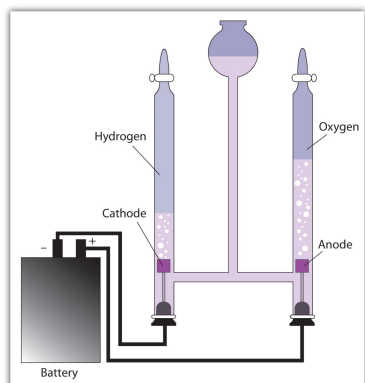


## Chem Unit 13.4 Notes - Electrolysis

### 13.4 Electrolysis



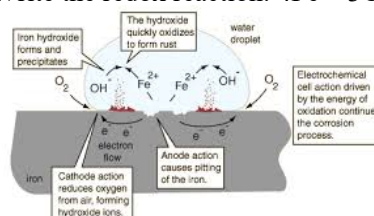
### Corrosion

**Def:** Loss of metal resulting from redox reactions.



1. Ex: Steel needs oxygen and water to rust – water acts as an electrolyte.

Write the redox reaction:  $4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$



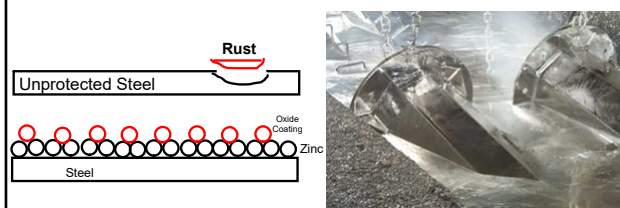
### Corrosion Prevention

Protect surfaces by painting: cars, ship hulls.

Galvanizing – dipping objects in molten zinc!

Zinc is reactive, but forms an armor-like oxide coating and does not flake off like rust.

Cr and Al do this too.



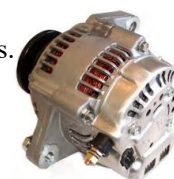
### Electrolysis

Chemical reactions can be reversed using electrolysis: breaking compounds apart with electricity.

Electrolytic Cell: A vat in which electrolysis occurs.

Rechargeable batteries use electrolysis to reverse the reaction.

Alternators recharge car batteries.



### Electrolysis of Water

You learned about hydrogen fuel cells.

Research is being done to find ways of producing hydrogen cheaply.

Electrolysis breaks water into  $\text{H}_2$  and  $\text{O}_2$ .

Demo: Water breaks up!



### Other Elements

Many elements have been discovered by electrolysis.

Humphrey Davy made sodium (and potassium) in 1807.

He melted sodium hydroxide, and ran electricity through it.

Molten sodium formed on the cathode!  
Imagine his surprise.

NaOH eats glass - demo.

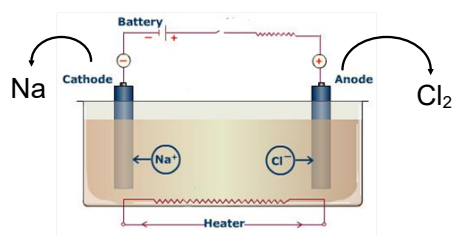
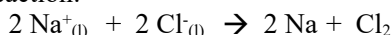


## Chem Unit 13.4 Notes - Electrolysis

### 2. Down's Cell Reaction

Sodium is made by electrolyzing molten NaCl.

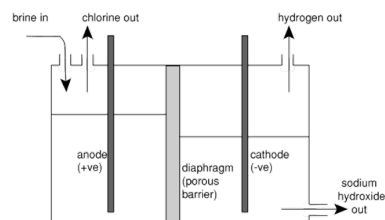
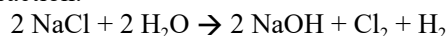
Reaction:



### 3. Brine Reaction

Brine's electrolysis (concentrated  $\text{NaCl}_{(aq)}$ ) makes  $\text{Cl}_2$  and  $\text{NaOH}$  – important industrial chemicals.

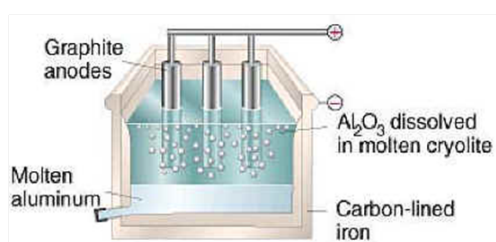
Reaction:



### Aluminum

The Hall-Héroult process converts molten aluminum oxide into aluminum metal and oxygen.

Before this, aluminum was more precious than gold: it required difficult lab conditions to make.



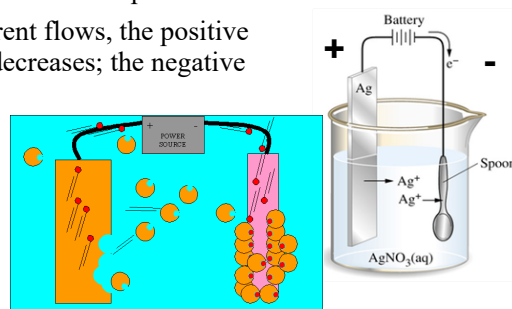
### Electroplating

Metal is deposited on another metal using electricity.

The metal to be deposited upon is negative, and a sacrificial metal is positive.

As current flows, the positive metal decreases; the negative grows.

Demo.



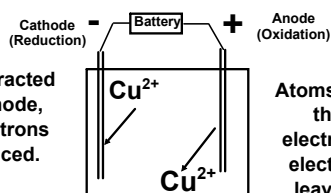
### A Note on Polarity

During electroplating, the location of the cathode and anode are reversed (vs. a battery).

Reduction still happens at the cathode, oxidation still happens at the anode.

Red-Cat-Negative (for electroplating).

Positive ions attracted to negative cathode, and pick up electrons as they're reduced.



Atoms oxidize as they lose electrons to the electrode, and leave as ions.

### Homework

13.4 Problems.  
Due: Next Class.