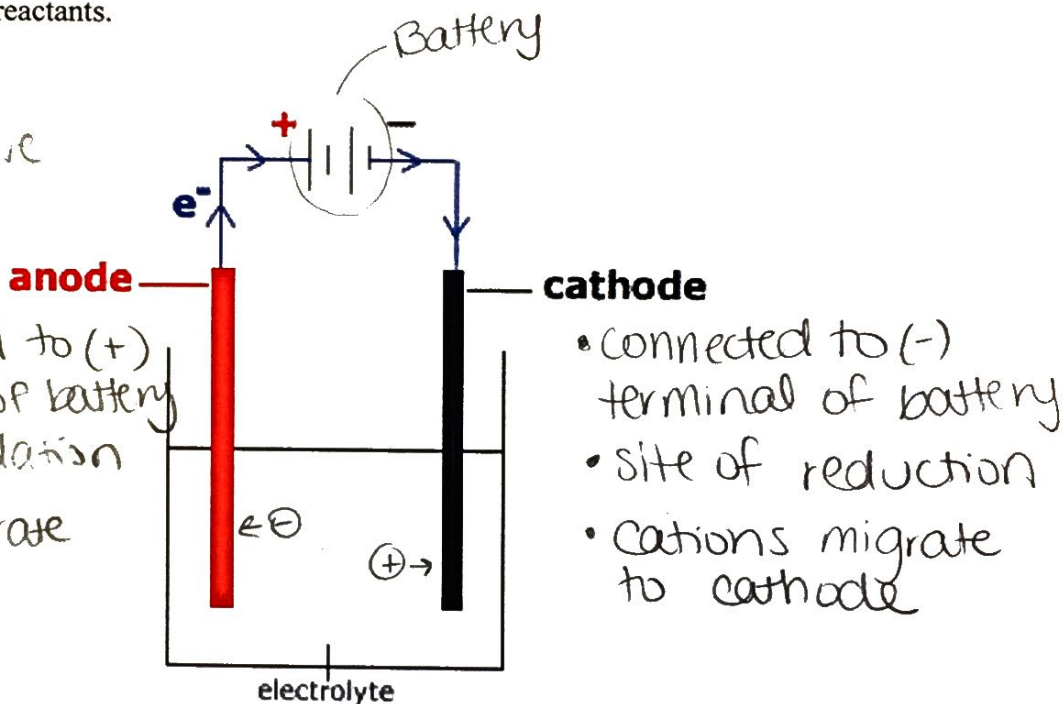
⊛ requires an external power source (battery) to force the nonspontaneous rxn to occur.

General Electrolytic Cell:

An electrolytic cell consists of a source of direct electrical current that is connected to the electrodes which are immersed in the reactants.

• electrodes are inert (not reactive themselves)

- connected to (+) terminal of battery
- site of oxidation
- anions migrate to anode

