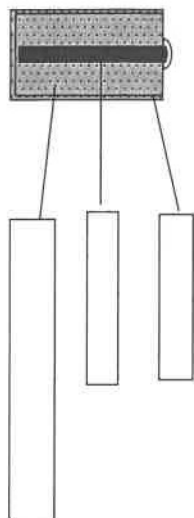


Cells (Batteries) Types – Student Notes

Primary Cells – _____

I. **Regular Carbon** – _____

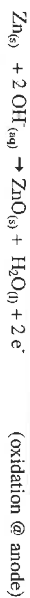
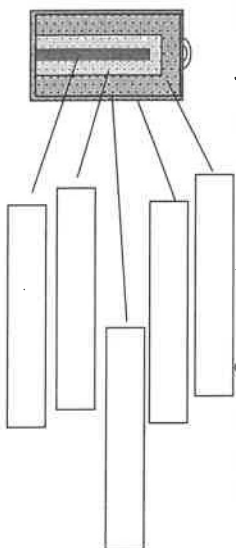


(oxidation @ anode)

(reduction @ cathode)

Overall reaction:

II. **Alkaline Dry Cells** – more efficient; better in high load situations



III. **Mercury Battery** – smaller; used to power hearing aids & calculators



(oxidation @ anode)

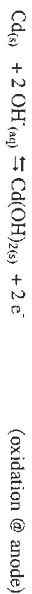
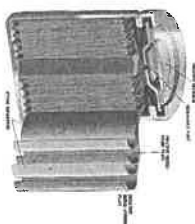
(reduction @ cathode)

Overall reaction:



Secondary Cells – these cells can be re-charged by running a current backwards through them

IV. **NiCad Batteries** – the first of the practical “dry cell” re-chargable



Overall reaction:

These reactions can be reversed. The cell can be re-charged many times over. The cells are more expensive to manufacture but last much longer. The reactions are not 100% reversible and eventually the cells can be made to “hold” a charge and must be replaced.

V. **Lead-Acid Storage Battery** – the first practical re-chargeable battery; still used in cars, motorcycles, boats etc.

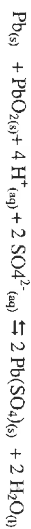


This is the first true "battery" made up of 6 separate cells. It is a good choice for motor vehicles because it provides a large initial supply of energy to start the engine, has a long shelf life, and is reliable at low temperatures. The downside is the weight of the batteries (they contain lead after all) and the environmental problems of lead.

_____ (oxidation @ anode)

_____ (reduction @ cathode)

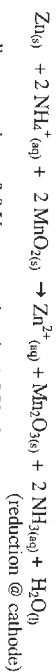
Overall Reaction:



VI. **Lithium Battery** – an alternative to the Lead-Acid battery; a much higher power to mass ratio than the lead-acid; better for use in electric cars, small electric devices such as cameras

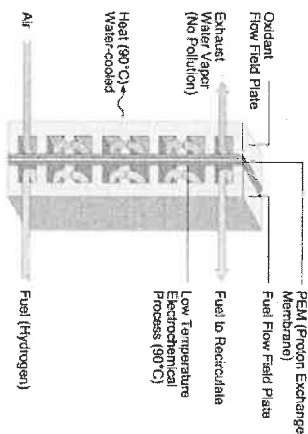


$\text{Li}_{(s)} \rightleftharpoons \text{Li}^+_{(aq)} + 2 e^-$ (oxidation @ anode)



These cells output almost 3.0 V compared to the 1.5 V of regular carbon – zinc cells.

VII. **Fuel Cells** – combining hydrogen gas with oxygen gas without "burning" but with the production of electricity.



The reaction occurs in two half cells as follows:

_____ (oxidation @ anode)

_____ (reduction @ cathode)

Overall Reaction:

(which is the same as burning H_2 with O_2)

The great thing about fuel cells is that they are very low polluters. The only product is water. The fuel sources are atmospheric oxygen and breaking down water can generate hydrogen. Large solar cells using the sun energy could be used to do this.