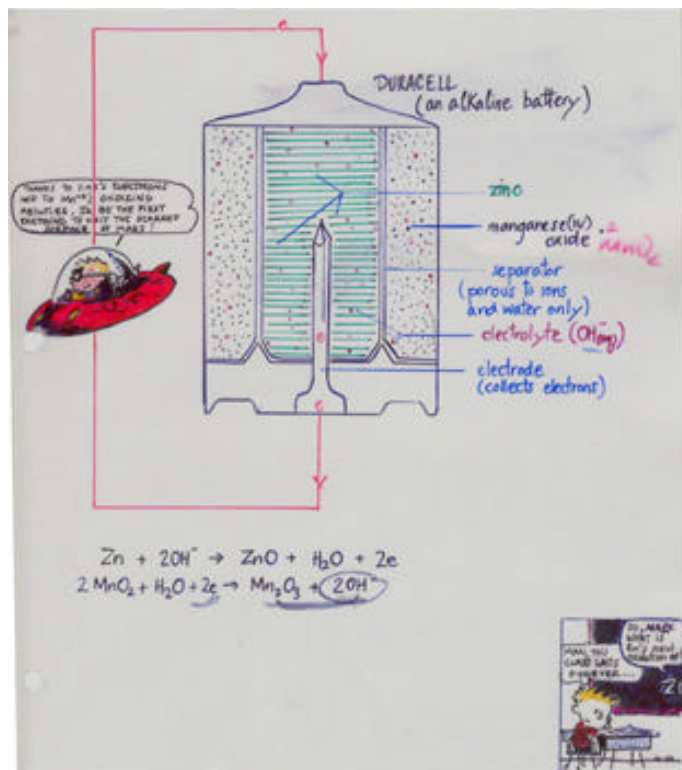
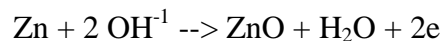


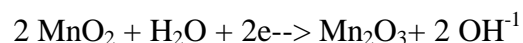
How a Duracell (Alkaline Battery) Works



Like the electrochemical cells we studied, an alkaline battery has an anode. At the anode, electrons are lost, and these are the electrons that leave the battery and power the gadgets that run on batteries. The anode is made of zinc:



The electrons eventually return to the battery, where they are accepted at the cathode by a black powder known as MnO_2 .



The anode and the cathode are kept apart by a plastic membrane that still allows hydroxide ion and water to flow back and

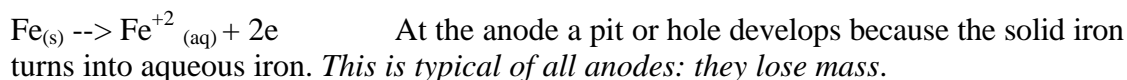
forth. The overall reaction has a positive potential; the reaction is spontaneous, and it provides the driving force for the work that batteries do.

There are two main reasons why alkaline batteries last longer than dry cells.

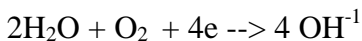
1. Notice how two of the reactants (water at the cathode, and OH^{-1} at the anode) are recycled.
2. In dry cells hydrogen gas is produced by one of the reactions, so that MnO_2 is wasted just to prevent the gas from increasing pressure within the battery. In alkaline cells, all of the MnO_2 is involved in generating energy.

How Corrosion Happens

Corrosion occurs when a water droplet facilitates the oxidation of iron:



At the cathode oxygen , with the help of water, collects the electrons and turns into hydroxide:



Still at the cathode the Fe^{+2} "swims" over from the anode, and eventually becomes Fe^{+3} . This ion combines with hydroxide and becomes $\text{Fe}(\text{OH})_3$ and eventually $\text{Fe}_2\text{O}_3 = \text{rust}$.

Salt on the road accelerates corrosion because it acts as a salt bridge for the electrochemical cell created by rusting, but also because FeCl_3 (from NaCl) that's formed is more soluble than $\text{Fe}(\text{OH})_3$. The consumption of Fe^{+3} drives the equilibrium (overall reaction of two mentioned half reactions) to the right, and forms more corroded iron.

To prevent corrosion of your car:

1. Wash your car frequently. Dirt traps moisture, which triggers both half-reactions.
2. Wax it. Wax prevents both oxygen and water from reaching the metal.
3. Fix any dents immediately. When metal is stressed it loses electrons more easily.
4. Coat the underneath with oil prior to the winter.
5. Make sure the manufacturer used Zn in the alloy. Zn sacrifices itself in the sense that it is better than iron at losing electrons, so it will reverse the initial reaction of corrosion:

