

Do now:

An electrochemical cell was set up with a Sn^{2+}/Sn half cell and a Ag^+/Ag half cell.

Half cell	Reduction potential (V)
Ag^+ / Ag	0.80
$\text{Sn}^{2+} / \text{Sn}$	-0.14

- Determine which half cell will undergo oxidation and which half cell will undergo reduction for the spontaneous reaction
- Write half equations for the reactions occurring in the half cells
- Justify your decision with reasons (loss/gain of e OR increase/decrease in oxidation number)
- Write the cell diagram
- Calculate E^0_{cell}

Electrochemical cells in everyday life

- Dry cell



- Lead acid cell



- Ni-cad cell



Dry cell (Leclanché Cell)

Most common type of electrochemical cell

Invented by Georges Leclanché in 1866.

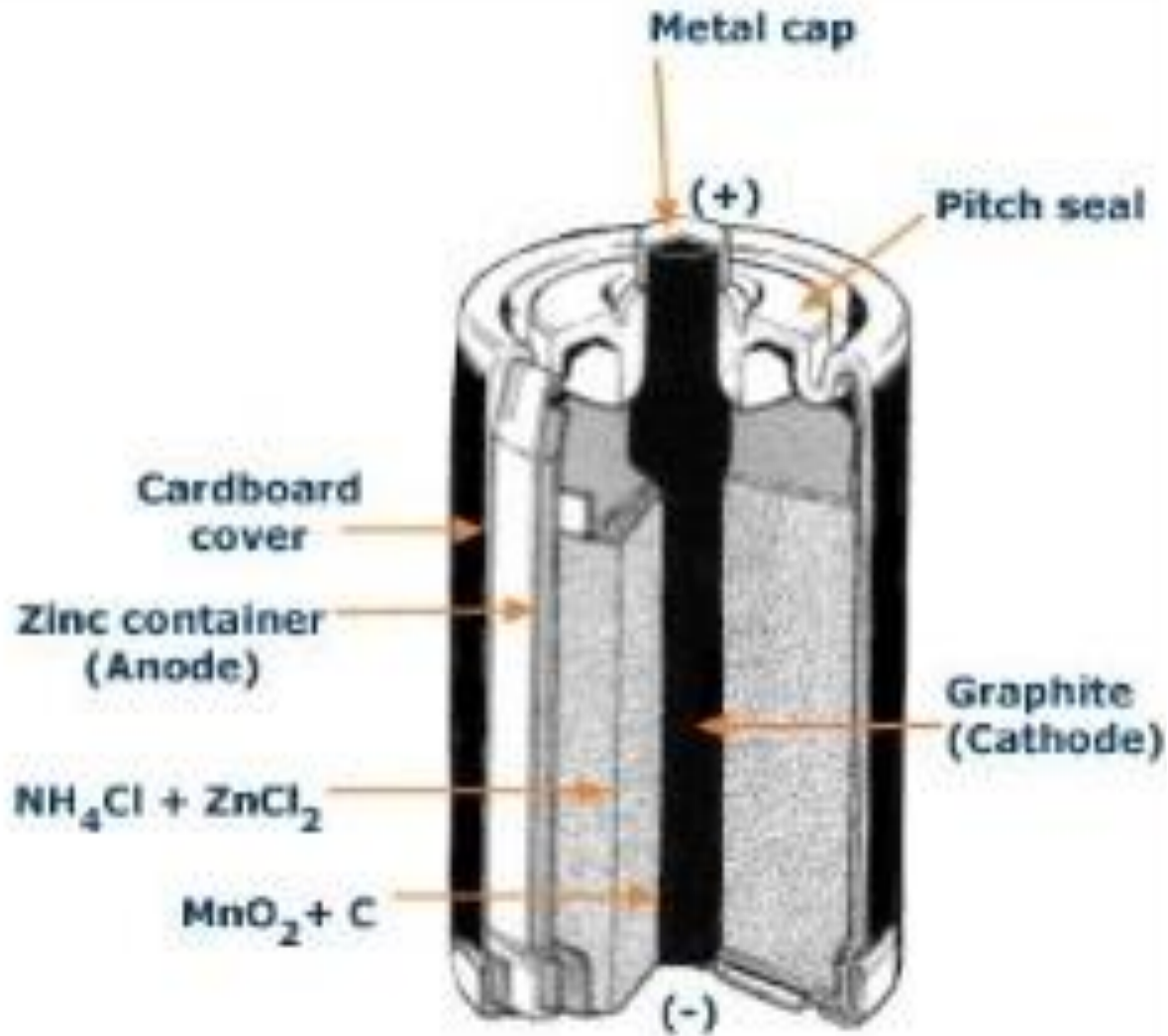


Consists of:

- manganese dioxide (MnO_2) and carbon black with graphite as a cathode
- zinc casing as an anode
- ZnCl_2 , NH_4Cl and water as an electrolyte
- insulators to prevent contact between electrodes

Not actually 'dry' as the electrolyte is a moist paste

Dry cell (Leclanché Cell)



Dry cell (Leclanché Cell)

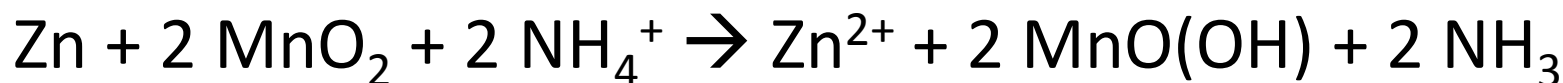
At the anode:



At the cathode:



What is the overall cell equation?



Why does a battery go flat?

The zinc casing corrodes and there is no more zinc metal to be oxidised. This causes the battery to stop working.



Dry cell (Leclanché Cell)

Advantages

- Compact
- Portable
- Completely contained within appliances
- No liquid electrolyte (not messy)