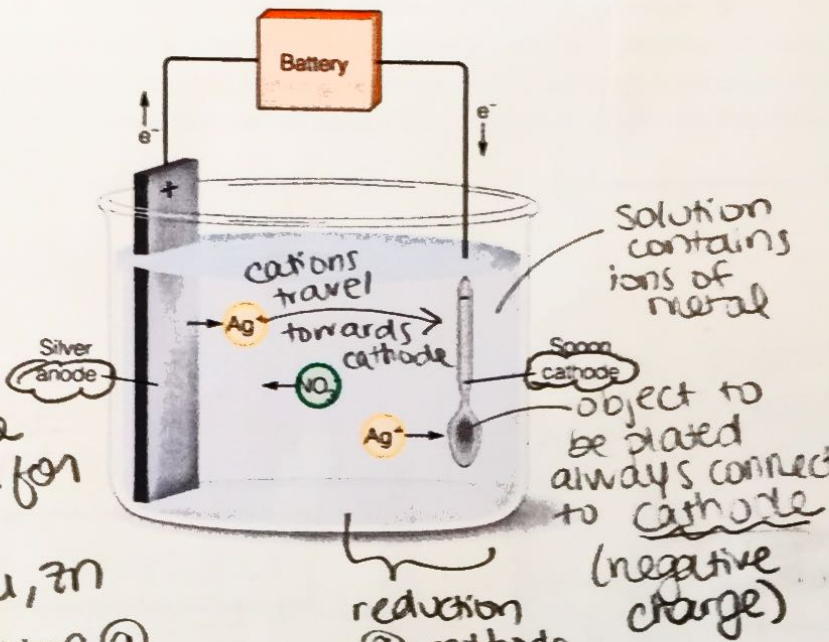


electrons flow from anode \rightarrow cathode

Electroplating

used to coat a material w/ a layer of metal

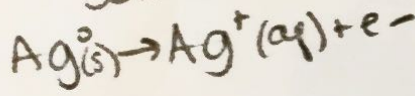
Electroplating is used in various industries. It can be utilized to add a protective barrier to materials to prevent reactions with atmospheric elements. Electroplating is also used to add a thin layer of precious metal to jewelry to enhance appearance. The car industry also utilizes electroplating on catalytic converters and car engines to enhance performance and resistance to heat exposure. These are only a few of the many useful applications of electroplating.



-anode is the metal used for plating

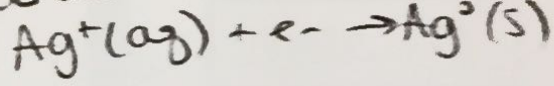
ex) Ag, Cu, Zn

• oxidation @ anode releases ions into solution



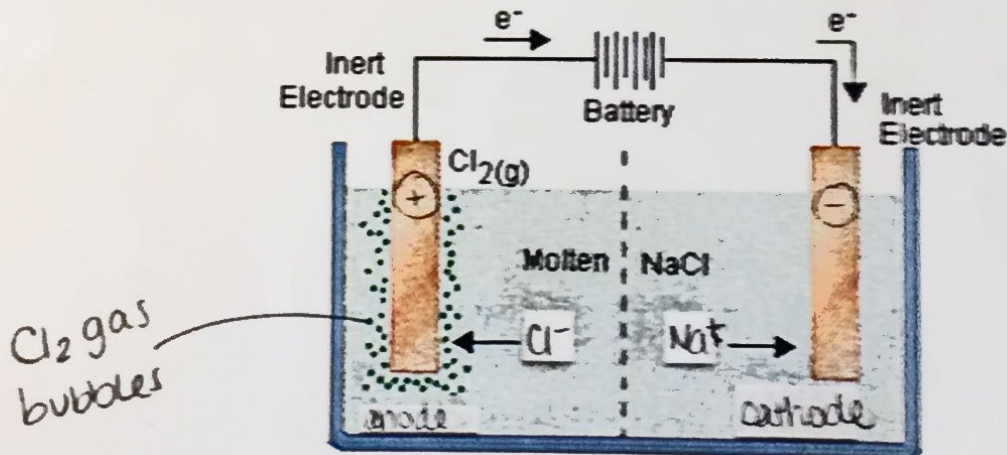
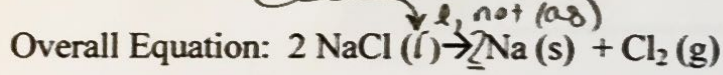
reduction @ cathode

causes metal atoms to stick onto & coat cathode

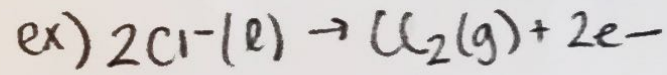


Electrolysis of Molten Salt

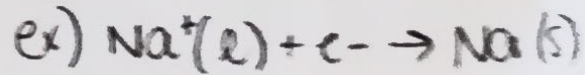
⊛ often used to obtain pure samples of group 1 & 2 metals