Disadvantages

- Can not be recharged

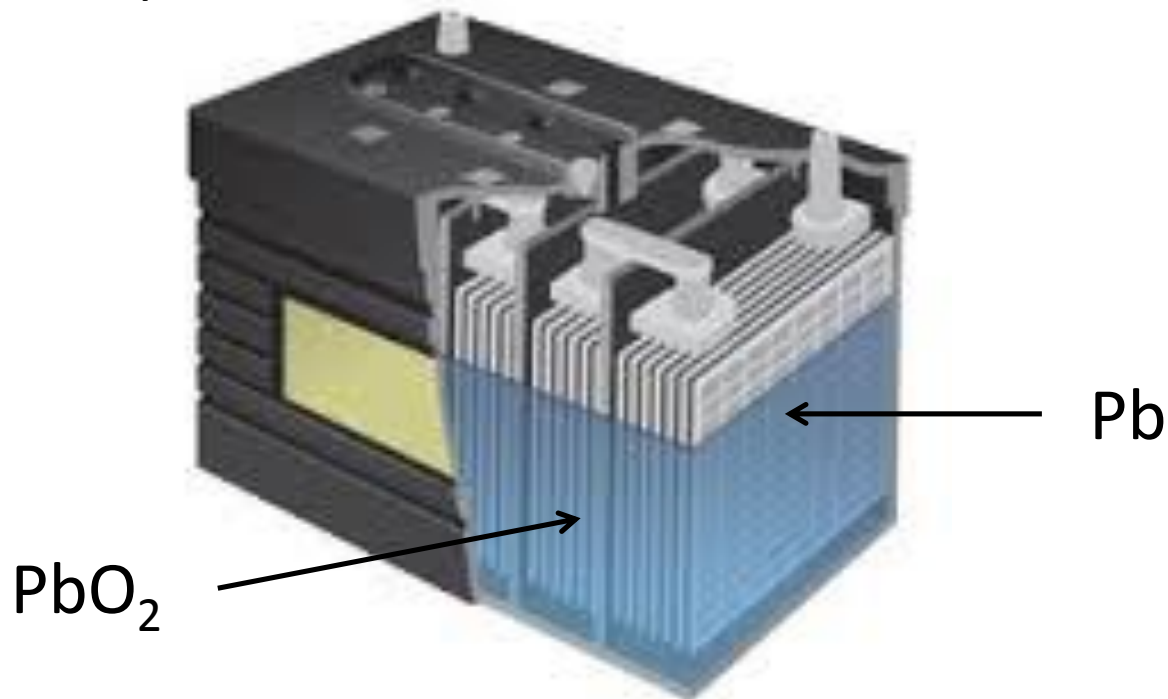


Lead acid cell

Most commonly used in car batteries

Usually consists of 6 cells connected in series

Each cell consists of plates of Pb (anode) and plates of PbO_2 (cathode) immersed in sulfuric acid.



Lead acid cell

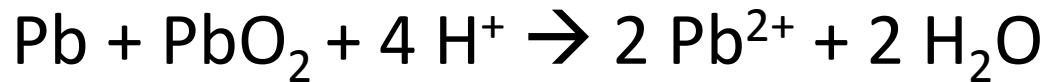
At the anode:



At the cathode:



What is the overall cell equation?



What happens to the Pb^{2+} ions?

They precipitate out to form lead sulfate (from the sulfuric acid) and hence the concentration of the sulfuric acid solution decreases.



Lead acid cell

How does recharging work?

Direct current is passed through the cell in the reverse direction. This provides the cell with energy to undergo a non-spontaneous reaction

The reaction at the anode:

Oxidation (anode is always oxidation!)



The reaction at the cathode:

Reduction (cathode is always reduction!)



Lead acid cell

Advantages

- Can be recharged

Disadvantages

- Often bulky
- Can leak acid

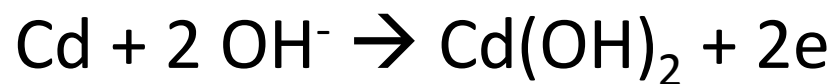


Ni-cad cell