anions travel to anode & are oxidized

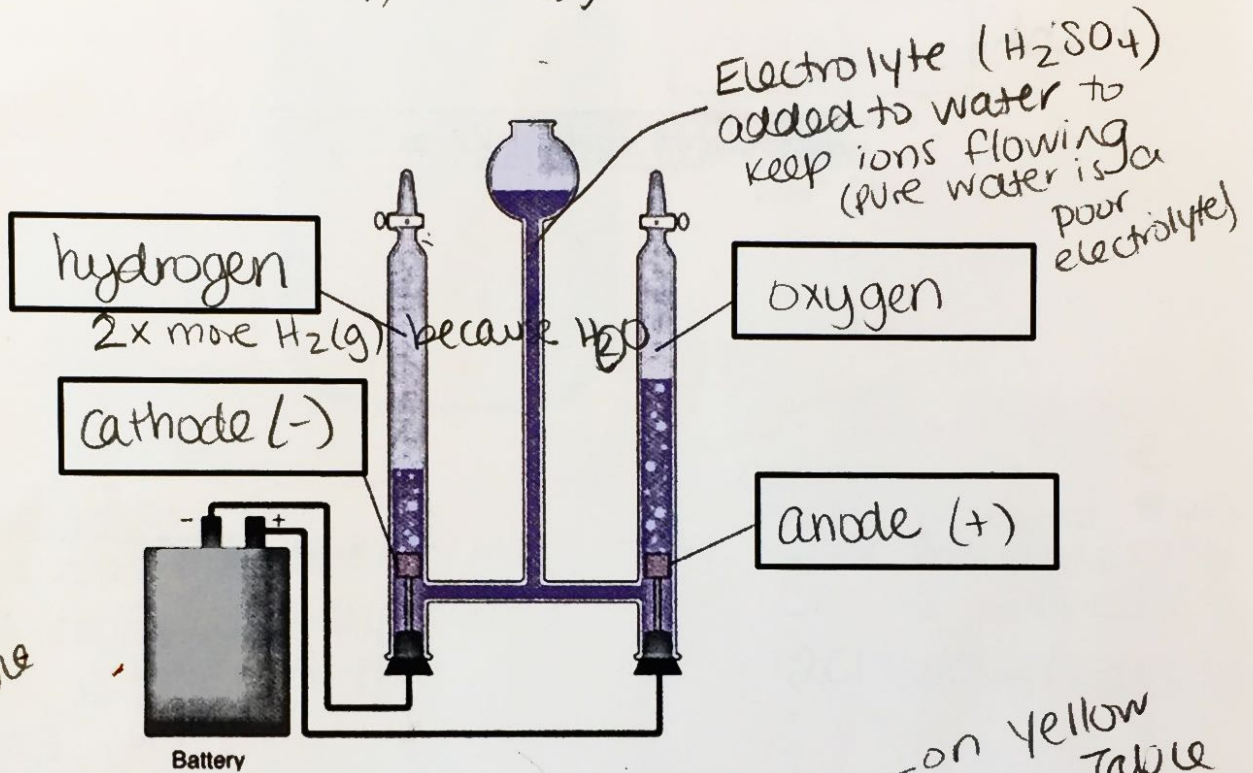
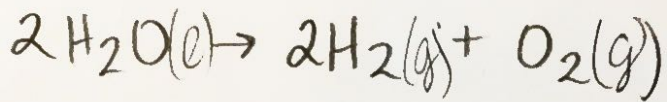


cations travel to cathode + are reduced



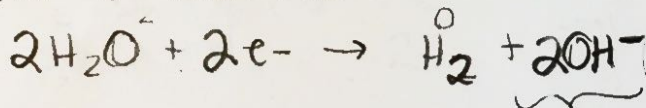
Electrolysis of Water

The hydrogen generated by the electrolysis of water can be used in conjunction with other renewable energy sources to provide a number of benefits to consumers and the environment. Hydrogen can be utilized to create highly efficient fuel cells, which can be used for a range of things including powering buildings, cars, trucks, to portable electronic devices and backup power systems. Hydrogen fuel cells can provide clean alternative energy with limited environmental impacts because they do not require the combustion of hydrocarbon fuel and do not create atmospheric emissions.



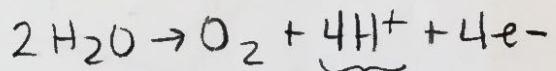
on yellow Table

reduction @ cathode:



makes the cathode compartment basic

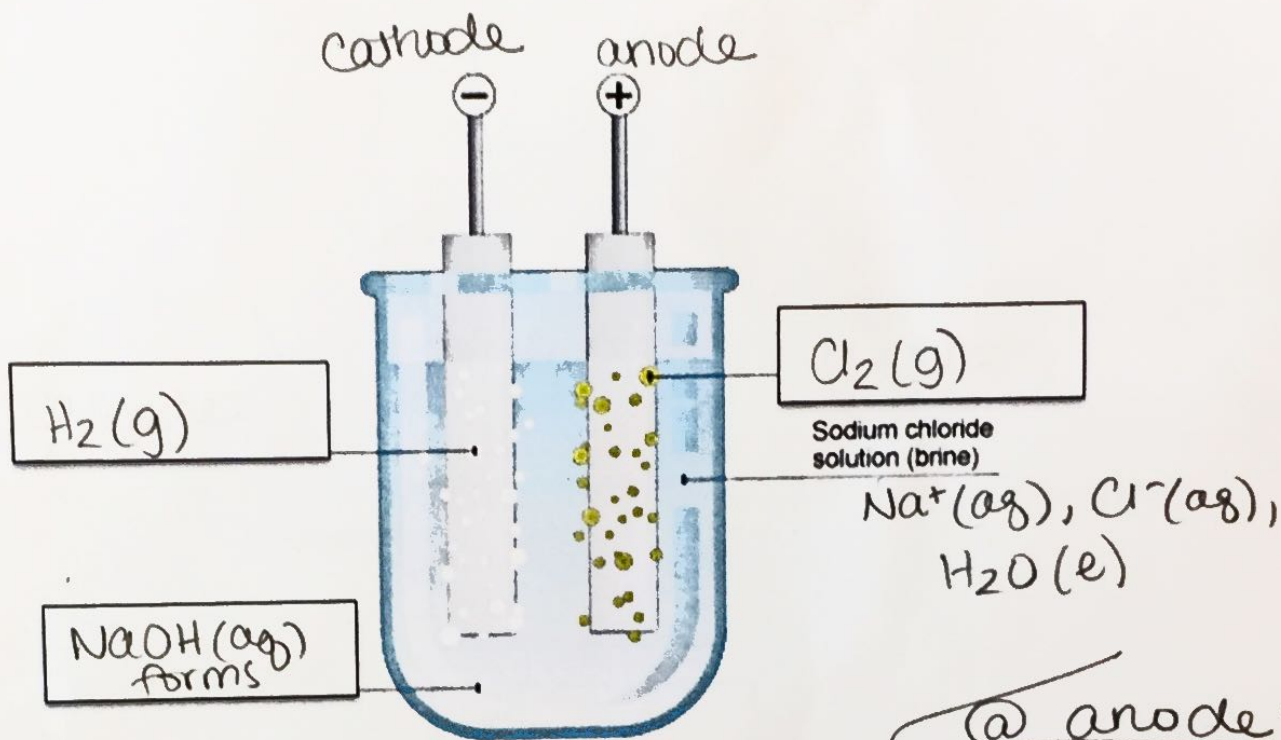
oxidation @ anode:



makes the anode compartment acidic

on yellow Table (flip)

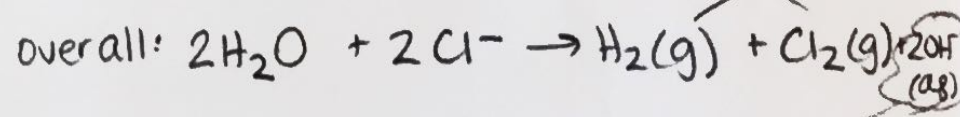
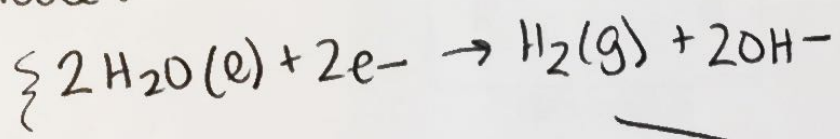
Electrolysis of Brine - NaCl (aq) - Brine - a concentrated aqueous solution of sodium chloride



@ Cathode:
 Water molecules are more easily reduced than sodium ions, so water is reduced @ cathode:

@ anode:
 Chloride ions more easily oxidized than water molecules, so Cl⁻ is oxidized.
 $2Cl^-(aq) \rightarrow Cl_2(g) + 2e^-$

same reduction as in electrolysis of water



go into solution so it becomes more basic (NaOH) over time.
 *used in cleaners.