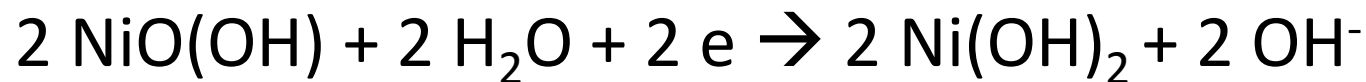
A popular form of rechargeable battery, consists of nickel and cadmium (hence the name!)

The battery is made up of a nickel(III) oxide-hydroxide (NiO(OH)) electrode plate, a cadmium (Cd) plate and a basic (alkaline) electrolyte (KOH).

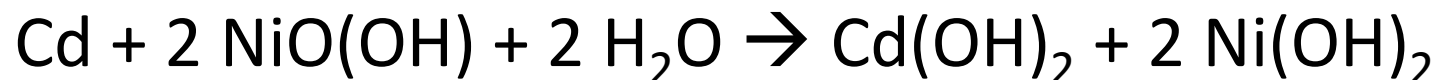
At the anode:



At the cathode:



What is the overall cell equation?



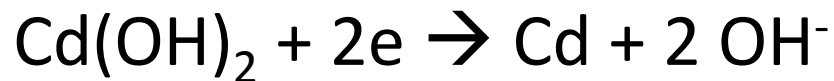
Ni-cad cell

Recharging: energy in the form of electricity is passed through the cell allowing the non-spontaneous reaction to happen

At the anode:



At the cathode:



What is the overall cell equation?



In the internal exam

You will be given:

- What the cell is made up of
- Standard reduction potentials for each half cell

You will be expected to:

- Discuss which species/material is oxidised and which is reduced and at which electrode
- Justify your choice with reference to ON or e transfer
- Write balanced half and full equations
- Calculate the cell potential
- Discuss the recharging process and how it is done (if there is one!)